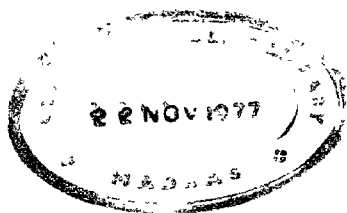


REPORT OF THE
NATIONAL COMMISSION ON
AGRICULTURE

1976

PART I
REVIEW AND PROGRESS



GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE AND IRRIGATION
NEW DELHI

P. Agr. 136 I

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PREFACE

22 NOV 1977

The Report of the National Commission on Agriculture comprises 69 chapters in 15 parts. A complete list of chapters and parts is given in pages (iii) to (v)

This volume entitled 'Review and Progress' is Part I of the Report and is divided into the following four chapters :

1. Introduction
2. Historical Review
3. Progress of Agricultural Development
4. Some Economic Aspects.

22 NOV 1977

**REPORT OF THE
NATIONAL COMMISSION ON AGRICULTURE**

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3. Progress of Agricultural Development
4. Some Economic Aspects

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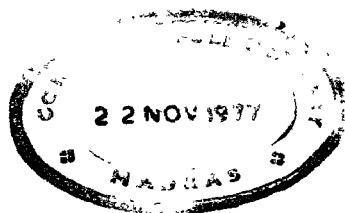
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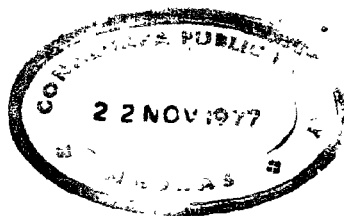
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INTRODUCTION

1 BACKGROUND

1.1.1 The Royal Commission on Agriculture was appointed in 1926 specifically to examine the conditions of agriculture and rural economy in India. Its comprehensive Report embodies valuable recommendations for the improvement of the agrarian economy. Since then momentous events changed radically the Indian economy and the agricultural scene. The country was partitioned and attained Independence. The Partition brought about an imbalance in the country's agricultural resource endowments. After Independence, the Central and State Governments adopted the objective of planned economic growth and social development. Also, there were new aspirations among the masses who looked forward not only to a higher standard of life but also for an egalitarian social order. Due to rapid growth in population, urbanisation and increase in income, the demand for food and agro-based commodities began to rise fast.

1.1.2 Faced with these new challenges, Indian agriculture at that time, particularly in early sixties, was under a spell of stagnation. In mid-sixties application of science and technology supported by infrastructural facilities and the requisite incentives and services ushered the new technology of agricultural development. There was a breakthrough in one or two cereal crops with a promise of similar breakthrough in other cereal and some non-food crops. While there was an impressive increase in foodgrains, there were critical shortages in fat and protein production. It, therefore, became necessary to diversify agriculture and to secure an integrated development of crop production, livestock development, fisheries and forestry. In this phase of agricultural growth and development, there is urgent need for policies to deal with the emerging problems of disparity among low and high income farmers, the irrigated and the rainfed and disadvantageous areas, and to establish an agrarian system based on equity and justice. This calls for sustained efforts in institution building and orienting research and extension facilities to new demands in development.

Terms of Reference

1.1.3 In the context of the agricultural situation as indicated above, the Government of India appointed the National Commission on Agriculture on August 29, 1970 with the following terms of reference :

1. To examine comprehensively the current progress of agriculture in India and to make recommendations for its improvement and modernisation with a view to promoting the welfare and prosperity of the people.
2. In particular, to investigate and report on the following aspects of agriculture :

A. Crop Production and Land and Water Development

- (i) Economics of land and water utilisation and the patterns, and scope for expansion of crops for balanced and nutritious food, industrial uses and exports with special reference to the need and scope for development of horticulture;
- (ii) Problems of soil and moisture conservation, particularly those related to the catchment areas of the major irrigation projects on the one hand and the composite implementation of soil conservation measures and improved agricultural practices on the other;
- (iii) Problems of water management and groundwater exploitation in relation to other surface irrigation projects, major and minor;
- (iv) Programmes for land reclamation and development with special consideration of the needs of areas affected by soil salinity;
- (v) Requirements of the new strategy of scientific agriculture in the shape of requisite supplies of inputs and production requisites with special consideration of sources of supply and problems and in particular :
 - (a) multiplication, distribution of high yielding varieties of seed and other improved seeds;
 - (b) propagation of soil nutrients including chemical fertilisers and other organic manures;
 - (c) measures for plant protection keeping in view the risk of pollution; and
 - (d) agricultural credit from Government, cooperative and other institutional agencies;
- (vi) The scope and long and short-term potentiality for mecha-

nisation of agriculture in the context of the use of advanced technology involving the use of high yielding varieties and adoption of multiple cropping without having adverse effect on rural employment situation.

B. Animal Products, Fisheries and Forestry

- (i) Development of animal husbandry both for providing nutritious diet to the population, draft power for agricultural operations and income and employment opportunities to the rural population;
- (ii) Development of poultry, piggery, sheep and goats for increasing income and employment opportunities in the rural areas, besides contribution to balanced diet;
- (iii) Measures necessary for disease control in animal population to increase their efficiency;
- (iv) Development of fisheries, marine, inland and estuarine for increasing income and employment opportunities for the weaker sections of population dependent for their livelihood on this occupation, besides their contribution to balanced diet and export earnings;
- (v) Development of forestry, including farm forestry as a factor in agricultural progress and as a source of raw material for industry, exports as well as for sustaining the ecological balance in nature, and for providing employment opportunities to large sections of tribal and other population living in these areas.

C. Research, Education and Training

- (i) Achievements, deficiencies and potential of the development of agricultural research and steps needed for promotion of agricultural research and its application to field conditions in the context of fast developing technology; and the need for scientific demonstrations on farmers' fields, for gearing up extension machinery and for the establishment of a two-way channel between farmers and scientists;
- (ii) Education and training of personnel, (a) at the Level of Universities and higher agricultural education, (b) middle level training of personnel engaged in occupations ancillary to agriculture, and (c) training of government and other personnel connected with agricultural development;

- (iii) Role of farmers' training and education, and methods of mobilisation of human resources and ensuring people's participation in agricultural development programmes.

D. Organisation and Supporting Measures

- (i) Examination of the structure and organisation of existing agencies and personnel both government and non-government engaged in the operation of agricultural research and development programmes and improvements and adjustments necessary to suit the changed requirements for the formulation of policies, preparation of programmes and implementation of action in the field; and the relative role and responsibilities of Central and State Governments;
- (ii) Development of transport, marketing and storage and processing industries with particular reference to food processing to support the programmes for growth in agricultural production including horticulture and animal husbandry.

E. Employment and Manpower

- (i) Employment potential of agricultural sector and the implications of the goal of full employment in agriculture for policies and programmes;
- (ii) Scope for pilot projects to demonstrate the types of schemes necessary for creating employment opportunities in the rural areas;
- (iii) Manpower requirements for agricultural programmes and methods of recruitment and training;
- (iv) Problems of small farmers and agricultural labour viewed in the context of social justice and equality of opportunity and as a factor in securing effective participation of the bulk of the Indian peasantry in stepping up agricultural production.

F. Other Aspects

- (i) Concept, potential and measures necessary for integrating area development with special reference to dry and rain-fed areas, command areas of irrigation projects and remote, economically backward hilly and tribal areas;
- (ii) Land reforms, consolidation of holdings and the link between land reforms and agricultural production;

- (iii) Study of agricultural price problems as a policy of incentives for agricultural production;
- (v) Availability of reliable and timely agricultural statistics for formulation and implementation of agricultural policies and programmes.

The Government Resolution setting up the Commission is given in Appendix 1.1.

2 COMPOSITION

1 2.1 According to Government of India Resolution, the National Commission on Agriculture comprised the Chairman, Member Secretary, five full-time Members and ten part-time Members. Shri C. Subramaniam, formerly Union Minister for Food and Agriculture, was appointed Chairman of the Commission and Shri J. S. Sharma, Economic and Statistical Adviser to the Ministry of Food and Agriculture, Government of India, and Agriculture Census Commissioner, its full-time Member Secretary, Dr. S. K. Mukherjee, Vice Chancellor, Kalyani University, Dr. H. R. Arakeri, Director of Agriculture, Mysore and Dr. P. Bhattacharya, retired Animal Husbandry Commissioner, Government of India were appointed full-time Members of the Commission by Notification dated the September 26, 1970. With effect from the same date the following part-time Members were also appointed :—

- (i) Shri M. V. Krishnappa, Member, Lok Sabha.
- (ii) Shri Randhir Singh, Member, Lok Sabha.
- (iii) Dr. Z. A. Ahmad, Member, Rajya Sabha.
- (iv) Sardar Jogendra Singh, Member, Rajya Sabha.
- (v) Dr. M. S. Swaminathan, Director, Indian Agricultural Research Institute, New Delhi.
- (vi) Shri D. P. Singh, Vice Chancellor, U. P. Agricultural University, Pantnagar.
- (vii) Shri T. A. Pai, Chairman, Life Insurance Corporation of India, Bombay.
- (viii) Shri B. S. Nag, formerly Adviser (Irrigation & Power), Planning Commission, New Delhi.
- (ix) Dr. A. M. Khusro, Professor of Economics, Institute of Economic Growth, Delhi.
- (x) Shri Hari Singh, Retired Inspector General of Forests, New Delhi.

(xi) Dr. N. K. Panikkar, Director, National Institute of Oceanography, Panaji.

Later one more part-time Member, Capt. Rattan Singh, MLA Punjab, was appointed by Notification dated November 7, 1970.

1.2.2 The Chairman of the Commission Shri C. Subramaniam resigned with effect from January 28, 1971. Shri B. Sivaraman, formerly, Secretary, Agriculture and retired Cabinet Secretary to the Government of India was appointed Vice-Chairman of the Commission on February 11, 1971. He looked after the duties of the Chairman till January 31, 1972. Shri Nathu Ram Mirdha, Member, Lok Sabha and formerly Minister for Agriculture, Rajasthan, was appointed Chairman of the Commission with effect from February 1, 1972. Shri T. A. Pai was appointed a member of the Central Cabinet on July 22, 1972. He, however, continued to be a Member of the Commission. Shri Sivaraman took over as full-time Member, Planning Commission on March 31, 1973 (AN) but he continued to function as Vice Chairman of the Commission.

1.2.3 Shri Randhir Singh, then part-time Member was appointed full-time Member (non-official) with effect from March 18, 1971. Sardar Jogindra Singh, one of the part-time Members was appointed Governor of Orissa with effect from September 20, 1971 and he ceased to be a Member of the Commission with effect from that date. Capt. Rattan Singh tendered his resignation from the membership of the Commission from May 29, 1972 on his becoming Development Minister in the Government of Punjab. Shri Triloki Singh, Member Rajya Sabha was appointed part-time Member with effect from May 29, 1973. Dr. Arakeri, consequent upon his appointment as Vice-Chancellor, University of Agricultural Sciences, Bangalore, relinquished charge of the post of a full-time Member of the Commission with effect from June 10, 1973 and he was appointed as part-time Member with effect from the same date. Dr. Bhattacharya went to Iraq on a UNDP assignment for four months, and during that period, ceased to be a Member. Shri D. P. Singh resigned from the membership of the Commission with effect from June 16, 1975. Dr. S. K. Mukherjee, consequent upon his appointment as Director, Bose Institute, Calcutta relinquished charge of the post of full-time Member with effect from January 1, 1976 and became a part-time Member with effect from the same date.

1.2.4 At present the Commission consists of the Chairman, the Vice Chairman, the Member Secretary, two full-time Members and eleven part-time Members. Appendix 1.2 indicates the composition of the Commission as on January 31, 1976.

3 MEETINGS

1.3.1 The Commission was formally inaugurated by the President of India on October 16, 1970, which was also observed as the Twentyfifth Anniversary of the Food and Agriculture Organisation of the United Nations. A copy of the Address delivered by the President on this occasion is given in Appendix 1.3. Referring to the happy coincidence of the date of inauguration of the National Commission on Agriculture with the Silver Jubilee day of the FAO, the President observed that the occasion was of historic importance for India's agriculture. Expressing his satisfaction that Shri C. Subramaniam, the former Union Minister of Food, Agriculture, Community Development and Cooperation and a principal architect of the new strategy had accepted the Chairmanship of the Commission, he stressed the urgency of rapid progress in agriculture and a bold employment policy to utilise surplus manpower. He hoped that the special programmes for small and marginal farmers, agricultural labourers and rainfed and chronically drought affected areas would have a lasting impact on Indian agricultural economy.

1.3.2 In his address on the occasion, the Chairman of the Commission recalled the events leading to the adoption of the new strategy for agricultural development in India and the progressive spread of the new technology in the form of area covered under the high yielding varieties. He drew attention to the three major types of imbalances that had developed as a result of the rapid progress in agriculture viz., the disparity between the benefits reaped by the farmers with larger holdings and those by the farmers with smaller holdings and poorer means, the advances made in the case of wheat and some millets while rice, pulses and commercial crops lagged behind and the differential rates of economic progress between irrigated farms and unirrigated farms. He also indicated briefly the major tasks set before the Commission. He emphasised the urgency of a critical and comprehensive review of the entire gamut of changes in Indian agriculture and the need for a careful assessment of the requirements in terms of additional scientific effort, training activities and input resources. A copy of the speech is given in Appendix 1.4.

1.3.3 Soon after the inauguration, the Commission called on the Prime Minister on October 17, 1970. Welcoming the Chairman and Members of the Commission the Prime Minister observed that it was an important Commission which was according first priority to scientific efforts and was giving due importance to the problem of rural employment. Among other issues the Prime Minister emphasised the need for diversification of agricultural development and proper

marketing facilities. She evinced keen interest in urgent remedial measures for removing deficiencies in agricultural research and those aspects of land reforms having immediate relevance to the adoption of the new technology.

1.3.4 The Chairman addressed letters to the Chief Ministers of States and Union Territories indicating the approach proposed to be adopted by the Commission and seeking their personal cooperation and involvement in the work of the Commission. He wrote to Vice Chancellors of agricultural universities and Directors of research institutes, drawing their attention to certain priority areas needing urgent action and the need for discussions with the scientists to have first hand knowledge of the work done by them to put agriculture on sound scientific base.

1.3.5 The Commission held in all 27 meetings. The Report as a whole was adopted on December 20, 1975. List of the meetings of the Commission and the dates on which these were held together with names of Members attending the different meetings is given in Appendix 1.5.

4 PROCEDURE OF WORK

1.4.1 When the Commission was set up it was felt that the bulk of technical information, statistical and other data needed for its work would be readily available in the Ministry of Food and Agriculture, Directorate of Economics and Statistics, Indian Council of Agricultural Research, Planning Commission and other technical and specialised organisations. In actual practice we had to supplement a great deal the available material. At an early stage we took necessary steps to collect additional material. On a variety of subjects, 59 questionnaires were issued to State Governments, agricultural universities and other educational and research institutes, farmers' organisations, political parties, other agencies, institutes and individuals. A subjectwise list of questionnaires is given in Appendix 1.6.

1.4.2 Technical and other specialists with long experience in various disciplines were appointed in the Commission to assist in investigation, collection and collation of the voluminous technical, statistical and other data as well as for analysis of the problems and preparation of material for its Report. The names of the technical, editorial and administrative personnel are given in Appendix 1.7.

1.4.3 Working group : We set up 27 working groups to examine in detail and to report on the past performance, the problems and potentialities in different fields of agricultural development, relevant

matters of policy and technical issues. In constituting the working groups we took care to enlist the assistance of top ranking specialists in the respective fields. The working groups provided an opportunity to obtain a cross section of expert opinion in the country. Some of the working groups set up sub-groups and study teams for collecting relevant information and ascertaining the views of scientists, technicians and others. The specialists in the Commission, the Ministry and/or the Central research institutes functioned as the convenors. Generally a Member of the Commission chaired a working group. A list of working groups, sub groups and study teams and their composition is given in Appendix 1.8.

1.4.4 Panel and special studies : We set up two panels : the Panel of Agricultural Administrators under the chairmanship of Shri B. Sivaraman, Vice-Chairman of the Commission and the Panel of Economists under the chairmanship of Prof. M. L. Dantwala, Professor and Head of the Department of Economics, University of Bombay. The names of the members of the panels are given in Appendix 1.9.

1.4.5 We entrusted to some specialised institutes and expert organisations a few studies to be carried out in depth. A list of the studies together with the names of institutes is given in Appendix 1.10.

5 CONSULTATIONS

State Visits

1.5.1 Soon after the completion of the preliminary study of the various problems and issues connected with our work we decided to visit States and consult Chief Ministers and their Cabinet colleagues, technical experts and departmental officials concerned with agricultural development on important policy issues, sent to them in advance. A copy of the letter addressed by the Chairman to the Chief Ministers is given in Appendix 1.11. A list of the dates of our visits to different States is given in Appendix 1.12. During our visit to States we also discussed major policy issues with progressive farmers, representatives of non-official organisations, Members of Lok Sabha and Rajya Sabha belonging to the States and Members of State Legislative Assemblies and Councils.

Research Institutes and Agricultural Universities

1.5.2 It was not possible for all of us to visit jointly the different

agricultural universities, Central and State research institutes and other organisations. Consultations on major policy issues in the sphere of research, education and extension were, therefore, arranged through visits of a group of Members.

Foreign Scientists

1.5.3 In the course of visits to this country, a number of scientists of international repute met us and discussed the various technical aspects and policy issues relating to agricultural development. Mention may be made particularly of Dr. Norman Borlaug, Director, International Maize and Wheat Improvement Centre, Mexico, Dr. A. H. Boerma, Director General, Food and Agriculture Organisation, Dr. W. David Hopper, Vice President of the Canadian Development & Research Association, Sir John Crawford, Vice Chancellor of the Australian National University and other specialists of the World Bank, Ford Foundation and Rockefeller Foundation.

1.5.4 We also met individually and in Groups agricultural scientists, Vice Chancellors of agricultural universities, project coordinators of all-India coordinated research projects, Directors of community development councils, officers of Central and State Governments, representatives of associations concerned with agriculture, progressive farmers and individuals in public life and discussed with them issues relating to agricultural development. We also received from some of these persons memoranda and notes on various matters connected with our work.

6 INTERIM REPORTS

1.6.1 We were required to submit Interim Reports on the following items mentioned in our terms of reference :

- (i) Agricultural research and extension;
- (ii) Administrative organisation for agricultural research and development;
- (iii) Employment potential of agricultural sector;
- (iv) Problems of small farmers and agricultural labourers;
- (v) Programmes for integrated area development;
- (vi) Any other items that the Commission may deem fit.

1.6.2 Besides the above broad subject-wise indications there were requests for Interim Reports from the Planning Commission and the Union Minister of State for Agriculture. The Planning Commission suggested that we should submit Interim Reports on a number of important topics so that they might be considered in connection with the

formulation of the Fifth Five Year Plan. In response to this request the following Reports were prepared :

- (i) Reorientation of Programmes of Small Farmers and Marginal Farmers and Agricultural Labourers' Development Agencies.
- (ii) Milk Production through Small and Marginal Farmers and Agricultural Labourers.
- (iii) Poultry, Sheep and Pig Production through Small and Marginal Farmers and Agricultural Labourers for Supplementing their Income.
- (iv) Modernising Irrigation Systems and Integrated Development of Commanded Areas.
- (v) Production Forestry—Man-made Forests.
- (vi) Social Forestry.
- (vii) Forest Research and Education.

1.6.3 The Union Minister of State for Agriculture requested us to submit Interim Reports on :

- (i) Marketing and pricing aspects of certain commercial crops.
- (ii) Structure and organisation of existing agencies and personnel engaged in development.
- (iii) Utilisation of irrigation potential and problems of water management
- (iv) Organisation and functions of Commodity Development Councils.
- (v) Agricultural price problems as a policy of incentives for agricultural production.

1.6.4 Under item (vi) indicated in paragraph 1.6.1, we submitted Interim Reports on Some Aspects of Agricultural Research, Extension and Training and Credit Services for Small and Marginal Farmers and Agricultural Labourers. The purpose of submitting these Reports was to obtain the Government's reaction to our proposals. We intended to take them into account in our Report.

1.6.5 We submitted Interim Reports on the following urgent problems on which the Government could take immediate action pending our Report. These are :

- (i) Multiplication and Distribution of Quality Seed pertaining to High Yielding Varieties and Hybrids of Cereals.
- (ii) Potato Seed.
- (iii) Fertiliser Distribution.
- (iv) Establishment of Agro-meteorological Divisions in Agricultural Universities.
- (v) Soil Survey and Soil Map of India.
- (vi) House-sites for Landless Agricultural Labourers.

1.6.6 Our Reports on Desert Development, Whole Village Development and Some Important Aspects of Livestock Development in North Eastern States were submitted under programmes of integrated area development. We submitted to the Government in all 24 Interim Reports. A list of the Interim Reports together with the dates of submission to the Government is given in Appendix 1.13.

1.6.7 We are glad to state that the Ministry of Agriculture and Irrigation set up task forces and officers' groups to examine these Reports in consultation with the concerned departments. Copies of Reports were sent to the States for necessary action. These were also taken into account by the Planning Commission and the Ministry in the formulation of the Fifth Five Year Plan. Quite a few of our major recommendations have been accepted by the Government and are being implemented as part of the policies/programmes under the Plan. Some recommendations have been modified and on some action has been delayed.

7 SCOPE OF THE REPORT

1.7.1 Before we indicate in detail the scope of the Report, a few preliminary observations may be in order.

1.7.2 The Report deals with the problems of agricultural development in 21 States and the Union Territories. Sikkim became the twenty-second State on May 16, 1975. As such it was too late to investigate the problems of agriculture in Sikkim and make recommendations for its improvement in the Report. As far as possible we have used in the chapters latest available up-to-date data. In most cases, the data relate to 1973-74.

1.7.3 The connotation of the word 'agriculture' is a comprehensive one and includes crop production together with land and water management, animal husbandry, fishery and forestry. In our Report we have used it generally in this sense. In some places we have used the word in its limited sense *e.g.*, crop production and land and water management. However, the use of the word in the limited sense would be clear from the context.

1.7.4 Chapters in each part have been so arranged that they by and large consist of related subjects. There has been some unavoidable overlapping which has been dealt with by suitable cross references. Important recommendations have been indicated in the last section of each chapter.

1.7.5 A decimal system of notation has been used for numbering the paragraphs of the Report. The first digit refers to the chapter,

the second digit to the section and the third to the paragraph number. Additional information needed for further explanation or understanding of the material contained in the text is given in appendices to each chapter. They are numbered in the same way as the chapters. References to the journals and books appear as foot-notes in the relevant page.

1.7.6 We are happy to state that the Report is unanimous and carries the general consensus of State Governments and concerned Central Ministries and progressive farmers on all major policies and programmes. It comprises 69 chapters in 15 parts. Part I including this chapter gives a brief historical review of the main policy and institutional changes since the publication of the Report of Royal Commission on Agriculture in India in 1928, progress upto 1973-74 of agricultural development before and after Independence and some economic aspects of agriculture.

1.7.7 Part II starts with the role of agriculture in economic development and proceeds to discuss the principle of growth with social justice. The main issues of policy and strategy and centre and State relations in agriculture are elaborated in the next two chapters. Nutrition policies are discussed in the last chapter of this part. Part III deals with demand projections, supply possibilities and export possibilities and import substitution.

1.7.8 In Part IV, the chapter on climate and agriculture is followed by descriptions of the important rainfall and cropping patterns in India. In Part V are elaborated Resource Development, such as irrigation, command area development, land reclamation and development, soil and moisture conservation and electricity for rural development.

1.7.9 Part VI deals with Crop Production. Sericulture and Apiculture in eight chapters : reorientation of cropping systems, foodgrains, commercial crops, horticulture, plantation and fodder crops, sericulture and apiculture.

1.7.10 Animal Husbandry has been discussed in Part VII in nine chapters. They are cattle and buffaloes, dairy development, sheep and goats, poultry, other livestock, mixed farming, livestock feeding, animal health, meat production and animal by-products. Fodder crops and animal husbandry research and education have been discussed in Parts VI and XI respectively.

1.7.11 There are four chapters in Part VIII on Fisheries viz. inland fisheries and aquaculture, marine fisheries, crustacean fisheries and their utilisation and making of fish and fishery products.

1.7.12 Part IX on Forestry begins with the chapter on forest policy and goes on to deal with the various aspects of forestry development in separate chapters on production and social forestry, minor forest

produce, forest ecology and wild life management, protection and law and planning, research and education related to forests.

1.7.13 Part X is concerned with Inputs, Separate chapters have been devoted to seeds, fertilisers and manures, plant protection chemicals, farm power and implements and machinery. Research, Education and Extension are covered in three separate chapters in Part XI. The supporting services and incentives are dealt with in Part XII. There are separate chapters on credit and incentives, marketing, transport and storage, processing and agro-industries.

1.7.14 Part XIII deals with Rural Employment and Special Area Programmes in two separate chapters. Planning, statistics Administration and farmers' organisations are discussed in Part XIV in separate chapters. There is also a brief chapter on international cooperation.

1.7.15 The last part of the Report, viz., Part XV is directed to agrarian Reforms. The first two chapters of this part give a review of the land reforms policy and land reforms legislation and implementation respectively. The agrarian structure and perspective and consolidation of holdings and agricultural labour are presented in three chapters.

1.7.16 The issues discussed in the Interim Reports are mentioned in the Report whenever necessary, but are not repeated. Most of the recommendations in the Interim Reports retain their validity and therefore the Interim Reports form important adjuncts to this Report.

1.7.17 The Statewise Reports on Rainfall and Cropping Patterns excluding that of Karnataka together with the basic data are being published separately as companion volumes. The Report on Karnataka appears as an Appendix to Chapter 14 of Part IV.

1.7.18 With a view to placing before a wider public the main features and a summary of conclusions and recommendations of this Report, an abridged Report would be brought out separately. Thus the Commission has prepared and submitted :

The Report comprising 69 chapters in 15 parts; 24 Interim Reports in 6 volumes; and Statewise Reports on Rainfall and Cropping Patterns in 16 volumes.

8 ACKNOWLEDGEMENTS

1.8.1 At the outset we would like to express our deep sense of gratitude to the first Chairman of the Commission Shri C. Subramaniam. It was under his unique leadership that the Commission's work in the initial phase was organised for dealing with the challenging task. Even after his resignation he continued to take keen interest in its work.

We are deeply grateful to Shri Fakhruddin Ali Ahmed, former Union Minister for Agriculture and Irrigation and now the President of India for his sustained interest in the work of the Commission. We extend our sincere thanks to Shri Jagjivan Ram, the Union Minister for Agriculture and Irrigation for his help and advice on numerous problems that confronted us at various stages of our work. To Shri A. P. Shinde and Shri Shah Nawaz Khan we would like to express our thanks for their interest and help in our task.

1.8.2 We had valuable assistance and unstinted cooperation from the administrative and technical officers of the Union Ministry of Agriculture and Irrigation and its attached offices. We would like to place on record our appreciation of their help. The officers of the Indian Council of Agricultural Research and the Directors and other scientists in the various research institutes under it gave us in full measure their cooperation and assistance. We are grateful to all of them.

1.8.3 We received unqualified cooperation from the State Governments and Administrations of the Union Territories. They made special arrangements for the collection and supply of information and material required by us. They also made excellent arrangements for our visits to the States. During these visits, the Chief Ministers, their Cabinet colleagues, concerned officials, both administrative and technical, many Members of Parliament and State Legislatures, progressive farmers and other interested and knowledgeable persons spared their valuable time to give us the benefit of their views. We wish to express our gratitude to all of them.

1.8.4 We thank the Vice Chancellors, Professors and other scientists of the agricultural and other universities and research institutes who furnished us valuable material and gave us the benefit of their advice and views during our visits to their Institutions.

1.8.5 We are highly appreciative of the informative discussions which we had with many distinguished Indian and Foreign scientists on technological developments in different fields of agriculture.

1.8.6 In connection with our work we had set up a number of panels, working groups, sub groups and study teams. We are grateful to the Chairmen, Convenors and members of these bodies for their expert contribution. We also thank the institutes which carried out various studies on our behalf.

1.8.7 The consultants, specialists, other technical and non-technical officers of the Commission who formed its backbone deserve our praise for their willing and untiring labour. We would like to acknowledge the valuable services rendered by the other staff of the Commission. The Chief Editor and the Editors had to put in very hard work in editing the Report which we deeply appreciate.

1.8.8 We wish to place on record our appreciation of the out-

standing contribution which the Member Secretary made with his devoted and hard work, ability and experience.

1.8.9 Since the very inception of this Commission, the Press has taken a very keen interest in its work. Whenever we submitted our Interim Reports to the Government or visited any State capital, we met the Press. We are indeed grateful for all the interest and understanding which the Press has always shown in the work of the Commission.

APPENDIX 1.1

(Paragraph 1.1.3)

Resolution Setting up the
National Commission on Agriculture
No. 25-13/68-Genl. Coord.

Government of India

Ministry of Food, Agri., C.D. & Co-operation
(Department of Agriculture)

New Delhi, the 29th August 1970

RESOLUTION

1. Agriculture has a dominant role in the Indian economy contributing nearly half of the national income, providing employment to about 70% of the working population and accounting for a sizeable share of the country's foreign exchange earnings.

2. Population has been increasing at a rapid rate, leading to increase in demand for food and other consumer goods, many of which have an agricultural base. There is a legitimate aspiration of the people in rural areas to improve their standards of living and to share the fruits of development.

3. Rapid improvement in agriculture is possible through advances in research and technological innovations, larger utilisation of inputs and reduction in dependence on the vagaries of weather through irrigation and other improved practices. Recent trends have thrown up vast possibilities of an accelerated growth in Indian agriculture. The experience of the Intensive Agricultural Development Programme (Package Programme). Intensive Agricultural Area Programme and the introduction of the new strategy have shown that the farmers are responsive to the adoption of scientific and improved agricultural practices and to the incentive of prices. Notable breakthrough has been achieved in respect of one or two crops and there is the promise of a similar breakthrough in respect of other cereal crops and some non-food crops. There has been increasing evidence of investment in irrigation and other facilities both from private and institutional resources with a view to reducing the dependence on vagaries of weather. The utilisation of technological and non-farm inputs has also been growing at a rapid rate. The development of transport and other facilities is opening up the rural areas and is providing outlet for the farm produce.

4. During the very process of this development, the need for taking measures to ensure that the benefits of the new technology are shared by the bulk of the farming population and are not limited to the better-off class of farmers has become obvious. It has become clear that besides the irrigated areas which permit of intensive development through multiple cropping and application of inputs in intensive doses, there are large tracts under rain-fed agriculture requiring special attention both in the matter of evolution of the appropriate technology suited to those areas and of making available the necessary resources to the farmers. Moreover, currently, while there have been impressive increases in foodgrains critical shortages are developing in respect of fat and protein production. It is, therefore, necessary to diversify agriculture between crops and to extend the new technology to horticultural crops

also. The overall objective should be to secure integrated development of agriculture, animal husbandry, poultry, inland fisheries and forestry for ensuring a balanced diet and development.

5. The possibilities of progress in different directions have made it incumbent to take a coordinated and forward view of the different aspects of development. In spheres such as those dealing with the problems of unemployment and reduction in the disparities between the low and high income farmers as well as irrigated and rain-fed areas urgent action is necessary. The existing arrangements for research and extension which are basic for sustaining the tempo of development have also to be reviewed for coping with the challenges posed by the adoption of new technology and providing a two-way channel of communication between the farmer and the scientist.

6. All in all, it has to be ensured that the development of agriculture to the welfare of the vast multitudes of population living in the rural areas.

7. It is in this background that the Government of India have taken the decision to set up a National Commission to enquire into the progress, problems and potential of Indian Agriculture. In status as well as in the assignment given to it, the Commission will be of the highest level and Government are confident that its report and recommendations would have a far-reaching and historic impact on the further development of Indian Agriculture in all its aspects.

8. In the context of the agricultural situation described in the foregoing paragraphs, the terms of reference of the Commission will be as follows:—

1. To examine comprehensively the current progress of agriculture in India and to make recommendations for its improvement and modernisation with a view to promoting the welfare and prosperity of the people;
2. In particular, investigate and report on the following aspects of agriculture :

A. Crop Production and Land and Water Development

- (i) Economics of land and water utilisation and the patterns, and scope for expansion of crops for balanced and nutritious food, industrial uses and exports with special reference to the need and scope for development of horticulture;
- (ii) Problems of soil and moisture conservation, particularly those related to the catchment areas of the major irrigation projects on the one hand and the composite implementation of soil conservation measures and improved agricultural practices on the other;
- (iii) Problems of water management and ground water exploitation in relation to other surface irrigation projects, major and minor;
- (iv) Programmes for land reclamation and development with special consideration of the needs of areas affected by soil salinity;
- (v) Requirements of the new strategy of scientific agriculture in the shape of requisites with special consideration of sources of supply and problems and in particular :—
 - (a) multiplication, distribution of high-yielding varieties of seed and other improved seeds;
 - (b) propagation of soil nutrients including chemical fertilisers and other organic manures;

- (c) measures for plant protection keeping in view the risk of pollution, and
- (d) agricultural credit from Government, cooperative and other institutional agencies;
- (vi) The scope and long and short-term potentiality for mechanisation of agriculture in the context of the use of advanced technology involving the use of high yielding varieties and adoption of multiple cropping without having adverse effect on rural employment situation.

B. Animal Products, Fisheries and Forestry

- (i) Development of animal husbandry both for providing nutritious diet to the population, draft power for agricultural operations and income and employment opportunities to the rural population;
- (ii) Development of poultry, piggy, sheep and goats for increasing income and employment opportunities in the rural areas, besides contribution to balanced diet;
- (iii) Measures necessary for disease control in animal population to increase their efficiency;
- (iv) Development of fisheries, marine, inland and estuarine for increasing income and employment opportunities for the weaker section of population dependent for their livelihood on this occupation, besides their contribution to balanced diet and export earnings;
- (v) Development of forestry, including farm forestry as a factor in agricultural progress and as a source of raw material for industry, exports as well as for sustaining the ecological balance in nature, and for providing employment opportunities to large sections of tribal and other population living in these areas.

C. Research, Education and Training

- (i) Achievements, deficiencies and potential of the development of agricultural research and steps needed for promotion of agricultural research and its application to field conditions in the context of fast developing technology; and the need for scientific demonstrations on farmers' fields, for gearing up extension machinery and for the establishment of a two-way channel between farmers and scientists;
- (ii) Education and training of personnel, (a) at the level of Universities and higher agricultural education, (b) middle level training of personnel engaged in occupations ancillary to agriculture, and (c) training of government and other personnel connected with agricultural development;
- (iii) Role of farmers' training and education, and methods of mobilisation of human resources and ensuring people's participation in agricultural development programmes.

D. Organisation and Supporting Measures

- (i) Examination of the structure and organisation of existing agencies

and personnel, both government and non-government engaged in the operation of agricultural research and development programmes and improvements and adjustments necessary to suit the changed requirements for the formulation of policies, preparation of programmes and implementation of action in the field; and the relative role and responsibilities of Central and State Governments;

- (ii) Development of transport, marketing and storage and processing industries with particular reference to food processing to support the programmes for growth in agricultural production, including horticulture and animal husbandry.

E. Employment and Manpower

- (i) Employment potential of agricultural sector and the implications of the goal of full employment in agriculture for policies and programmes;
- (ii) Scope for pilot projects to demonstrate the types of schemes necessary for creating employment opportunities in the rural areas;
- (iii) Manpower requirements for agricultural programmes and methods of recruitment and training;
- (iv) Problems of small farmers and agricultural labour viewed in the context of social justice and equality of opportunity and as a factor in securing effective participation of the bulk of the Indian peasantry in stepping up agricultural production.

F. Other Aspects

- (i) Concept, potential and measures necessary for integrating area development with special reference to dry and rainfed areas, command areas of irrigation projects and remote, economically, backward, hilly and tribal areas;
- (ii) Land reforms, consolidation of holdings and the link between land reforms and agricultural production;
- (iii) Study of agricultural price problems as a policy of incentives for agricultural production;
- (iv) Crop insurance;
- (v) Availability of reliable and timely agricultural statistics for formulation and implementation of agricultural policies and programmes

9. The Commission will consist of a Chairman, a Member-Secretary five full-time Members and ten part-time Members. It has been decided to appoint Shri C. Subramaniam, formerly Union Minister for Food & Agriculture, as the Chairman of the National Commission. Shri J. S. Sarma, Economic & Statistical Adviser to the Ministry of Food and Agriculture, Government of India and Agricultural Census Commissioner has been appointed as its whole-time Member-Secretary. The other names will be announced later.

10 The Commission will make its recommendations as soon as practicable and in any case within a period of two years. In particular, the Commission will make interim recommendations on items C(i), D(i), E(i), E(iv) and

F(i) of the terms of reference and any other items that it may deem fit.

11. The Commission will be free to set up study teams or Sub-Committees for specific discipline or to study problems in depth. The Commission may also have technical Consultants on whole-time and part-time basis. On any aspect which is covered by the terms of reference of the Commission and which is relevant for its work, if there is any other expert body or Commission going into these matters, the Commission shall be provided the facility of consultations with such expert bodies and Commissions.

12. The Headquarters of the Commission will be in New Delhi.

13. The Commission will devise its own procedure. It may call for such information and take such evidence as it may consider necessary. The Ministries/Departments of the Government of India will furnish such information and documents and render such assistance as may be required by the Commission.

14. The Government of India trust that the State Governments/Administrations of Union Territories will extend to the Commission their fullest co-operation and assistance.

29-8-70

Sd/-

(T. P. Singh)

Secretary to the Government of India.

APPENDIX 1 2

(Paragraph 1.2-4)

Composition

(As on January 31, 1976)

Chairman	Shri Nathu Ram Mirdha, MP
Vice-Chairman	Shri B. Sivaraman, Member, Planning Commission
Member-Secretary	Shri J. S. Sarma
Full-time Members	1. Dr. P. Bhatta charya 2. Ch. Randhir Singh
Part-time Members	1. Shri M. V. Krishnappa, MP 2. Dr. Z. A. Ahmed, MP 3. Dr. M. S. Swaminathan, Director-General, ICAR, and Secretary to the Government of India, Ministry of Agriculture and Irrigation, New Delhi. 4. Shri T. A. Pai, Union Minister for Industry and Civil Supplies, New Delhi. 5. Shri Balwant Singh Nag, former Adviser (Irrigation & Power) Planning Commission, New Delhi. 6. Dr. A. M. Khuro, Vice-Chancellor, Aligarh Muslim University, Aligarh. 7. Shri Hari Singh, former Inspector General of Forests, Ministry of Agriculture and Irrigation, New Delhi. 8. Dr. N. K. Panikkar, Vice-Chancellor, Cochin University, Cochin. 9. Dr. H. R. Arakeri, Vice-Chancellor, University of Agricultural Sciences, Bangalore. 10. Shri Triloki Singh, M 11. Dr. S. K. Mukherjee, Director, Bose Research Institute, Calcutta.

NOTES :

1. The names of the three full-time Members of the Commission and eleven part-time Members were announced on September 26, 1970.
2. Capt. Rattan Singh was appointed as part-time Member on November 7, 1970 and resigned w.e.f May 29, 1972.
3. Shri C. Subramaniam resigned the chairmanship of the Commission with effect from the afternoon of January 28, 1971.
4. Shri Nathu Ram Mirdha assumed office of the Chairman on February 1, 1972.
5. Shri B. Sivaraman was appointed Vice-Chairman of the Commission with effect from February 11, 1971.
6. Ch. Randhir Singh then part-time Member of the Commission was appointed full-time non-official Member with effect from March 18, 1971.

7. Sardar Jogendra Singh ceased to be a part-time Member of the Commission with effect from September 20, 1971 on his appointment as Governor of Orissa.
8. Shri Triloki Singh, MP was appointed as part-time Member on May 29, 1973.
9. Dr. H. R. Arakeri, formerly full-time Member was appointed part-time Member on June 10, 1973 consequent upon his appointment as as Vice-Chancellor, University of Agricultural Sciences, Bangalore.
10. Shri D. P. Singh ceased to be a part-time Member with effect from June 16, 1975.
11. Dr. S. K. Mukherjee formerly full-time Member became a part-time Member with effect from January 1, 1976.

-APPENDIX 1.3

(Paragraph 1.3.1.)

Inaugural Address of the President Shri V. V. Giri on the occasion of the 25th Anniversary of the Food and Agriculture Organisation of the United Nations and the Inauguration of the National Commission on Agriculture at New Delhi on October 16, 1970.

I am glad to participate in this special function organised to mark the 25th anniversary of the Food and Agriculture Organisation of the United Nations and the inauguration of the National Commission on Agriculture. All nations today are familiar with the work of the United Nations and its allied organisations. The activities of these organisations are producing a profound influence not only in international affairs but also in the policies and programmes adopted by various national governments.

In the U.N. family, FAO is the specialised agency for international action, to fight poverty, hunger and malnutrition, the greatest enemies of present day world. The aims and objectives of this agency are so noble and appealing that they have received a universal support ever since it was born on this day 25 years ago. After several years of destructive warfare, the energies of the United Nations were to be concentrated on constructive efforts for the development of agriculture as also for the equitable distribution of the world's food resources.

We all recognise the contribution of the FAO in assisting the developing countries in securing improvement and efficiency in agricultural production. This important organisation has been a dynamic force in meeting the challenges of hunger and malnutrition. We in India have also received valuable assistance from FAO in programmes of agricultural development. We are grateful to this organisation for such help. It is my hope that FAO will continue its activities with greater zeal. I take this opportunity to offer my warmest tributes to it for the outstanding work done for the developing countries during the last two and a half decades. A major landmark in the efforts of the FAO in recent years has been the preparation of the Indicative World Plan with a time perspective of twenty years upto 1985.

While FAO's work in the last 25 years has been quite praiseworthy, it has still to play a much bigger role in achieving the objectives envisaged by its founders. We all know that large parts of this world are stricken by abject poverty. The problem of poverty and hunger is particularly acute in countries which have high density of population, where land-man ratio is low and opportunities for gainful employment are extremely poor. This situation is often aggravated by inequalities of opportunities and disparities in incomes. The awareness of this situation and efforts to bring about improvements are essential for building up a better world. There cannot be a lasting peace or stability unless the curse of poverty and want is eliminated. I understand that a great deal of work has been done under the Freedom-from-Hunger Campaign to promote awareness of this problem. Certain action programmes have also been initiated. But a stage has come when all the countries of the world, particularly high income countries, have to join in a concerted effort to attack the problem of poverty so as to root out this evil as quickly as possible. Time is an important element in this process. Unless we act quickly, many of the achievements of the present day civilisation would be put to jeopardy.

The FAO has so far performed a role of providing relief and timely help and stimulating productive activity in developing countries. What about its role

in the future ? In my view, the success of the FAO in the coming years will be judged chiefly by the extent to which it can sustain the stimulus and incentive for higher production in developing countries. It will also be judged by the leadership and support which FAO can give in providing to the small farmer, the small fisherman and other primary producers the resources required for increasing productivity and improving their levels of living.

On this silver jubilee day of the FAO, we are also inaugurating our National Commission on Agriculture. It is an occasion of historic importance for India's agriculture. The first comprehensive study of India's agriculture was made by the Royal Commission on Agriculture in 1928. During the 40 years since then, vast changes have taken place in the political, economic and social spheres of the country. We have today with us the experience of 20 years of planning in which a high priority has been given to the development of agriculture. The efforts of scientists, planners, administrators, extension workers and farmers are revolutionising Indian Agriculture. More particularly during the last five years, a new strategy for agricultural development is in operation. Its emphasis has been on increasing application of science and technology. A rapid improvement in production is giving rise to what are known as second generation and third generation problems. These include problems of handling large marketable surpluses, transport, storage, processing and the implications of increased disparities in incomes leading to social tensions and massive changes in tenurial relationships and employment pattern at the village level.

We want to achieve rapid progress in agriculture as a base for economic and social progress aimed at through our successive Five Year Plans. We have also to face the challenge posed by population explosion bringing forth large armies of youth seeking employment opportunities. In the next ten years, there will be 60 million people added to the ranks of employment seekers and out of these about 45 million would be in the rural sector. Rural unemployment and underemployment could lead to vague and haphazard urban migrations and formation of urban slums which are the breeding grounds for lawlessness. Thus, an extensive programme of absorbing the unemployed surplus is an urgent necessity. The absorption of additional rural labour in gainful employment is possible through the adoption of an enlightened employment policy. The surplus manpower could be utilised for labour intensive rural work schemes such as road building, minor irrigation, soil conservation, irrigation, flood control, rural electrification and a crash programme of rural housing. Such a bold employment policy would create the necessary infrastructure for rural development and would thus yield high returns from the point of view of rapid economic growth. Already, under the able stewardship of Shri Ahmed, the Ministry of Food and Agriculture have undertaken implementation of special programmes for small farmers, agricultural labourers and rainfed and chronically drought affected areas. I am confident that these programmes will have a lasting effect on our agricultural economy.

One can well foresee that the problems and challenges of seventies and subsequent years are going to be enormous. Therefore, comprehensive guidelines have to be worked out well in advance. It is in this background that it has been considered necessary to set up a National Commission on Agriculture. I hope the Commission would make a comprehensive review of the entire agricultural structure, analyse the nature, magnitude and trends of recent technological advance, examine the problem of rural employment, give a close look at the newly emerging problems of social disparities and tensions, and provide

guidance for the future.

I am happy that Shri C. Subramaniam, who was formerly Union Minister of Food, Agriculture, Community Development and Cooperation and who had an important hand in working out the new strategy for agricultural development adopted since 1966-67, has accepted the Chairmanship. I am sure, under his competent leadership and with the cooperation of not only the Members of the Commission but also of various scientists, administrators, economists and other experts all over the country, we shall be able to have guidelines for the development of our agricultural economy in the next two to three decades. I extend my best wishes to the Commission in the performance of the arduous task entrusted to it.

I am very glad to know that the Krishi Pandits and other prize winning farmers in the All India Crop Competitions in paddy and wheat 1969-70 have also been invited in this function to receive the prizes for their extremely commendable performance. I understand that per hectare yields of more than 14 tonnes of paddy and more than 12 tonnes of wheat have been obtained. I congratulate prize winners on their achievement. I am confident that the example set by them will be emulated by millions of farmers all over the country.

Before I conclude, I wish to express my pleasure on having received the commemorative coins of rupees ten and paise twenty which have been issued on this occasion of twenty-fifth anniversary of the FAO. These coins have been really designed beautifully. I hope these coins will help to promote awareness of the important work being done by FAO and increase international cooperation for the prosperity of the world agriculture.

Jai Hind.

APPENDIX 14

(Paragraph 1.3.2)

Speech of Shri C. Subramaniam, Chairman, National Commission on Agriculture, on the Occasion of the 25th Anniversary of the Food and Agriculture Organisation of the United Nations and the Inauguration of the National Commission on Agriculture at New Delhi on October 16, 1970.

I am glad that the inauguration of the National Commission on Agriculture takes place on a day which marks the 25th Anniversary of the Food and Agriculture Organisation of the United Nations. The work of the FAO in promoting development of agriculture all over the world is well known. We are particularly happy that the Director General has accepted the High-Yielding Varieties Programme as one of the five major areas for concentration of efforts. India was the first nation to conceive and introduce this Programme as an organised developmental project designed to accelerate agricultural production. I may also refer to the monumental work done by the FAO in drawing up the World Indicative Plan which is of great significance to the developing countries. The exchange of ideas and the bonds that have developed between the FAO and India have been mutually beneficial.

Let me recall here the events leading to the adoption of the New Strategy for Agricultural Development in India in the year 1965. After an impressive increase in agricultural production during the first two Five Year Plans there was a spell of stagnancy in the early 1960s. Population increased at a rapid rate, agricultural production failed to catch up, imports of foodgrains had to be stepped up and the target of self-sufficiency in foodgrains seemed elusive. Then came the crisis of 1965 and 1966 as a consequence of one of the severest droughts of the century. Steep fall in foodgrains production, scarcity conditions over large parts of the country, and rising prices led to widespread distress. It was even predicted by some foreign observers that at least one million starvation deaths would take place in Bihar alone. The prophets of doom were proved wrong. Careful and prudent management of the available supplies together with the generous support and assistance from foreign countries in the form of concessional imports and gifts helped us to tide over the crisis. It is during this period of crisis we decided to step up our food production through the adoption of the New Strategy. This was facilitated greatly by the availability of high-yielding exotic strains of wheat and paddy. This had to be backed by a policy of assurance of remunerative prices to farmers. But the strategy would not have succeeded but for the willingness of the farmer himself to adopt the new technology. Beginning with an area of 19 million hectares in 1966-67, the programme covered 11 million hectares in 1969-70. The pace and progress again proved the skeptics wrong and ushered in the beginning of an agricultural revolution. And this is not confined to India; it covers the whole of South and South-East Asia.

Even now, there are people who attribute the last years' high production levels to the grace of nature and favourable monsoons. But a little analysis will show that it was inherently something else—the promise and performance of a new technique altogether that brought about the favourable trend. In wheat, higher production levels have been reached during the last three or four years. In terms of yields per hectare also the all-India yields had gone up from about 900 kg per hectare in 1964-65 to 1,200 kg in 1969-70. In Punjab, current average yield levels are as high as 2,200 kg per hectare. It is true that with

regard to rice and other cereals, the position is not equally good. The factors responsible for the slow progress in the adoption of high-yielding varieties programme in the case of these crops need close analysis. Our Commission will no doubt go into these factors. But what is important is that the process of transformation of Indian agriculture should not be allowed to slacken.

As early as in December 1967, I wrote to the Prime Minister suggesting the need for a critical and comprehensive review of the entire spectrum of change currently witnessed in Indian agriculture and for a careful assessment of the needs in terms of additional scientific effort, training activities and input resources. This I did after an on-the-spot study of the agricultural transformation that had taken place in Mexico. In 1950, Mexico had an average yield of wheat of about 800 kg per hectare. By 1966, the average yield per hectare had more than trebled. This was possible through intensive research on the development of high-yielding varieties, through attention to problems of soil fertility and through the simultaneous improvement in the entire range of agricultural activities, starting from the sowing of the crop to processing, marketing and storage. It has been widely realised that such changes in traditional agriculture create many new problems which ought to be anticipated and for which prior solutions must be evolved if sustained progress is to be maintained. This is because conditions which are favourable for the growth of the plants are also those which encourage pests and pathogens. Also, increased production creates new demand for threshing, processing and storage. New implements and equipment will have to be fabricated and produced on a large scale, to meet the needs of a more intensive agriculture.

If we are to ensure that the path India has now adopted ultimately leads to the desired destination of securing for the people of the country not only a balanced and nutritious diet, but results in agrarian prosperity covering the entire rural India, we must, from now on, pay attention to all the new problems of our emerging agriculture. We propose to give first priority to these problems in the work of the Commission. Even before we start the regular work of the Commission, we intend to have consultations with the scientists working in the various Agricultural Universities and Research Institutions, as the future of agriculture will mostly depend on a sound scientific base.

The terms of reference of our Commission are comprehensive. The Commission will review the current progress of agriculture and make recommendations for its improvement and modernisation with a view to promoting the welfare and prosperity of the people. Multifarious aspects of crop production and land & water development would receive attention. In the fields of animals products, fisheries and forestry, modernisation cannot brook any delay and science and technology will have to be fully harnessed in these fields. Important developments initiated in the fields of agricultural education and training during the recent years will be carefully studied and measures to strengthen them suggested to support the future agricultural programmes. Manpower and employment on which hinge the expectations and aspirations of the new generation, form one of the major problems in agriculture and general economic development. Development of the infrastructure—transport, marketing, storage, processing and allied fields—inherent in the modernisation of agriculture, will receive due consideration by us.

While giving due attention to all the problems set out in the terms of reference, it would be our endeavour to submit interim recommendations on priority areas for concurrent action. I have already referred to the scientific efforts to

which highest priority needs to be given. The Commission would review the present research set-up, identify the gaps, and make appropriate recommendations. The Commission will also devote attention to the three major types of imbalances that have developed as a result of the recent rapid progress in agriculture. The first kind of imbalance relates to the larger benefits reaped by farmers with larger holdings in areas with assured irrigation facilities, while farmers with smaller holdings and poorer means have been left behind. The second kind refers to the progress made in increasing the yields of different groups of crops. While major advances have been made in increasing the productivity of wheat and some of the millets, the progress in the case of rice production has not been as satisfactory as in the case of wheat. New technology for improving the production of other crops such as pulses, oil-seeds, fibres and feeds has also to be developed. The third kind of imbalance, which has more serious social implications, is the differential rates of economic progress between irrigated farms and unirrigated farms. The problems of rain-fed agriculture also need urgent attention. Other priority areas would include the arrangements for seed multiplication and distribution and provision of short-term institutional credit. In the sphere of employment, we wish to lay emphasis on implementation of pilot projects for generating employment potential in different categories of areas.

Simultaneously, we also propose to go into perspective planning for agriculture in the context of the demands that might arise for the various agricultural products, cereals, pulses and oils with a view to securing a balanced and nutritious diet. Even after self-sufficiency in foodgrains is achieved, the gigantic problem of dealing with the scourge of malnutrition and under-nutrition may still remain. The extent of this problem would, however, vary from area to area and within the same area from class to class. Above all, the nutritional needs of the critical age-groups and expectant mothers will have to be attended to on a priority basis. What we are attempting is not the mere introduction of a new technology for increased production but transformation of the entire agrarian economy, where there is now widespread poverty and unemployment and under-employment. Agrarian reform of one sort or another, adjusted to the conditions and opportunities in the several regions, aimed at creating such a relationship between man and land that the tiller has opportunities and incentives to exert himself, will have to play a crucial role in this development. The Commission will recommend such a redirection of all institutional reforms—providing and subsidising agricultural extension, market outlets, and availability of fertilisers and other agricultural implements—that they will serve the masses and not, as now, cause a widening of the gap between the rich and the poor. The Commission will also try to identify the type of agrarian reforms needed for bringing about a real transformation in the agrarian economy leading to a more egalitarian society.

In the Commission we have an excellent team of colleagues who have distinguished themselves in different fields. Even so, the Commission would not arrogate to itself the wisdom and the talent that this great country could muster for laying down the guidelines for the coming decades. In our task, we would earnestly seek the cooperation and assistance of the distinguished scientists, administrators working in the State and Central Governments, agricultural universities and research institutions within the country and outside. In formulating the recommendations of the Commission, we shall make every effort to reflect the views of the field workers and above all the interests of the farmer who in the ultimate analysis determines the course of agricultural progress.

APPENDIX 1.5

(Paragraph 1.3.5)

Meetings of the Commission held and the Members attending the same

1st Meeting	October 17, 1970
2nd Meeting	November 4, 1970
3rd Meeting	December 5, 1970
4th Meeting	January 27, 1971
5th Meeting	March 22-23, 1971
6th Meeting	May 7, 1971
7th Meeting	June 21, 1971
8th Meeting	October 6, 1971
9th Meeting	November 24-25, 1971
10th Meeting	December 29, 1971
11th Meeting	March 14, 1972
12th Meeting	August 10-11, 1972
13th Meeting	February 27, 1973
14th Meeting	August 3, 1973
15th Meeting	March 23, 1974
16th Meeting	February 25-26, 1975
17th Meeting	May 5, 1975
18th Meeting	June 6, 1975
19th Meeting	June 26, 1975
20th Meeting	July 11, 1975
21st Meeting	August 13, 1975
22nd Meeting	September 8, 1975
23rd Meeting	September 29, 1975
24th Meeting	October 25, 1975
25th Meeting	November 15, 1975
26th Meeting	November 27, 1975
27th Meeting	December 20, 1975

Members who attended the meetings of the Commission

	Oct. 17, 1970	Nov. 4, 1970	Dec. 5, 1970	Jan. 27, 1971	May, 22-23, 1971	May 7 1976	June 21, 1971	Oct. 6, 1971	Nov. 24-25, 1971	Dec. 29, 1971	Mar. 14, 1972	Aug. 10-11, 1972	Feb. 27, 1973	Aug. 3, 1973	March 23, 1974	Feb. 25-26, 1975	May 5, 1975	June 6, 1975	June 26, 1975	July 11, 1975	Aug. 13, 1975	Sep. 8, 1975	Sep. 29, 1975	Oct. 25, 1975	Nov. 15, 1975	Nov. 27, 1975	Dec. 20, 1975
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Sh. C. Subramaniam(e)	X			X																							
Sh. Nahu Ram																											
Mirdha (b)																											
Sh. B. Sivarman (e)																											
Sh. J. S. Sarma																											
Dr. S.K. Mukherjee																											
Dr. H. R. Arakeri																											
Dr. P. Bhattacharya(d)																											
Ch. Randhir Singh																											
Sh. M. V. Krishnappa																											
Dr. Z. A. Ahmed																											
S. Joginder Singh (e)																											
Dr. M.S. Swaminathan																											
Sh. D. P. Singh (f)																											
Sh. T. A. Pai																											

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
Sh. B. S. Nag	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Dr. A. M. Khuroo	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Sh. Hari Singh	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Dr. N. K. Panikkar	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Capt. Rattan Singh(s)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Sh. Triloki Singh (h)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

NOTE : x—indicates attended.

(—) indicates did not attend

(a) Resigned w.e.f. January 28, 1971.

(b) Assumed Chairmanship w.e.f. February 1, 1972.

(c) Appointed Vice-Chairman w.e.f. February 11, 1971.

(d) On foreign assignment between January-April, 1971.

(e) Ceased to be a Member w.e.f. September 20, 1971.

(f) Resigned w.e.f. June 16, 1975.

(g) Resigned w.e.f. May 29, 1972

(h) Appointed Member w.e.f. May 29, 1973.

APPENDIX 1.6

Questionnaires

(Paragraph 1.4.1)

RESOURCE DEVELOPMENT

1. Infrastructure in Command Areas of Major and Medium Irrigation Projects.
2. Ground water.
3. Review of Medium Sized Storage Projects.
4. Sprinkler Irrigation System.
5. Water Requirements for Crops.
6. Problems of Saline, Alkaline and Water-logged Soils.
7. Major and Medium Storage Reservoirs.
8. Availability of Soil Testing Facilities in Different States.
9. Construction and Maintenance of Water Courses and Field Channels.
10. Land Reclamation and Development—Analysis of the Various Aspects.
11. Rural Electrification.
12. Various Aspects of Fisheries Development.

CROP PRODUCTION AND SERICULTURE

13. Potato Seed.
14. Problems of Development of Cashewnut.
15. Problems of Development of Cardamom.
16. Sericulture.

ANIMAL HUSBANDRY

17. Poultry Farming, Sheep and Goat Rearing, Pig Production and Vegetable Growing in SFDA and MFAL Districts.

FORESTRY

18. Forest Revenue, Expenditure, Percentage of Revenue spent on Forestry Activities and Budget Provision during the Successive Plans in (a) Southern States; (b) Eastern States; and (c) Northern States (For Regional Conferences of the Conservator of Forests, etc.).
19. Starting Forestry Education in the Agricultural Universities in India.
20. Research and Educational Reorganisation in the Forestry Sector.
21. Development of Tassar Silk for Uplifting the Adivasies in Forest Areas.
22. Forest Protection Measures.
23. Extent and Problem of Grazing.
24. Farm Forestry—Rights, Privileges and Concessions enjoyed by Forest Dwellers including Tribals.
25. Farm Forestry—Shifting Cultivation.
26. Minor Forest Produce.
27. Performance of Eucalyptus.
28. Performance of Tropical Pines.
29. Poplars.

30. Forest Fires.**INPUTS**

- 31. Improved Seeds.
- 32. Fertiliser Producers.
- 33. Arrangements for Supply of Fertilisers and Chemicals—Quality Aspect.
- 34. Fertiliser Distribution.
- 35. Pesticides.
- 36. Agricultural Machinery and Implements.

RESEARCH, EDUCATION AND EXTENSION

- 37. Agricultural Research.
- 38. Agricultural Extension.
- 39. Agricultural Education.
- 40. Agricultural Education, Extension, Training and Information.
- 41. Creation of Agromet Centres in Agricultural Universities.
- 42. National Demonstrations.
- 43. Coordinated Research Projects.
- 44. Commodity Development Councils.
- 45. Commodity Development Directorates.
- 46. ICAR Institutes.

SUPPORTING SERVICES AND INCENTIVES

- 47. Regulated Markets.
- 48. Agricultural Price Policy.

RURAL EMPLOYMENT AND SPECIAL PROGRAMMES

- 49. Development of Hill Areas.
- 50. Rural Employment and Rural Wages.
- 51. Rural Works Programme.

AGRICULTURAL ADMINISTRATION

- 52. Problems of Agricultural Organisation and Administration.

AGRARIAN REFORMS

- 53. Small Farmers.
- 54. House sites for Agricultural labour.
- 55. Whole Village Development.
- 56. Seasonal Migration of Agricultural Labour.
- 57. Land Reforms.
- 58. Farmers' Organisation.
- 59. Consolidation of Holdings.

APPENDIX 1.7

(Paragraph 1.4.2)

List of Officers of the Commission

Name	Designation	From	To
I. TECHNICAL DIVISION			
Specialists			
Shri S. B. Palit	Specialist (Forestry)	9-1-73	12-1-76
Shri G. N. Kathpalia	Specialist (Water Utilisation)	6-8-73	23-11-75
Dr. H. G. Kewalramani	Specialist (Fisheries)	3-8-71	31-1-76
Dr. R. K. Misra	Specialist (Agronomy)	23-8-71	31-12-75
Dr. R. S. Murthy	Specialist (Soils)	6-12-71	28-12-71
Shri T. Narayanan	Specialist (Animal Husbandry)	1-1-72	1-3-75
Dr. N. R. Datta Biswas	Specialist (Soils)	17-4-72	8-10-73
		6-11-74	31-12-75
Dr. J. M. Lall	Specialist (Livestock Health)	28-11-72	31-1-76
Shri J. S. Srivastava	Specialist (Livestock Production)	24-5-74	30-9-75
Shri B. N. Ganguly	Specialist (Forestry)	21-1-71	1-9-72
Shri N. K. Dikshit	Specialist (Water Utilisation)	1-7-71	20-7-73
Shri B. N. Agnihotri	Specialist (Horticulture)	19-9-72	31-12-75
Dr. S. P. Singh	Specialist (Agricultural Administration)	4-12-72	1-12-75
Shri Ram Sarup	Specialist (Dairy Development)	6-1-73	31-10-75
Dr. V. Nagarajan	Specialist (Nutrition)	1-2-73	31-10-74
Shri P. S. Srinivasan	Specialist (Cropping Pattern)	26-3-73	31-12-73
Shri L. R. Dua	Specialist (Agricultural Labour)	1-6-73	31-12-75
Shri T. K. Das Gupta	Specialist (Land Reforms)	1-9-73	31-1-76
Dr. Paritosh Nandi	Specialist (Agricultural Research)	5-11-73	4-11-74
Dr. A. N. Krishnamurthy	Specialist (Agricultural Marketing)	22-8-74	31-12-75
Shri P. S. Sangwan	Specialist (Agriculture)	30-6-71	17-3-75
Shri J. S. Parolkar	Specialist (Agricultural Education)	1-12-71	31-12-75
Shri P. T. George	Specialist (Land Reforms)	22-2-72	14-8-72
Shri C. R. Mohapatra	Specialist (Forest Utilisation & Industry)	28-4-75	7-1-76
Consultants			
Shri C.D. Mathews	Consultant (non-official)	10-1-72	3-4-72
Shri G.B. Singh	Consultant (non-official)	15-2-72	26-6-72
Shri K. N. Rao	Consultant (non-official)	18-2-72	31-12-75
Shri A.K. Chakravarty	Consultant (non-official)	16-8-72	30-4-74
Shri N.N. Chatterjee	Consultant (non-official)	29-9-72	7-9-73

Name	Designation	From	To
Dr. Paritosh Nandi . . .	Consultant (non-official)	12-1-73	30-10-73
Shri A.S. Brar . . .	Consultant (non-official)	27-1-73	26-7-73
Dr. S. Guha . . .	Consultant (non-official)	10-4-73	31-12-75

II. RESEARCH DIVISION

Shri Sada Nand . . .	Joint Director	23-3-71	27-10-74
Shri S.K. Mitra . . .	Joint Director	1-5-71	31-1-76
Shri R.S. Chadha . . .	Joint Director	18-11-72	31-1-76
Shri R.N. Bishnoi . . .	Joint Director	20-6-75	31-12-75
Shri M.L. Manrai . . .	Deputy Director	9-11-72	31-1-76
Shri S.M. Krishnamachar . . .	Deputy Director	31-5-71	31-1-76
Shri K.G. Aneja . . .	Deputy Director	17-9-71	16-10-74
Shri James Kurian . . .	Deputy Director	1-4-72	31-1-76
Shri J.S. Dawar . . .	Deputy Director	1-12-72	28-2-73
Shri Rameshwar Calla . . .	Deputy Director	12-1-73	31-12-75
Shri B.N. Kacker . . .	Deputy Director	30-4-73	31-12-75
Shri B.K. Verma . . .	Deputy Director	12-2-75	31-12-75
Shri M.L. Manrai . . .	Assistant Director	25-5-71	8-11-72
Shri R.S. Sangwan . . .	Assistant Director	4-10-71	31-12-75
Shri J. Satyanarayana . . .	Assistant Director	1-12-71	11-9-74
Shri T.N. Khushu . . .	Assistant Director	1-4-72	31-1-76
Shri Ziley Singh . . .	Assistant Director	1-9-72	31-12-75
Shri D.S. Bhatnagar . . .	Assistant Director	22-11-72	31-1-76
Shri B.S. Kapila . . .	Assistant Director	30-11-72	31-12-75
Shri V. Bhaskaran . . .	Assistant Director	30-12-74	31-1-76
Shri V. D. Seth . . .	Assistant Director	6-3-74	31-1-76

III. EDITORIAL CELL

Shri K. Mitra . . .	Chief Editor	22-2-75	31-1-76
Shri R.C. Sawhney . . .	Consultant Editor	7-4-75	31-12-75
Shri R.S. Chakravarthi . . .	Consultant Editor	28-5-75	31-12-75

IV. ADMINISTRATION DIVISION

Shri V. Balasubramanian . . .	Director	23-4-71	14-12-73
Smt. K. Chatterjee . . .	Director	1-2-74	31-1-76
Shri M. L. Gupta . . .	Deputy Director	14-1-71	29-1-74
Shri L.P. Subramanian . . .	Deputy Director	29-1-74	31-1-76

APPENDIX 1.8

(Paragraph 1.4.3)

Working Groups, Sub-Groups and Study Teams set up by the National Commission on Agriculture**I—List of Working Groups, Sub Groups and Study Teams****1. AGRICULTURAL CREDIT****2. ANIMAL HUSBANDRY AND DAIRYING**

- (i) Cattle Breeding
- (ii) Animal Health
- (iii) Animal Nutrition including Feeds & Fodder
- (iv) Dairy Development
- (v) Poultry Development
- (vi) Sheep & Goat Development
- (vii) Piggery
- (viii) Horses, Camels & Yaks
- (ix) Utilisation of Fallen Animals, Animal By-products and Animal Wastes
- (x) Improvement of Slaughter Houses, Meat and Meat Products
- (xi) Education and Training on Animal Health, Animal Production and Dairy Science

3. FERTILIZER AND CHEMICALS**4. IRRIGATION, SOIL AND WATER MANAGEMENT**

- (i) Water use in Agriculture
- (ii) Soil & Water Conservation in Catchment areas
- (iii) Soil & Water Conservation in Cultivated areas
- (iv) Saline and Alkaline Soils & their Reclamation
- (v) Groundwater

5. HORTICULTURE

- (i) Citrus
- (ii) Pineapple
- (iii) Mango
- (iv) Grapes
- (v) Guava
- (vi) Apple and Stone Fruits
- (vii) Papaya
- (viii) Plantation Crops
- (ix) Medicinal Plants
- (x) Cardamom and Pepper
- (xi) Banana
- (xii) Potato and Tuber Crops
- (xiii) Processing, Preservation, Storage and Marketing of Fruits and Vegetables
- (xiv) Vegetables
- (xv) Mushroom Cultivation
- (xvi) Feasibility of Growing Vegetables and Forage Crops around cities

6 LAND REFORMS**7. FORESTRY DEVELOPMENT**

- (i) Farm Forestry, Extension Forestry, Management of Marginal lands, Shifting Cultivation & Forest Land under Cultivation
- (ii) Preservation of Environment, Recreation, Wild Life Management and Tourism, Landscape Planning in Forestry.
- (iii) National Inventory, Timber and Fuel Trends and Prospects, National Wood Requirements, Planning Methodology, Growth Goals, Industry oriented Project Plans and Statistical Methodology in Forestry.
- (iv) Forest Economics, Financing and Budgeting
- (v) Forest Policy, Law and Administration
- (vi) Management of Grazing Lands, Pasture Lands and Grazing Policy in the Forests
- (vii) Forest Industries, Large and Small
- (viii) Forest Education & Research
- (ix) Development of Andaman Forests
- (x) Export Potential of Indian Timbers
- (xi) Investment Analysis on Poplars in Tarai & Bhabhar in Uttar Pradesh
- (xii) Minor Forest Produce

8. FISHERIES

- (i) Inland Fisheries
- (ii) Prawn Fishing
- (iii) Deep sea Fishing
- (iv) Fisheries Education and Training
- (v) Marine Products

9. MECHANISATION

- (i) Agricultural Operations Requiring Power
- (ii) Power Availability and Requirements in Different Regions
- (iii) Mechanisation
- (iv) Manufacture of Agricultural Machines
- (v) Service Organisations

10. IMPLEMENTS AND TOOLS

- (i) Research
- (ii) Manufacturing and Marketing
- (iii) Extension and Training

11. AGRICULTURAL LABOUR**12. CONSOLIDATION OF HOLDINGS****13. EXPORT ORIENTED AGRICULTURAL COMMODITIES****14. STATISTICS**

- (i) Irrigation
- (ii) Livestock
- (iii) Fisheries
- (iv) Forestry

- (v) Fruits and Vegetables
- (vi) Estimates of Foodgrains Production for 1967-68 and 1969-70

15. AGRICULTURAL MARKETING

- (i) Post-Harvest Technology and Processing
- (ii) Problems of Storage and Transport
- (iii) Marketing and Grading

16. PROJECTIONS OF DEMAND AND SUPPLY FOR SELECTED AGRICULTURAL COMMODITIES

- (i) Technical Group on Supply Projections
- (ii) Technical Group on Demand Projections

17. CLASSIFICATION OF COUNTRY INTO SUITABLE AGRO CLIMATIC REGIONS AND THEIR PRODUCTION POTENTIAL

- (i) Soil and Climatic Zoning of India
- (ii) Crops and Cropping Patterns
- (iii) Economic Factors Related to Crop-Zoning

18. FIELD CROPS

- (i) Wheat, Barley and Oats
- (ii) Paddy
- (iii) Maize
- (iv) Jowar
- (v) Bajra
- (vi) Ragi and other Millets
- (vii) Pulses
- (viii) Oil Crops
- (ix) Fibre Crops (Cotton etc.)
- (x) Fibre Crops (Jute etc.)
- (xi) Sugar Crops
- (xii) Tobacco
- (xiii) Fodder Crops

19. RURAL ELECTRIFICATION

20. AGRICULTURAL EDUCATION, EXTENSION TRAINING

- (i) University Level Programme including all Aspects of Agricultural Universities
- (ii) Non-Degree Programmes of Agricultural Education, including Pre-university Level Programme
- (iii) Extension Education including Farmers' Training and Information
- (iv) Training of Personnel for Employment by Government and Institutes (both Public and Private)

21. FARMERS' AND OTHER RURAL ORGANISATIONS

22. FLOWERS

23. CROP WEATHER RELATIONSHIP

24. CENTRAL STUDY GROUP FOR WHOLE VILLAGE DEVELOPMENT

25. IMPROVED SEEDS

- (i) Overall Problems
- (ii) Credit
- (iii) Assessment, Procurement Agencies Involved, Processing Equipment and Marketing
- (iv) Release of Varieties
- (v) Storage, Transport and Quality Control.

26. LAND RECLAMATION AND DEVELOPMENT

27. STRATEGY FOR AGRICULTURAL PLANNING IN DROUGHT AND FLOOD PRONE AREAS

NOTE : Part II of this Appendix which follows gives the Composition of the Working Groups, Sub Groups and Study Teams. Abbreviations and symbols have been used to indicate the following :

WG : Working Group

@ Coopted Member

ST : Study Team

* Invitee

SG : Sub Group

StG : Study Group

G : Group

II—Composition of the Working Groups, Sub-Groups and Study Teams

1 AGRICULTURAL CREDIT (ST)

Shri T. A. Pai
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New Delhi.

Shri Ghulam Ghouse,
Credit Planning Deptt.
RBI,
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Shri B. Rudramoorthy,
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Shri C. V. Ramachandran,
Financial Adviser, Food Corp.,
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Shri M. K. Mukharjee,
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Deptt. of Agri.
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Shri K. Ramamurthy,
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Deptt. of Agri.
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Indian Institute of Management,
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Dr. N. C. Mehta,
Director Institute of Bank Management,
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Dr. C. D. Datey,
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RBI,
Bombay.

Smt. Sarla Grewal,
Development Commissioner,
Chandigarh.

Shri G.V.K. Rao,
Development Commissioner,
Bangalore.

Shri K.S. Bawa,@
Joint Secretary,
Deptt. of Cooperation,
New Delhi.

Shri A.K. Dutt,@
Joint Secretary,
Deptt. of Banking,
New Delhi.

Shri R.K. Talwar*,
Chairman,
SBI,
Bombay.

Shri K.P.K. Prabhu*,
Custodian,
Canara Bank,
Bangalore.

Shri Y.L. Bhatt*,
Superintendent,
Canara Bank,
Bangalore.

Shri Suresh Kulkarni*,
Institute of Economic Growth,
Delhi.

Dr. N.V. Ratnam*,
National Institute of Bank Management,
Bombay.

Shri S.C.Verma,
Production Commissioner,
Bhopal.

Shri S.S. Puri@,
Joint Secretary,
Planning Commission,
New Delhi.

Shri M.S. Gill@,
Secretary,
National Coop. Development
Corporation, New Delhi.

Shri K.K. Pai*
Custodian,
Syndicate Bank,
Manipal.

Shri K.V. Baliraya*,
Manager,
Syndicate Bank,
Manipal.

Shri A. Bose*,
Chief, Agri,
Banking Department SBI,
Bombay.

Dr. Tridip Mukherjee*,
National Institute of Bank Management,
Bombay.

2 ANIMAL HUSBANDRY AND DAIRYING (WG)

Shri M.V. Krishnappa,
Member, NCA,
New Delhi.

Capt. Rattan Singh,
Member, NCA,
New Delhi.

Shri Bajrang Bahadur Singh,
Progressive Cattle Breeder, Bhadri,
Pratapgarh.

Dr. K.N. Raj,
Chatra Marg,
University Campus,
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Dr. C. Krishna Rao,
Animal Husbandry Commissioner,
Deptt. of Agri.,
New Delhi.

Dr. P. Bhattacharya,
Member, NCA,
New Delhi.

Dr. M.S. Swaminathan,
Member, NCA,
New Delhi.

Dr. V. Kurien,
Chairman, National Dairy Dev. Board,
Anand.

Dr. M.S. Gore,
Director,
Tata Institute of Social Sciences,
Bombay.

Dr. D. Sundaresan,
Director,
National Dairy Research Institute,
Karnal.

Dr. S.C. Ray,
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National Dairy Development Board,
New Delhi.

Shri V.N. Amble,
Joint Director,
CSO,
New Delhi.

Shri Manibhai Desai,
Director,
Bharatiya Agro Industries Foundation,
Urlikanchan,
Poona.

Shri N.S.S. Manradiar,
Progressive Cattle Breeder,
Palayamkottal,
Coimbatore.

2 (i) CATTLE BREEDING (G)

Dr. D. Sundaresan,
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National Dairy Research Institute,
Karnal.

Brig. Chandan Singh,
Director,
Dte. of Military Farms,
New Delhi.

Dr. O N. Singh,
Joint Commissioner,
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New Delhi.

Shri R.S. Dyal,
Director,
Animal Husbandry,
Haryana, Chandigarh.

Dr. B R. Murthy,
Genetist,
IARI,
New Delhi

Shri Subbiah,
Progressive Cattle Breeder
Whitefield, Bangalore.

Dr. Y. Nayudamma,
Director,
CLRI,
Madras.

Dr. S.S. Prabhu,
Dean, College of Animal Sciences,
Haryana Agri. University,
Hissar.

Shri Manibhai Desai,
Director,
Bharatia Agro Industries Foundation,
Urlikanchan,
Poona.

Dr. O.B. Tandon,
Head,
Dn. of Animal Genetics,
IVRI, Izatnagar.

Dr. P.N. Bhatt,
Project Coordinator,
IVRI,
Izatnagar.

Dr. S.N. Misra,
Agri. Economist,
IARS,
New Delhi.

2 (ii) ANIMAL HEALTH (G)

Dr. C.M. Singh,
Director,
IVRI,
Izatnagar.

Dr. D.R. Marwaha,
Director,
Animal Husbandry,
Jammu.

Dr. N. G. S. Raghavan,
Director,
National Instt. of Communicable
Diseases,
Delhi.

Dr. M.N. Menon,
Regional Manager,
Indian Dairy Corp,
Madras.

Dr. Bertie A. D'Souza,
16, Clemens Road,
Vepery, Madras.

Dr. R.L. Kaushal,
Dean,
J.N. Krishi Vishwa Vidyalaya,
Jabalpur.

Dr. P.R. Nilkanthan,
Dy. Commissioner,
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New Delhi.

Dr. C. L. Sharma,
Dean, College of Vet. Medicine,
Haryana Agri. University,
Hissar.

Dr. Kr. Suresh Singh,
Head,
Dn. of Parasitology,
IVRI,
Izatnagar.

2 (iii) ANIMAL NUTRITION (INCLUDING FEEDS AND FODDER) (G)

Dr. S.N. Ray,
Emeritus Scientist,
G.B. Pant University
of Agri. & Tech,
Pantnagar.

Dr. S.K. Ranjan,
Head,
Animal Nutrition Dn.
IVRI,
Izatnagar.

Dr. P.M. Dhabadgao,
Head,
Dn. of Grassland,
IGFRI,
Jhansi.

Dr. S.S. Bains,
Head,
Agronomy Division, IARI,
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Dr. N. Satpathy,
Tech. Manager,
Tata Oil Mills Ltd.,
Bombay.

Dr. M.L. Mathur,
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National Dairy Res. Instt.,
Calcutta.

Shri S. N. Mohan,
Addl. Director, Farms,
G.B. Pant University of Agril. & Tech,
Pantnagar.

Dr. B.D. Patil,
Agrostologist,
Central Sheep & Wool Research
Instt.,
Malpura.

Prof. S.P. Dutta Gupta,
Prof. of Economics,
University of Kerala,
Trivandrum.

2 (iv) DAIRY DEVELOPMENT (G)

Dr. V. Kurien,
Chairman,
National Dairy Dev. Board,
Anand.

Dr. D. Sundaresan,
Director,
National Dairy Research Institute,
Karnal.

Shri K.K. Iya,
ex-Dy. Director General,
ICAR,
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Shri D. N. Khurody,
Controller,
Larsen & Toubro Ltd.,
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Dr. L.C. Sikka,
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Indian Dairy Entrepreneurs Agri.
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Shri G. Gopinath,
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Deptt. of Agri.,
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Shri V.H. Shah
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Kaira Distt. Coop. Milk Soc
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Institute of Eco. Growth,
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Shri A.K. Ray Choudhuri,
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Dr. S.C. Ray,
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National Dairy Development Board,
New Delhi.

Shri M. Mathias,
Hindustan Thompson Assoc. Ltd.,
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Shri N.S. Dave,
General Manager,
Greater Bombay Milk Scheme,
Bombay.

Dr. V.S. Vyas,
Hony. Director,
Agro Economic Res. Centre,
Anand.

2 (v) POULTRY DEVELOPMENT (G)

Shri V.R. Patil,
Maharashtra State Coop. Bank,
Bombay.

Dr. B. Panda,
Head,
Poultry Res. Dn.,
IVRI,
Izatnagar.

Shri J.N. Panda,
Joint Commissioner,
Deptt. of Agri.,
New Delhi.

Dr. D.K. Biswas,
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Hessarghatta, Bangalore.

Shri K.N. Pai,
Poultry Dev. Officer,
Dte. of Animal Husbandry,
Bangalore.

Shri Harbhajan Singh,
Director,
Animal Husbandry,
Punjab, Chandigarh.

Shri J.S. Sandhu,
Eco. Adviser,
Punjab, Chandigarh.

Dr. N. Satpathy,
Technical Manager,
Tata Oil Mills Ltd.,
Bombay.

Shri Ramavtar Singh,
Progressive Breeder,
Kegg Farm,
Gurgaon

2 (vi) SHEEP AND GOAT DEVELOPMENT (G)

Dr. C. Krishna Rao,
Animal Husbandry Commissioner,
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New Delhi.

Dr. O.N. Singh,
Joint Commissioner,
Deptt. of Agri.,
New Delhi.

Dr. G.C. Negi,
Director,
Animal Husbandry,
Simla.

Dr. R.M. Acharya,
Director,
Central Sheep & Wool Res. Instt.
Malpura.

Shri D.S. Sawhny,
Secy.,
Kashmir Corriedale Assoc.,
Srinagar.

Dr. B.D. Patil,
Agrostologist,
Central Sheep & Wool Research Instt.,
Malpura

Shri G.A. Bandey,
Director.
Sheep Husbandry,
Jammu.

Shri G.K. Singhanian,
Chairman,
Raymond Woollen Mills Ltd.,
Bombay.

Dr. M.R. Jaliha,
Joint Commissioner,
Deptt. of Agri.,
New Delhi.

Dr. G.C. Taneja,
Director,
CAZRI,
Jodhpur.

2 (viii) PIGGERY (G)

Shri Y. Prasad,
Director,
Animal Husbandry,
Patna.

Shri S. Gupta,
Dy. Director,
Deptt. of Animal Husbandry,
Nadia.

Shri A.K. Chatterjee,
Deputy Commissioner,
Deptt. of Agri.,
New Delhi.

Shri S. Krishnamurthy,
Asstt. Commissioner,
Deptt. of Agri.,
New Delhi.

2 (viii) HORSES, CAMELS AND YAKS (G)

Shri D.K. Desai,
Director,
Animal Husbandry,
Ahmedabad.

Shri K.G. Mahindru,
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Brig. D.R. Sahni (Retd.),
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Maj. P.K. Mehra,
Commandant,
Presidents Bodyguard,
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Shri M.M. Joshi,
Director,
Animal Husbandry,
Jaipur.

Shri Ram Swarup,
Specialist,
NCA,
New Delhi.

Col. K.S. Kutty,
Dy. Director,
Ramount & Vet Dte. AHQ,
New Delhi.

2 (ix) UTILISATION OF FALLEN ANIMALS, ANIMAL BY-PRODUCTS AND ANIMAL WASTES (G)

Shri Jwala Prasad,
Asstt. Commissioner,
Deptt. of Agri.,
New Delhi.

Shri Noorul Haq,
Carcas Utilisation Officer,
Model Trg. cum Production Centre,
Lucknow.

Dr. S. Sethuram,
Project Officer,
Animal By-products Plant,
Kesarapally,
Gunnaram.

Shri A.S. Bansal,
Dev. Officer,
Khadi Village Industries Commission
Ambala.

2(x) IMPROVEMENT OF SLAUGHTER HOUSES, MEAT AND MEAT PRODUCTS (G)

Shri A.K. Chatterjee,
Deputy Commissioner,
Deptt. of Agri.,
New Delhi.

Dr. B.R. Baliga,
Scientist,
CFTRI,
Mysore.

Dr. D.M. Bailur,
GM,
Deonar Abattoir Slaughter House,
Bombay.

Capt. D. Chatterjee,
Project Officer,
Dte. of Vet. Services,
Calcutta.

Shri S. Jayaraman,
Sr. Marketing Officer,
Dte. of Marketing & Inspection,
Faridabad.

Dr. J.M. Lall*,
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NCA,
New Delhi.

Dr S.C. Adlakha,*
Joint Director,
Planning Commission,
New Delhi.

Shri B. Venkateswarlu,*
Asstt. Commissioner,
Deptt. of Agri.,
New Delhi.

2 (xi) EDUCATION AND TRAINING ON ANIMAL HEALTH ANIMAL PRODUCTION AND DAIRY SCIENCE (G)

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IVRI,
Izatnagar.

Dr. R.L. Kaushal,
Adviser to VC,
Rajendra Agri. University,
Patna.

Dr. Mohan Singh,
Dean, College of Vety. Science,
Udaipur Agri. University,
Bikaner.

Dr. S.S. Prabhu,
Dean,
College of Animal Sciences,
Haryana Agri., University, Hissar.

Dr. J.R. Patel,
Principal,
Dairy Science College,
Anand.

Dr P .G. Nair,
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Dairy Science College,
NDRI,
Karnal.

Shri A.C. Mathur,
Asstt. Director General,
ICAR,
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Dr. R.M. Acharya,
Director,
Central Sheep & Wool Res. Instt.,
Malpura.

Shri T. Narayanan,
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New Delhi.

3 FERTILIZER AND CHEMICALS (WG)

Dr. S.K. Mukherjee,
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Dr. B.V. Mehta,
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Research,
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Pesticides Association of India,
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Dr. K.R. Srivastava,
Southern Petro-Chemicals Ind.
Corp. Ltd.,
Madras

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Shri V. N. Kasturirangan,
Chief Project Officer,
Deptt. of Pet. & Chemicals,
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Dr. H.R. Arakeri,
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Dr. S.K. Mukherjee,
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Dr. S. Pradhan,
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Dr. G.S. Kalkat,
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Dr. D. Das Gupta,
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4 IRRIGATION SOIL AND WATER MANAGEMENT (WG)

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NCA,
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Choudhri Randhir Singh,
Member, NCA,
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Dr. S.K. Mukherjee,
Member,
NCA,
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Dr. H.R. Arakeri,
Member, NCA,
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Dr. A.M. Michael,
Prof, IARI,
New Delhi.

Dr. R.S. Murthy,
All India Soil & Land Use Survey,
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Shri J.K. Jain,
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Deptt. of Agri.,
New Delhi.

Shri J.P. Naegamvala,
Member,
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Dr. B.S. Pathak,
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Dr. D.R. Bhumbra,
Director,
CSSRI,
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Shri J.K. Ganguli,
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Dr. N.D. Rege,
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Dr. K.V. Raghava Rao,
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4 (i) WATER USE IN AGRICULTURE (SC)

Shri J.P. Naegamvala,
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Dr. N.D. Rege,
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Dr. Y.S.P. Yadava,
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Dr. H. S. M. Channabasiah,
Agri. Engineer,
ICAR,
Siruguppa (Mysore).

Shri P. S. Harihar Iyer,
Director,
Met. Deptt.
New Delhi.

Dr. S.V. Patil,
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Res. University of Agri. Sc.,
Bangalore.

Dr. N.G. Dastane,
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Shri C. S. Sridharan,
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4 (ii) SOIL AND WATER CONSERVATION IN CATCHMENT AREAS (SG)

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Shri R.C. Kaushik,
Chief Conservator of Forests,
Simla.

Dr. R.S. Murthy,
All India Soil & Land Use Survey,
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Shri N.C. Rawal,
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Shri J.K. Ganguli,
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Shri B.R. Shori,
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Shri D.V. Khisty,
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Shri R.K. Mukherjee,
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Dr. C.P. Gupta,
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Shri B.N. Murthy,
Senior Dn. Engineer,
Maithon Dam,
DVC,
Dhanbad.

Shri P.C. Mitra,
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4 (iii) SOIL AND WATER CONSERVATION IN CULTIVATED AREAS (SG)

Shri J.S. Bati,
Dy. Commissioner,
Deptt. of Agri ,
New Delhi.

Shri S. Narayanswamy,
Agri. Engineer,
Deptt. of Agri ,
Madras.

Shri R.V. Satpute,
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State Coop. Land Mortgage Bank,
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Dr. R.S. Murthy,
All India Soil & Land Use Survey,
IARI,
New Delhi.

Shri C. Patro,
Jt. Director,
Soil Conservation,
Bhubaneswar

6—130 Deptt of Agr./76

Shri Amar Singh,
Addl. Director,
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Lucknow.

Shri M. G. Shettar,
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Bangalore.

Shri A.C. Sharma,
Jt. Director,
Agriculture,
Chandigarh (Haryana).

Shri J.N. Pandey,
Director,
Soil Conservation,
Patna

4 (iv) SALINE AND ALKALINE SOILS AND THEIR RECLAMATION (SG)

Dr. C.L. Mehrotra,
Agri. Chemist, U.P.,
Inst. of Agri. Sciences,
Kanpur.

Dr. N.G. Perur,
Prof. Agril. College,
Bangalore.

Dr. H.G. Pandya,
Joint Director,
Agriculture,
Ahmedabad.

Dr. R.P. Sharma,
Director,
Land Recl. Irrigation & Power
Research Instt.,
Amritsar.

Shri R.S. Melkote,
Director,
CCM Laboratory,
New Delhi.

Dr. D.R. Bhumbal,
Director,
CSSRI,
Karnal.

4 (v) GROUNDWATER (SG)

Dr. K. V. Raghava Rao,
Director,
Central Ground Water Board,
Hyderabad.

Shri V. Subramanyam
DDG, Geological Survey of India,
Calcutta.

Shri A.N. Malhotra,
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Haryana Minor Irrigation Tubewells Corp.,
Chandigarh.

Dr. L.P. Abrol,
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Soil Sc. & Agronomy Dn., CSSRI,
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Shri Kailash Narayan,
Director,
CWPC,
New Delhi.

Shri T.N. Mehra,
Director,
Rajasthan Water Board,
Jodhpur.

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Shri K. V. George,
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5 (i) CITRUS (ST)

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5 (iii) **MANGO** (ST)

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5 (iv) **GRAPES** (ST)

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5 (v) **GUAVA** (ST)

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5 (vi) **APPLE AND STONE FRUITS** (ST)

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5 (vii) **PAPAYA** (ST)

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5 (viii) PLANTATION CROPS (ST)

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5 (ix) MEDICINAL PLANTS (ST)

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5 (x) CARDAMOM AND PEPPER (ST)

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5(xii) POTATO AND TUBER CROPS (ST)

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5 (XIII) PROCESSING, PRESERVATION, STORAGE AND MARKETING OF
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5(xv) MUSHROOM CULTIVATION (ST)

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6. LAND REFORMS (WG)

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7 (i) FARM FORESTRY, EXTENSION FORESTRY, MANAGEMENT OF MARGINAL LANDS, SOFTING CULTIVATION AND FOREST LAND UNDER CULTIVATION (STG)

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Shri Gurbachan Singh,
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7(ii) PRESERVATION OF ENVIRONMENT, RECREATION, WILD LIFE MANAGEMENT AND TOURISM, LANDSCAPE PLANNING IN FORESTRY (STG)

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Shri G. Naqushband,
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7(iii) NATIONAL INVENTORY, TIMBER AND FUEL TRENDS AND PROSPECTS—NATIONAL WOOD REQUIREMENTS, PLANNING METHODOLOGY, GROWTH GOALS ETC. (STG.)

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7(iv) FOREST ECONOMICS, FINANCING AND BUDGETING (STG)

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7(v) FOREST POLICY, LAW AND ADMINISTRATION (STG)

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Shri G.N. Singh,
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7(vi) MANAGEMENT OF GRAZING LANDS, PASTURE LANDS AND GRAZING POLICY
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7(vii) FOREST INDUSTRIES—LARGE AND SMALL (STG)

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7(viii) FOREST EDUCATION AND RESEARCH (STG)

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7(ix) DEVELOPMENT OF ANDAMAN FOREST (STG)

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Shri Bachan Singh,
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7(x) EXPORT POTENTIAL OF INDIAN TIMBERS (STG)

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7 (xi) INVESTMENT ANALYSIS ON POPLARS IN TARAI AND BHABAR IN
UTTAR PRADESH (STG)

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Shri C. Chandrasekharan,
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7 (xii) MINOR FOREST PRODUCE (STG)

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Shri S. S. Buit,
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Poona.

Shri R.C. Kaushik,
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8 FISHERIES (WG)

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Dr. R. Raghu Prasad,
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8 (i) INLAND FISHERIES (SG)

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Dr. V. G. Jhingran,
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Dr. G. P. Dubey,
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Dr. H.C.P. Shetty,
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Dr. M. P. Motwani,
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8 (ii) PRAWN FISHING (SG)

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Shri A. I. George,
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Shri Rabindranath,
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8(iii) DEEP SEA FISHING (SG)

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8 (iv) FISHERIES EDUCATION AND TRAINING (SG)

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Cap. P. S. Barve
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Dr. A. N. Bose,
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Dr. R. Raghu Prasad,
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8 (v) MARINE PRODUCTS (SG)

Dr. V. K. Pillai,
Director,
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Dr. M. N. Moorjani,
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Shri V. G. Marathe,
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9 MECHANISATION (WG)

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Gadapura, Gotri Road,
Baroda,

Shri V.R. Reddy,
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Shri W.R. Fermie,
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National Dairy, Dev. Board,
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9(i) AGRICULTURAL OPERATIONS REQUIRING POWER (ST)

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Tractor Trg. & Testing Station
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9(ii) POWER AVAILABILITY AND REQUIREMENTS IN DIFFERENT REGION (ST)

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Director,
National Dairy Dev Board,
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Shri V. R. Reddy,
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9(iv) MANUFACTURE OF AGRICULTURAL MACHINES (ST)

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Vice-President,
Escorts Ltd ,
Faridabad.

Prof C. Gopinath,
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Shri V. R. Reddy,
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Shri M. Ramaswamy,
Manager,
Tractors & Farm Equipment Ltd.,
Madras.

Shri S. Bandopadhyay,
Deputy Director,
SSI,
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Shri S. K. Garg,
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Metal Fabs India (P) Ltd.,
Meerut.

Shri B. K. S. Jain,
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Agro Industrial Dev. Voltas Ltd.,
Bombay.

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Indian Institute of Management,
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9(v) SERVICE ORGANISATIONS (ST)

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68, Khursheed Bagh,
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Shri W. R. Fermie,
Vice-President,
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Faridabad.

Shri M. L. Taneja,
Deputy Commissioner,
Deptt. of Agri.,
New Delhi.

Shri P. J. Zachariaha,
Joint Commissioner,
Deptt. of Agri.,
New Delhi.

Maj. H. S. Sandhu,
President,
{ Tarai Farmers' Assoc, Rudrapur,
Nainital

10 IMPLEMENTS AND TOOLS (WG)

Prof. A. C. Pandya,
Director,
National Dairy Dev Board,
Anand.

Shri Rajender Raikhy,
Raikhy Enterprises,
G.T. Road,
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Shri S. R. Verma,
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Dr. S.V. Patil,
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Shri N. L. Khanna,
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Shri T. H. Nirmal,
Dn. of Agri. Engg.,
IARI,
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Shri S. N. Pradhan,
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Shri S. Bandopadhyay,
Deputy Director, SSI,
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Shri D. N. Kherdekar,
Joint Commissioner,
Deptt. of Agri.,
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Shri C. S. Sridharan,
Asstt. Director General,
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10(i) RESEARCH (ST)

Shri C. S. Sridharan,
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10(ii) MANUFACTURING AND MARKETING (ST)

Shri S. Bandopadhyay,
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Shri Rajender Raikhy,
Raikhy Enterprises,
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Shri N.L. Khanna,
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Asstt. Director, ISI,
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10(iii) EXTENSION AND TRAINING (ST)

Shri D. N. Kherdekar,
Joint Commissioner,
Deptt. of Agri.,
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Shri Rajender Raikhy,
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Shri K. Roy,
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Shri A. A. Memon,
Supdt. Agril. Officer,
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Shri N. L. Khanna,
Cossul Engg Works,
The Mall,
Kanpur.

11 AGRICULTURAL LABOUR (WG)

Chaudhry Randhir Singh,
Member, N.C A ,
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Smt. Purabi Mukherji,
Member Parliament,
New Delhi.

Shri G. S Misra
Member Parliament,
New Delhi.

Dr. Z. A. Ahmad
Member, N. C. A ,
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Dr. A.M. Khusro,
Member NCA,
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Shri Sitaram Kesri,
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Gokhale Inst. of Pol. & Eco.
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Shri N. S. Pandey
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Km. Kartar Devi
Harijan Leader,
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Shri B.P. Kala
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Smt. Shakuntala Devi.*
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12 CONSOLIDATION OF HOLDINGS (WG)

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Shri Rajender Nath Barua,
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Shri Saran Singh,
Land Reforms Commissioner,
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Shri T. N. Jayachandran,
P. S. to Chief Minister,
Trivandrum.

Shri S. P. Bhatnagar,
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Shri Aziz Imam,
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Shri H.'K. Jain,
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Shri V. P. Sawhney,
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Shri Ram Saran,
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18 (iii) MAIZE (ST)

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18 (vi) RAGI AND OTHER MILLETS (ST)

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18 (viii) OIL CORPS (GROUNDNUT SESAMUM LINUM MUSTARD CASTOR SOYBEANS
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18 (ix) FIBRE CORPS (COTTON LINT OTHER FIBRES AND ASSOCIATED SYNTHETIC
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18 (xi) SUGAR CORPS (SUGARCANE AND BEETROOT) (ST)

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18 (xiii) FODDER CORPS (LUCERNE, BERSEEM, JOWAR, MAIZE, PULSES, GRASSES AND OTHER FODDER CORPS) (ST)

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20 (iii) EXTENSION EDUCATION INCLUDING FARMERS TRAINING AND
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20 (iv) TRAINING OF PERSONNEL FOR EMPLOYMENT BY GOVERNMENT AND INSTITUTES (BOTH PUBLIC AND PRIVATE) (SG)

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Shri K. Ramamurthy,
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Bhubaneswar.

Smt. Shantaben Bholabhai Patel,
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Shri S.S. Rana,
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9—130 Deptt of Agri./76

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24 CENTRAL STUDY GROUP ON PILOT PROJECTS FOR WHOLE VILLAGE DEVELOPMENT

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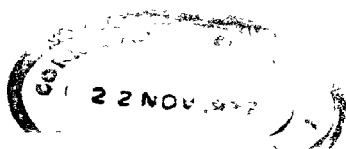
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APPENDIX 1.9

(Paragraph 1.4.4)

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Shri D K. Diraviam,
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Shri V C Pandey,
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APPENDIX 1.10

(Paragraph 1.4.5)

STUDIES/PROJECTS BY RESEARCH INSTITUTES

Sl. Title of the study/project No.	Institute undertaken the study/project
1. Assessment of the Requirements of High Yielding Seeds and Developing Seed Industry (M).	Indian Institute of Management, Vastrapur, Ahmedabad.
2. Factors Affecting Growth of Demand For Fertilisers (M).	Do.
3. An Organisation Study of the Indian Council of Agricultural Research (P).	Do.
4. A study of the Bottlenecks in the Farm Equipment Industry in India (M).	Do.
5. A Survey of Current Problems of Agriculture Machinery Manufacturers, Distributors and Users in India (T).	Do.
6. Fisheries Research Project—Economics of Inland Fishing with particular reference to Cooperative Organisation in East India (T).	Indian Institute of Management, 56-A, B. T. Road, Calcutta.
7. Projections of Demand for and Supply of Selected Agricultural Commodities (M).	National Council of Applied Economic Research, Parasilla Bhavan, Indraprastha Estate, New Delhi.
8. Impact of Mechanisation in Agriculture on Employment (P).	Do.
9. Application of Science and Technology in Agriculture (M).	Administrative Staff College of India, Bella Vista, Hyderabad.
10. Creation of Employment Opportunities and Mechanisation in Agricultural Sector (M)	Do.
11. Mechanisation of Indian Agriculture (M).	Institute of Economic Growth, University of Delhi, Delhi.
12. Study of Agricultural Credit (M).	Do.
13. Economics of Milk Production in Selected Centres in the Southern Region (T).	Institute for Techno-Economic Studies 42-A/1, Harrington Road, Madras.
14. Organisation of Farm Machinery Maintenance and Repair Service Institution (M)	Punjab Agricultural University Ludhiana.

APPENDIX 1.10 (Contd.)

Sl. No.	Title of the study/ project	Institute undertaken the study/project
15.	Some Aspects of Agricultural Labour Problems : And Explanatory Study (M).	Shri Ram Centre for Industrial Relations and Human Resources, 5, Sadhu Vaswane Marg, New Delhi.
16.	Preparation of Working Documents for the Study of Cost Factor in relation to Certain Commodities: (a) Fresh and Processed Fruits and Vegetables (b) Marine Products (c) Coir and Coir based Products (d) Tea and (e) Jute (M).	Indian Institute of Foreign Trade, H-24, Green Park Extension, New Delhi.
17.	Limited Study on Cost Aspects of Cotton Textiles, Coffee, Tobacco, Cardamom and Black Pepper (M).	Do.
18.	Industrial Uses of Agricultural Products (M).	Institute of Marketing and Management, 62-F, Sujan Singh Park, New Delhi.
19.	Pork and Pork Products in India (T).	Progressive Agro-Industrial Consultants, New Delhi.
20.	Survey Report and Scheme on Retting Water Facilities (T).	Indian Jute Industries Research Association, Calcutta.
21.	Employment Potential in Agriculture (M).	Progressive Agro-Industrial Consultants, New Delhi.

M—Mimeographed.

T—Typed.

P—Printed.

APPENDIX 1.11

(Paragraph 1.5 1)

Copy of letter No. D.O No NCA/CONF/29/73, dated December 15, 1973, from Shri Nathu Ram Mirdha, Chairman, addressed to Chief Ministers.

As you are aware, the National Commission on Agriculture has been submitting to the Government, from time to time, Interim Reports on various subjects which are of an urgent nature or are important in connection with the formulation of the Fifth Five Year Plan. So far 18 Interim Reports have been submitted and a few more are under consideration.

The Working Groups set up by the Commission to look into some of the specific problems are expected to complete their work shortly. The studies sponsored by the Commission have also been completed. We are now formulating our views with regard to the main problems and perspective of agricultural development for inclusion in the Final Report of the Commission. Before finalising our views, we feel that it would be both useful and important to visit the States and hold discussions with you and your colleagues on various aspects of agricultural development which will help us in finalising the long-term agricultural policy and the strategy and also the scope and content of the various programmes which should be undertaken in this context.

To facilitate the discussions, a list of important policy issues which will form the basis for discussions has been drawn up and is enclosed.

We would also like to utilise this opportunity of the visits to States to meet some of the knowledgeable M.L.As, M.Ps, farmers representatives of farmers' organisations and other public men who are interested in the development of agriculture. The discussions will be held at the State Headquarters.

We would let you know the names of members of the Commission who will be visiting the States and the actual dates of the visit, in due course. In the meanwhile, you may like to go through the list of policy issues and keep the material ready.

List of Policy Issues

The main Term of Reference given to the National Commission on Agriculture is, to examine comprehensively, the current progress of agriculture in India and to make recommendations for its improvement and modernisation with a view to promoting the welfare and prosperity of the people. In this context, the main problem to be considered is the approach to agricultural development in the country in the time-perspectives of 1985, 1990 and 2000AD. The rate of growth in this sector, on which 70 per cent of the population depends for livelihood, should be accelerated by modernising it through the adoption of science and technology. Optimum utilisation of the available resources should be aimed at and the production potential of each area should be tapped. There should be balanced regional development and the weaker sections of the population should be assisted to increase agricultural productivity and earn an income which would give them a decent standard of living. In addition, agricultural development should be employment-oriented. Thus, the stress should be on growth with social justice.

It is in this background that the National Commission on Agriculture wishes to hold discussions with the State Governments and Union Territories regarding

the agricultural development—its problems and perspective. To facilitate the discussions, a few important policy issues have been specifically listed in the following pages.

Approach and Strategy

1 In the Commission, work on classification of the country into agro-climatic regions based on rainfall, soils and existing cropping patterns is being done. On this basis, areas will have to be marked out for forests, grasses and fodder crops, plantation crops and field crops. The emphasis should be on developing diversified multiple-cropping systems in the irrigated areas. In the heavy rainfall areas, the most predominant crops are paddy and plantation crops. In low rainfall areas, there is predominance of millets. The growing of paddy in the transitional belts should be avoided for optimum utilisation. In the low rainfall areas the emphasis has to be on animal production. Areas under arable crops should be restricted to level areas where water conservation practices could be followed intensively. Does the State Government approve of this approach? Does it envisage any difficulties in adopting this approach?

2 In each State there are areas at various levels of development including agriculturally backward areas arising mainly due to regional constraints. What are the broad regions into which the State can be divided on the basis of degree of development or otherwise? What are the factors holding up development and what is the approach to be adopted to remove those constraints?

3 A mixed farming approach to agricultural development seems not only desirable but also essential, particularly for the small and marginal farmers. What is holding up the rapid extension of mixed cropping? What steps should be taken to accelerate the adoption of this approach?

4 With the growing population, the pressure on land will increase more in the rural sector than in the urban sector. Even if production per unit area increases, the pressure on land still will be tremendous. One of the suggestions is that semi-urban areas should be created where industries based on agriculture may be set up on a small or medium scale. This will create job opportunities for the rural unemployed. What is the State Government's view regarding this approach? What are the possibilities of implementing this idea in the State?

5 Agricultural products can be divided into (i) main products, (ii) by-products, and (iii) wastes. Has the State Government given thought to the question of making use of the by-products and wastes? Has the State Government any programme for developing their use?

6 What is the export potential of the commodities at present being produced in the State? What steps are being taken to develop those commodities? What is the scope for developing the production of new commodities which have considerable export potential?

Irrigation and Land Development

7 In many States, the responsibility for survey, investigation and exploitation of ground water for irrigation and drinking water supply rests with more than one Department. One of the suggestions is that the Ground Water Organisation at the State level should have two Divisions—one Division with predominantly engineering component working under the State Irrigation Department and the other Division dealing with drilling and boring of private wells and

tubewells, extension works, etc under the State Agriculture Department. Another suggestion is that there should be a unified agency at the State level for undertaking survey, investigation and exploitation of ground water for various uses. Which of the two views would the State Government favour, or would it suggest any other alternative? If a unified agency is proposed, what is the composition of this agency and under which Department should it be set up?

8. What are the prospects for making conjunctive use of ground water and surface water resources in the command areas of irrigation projects in the State? What are the impediments?

9. Can big farmers wishing to have their own tubewells be allowed to have them within the ayacut of the State tubewells? Will this require any legislation? Will this adversely affect the economics of the State tubewells and if so how?

10. What are the State policies regarding distribution of electricity and its availability to small and cottage industries and for weaker sections of the society?

11. Should there be concessional and special power rates for agricultural operations and cottage industries in the rural areas for Harijans, small and marginal farmers, etc.?

12. What should be the role of *Gram Panchayats*, *Block Samitis*, *Zila Parishads* in rural electrification programme?

13. Is there need for establishment of a Central Land Reclamation Corporation? Is it desirable to have an integrated single Land Corporation after merging the National Seeds Corporation, Central and State Farms, State Land Reclamation organisations, etc.

14. What are the organisational patterns considered suitable for land reclamation at different levels?

15. If reclaimed and developed land is allotted to individuals, co-operatives, associations and bodies, what would be the pattern to be adopted for the realisation of reclamation and development costs from beneficiaries and allottees as arrears of land revenue?

16. It has been suggested that the Government should carry out soil conservation operations such as land levelling, terracing, contour bunding, etc. and recover from the beneficiaries the cost in a suitable manner. Is it feasible to recover the cost as part of land revenue on the basis of actual expenditure incurred?

17. There is great scope for adopting the known technology for accelerating agricultural production in the dry areas. What are the prevailing reasons for not adopting the improved practices? Is credit the main bottleneck? What are the other difficulties?

Inputs

18. What are the arrangements in the State for multiplication of improved varieties of seeds evolved by the research scientists at various stages such as breeders' seed, foundation seed and certified seed? Which are the agencies responsible for the procurement and distribution of certified seed to the farmers and what are the arrangements for ensuring their timeliness and quality?

19. There is abundant scope for utilisation of organic manure, compost, farmyard manure and bio-fertilisers. What are the reasons for slow progress in this direction despite the emphasis laid on the development of these resources

in the successive Five Year Plans? What are the organisational problems involved in making use of organic manures?

20. In future, Government agencies will not be directly involved in procurement, storage and distribution of inputs. At the same time, government assistance in setting up the requisite organisation—private, public or cooperative will be necessary. Government agencies should also be responsible for enforcement of quality control. What are the State Government's proposals for setting up appropriate agencies at the State, district and tehsil levels for all inputs taken together? Does the State Government agree that there should be two sets of agencies one dealing with supply of inputs and the other dealing with enforcement of quality control?

Post-Harvest Operations, etc.

21. The attention that is at present being paid to post-harvest operations, *i.e.*, processing, storage, grading, marketing and transport, is inadequate. What are the organisational problems involved in making adequate arrangements? Are the State Warehousing Corporation, Central Warehousing Corporation, State Marketing Federations or other Apex Cooperative marketing organisations fulfilling the basic objectives for which they have been set up. Are there arrangements for coordination between the different State level organisations? Are they working satisfactorily?

22. At present there are Boards for looking after different aspects of coffee, tea and rubber. What is the State Government's view regarding the extension of this idea to other commodities. If this idea is to be extended, what should be the jurisdiction of the Board and what should be its functions? Should not basic and applied research continue with the ICAR and Agricultural Universities with regard to the commodities covered by the Board, and the adaptive research with the State Governments? Is there any advantage in entrusting development of production to these Boards, or should their functions be confined to marketing, pricing and export promotion?

Mechanisation

23. Associated with 5% increase in agricultural growth, the increase needed in power requirements will be of the order of 8%. To what extent can these extra power needs be met by bullock power and to what extent by other mechanical means? Has the State Government made any study of mechanisation-versus-bullock power? If so, what are its views regarding mechanisation keeping in mind its effect on employment? If it is agreed that selective mechanisation should be accepted, what are its implications?

24. Almost every State has set up an agro-industries corporation. How are these corporations functioning? Should they concentrate on service and supply aspects only, or should they venture into production of agricultural requisites and processing also?

Animal Health and Dairying

25. Maintenance of milch animals for commercial milk production in the urban areas poses a danger to urban sanitation. What measures does the State Government suggest, including legislation for discouraging this practice?

26. What should be the most effective organisation for rural milk production and marketing projects? Would not cooperatives of milk producers be the

best for this purpose? Where the cooperative system and ideas have not gained sufficient importance and acceptance as yet, should a public sector dairy corporation be given the responsibility for running urban milk supply and milk production plants with collection of milk through producers' cooperatives and other producer-oriented organisations?

27. Wherever there is a dairy project authority—whether a cooperative or a corporation—should it not look after all the aspects of the programme starting from milk production enhancement to marketing of milk and milk products. What should be the arrangements for improving milk production in the areas not covered by the dairy projects? Should not the State Departments assume direct responsibility?

28. After the organisation of the dairy system as envisaged above, what should be the responsibility of the State Departments in charge of Dairy Development? Should the Department not be responsible for such important activities as dairy policies and monitoring their implementation, formulation and enforcement of regulatory measures, training, extension?

29. What would be the organisation proposed for poultry development? Should there be an egg marketing federation in each State for organising, collection, storage, processing and marketing of eggs and egg products? What should be the arrangements for linking up this federation with other regional marketing federations so that surplus eggs could be marketed in the main cities and towns in different parts of the country?

30. Should the development of wool grading and marketing be organised on a Statewise basis through State wool boards?

31. What should be the policy regarding the development of goats? Should it be restricted to improvement in milk yields and rising of milch goats under stall-fed conditions, or should the goats be developed both for milk and meat? What are the views of the State Government in this regard?

32. Fodder cultivation should be organised on scientific basis on a massive scale for supporting milk production programmes envisaged in the country. Which organisation should be responsible for promoting the development of feed and fodder? A suggestion has been made that since the Agriculture Departments have the supporting expertise in plant breeding, agronomy, pest control, etc. and they are responsible for deciding the cropping patterns in the States, they should be entrusted with the responsibility for feed and fodder development maintaining liaison with the Animal Husbandry Department. Does the State Government agree with this view?

33. For rapid growth of animal feed industry, immediate steps are necessary to enforce quality control measures. What steps does the State Government envisage for this purpose? Should not livestock feeds be brought under the Essential Commodities Act? Should the establishment of feed manufacturing units be subjected to licensing policy? Should Feed Laws be enacted and if so, what should be their scope?

34. It is essential to set up immediately an Indian Veterinary Council with corresponding Councils at State level on the lines of the Indian Medical Council, to facilitate veterinarians to carry out their professional activities and maintain professional ethics with statutory support. Similar Statutory Councils have already been formed in professions like Medicine, Dentistry, etc. Does the State Government agree to the setting up of the Indian Veterinary Council?

35. There is a view that the State should be self-sufficient with regard to the biological products, and that the requirements for routine vaccination should be produced by the State biological production centres. Is this being done at

present, and what are the State Government's view with regard to self-sufficiency? Should not the manufacture of biological products be as a commercial venture and therefore be organised through Corporations or through Departmental Undertakings?

36. It has been suggested that in the interest of livestock development, a Central Act for regulating inter-State movement of livestock is required to check the spread of animal diseases and pests from one region to another? What are the views of the State Government in this regard?

37. In the interest of providing hygienic and wholesome meat, slaughter of animals should be done in modern abattoirs. How should the slaughter houses be organised? Should there be a Meat Corporation which should set up and run the slaughter houses, or should this function be entrusted to the Municipalities who could be given necessary financial assistance for modernising the slaughter houses?

Fisheries

38. There are several factors which act as constraints to the rapid development of inland fisheries. The existing legal rights are reported to be one such factor. Does the State Government agree with this view? What should be the policy regarding tenure of water holdings, i.e., ponds, tanks and bheels to promote the development of inland fisheries? How should the lease of these waters be regulated? Should private parties be induced to take on lease larger water areas?

39. What should be the arrangements for meeting the requirements of fish in large cities like Bombay, Calcutta and Delhi? Is there any monopoly with regard to marketing of fish in these areas? If so, how could this monopoly be broken?

40. To what extent should Gram Panchayats be entrusted with the responsibility in the matter of inland fisheries? What should be their role and functions?

41. What is the experience of cooperative organisation for the development of inland fisheries? Is this the desirable method of organising them? If so, what measures does the State Government suggest for making them effective?

Forestry

42. In the National Policy Resolution, it is stated that for the country as a whole the area under forests should be 33-1/3%. What is the proportion of area under forests in your State? Is this adequate, or should it be increased? What steps does the State Government propose to take to see that the present area under forests is not reduced? There would be special circumstances as in the case of land required for irrigation projects, where the forest areas may have to be taken over. In such cases, is it feasible to compensate for the area by growing forests on lands elsewhere?

43. People living in areas adjoining forests have a number of rights with regard to the forest produce. Does the State Government think that these rights have been inhibiting the proper development of forests? What measures does it suggest to lessen, if not altogether eliminate, the adverse effects of these rights? Can any employment programme be drawn up to replace the forestry rights?

44. Does the State Government agree with the suggestion to set up Forest Corporations for management of production forestry, to take advantage of institutional finance ?

45. What is the pricing policy for sale and pricing of forest products ? Is it possible to ensure that a commercial rate of return is insisted for the forest produce sold outside, in view of the need for ensuring optimum development of forest industries ?

Agricultural Research and Education

46. Would the State Government favour agricultural research to be fully under governmental control, or under joint control with responsibilities allocated amongst the State Government laboratories, universities and Central institutes ?

47. For building up a robust research organisation in agricultural research in the State, it must give a massive support, financial as well as organisational, in addition to what is being provided by the ICAR and the Central Government. What is the thinking of the State Government in the matter and how does it propose to provide funds for agricultural research in the State ?

48. Given the responsibility of adaptive research and extension of research results to the field throughout the State, how would the State Government like to strengthen its own research organisation ? In the context of the basic and applied research being the responsibility of the university, how would the State Government like to maintain liaison and coordination with the university ?

49. What is State Government's attitude and relationship with the regional research institutes/stations in the matter of sharing research results and co-operating with them in extension work ?

50. To what extent are the Central research institutes situated in the State helpful in solving agricultural problems in the State ? What are the suggestions of the State Government for making these institutes more helpful ?

51. Education is a State subject and the setting up of new Agricultural Universities is the responsibility of the State Governments. Maintaining the authority of the States, what steps should be taken to ensure that uniform standards are maintained in the universities and other educational institutions throughout the country ?

52. Is it necessary that there should be uniform pattern for all Agricultural Universities ? Should there not be emphasis in Agricultural Universities specialising in courses designed to meet the special requirements of their locations ?

53. What should be the place of agricultural subjects in the curricula for school education ?

54. Should there be one college of animal sciences attached with each agricultural university which should turn out graduates in veterinary medicines, animal production and animal production technology, or should there be separate institutions for each of these different disciplines ?

Agricultural Administration

55. What should be the administrative set-up for agricultural development from the field to the State level ? Does the State Government agree that there should be a single line of authority from the field to the State level ? Should the pattern of organisation be the same all over the State, or should there be distinction in other patterns between intensive agricultural areas and other areas ? What should be the pattern of organisation for dealing with special areas and special crops ? How should this special organisation be fitted into normal administrative organisation of the Department of Agriculture ? What should be the pattern of organisation in areas where Zila Parishads are operating

and are effective? What should be the role of Zila Parishad in the implementation of agricultural programmes?

56. What is the role of VLW in agricultural development in intensive agricultural areas and other areas. Should he be put under the unified command of Agricultural Department? What should be the jurisdiction of the VLW in intensive areas and other areas? What should be his qualifications? Does the State Government agree that ultimately the VLWs should be agricultural graduates? Does the State Government agree that immediately agricultural graduates should be appointed in-charge of a circle of population of 10 to 12 thousand persons?

57. What should be the organisation at the State headquarters in-charge of agricultural development? Should there be integrated Department of Agriculture and Rural Development at the secretariat level headed by Secretary-cum-Commissioner, Agricultural Production and Rural Development? In view of the increasing complexity of agricultural problems in the context of modernising agriculture based on science and technology, should not this officer be a technical officer?

58. Should the Director of Agriculture function as Head of the Department, or should he also have suitable secretariat status so that decisions on various issues are taken quickly?

59. There have been proposals from time to time regarding the constitution of an All-India Agricultural Service. What are the views of the State Government regarding this? Should this cover all agricultural disciplines?

60. For manning subordinate positions should a separate service be created on the lines of the Provincial Services which would absorb primarily the Agricultural Extension Officers?

61. If the management system has to be instrumental in the speedy implementation of development programmes, does the State Government agree that there should be training courses for Agricultural Officers, at different levels, in Agricultural Administration and Management? What are the views of the State Government regarding the setting up of an Administrative Staff College for Agriculture at the all-India level and for setting up of regional institutions for Agricultural Administration and management and staff college for Agricultural Administrator in each State?

62. Does the State Government agree that there should be effective arrangements for evaluating the implementation of different schemes and projects? What should be the nature of this evaluation and what would be the type of machinery that the State Government suggest for this purpose?

63. Several deficiencies have been thrown up with regard to the actual functioning of the *Patwari* as the primary reporter for agricultural statistics. At the same time, it is difficult to collect agricultural statistics without the active involvement and cooperation of the *Patwari*. What are the measures necessary for ensuring that the *Patwari* takes interest in the job and reports fairly accurate data on time?

64. What are the measures necessary for ensuring that the supervisory officers take interest in their work of agricultural statistics among the other multifarious duties which they have and see that the agricultural statistics reports are sent on time?

Incentives and Price Policy

65. What should be the type of incentives that should be offered for promot-

ing agricultural development schemes? Various types of subsidies have been in vogue for the last so many years. Have they produced the results expected? What is the experience of the State Government regarding subsidies? What are the other direct and indirect incentives that could be offered to the farmers for adopting improved practices? Does the State Government agree that cash subsidy should be avoided at all cost? Does it agree that if at all subsidies are to be given, they should be confined to weaker sections and backward areas for expediting the development?

66. There is a suggestion that investments in agriculture which benefit the bigger and medium farmers and which are remunerative should be financed by the institutional agencies with the Government activity assisting in the formulation of the schemes and in assessing their technical feasibility, and that the Government should take over the responsibility of undertaking the works benefiting the small and marginal farmers either individually or on a command area basis with provisions for subsidy, wherever necessary. Does the State Government agree with this view?

67. Although the idea of crop insurance has been considered several times, no general scheme of crop insurance has yet been formulated. A limited proposal is being tried by the LIC in cooperation with the Gujarat Fertiliser Factory, with regard to the insurance of cotton crop. What are the views of the State Government regarding the question of crop insurance?

68. Is there any experience of implementing the cattle insurance scheme in the State? Has the scheme been successful? What are the difficulties and what are your suggestions for making it a success?

Agrarian Structure

69. The transformation of traditional agriculture into a technologically progressive and modern agriculture leading to higher productivity and equitable distribution of opportunities for growth and the benefits therefrom are the two accepted goals of the country's policy. What kind of agrarian society and structure does the State Government visualise in the long run which will enable the achievement of these goals?

70. In order to bring about transformation of Indian agriculture, as also to ensure reduction in inequalities, should there be peasant proprietorship, or should there be cooperativisation? Is there any other form of agricultural organisation feasible or desirable?

71. What is the role of large mechanised farms, State-owned or otherwise, in Indian agriculture? If these are to be promoted, what should be their functions?

72. What should be the principles governing redistribution of surplus land? Should the surplus land be given to landless and peasants with very small holdings or to those with marginal holdings to make them viable? What should be the safeguards to ensure that the allottees continue to cultivate the land?

73. What principles should govern the payment of rent by the tenants to the land owners, regarding extent and mode of payment (cash or kind), timing, legality and methods of administration? Once tenancy is established, should ejection be allowed? If so, under what circumstances?

74. Should the system of share cropping continue and if so, under what conditions and with what safeguards?

75. A suggestion has been made that in each State there should be a Land Commission charged with the definite responsibilities for enforcing, supervising

and coordinating land reform measures. What are the views of the State Government regarding this suggestion? Should a separate administrative organisation distinct from the existing land revenue set up at the lower levels be established under the Land Commission?

76. Should consolidation of holdings be made a mandatory measure for the entire country? Should there be uniform laws for consolidation of holdings all over the country? What are the views of the State Government regarding these questions?

77. Should certain restrictions be imposed on the transfer, alienation and sale of agricultural land as a safeguard against potential fractionalisation, subdivision and fragmentation of holdings? Should laws of inheritance and succession be changed to save compact economic units from disintegration?

78. What incentives should be given to the farmers in the matter of cost of consolidation to accelerate the pace of consolidation?

79. Is there a Minimum Wages Act operating in the State? What are the areas in which it is operating? Is it effective? If not, what are the reasons and what measures should be taken to enforce the Act.

80. Is transfer of population feasible from labour-surplus areas to labour-scarcity areas by organising the labour force as Land Army for reclaiming developing wastelands and making it fit for cultivation?

81. It is agreed that there should be farmers' organisations at the village, block, district, State and national levels. What should be the pattern of organisation and the functions? How should these organisations be financed?

82. How should the farmers' organisations be associated in policy-making and programme operation?

83. What are the special problems of landless labour, tribals, women folk and weaker sections of the society? Should they be organised within the framework of the farmers' organisations at different levels?

APPENDIX 1.12

(Paragraph 1.5.1)

Visit to Different States and Union Territories

State/Union Territory	Date of Visit
Haryana	July, 17, 1974
Punjab	July 18, 1974
West Bengal	July 29-31, 1974
Orissa	August 1-3, 1974
Karnataka	September 25-26, 1974
Andhra Pradesh	September 27-29, 1974
Manipur	} November 20-26, 1974
Nagaland	
Assam	
Arunachal Pradesh	
Kerala	December 9-10, 1974
Tamil Nadu	December 12-13, 1974
Maharashtra	January 6-8, 1975
Goa	January 8-10, 1975
Rajasthan	January 11-12, 1975
Bihar	February 7-9, 1975
Gujarat	March 10-11, 1975
Madhya Pradesh	April 16-17, 1975
Jammu & Kashmir	July 14-15, 1975
Himachal Pradesh	July 29-30, 1975
Uttar Pradesh	November 24-25, 1975
Delhi	November 29, 1975

APPENDIX 1.13

(Paragraph 1.6.6)

Interim Report

Report	Date on which presented
1. Multiplication and Distribution of Quality Seed pertaining to High Yielding Varieties and Hybrids of Cereals	November 29, 1971
2. Fertiliser Distribution.	Do.
3. Some Aspects of Agricultural Research Extension and Training	Do.
4. Credit Services for Small and Marginal Farmers and Agricultural Labourers	January 1, 1972
5. Milk Production through Small and Marginal Farmers and Agricultural Labourers	Do
6. Establishment of Agro-Meteorological Divisions in Agricultural Universities	Do.
7. House-sites for Landless Agricultural Labourers.	August 21, 1972
8. Production Forestry—Man-Made Forests	Do.
9. Soil Survey and Soil Map of India	Do.
10. Potato Seeds	Do.
11. Organisational Aspects of All-India Coordinated Research Projects	March 13, 1973
12. Modernising Irrigation Systems and Integrated Development of Commanded Areas	Do.
13. Whole-Village Development Programme	Do.
14. Organisation and Functions of the Commodity Development Councils and Directorates	Do.
15. Reorientation of Programmes of Small Farmers and Marginal Farmers and Agricultural Labourers Development Agencies	August 16, 1973
16. Poultry, Sheep and Pig Production through Small and Marginal Farmers and Agricultural Labourers for supplementing their Income	Do.
17. Sericulture	Do.
18. Social Forestry	Do.
19. Forest Research and Education	April 19, 1974
20. Desert Development	Do.
21. Certain Important Aspects of Selected Export Oriented Agricultural Commodities	Do.
22. Agricultural Price Policy	March 13, 1975
23. Certain Important Aspects of Marketing and Prices of Cotton, Jute, Groundnut and Tobacco	Do.
24. Some Important Aspects of Livestock Production in the North-Eastern States	July 17, 1975

HISTORICAL REVIEW

1 INTRODUCTION

2.1.1 This Chapter gives a brief review of the main changes in agricultural policies and the development of institutional framework since 1928 when the report of the Royal Commission on Agriculture in India (RCA) was published. To the extent possible the review has been made in the context of significant economic, political and social factors bearing on these developments. Recommendations of the various commissions/committees have been appropriately referred to. A synoptic view of the main developments presented below refers also to the period prior to the RCA.

2.1.2 In the early phase of the British Rule in India the growth and improvement of Indian agriculture was characterised by the lack of a deliberate State policy for the development of the resources of the national economy for the welfare of the people. Introduction of land tenure systems, opening up of road and rail communications and promotion of export trade in certain agricultural commodities within the framework of the free trade policy of the colonial power were important steps taken by the British Government in India. However, the system of land settlement generally led to a large scale deprivation of ryots of their land in the *ryotwari* areas and rack renting and exploitation of tenants in *zamindari* areas; foreign competition and restrictive policy of the Government resulted in the destruction of indigenous industries and handicrafts and increased pressure on land.

2.1.3 The restructuring of land relations and improvement in the law and order situation resulted in a steady expansion of cultivated area. Productive irrigation schemes in the deltas of major rivers were undertaken specially for raising additional revenues. A separate Department of Agriculture was created in the Government of India in 1871 and subsequently similar departments were set up at provincial levels. Higher education in agriculture was organised at Coimbatore in 1878 and at Poona in 1890. The Forest Department was created in 1864 under an Inspector General of Forests and the Indian Forest Act, 1865 was enacted for the management of forests. The Act was

revised in 1878. After the Great Famine of 1876-78, a Famine Commission was appointed in 1880. As Agricultural Departments remained pre-occupied with collection of statistics, surveys and famine-relief administration, implementation of a positive policy for agricultural improvement did not receive due attention of the Government. In 1889, the Secretary of State for India sent out Dr. J. A. Voelcker, Consultant Chemist to the Royal Agricultural Society, to advise on the application of agricultural chemistry to Indian agriculture and to effect improvements in it. This might be regarded as the first serious endeavour to frame a policy of agricultural research suited to the conditions of India.¹ Dr. Voelcker's impressions and recommendations are contained in his Report on Improvement of Indian Agriculture. The attitude of complacency of the Government about the existing conditions of agriculture was primarily due to the following :

- (i) the sub-continent and Burma formed one single unit which together produced a substantial surplus of food-grains viz., wheat and rice even in famine years; and
- (ii) certain segments of the farm economy which were of special concern to the colonial power e.g., cotton, jute, indigo and other plantation crops showed marked expansion during the period in response to private initiative and market stimuli.

2.1.4 In the field of animal sciences, the Imperial Bacteriological Laboratory was established in 1889 at Poona for research in animal diseases. It was shifted to Mukteswar-Kumaon in 1893 and developed into the Imperial (now Indian) Veterinary Research Institute (IVRI) with its main campus at Izatnagar. Production of veterinary biologicals started at this institute in 1898. The Civil Veterinary Department was set up in 1891; its establishment was recommended first by the Cattle Plague Commission of 1868 and later by another commission constituted in 1886. A beginning with veterinary education was made in 1862 when a veterinary school was opened at Poona.

2.1.5 Dr. Voelcker in his report had stressed the importance of giving an agricultural orientation to the work of Forest Department. The general policy for forest management was laid down by the Government of India by a resolution in 1894.

2.1.6 In the first decade of this century, the Departments of Agriculture both in the Centre and Provinces were reorganised by providing additional staff and research facilities. The Imperial (now Indian) Agricultural Research Institute (IARI) was set up in 1905 at Pusa in Darbhanga district of Bihar for research and higher education.

1 1928. The Report of Royal Commission on Agriculture in India, 18, Bombay, Government Central Press.

The reorganisation scheme envisaged setting up of agricultural colleges and experimental farms in all the provinces for which a special fund was set aside annually. The agricultural colleges were to be manned by qualified staff and were to provide a three-year course. Demonstration farms were to be set up at suitable locations to provide a link between agricultural colleges and districts. In pursuance of this scheme agricultural colleges were started or reorganised at Poona, Kanpur, Nagpur, Lyallpur and Coimbatore. Directors of Agriculture were appointed in the Provinces supported by Deputy Directors at circle level.

2.1.7 On the recommendations of the Irrigation Commission of 1901 greater attention was devoted to irrigation schemes mainly of protective nature in scarcity areas. The recommendations of the Famine Commission of 1901 in regard to cooperative credit were given effect to by the Cooperative Societies Act of 1904. The Forest Research Institute was established in 1900. However, due to outbreak of World War I in 1914 the newly organised departments and institutions in agriculture, animal husbandry and forestry could not achieve much progress.

2.1.8 The Constitutional Reforms of 1919 developed the responsibility for improvement of agriculture including veterinary and co-operation on the Provinces. The Central Department of Agriculture was pruned and merged in the Department of Health, Education and Lands. Subjects of research, irrigation and forestry, however, remained with the Government of India.

2.1.9 In several ways the twenties was a remarkable decade. In the political sphere the national struggle for Independence was launched on a mass scale. For the first time population growth registered a significant increase. The establishment of the Indian Central Cotton Committee in 1921 gave a new direction to crop research. The Imperial Institute of Animal Husbandry and Dairying was set up in 1923 at Bangalore. It was the forebear of the National Dairy Research Institute which came up in Karnal in 1955. In the manufacturing sector under the Policy of Discriminating Protection some new industries developed, but the agricultural economy remained stagnant under extortive land tenures and was characterised by instability and low yields. Due to the capital intensive nature of industrial development, pressure on land increased further. The Government appointed several committees to study the pressing problems of the Indian economy, e.g., Economic Inquiry Committee and Committees on Taxation, Labour, Currency and Finance. In 1926, the Government decided to appoint the Royal Commission on Agriculture in India under the chairmanship of the Marquess of Linlithgow to make a com-

prehensive report on all the aspects of improving Indian agriculture. Unfortunately, before much could be achieved by implementing the Commission's recommendations, the Great Economic Depression came. Owing to the restrictive budgetary policy of the Government to combat the effects of the depression, most of the recommendations of the RCA of developmental nature were not acted upon. A significant and immediate outcome was the establishment of the Imperial (now Indian) Council of Agricultural Research in 1929.

2.1.10 To meet the emerging political situation, further Constitutional Reforms were introduced in 1935. Under the Government of India Act, 1935, greater autonomy was granted to the Provinces and Burma was separated from India. These changes had special significance to agricultural development and the food policy of the Government. Popular Ministries were formed in all Provinces in 1937; however, the Ministries formed by the Indian National Congress remained in office only for about two years. The popular Ministries sponsored a number of socio-economic policies bearing on the improvement of Indian agriculture and the conditions of the peasantry. But no sustained and significant results could be attained because of the short tenure of these Ministries and the limited power enjoyed by them particularly over financial resources, which was not commensurate with their responsibility for nation-building.

2.1.11 The World War II broke out in 1939 and dislocated normal flow of goods, particularly primary products to foreign markets, adversely affecting the condition of farmers and the agricultural sector. In 1942 the Japanese occupation of Burma and the consequent loss of imports of Burma rice completely upset the food strategy of the Government of India. Under these compelling circumstances the Government had to make determined efforts to increase food production and to evolve a viable food policy to meet the prevalent scarcity condition. During this period, various steps were taken to develop a comprehensive and integrated policy for development of agriculture and a Basic Food Plan for the distribution of foodgrains in the country under a situation of scarcity.

2.1.12 Partition of the country in 1947 brought about far reaching imbalances in the agricultural sector. However, with Independence, efforts were made for the first time to develop a national policy to improve agriculture not only to meet the current shortage but also to get over the imbalances caused by Partition and to make this sector the keystone for growth and development of the national economy and increasing the living standards of the people. With the appointment of the Planning Commission in 1950 and the implementation of the five year plans, agricultural development (including animal husbandry,

forestry and fisheries) became a major objective of a consistent plan of action embracing all sectors of the national economy supported by requisite policy measures and institutional framework.

2.1.13 In the following sections the main policy changes and institutional developments since the Report of the RCA have been reviewed in some detail :

- (i) Royal Commission on Agriculture;
- (ii) Great Economic Depression;
- (iii) Constitutional Reforms and After;
- (iv) World War II and After;
- (v) Independence; and
- (vi) Five Year Plans.

2 ROYAL COMMISSION ON AGRICULTURE

2.2.1 In the World War I, the Indian people made a fair contribution. After the close of the War the twin objectives of the British Policy towards India were :

- (i) in the political sphere to introduce responsible form of government by stages; and
- (ii) to undertake a close examination of the multifaceted problem of Indian economic development through a number of expert committees and high powered commissions.

In 1919, under the Montague Chelmsford Reforms, Dyarchy* was introduced in the Provinces. The Government also took steps for investigating the various aspects of economic life by appointing a series of committees and commissions of enquiry such as the Economic Inquiry Committee, the Taxation Enquiry Committee, the Banking Enquiry Committee, the Royal Commission on Currency and Finance, the Royal Commission on Agriculture and the Royal Commission on Labour.

2.2.2 The Royal Commission on Agriculture was appointed in 1926 under the chairmanship of the Marquess of Linlithgow. It was directed "to examine and report on the present conditions of agricultural and rural economy in British India, and to make recommendations for the improvement of agriculture and to promote the welfare and prosperity of the rural population".¹ The RCA recognised that "India is still preeminently the land of the small holders". "The typical agriculturist is still the man who possesses a pair of bullocks and

^{*} Under Dyarchy some departments, e.g. Home, Finance etc were reserved from legislative control and other departments were transferred and placed under Ministers responsible to the legislature.

¹ Ibid. 1 (p. 126) : Order of Appointment (i).

who cultivates a few acres with the assistance of his family and occasional hired labour"², and "He requires all the help which science can afford, and which organisation, education and training can bring within his reach"¹. The Report emphasised the importance of providing for a minimum standard of life in villages and controlling the rate of growth of population in promoting agricultural development. Modernisation of Indian agriculture was to be brought about through research, extension, greater coordination of various departments dealing with agriculture and development of cooperative institutions.

2.2.3 The RCA made detailed suggestions and recommendations in various fields like agricultural research, crop production, animal husbandry, forestry, fisheries, cooperation, village development, agricultural finance, communications, marketing, education and public health. Under organisation of agricultural research, the main recommendations were : establishment of an Imperial Council of Agricultural Research (ICAR), Central Jute Committee and regional agricultural research stations and promotion of agricultural research in universities. Under crop husbandry, recommendations were made for anti-soil erosion measures, improvement of crop varieties, seed production, improved implements, use of organic manures, plant protection measures and ocular demonstrations. Under agricultural finance, the Commission recommended encouragement of cooperative credit societies, establishment of land mortgage banks and imposition of restrictive measures on money lenders. For the improvement of livestock, a policy of selective breeding, a general reduction in unwanted stock, improvement of draught and milch cattle, expansion of veterinary departments, upgrading of veterinary education and greater attention to fodder cultivation were recommended. The main recommendations in regard to forestry related to provision of fodder for livestock and fuel and timber for the rural population and protection of soils exposed to erosion hazards. Its other recommendations related to legislation to promote consolidation of holdings, encouragement to group marketing, establishment of regulated markets, appointment of marketing staff at Centre and Provinces and setting up of a Central Bureau of Information on Irrigation to deal with matters arising out of hydro-electric development.

2.2.4 The Report of the RCA was considered in a conference of Provincial representatives convened by the Government of India at Simla in October, 1928. While the Report was accepted as the basis for future development of agriculture, the financial implication of implementing the recommendations were far beyond the available

resources. Therefore Provincial Governments agreed to the implementation of these recommendations by stages. Immediate action was taken on the setting up of the ICAR in 1929 with the main objective of promoting, guiding and coordinating agricultural and veterinary research in India.

2.2.5 A major gap in the recommendations was that the pressing problems of land ownership and tenancy were not covered as the subjects were excluded from the terms of reference assigned to the RCA. Furthermore, there were no recommendations on the specific needs of farmers with tiny holdings and small means. Above all, while the Provincial Departments of Agriculture required greater financial freedom to implement the recommendations, they were unduly restricted in this regard by inelastic rules and regulations and the prevailing system of financing schemes.¹

3 GREAT ECONOMIC DEPRESSION (1929-33)

2.3.1 Before much progress could be achieved in implementing the recommendations of RCA, an economic depression of unprecedented magnitude set in. It affected directly India's market for raw and manufactured jute and indirectly the demand for other Indian exports. Also, due to contraction of overseas lending by creditor countries, economic progress in India was hindered. However, there was a marked difference between the impact of the Depression on the western economies and that on the Indian economy. During the decade preceding the Depression, the western economies had a spell of expansion of output, income and employment. In India even during 1925-29 despite some expansion in the protected manufacturing sector of the economy, there was stagnation. Producers of agricultural commodities were selling their stationary output at falling prices. Therefore, while in the western economies, the fall in prices due to Depression was from a peak level, in India the prices fell from a level which was already very depressed. For instance, the general wholesale price index for Calcutta (July 1914 = 100) which stood at 202 in 1920 declined to 173 in 1924 and 141 by 1929 and touched the rock-bottom of 87 points in 1933. Indices of cereals, pulses and oilseeds in 1933 stood at 66, 84 and 74 points respectively.¹

2.3.2 The precipitous fall in prices hit the rural population hard. Even cultivators of some means found it difficult to meet their fixed

¹ Vera Anstey, 1949. *The Economic Development of India*—Third Edition, 182, London, Longmans Green & Co.

2 *Ibid* : 493-94 and 637.

liabilities such as rent, land revenue, interest payments etc. The condition of the small and marginal farmers, who even in normal times had to borrow from money lenders for meeting their pre-harvest food requirements became really precarious. Except the Governments of United Provinces and Punjab, the Provincial Governments did not grant any remission of land revenue. Furthermore, there was exploitation by the landlords. The net result was that agricultural indebtedness which was estimated at Rs. 900 crores in 1929 by the Central Banking Enquiry Committee nearly doubled between 1929 and 1936*. Many agriculturists turned into landless labourers.

2.3.3 There was a sharp contrast between the measures adopted by the Governments in the western countries and those adopted by the Government of India to combat the effects of the Depression. In the western economies, agricultural prices were raised by restricting production, purchasing of surplus produce from the market and encouraging exports through bilateral agreements. There were other economic, fiscal and monetary measures such as investment planning for increasing output, income and employment, currency depreciation etc. In India a few measures were taken which were very inadequate and some of them came after a time-lag. No action was taken by the Government to support the prices of agricultural commodities except sugarcane. Nor did the Government take any measures to inject purchasing power into the economy, particularly the rural economy through public works or provide liberal credits to individuals for undertaking works of agricultural improvement, construction etc. In fact, the Government pursued an exactly opposite policy. Gross public investments were reduced from Rs 81.44 crores in 1929-30 to Rs. 33.40 crores by 1933-34. Expenditure on agricultural research etc. was drastically reduced; not even half per cent of the total expenditure—Central and Provincial—was allocated to agriculture. Assessing the Government of India's policies, Gadgil observed: "India was perhaps the one important country in the world in which the State did almost nothing to help the agriculturist through the crisis. On the question of price policy.....the Government of India which ruled it was swayed by considerations very remote from those of the welfare of the agriculturist". While in the western economies, out of the Depression a new economic policy characterised by increased State intervention emerged, in India the traditional

*Measured in commodities, it must now be twice as large as a result of fall in prices since 1929" Preliminary Report on Agricultural Credit by the Reserve Bank of India, 1936, para 13—quoted in Jathar, G. B. & Beri, S. G. Indian Economics Vol I, p. 253, London, Oxford University Press.

1 Gadgil, D. R., 1942—Industrial Evolution of India in *Recent Times*—Fourth Edition, Preface (p. vi), London, Oxford University Press

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laissez faire policy of the Government continued.

4 CONSTITUTIONAL REFORMS AND AFTER

2.4.1 While under the impact of the recession Indian poverty was widening and deepening, the political movement for Independence gathered momentum. The Government's policy towards the movement alternated between repression and negotiation. Finally in 1935, under the Government of India Act, a further step was taken towards introduction of responsible Government in India. At the Centre there was dyarchy and in the provinces there was complete autonomy and responsible Government. Burma was separated and two new provinces of Orissa and Sind were created. The Provincial Governments were to exercise complete control on agriculture, land, water-supply, irrigation, forest, fisheries, education, public health etc. However, under the Act except a share in income-tax, no elastic source of revenue was allocated to Provinces. While responsibility for nation-building subjects including agriculture was transferred to the Provinces there was no adequate financial support for making substantial progress in development.

2.4.2 The separation of Burma in 1937 involved considerable economic readjustment as close links existed between the economies of India and Burma. A large complementary trade had long existed—India depending on Burma for rice, mineral oil and timber, and Burma purchasing Indian manufactures such as cotton textiles, jute goods, coal and sugar. India's balance of trade was rendered less favourable as a result of separation of Burma.

Popular Ministries in Provinces

2.4.3 Provincial autonomy came into force in 1937 with the Congress Party forming Ministries in 7 out of 11 Provinces and coalition Governments taking over in others. During the short tenure, popular Ministries in the Provinces sponsored legislative action on social and economic matters bearing on the development of agricultural economy and welfare of the farming population. Some of the important measures are briefly indicated below.

2.4.4 Debt relief : Measures were taken for reducing the burden of indebtedness and regulating money lenders. Moratorium was granted, pending suitable relief legislation and reduction of debt on a voluntary basis through Debt Conciliation Boards. In almost all Provinces laws were passed for compulsory debt reduction, licensing and regulation of money lenders.

2.4.5 Tenancy reforms : With a view to ensuring security of tenure and fair rent to cultivators, Tenancy Acts were either passed or amended by Provincial Governments. In Bengal, enhancement of rent was suspended for 10 years, interest on arrears of rent fixed at $6\frac{1}{2}$ per cent and right of pre-emption conferred on co-shares. The Bihar Tenancy Act provided for cancellation of all enhancement of rent between 1911 and 1936 and its reduction in proportion to fall in prices. Under United Provinces Tenancy Act, 1939, statutory tenants and tenants cultivating 'sir' lands were made hereditary tenants; rents were scaled down and landlords enjoined not to raise rents. The Central Provinces Tenancy Act, 1938 abolished 'begar' and allowed transfer of land to cultivators. The Bombay Tenancy Act, 1938 (implemented in 1941 in a limited area) specified the grounds on which tenants could be ejected and allowed compensation for improvements effected. The tenancy legislations did not, however, provide any substantial relief to cultivators as they did not tackle the problem of subletting. The occupancy rights were not attached to the land but to a particular class of tenants who might be non-agriculturist or might cease to cultivate. The right of free transfer enabled passing of *raiya* lands into the hands of money lenders and non-cultivators. The problem of conflicting interests in land could be solved only by abolishing all intermediaries between the tiller and the Government. Though the popular Government realised this, action on these lines could not be taken due to certain provisions in the Government of India Act, 1935.

Consolidation of Holdings

2.4.6 Some steps were taken during this period for consolidation of holdings in a few provinces, strengthening the cooperative credit structure, and creating basic infrastructure for the marketing of agricultural produce. To tackle the problem of subdivision and fragmentation, the RCA suggested an intensive drive, relying on voluntary approach and persuasion. The Government of Punjab had pioneered the experiment in 1921 with the help of special cooperatives. In 1928 the Government of Central Provinces resorted to special legislative powers for the purpose. The Punjab Legislature passed the Consolidation of Holdings Act in 1936, which provided that consolidation operations should be carried out compulsorily if two-thirds of the landholders agreed to consolidation. In the United Provinces the relevant Act was passed in 1939 and enforced in the following year.

Credit

2.4.7 During the period of Depression, due to steep fall in prices, there was heavy accumulation of dues with cooperative societies and consequently their assets were frozen. The societies could not, therefore, provide adequate assistance to cultivators. Between 1935 and 1939 committees or special officers were appointed in almost all provinces for rehabilitating the cooperative movement and ensuring its future growth on sound lines. The loans due to primary societies were scaled down to the repaying capacity and were made payable in easy instalments. As recommended by the RCA, land mortgage banks were set up in several provinces, for providing long-term finance to cultivators; however, nowhere except in Madras Province did these banks make any substantial progress.

Marketing

2.4.8 Even though RCA had recommended the setting up of suitable agencies for development of marketing, Provincial Governments found it difficult to take action owing to financial stringency. The Government of India, however, was convinced that improved agricultural marketing would facilitate quicker economic recovery. As a first step, an expert was appointed on the staff of the ICAR in April, 1934. The office of the Agricultural Marketing Adviser at the Centre and Provincial Marketing Departments came into being in the following year. They jointly conducted marketing surveys on a number of crops and made recommendations for improving their marketing. With the enactment of the Agricultural Produce (Grading and Marketing) Act, 1937, progress was also made in grading and standardisation of agricultural produce. In the Central Provinces, Agricultural Produce Markets Act was passed for the establishment of regulated markets in commodities other than cotton, particularly rice, wheat and oilseeds.

2.4.9 Among other important developments during this period mention might be made of the establishment of the Central Jute Committee (1936) for promoting the cultivation and marketing of jute. In April, 1935 the Reserve Bank of India came into existence.

Discriminating Protection and Agriculture

2.4.10 The Government of India adopted in 1923 the Policy of Discriminating Protection. Under this policy, during the 1930s, there was some progress in industrial development which had beneficial effects on the development of agriculture. Protection was first granted to iron and steel, cotton textile, paper, match and plywood industries. In 1931 sugar industry was granted protection with a view to attracting

more capital into the industry. Protection was extended to sericulture in 1934. Growth of the cotton industry stimulated production of medium staple cotton which commanded a premium in the market. As area under improved sugarcane varieties increased steadily, it was feared that unless manufacturing capacity was developed, there would be a glut in the market and cane prices would crash. Area under sugarcane increased from 1,052 thousand hectares in 1930-31 when protection to sugar industry was first granted, to nearly 1,457 thousand hectares in 1939; of these 1,052 thousand hectares were under improved varieties against only 405 thousand hectares in 1930-31. Yield per hectare of sugarcane also improved from 30 to 35 tonnes.

Economic Planning

2.4.11 When the Congress Ministries were in power, the Indian National Congress appointed in 1938 a National Planning Committee with Shri Jawaharlal Nehru as the Chairman. During the period of struggle for freedom the Congress regarded political freedom as a means to establish life and society on the basis of economic progress and justice. In the thirties the achievements of the planned economy in USSR attracted attention all over the world. Therefore, the National Planning Committee and its various sub-committees were established to undertake a survey of the resources and the production potential of the Indian economy and formulate policies and, to the extent possible, programmes for tackling the problems of poverty and unemployment. However, with the outbreak of the World War II and resignation of the Congress Ministries, the work of the National Planning Committee was suspended. In the forties some of the Reports of the National Planning Committee/sub-committees were published.

5 WORLD WAR II AND AFTER

2.5.1 The World War II in many ways was a turning point. Congress Ministries in the Provinces resigned office following the unilateral declaration of war by the Viceroy on September 3, 1939. Thus came to a close the constitutional experiment in progressive realisation of responsible government. The immediate effects of the war on the economy were that commercial crops like jute, cotton and groundnut lost their export markets and demand for foodgrains increased manifestly pushing up prices. Government sought to meet the situation by restricting area under cash crops and encouraging diversion to food crops. However, the newly assumed responsibility of the Government of supplying foodgrains to defence personnel caused continuous pressure on supplies and prices. The situation became suddenly grave

following the entry of Japan into the war in December, 1941 and the occupation of Burma by Japanese forces in 1942.

Grow More Food Campaign

2.5.2 The Advisory Board of the ICAR and Indian Central Cotton Committee had been urging the Government of India to initiate measures for growing more food within the country. In deference to the views of these bodies and also forced by the steadily deteriorating food situation, the Government convened a Food Production Conference in April, 1942 which was attended by representatives of the Provinces and States. "The Conference viewed with grave concern the shortage of food which was likely to face the country largely because of the loss of imports of rice from Burma and recommended that a planned drive for the increased production of food and fodder crops should be immediately initiated". To achieve immediate increase in agricultural production the Conference suggested the following steps :

- (i) increase in area under food and fodder crops by (a) bringing new land including fallows under cultivation, (b) double cropping, and (c) diverting land from non-food crops to food crops;
- (ii) increase in the supply of water for irrigation by improving and extending existing irrigation canals, construction of additional wells etc.;
- (iii) increase in the supply of improved seeds; and
- (iv) increased use of manures and fertilisers.

The broad plan of action formulated and the various resolutions passed at the Food Production Conference laid the foundations of the Grow More Food (GMF) Campaign, which marked the beginning of a sustained national effort at increasing agricultural production and improving agriculture.

2.5.3 The two years 1942 and 1943 were a period of extraordinary strain for the Government, mainly because of the difficulties on the food front. There were a series of developments which led to the Bengal famine and also to the emergence of a national food policy. These are referred to in a subsequent section. From 1943, the Government of India began assuming wider responsibilities in regard to food production, a field which for over two decades was the primary concern of the Provincial Governments. They began to direct the GMF Campaign and brought about greater involvement of Provincial Governments by offering special assistance by way of grants and loans. The Foodgrains Policy Committee (FPC) (1943) and the Famine

1 1945. *The Famine Inquiry Commission*, Final Report, p. 11, Delhi, Manager of Publications.

Inquiry Commission (FIC) (1945) appointed mainly to report on the food problem and food administration strongly supported the continuance of the Campaign. The FIC in its Final Report gave a number of suggestions for improving agriculture, which covered all important aspects like irrigation, manures, fertilizers, improved seeds, agricultural implements, plant protection, diversification of cropping, agricultural research, animal husbandry and fisheries. Cereals being the staple diet of the people, the FIC suggested that self-sufficiency in cereal production at a satisfactory level of intake should be the cardinal aim of food and agricultural policy. As an increase in cereal production alone was not likely to improve the diet of the people, they laid stress on increased production of supplementary foods like pulses, oilseeds, vegetables, tuber crops, fruits, milk, eggs etc. One of the important recommendations relating to agriculture made by the FPC was that indigenous production of fertilisers, particularly ammonium sulphate, should be encouraged by providing necessary assistance to industrialists for setting up manufacturing plants. Fertilisers and Chemicals Travancore Ltd. was the first major factory to come up in the country; work on it began in 1943 and it went into production in 1947.

2.5.4 There were no targets set for food production during the early phase of the GMF Campaign. The aim of policy was on diversion of area from cash crops, mainly short-staple cotton to food crops; extension of cultivation to current fallows and culturable wastes; and intensive cultivation. There was some decline in area under cotton, increase in irrigation particularly through minor irrigation works like tubewells and also some progress in soil conservation and land reclamation work. Scope for extending cultivation to fallow lands being limited, reliance was placed on reclamation of culturable waste lands with the help of heavy machinery. To speed up this operation, the Central Tractor Organisation was established in 1946. The Campaign, however, suffered during 1946 and 1947 on account of unfavourable weather, uncertain political situation, communal riots and ineffective control on supply, prices etc.

Departments for Food and Agriculture

2.5.5 Foundation for an adequate machinery at the Centre to take care of agricultural developments in the country was laid during this period. In 1942 the Department of Food was created to cope up with the difficult food situation. Subsequently in 1944 as part of a scheme for streamlining the work of the GMF Campaign a number of key-posts were created which included those of Irrigation Adviser, Fisheries Development Adviser and Statistical Adviser*. In 1945, the

* The post was redesignated subsequently as Economic and Statistical Adviser.

Department of Education, Health and Lands was trifurcated to form a separate Department of Agriculture. The Directorate of Plant Protection, Quarantine and Storage was set up in 1946.

All India Policy on Agriculture

2.5.6 A major development of this period was the first ever elaboration of an all India policy on agriculture. The spade work for the policy statement was done by a number of expert groups. A preliminary plan for economic development covering all important sectors including agriculture and elaboration of policies to be pursued in respective areas were attempted by the Reconstruction Committee of Council constituted in early 1943¹. The Council had set up a number of policy committees to assist it; one of them was the Policy Committee on Agriculture, Forestry and Fisheries. The latter in turn had appointed individual experts and sub-committees to report on problems and specific areas like production possibilities in agriculture, agricultural prices, agricultural finance, marketing and fisheries. Mention might be made here of the study undertaken by Dr. W. Burns on 'Technological Possibilities of Agricultural Development in India' based on existing farm situation and available indications of production possibilities from known technological improvements. Some of the other studies made are referred to later in the Section. The policy formulations on agriculture contained in the report of the Reconstruction Committee was based on all these studies. At about the same time, the ICAR prepared a Memorandum² indicating the ways and means of optimising agricultural production which was generally endorsed by the Policy Committee on Agriculture. The Famine Inquiry Commission (1945) also gave a series of recommendations for improving agriculture in its Final Report. After careful consideration of the various suggestions and recommendations made by these bodies, the Government of India issued a 'Statement of Agriculture and Food Policy in India' in January, 1946. The Statement also spelt out the objectives to be achieved, the measures to be taken and the respective roles of the Centre and the Provinces.

2.5.7 According to the Statement, "The all-India policy is to promote the welfare of the people and to secure a progressive improvement

- 1 1944. Second Report on Reconstruction Planning—Reconstruction Committee of Council, New Delhi, Government of India Press.
- 2 1944. Memorandum on the Development of Agriculture and Animal Husbandry in India, Advisory Board of the ICAR, New Delhi, Government of India Press.

of their standard of living. This includes the responsibility of providing enough food for all, sufficient in quantity and of requisite quality. For the achievement of this objective, high priority will be given to measures for increasing the food resources of the country to the fullest extent, and in particular to measures designed to increase the output per acre and to diminish dependence on the vagaries of nature. Their aim will be not only to remove the threat of famine but also to increase the prosperity of the cultivator, raise levels of consumption and create a healthy and vigorous population".¹ The ten objectives of policy included increase in production of foodgrains and protective foods; improvement in methods of agricultural production and marketing; stimulating production of raw materials for industry and exports; securing remunerative prices for the producer and fair wages to the agricultural labour; ensuring fair distribution of the food produced; and promoting nutritional research and education.

2.5.8 The reports of many of the sub-committees appointed by the Policy Committee on Agriculture, Forestry and Fisheries helped to shape future policy in the respective fields. For instance the Prices Sub-Committee chaired by Shri V. T. Krishnamachari recommended price support to all important foodgrains and cash crops through floor and ceiling prices. The floor prices were to be announced in advance of the sowing season and the ceiling prices subsequently when crop prospects were known. These prices were to be enforced by open market purchases at minimum prices if prices happened to be falling and by requisitioning stocks and regulating distribution when prices rose beyond limits. Creation of buffer stocks of adequate size and sufficient storage capacity were considered essential for the success of State intervention. The Sub-Committee proposed a set of complementary organisations at the Centre consisting of an All India Agricultural Prices Council, a Price Determination Commission and a Commodity Corporation to carry out the respective functions of formulation of policy, determination of maximum and minimum prices and the enforcement of prices fixed. The Sub-Committee also recommended the establishment of a Bureau of Economics and Statistics for collection, analysis and interpretation of relevant data.

2.5.9 The main recommendations of the Agricultural Finance Sub-Committee headed by Professor D. R. Gadgil related to reduction of accumulated debt and reorganisation of cooperative structure. It was recognised that reorganisation of agricultural credit structure was not possible without reducing the crushing burden of accumulated

1 1946. A statement of Agriculture and Food Policy in India : 1, Department of Agriculture and Department of Food, New Delhi, Government of India Press.

debt. The outstanding debt was to be so adjusted that it did not exceed twice the principal originally borrowed. This sum was to be repaid immediately by debtors by borrowing on easy terms from land mortgage banks or special Government agencies set up for the purpose. The process of debt adjustment was to be followed by a complete re-fashioning of the financial structure, the primary aim of which was to provide an agency alternative to the money lender. The Sub-Committee suggested the setting up of autonomous agricultural credit corporations in Provinces to provide all types of credits, directly and indirectly to cultivators. Further, commercial banks and private corporations were also to be enlisted for providing credit, particularly for marketing purposes. They also recommended emergency finance mainly in the form of grants and special purpose loans at concessional rates from the Centre to Provinces in case of emergencies like famines, floods etc., construction of warehouses at important centres and the creation of a public corporation to operate them.

2.5.10 Major recommendations made by the Marketing Sub-Committee related to the setting up of regulated markets in all Provinces and States, organising cooperative marketing societies on a larger scale, conducting of marketing surveys, providing adequate storage facilities, placing marketing charges on a uniform and reasonable basis in all markets and strict enforcement of the Regulated Markets Act and rules framed thereunder. The Sub-Committee recommended that multi-purpose cooperative societies should be organised which should advance loans to cultivators on the security of the produce and arrange for its sale.

Research

2.5.11 The Government took steps to organise research support to Agriculture through research institutes and commodity committees. Most important among the institutions established was the Central Rice Research Institute at Cuttack in 1946. The Committees set up were the Indian Central Sugarcane Committee (1944), the Indian Central Tobacco Committee (1945), the Indian Central Coconut Committee (1945) and the Indian Central Oilseeds Committee (1947). Besides crop research, the commodity committees attended to problems of development and marketing and advised the Government on matters relating to the crop concerned. The Government also founded two research institutes for the study of problems relating to inland and marine fisheries.

Animal Husbandry

2.5.12 Main concern in the field of animal husbandry was to

bring about improvements in the draught and milking qualities of cattle, provision of better feed and fodder and protection of livestock against diseases. For improvement of cattle through breeding, the main constraint was the paucity of pure bred bulls from Government farms. Efforts were therefore made to utilise improved bulls available with private breeders. Simultaneously the Departments of Animal Husbandry in the Provinces initiated programmes for castration of scrub bulls and a number of Provinces introduced the Livestock Improvement Act. Artificial insemination was introduced on a field scale after preliminary trials at the IVRI and its four regional centres. Sheep developmental activities, aimed at improving the quality and increasing the quantity of wool through distribution of stud rams were undertaken in some sheep rearing areas. Pilot projects were launched for training shepherds in improved wool shearing methods. Research programmes on poultry breeding were undertaken with the object of obtaining higher egg production. Work on development of biological products and methods for control of animal diseases continued to make progress at the IVRI.

Fisheries

2.5.13 Recognising the need to develop fisheries, the Government of India appointed a Fisheries Development Adviser in May, 1944. Supporting staff to prepare plans for research and development was provided during 1945-46. The Deep Sea Fishing Organisation was established at Bombay in 1946 for undertaking survey of marine fisheries resources. The problem of fishery development was subjected to a thorough study by the Fish Sub-Committee of the Policy Committee on Agriculture, Forestry and Fisheries. An important recommendation made by the Sub-Committee was that a Central Fish Committee and a Central Fishery Research Institute might be established. Proposals for the latter were accepted in 1947 and two research institutes, one for marine fisheries at Mandapam and the other for inland fisheries at Barrackpore (Calcutta), were set up. Arrangements were also made for institutional training in fisheries to train personnel for Provinces and for specific jobs.

Forestry

2.5.14 In view of the importance of forest as a stockade against soil erosion in river catchments and a source of fuel for villages, the problem received the attention of the Reconstruction Committee. They indicated that the main concern of post-war forest policy should be threefold rehabilitation of government forests already deleted due

to indiscriminate fellings during the war; prevention of soil erosion; and extension of afforestation for its own sake and also to make available fuel and small timber to villagers. Provinces were to strive for a minimum coverage of 20 to 25 per cent of their area under forests. Some control over private forests was considered unavoidable to ensure progress in this direction. Steps were also urged for the development of industries for utilising minor forest produce and providing employment. A number of development schemes were initiated during this period, which included large scale planting activity and extension, and improvement of communications in forest areas. New forest industries also began coming up including some big industries like the newsprint factory at Nepanagar in Madhya Pradesh. The Forest Research Institute set up in 1906 was expanded and reorganised to meet the research needs of forestry, forest production and utilisation.

Food Administration and Food Policy

2.5.15 As indicated earlier, soon after the outbreak of the war, a number of factors combined to make the food situation grave; and by and by, contours of a national food policy began to emerge. The Government intervened in the foodgrains market for the first time in December, 1941 when ceiling prices were imposed in wheat in the Punjab markets following a steep rise in prices. Fall of Burma and stoppage of rice supplies from that country created a panicky situation which greatly aggravated food scarcity and rise in prices. Government promulgated the Foodgrains Control Order of May, 1942 with a view to licensing traders and isolating speculators. The Provincial Government banned movement of foodgrains outside their borders in an attempt to conserve supplies. The Food Department which was established in December, 1942 for formulating food policy and administering the same, was also to undertake purchase of foodgrains and take care of movement, storage and inspection of grain stocks. One of the first steps taken by the Department was to evolve a "Basic Plan" indicating the extent of surpluses as well as deficits of foodgrains in various Provinces and the direction of movement of stocks. Even before any progress could be made to implement the Plan, a food crisis of unprecedented magnitude began developing in the eastern region, particularly in Bengal. The Basic Plan took time to get off as Provincial Governments were somewhat unrealistic in assessing their surpluses/deficits. The Government of India, therefore, temporarily suspended the Basic Plan to facilitate movement of foodgrains stock to the eastern region. However, this step instead of improving the situation precipitated a food crisis in Bengal from which there was no immediate escape. The policy evoked great public resentment and was

abandoned almost immediately in August, 1943. Meanwhile the Government appointed the Foodgrains Policy Committee (FPC) in July, 1943 to lay the guidelines of food policy and food administration in the country. The Committee made an interim recommendation to introduce rationing of foodstuffs in all big towns and cities. The final recommendations of the Committee fell under five major heads, viz. augmentation of supplies by stoppage of exports and increase in imports; improvement in procurement; extension of rationing; check on food prices by imposing statutory controls on principal foodgrains; and general overhaul of the administrative machinery and readjustment of relations between Provincial Governments and the Central Government. In pursuance of these recommendations, rationing was extended to major cities and towns as also to some rural areas. Government also intensified procurement operations and arranged for additional imports.

2.5.16 The food scarcity which began developing in early 1943 in the eastern region finally converged on Bengal under pressure from unscrupulous market elements to cause an acute famine of unprecedented magnitude. Judging from intensity of suffering and loss of life it caused the Bengal Famine was undoubtedly the worst of the century. The Famine Inquiry Commission (FIC) appointed in July, 1944 under the chairmanship of Sir John Woodhead, after a very careful examination of all relevant factors came to the view that the impact of the tragedy could have been greatly reduced, if not avoided, by more efficient and vigilant administration. In their Final Report the FIC urged the Government to recognise the ultimate responsibility in making food available to all. They ruled out the policy of *laissez faire* in the matter of food supply and distribution as inexpedient and suggested that all the resources of the Government must be brought to bear on achieving an equitable distribution. The recommendations of the FPC and FIC provided the initial frame for a national food policy which was modified from time to time according to exigencies of the situation.

2.5.17 Thus during the period 1939 to 1947 Government took measures not only to meet the immediate food shortage but also to make permanent improvements in agriculture. In response to the challenging situations in production and distribution of foodgrains, the rudiments of a national production policy as also food policy began to emerge. However, the limited scope for extension of cultivation to new areas, the limitation on intensive crop production imposed by difficult supply position of inputs and lack of financial resources with cultivators continued to create problems in raising yields and production. In the absence of a suitable extension organisation, there was no effective

communication of the results of the meagre research effort to farmers. All these had an inhibiting effect on crop production. Moreover, production efficiency did not depend only upon land and inputs, but was also governed by social, economic and legal status of cultivators. Despite the provisions of various Tenancy Acts, a large proportion of actual cultivators did not enjoy ownership rights, security of tenure and protection from excessive rents. As a result, in spite of high prices of agricultural produce during the War period, crop production did not record any significant increase.

6 INDEPENDENCE

2.6.1 On August 15, 1947, India became Independent. The Departments of Food and Agriculture became Ministries under the charge of a Cabinet Minister. However, the Partition and the consequent distribution of irrigation and other resources between India and Pakistan further deepened the crisis in food situation in India and created new problems in respect of cotton and jute. Government made frequent modifications, sometimes drastic, in the production and distribution policies to meet the emerging situations.

Grow More Food Campaign Reoriented

2.6.2 The immediate task facing the National Government was to increase the domestic production of all agricultural commodities. The GMF Campaign was therefore placed on a planned basis from 1947-48. A target of additional production of 4 million tonnes was fixed to be achieved over a period of 5 years. The Foodgrains Policy Committee appointed in September, 1947 under the chairmanship of Shri Purshotamdas Thakurdas to examine the supply position of foodgrains and advise the Government on measures for increasing domestic production, procurement and imports, recommended that greater attention should be paid to minor irrigation, development of local manurial resources, distribution of improved seeds and land reclamation. It also emphasised the need for planning production of fertilisers.

2.6.3 However, as the GMF Campaign was not responding adequately, in terms of crop production, a review was undertaken by Lord Boyd Orr towards the end of 1948, at the instance of the Government of India. He recommended that the whole campaign should be placed on an emergency footing and bottlenecks of supply and in movement of essential materials should be removed. Coordinating

agencies at the Centre and in the States were to be appointed with wide powers to execute the programme. The objective of the Programme was to achieve self-sufficiency in foodgrains by March, 1952.

2.6.4 The recommendations were followed up with suitable measures. The Government of India appointed a Commissioner of Food Production in July, 1949 with special powers to implement the new policy. State Governments also appointed counterpart officers. However, agricultural production continued to remain sluggish which prompted a major change in the approach. Instead of spreading the efforts thin all over the country it was decided in 1950-51 to concentrate such efforts in compact areas called 'intensive cultivation areas' which possessed assured water supplies and fertile soils. Meanwhile, the difficulties of importing cotton and jute from Pakistan highlighted the importance of stepping up the production of these essential raw materials. The Government therefore decided to extend the Campaign to cover these two crops as well. The extended programme called the 'Integrated Production Programme' was launched in June, 1950. While the short-term objective of the programme was "to win freedom from foreign bread and achieving progressive self-sufficiency" 'land transformation' was considered as its ultimate objective. By land transformation was meant securing "utilization of land on a rational basis so that the available resources of land, water and livestock were developed to the maximum extent". As some diversion of area from foodgrains to cotton and jute became inevitable to offset the likely loss, a few schemes like development of fisheries, subsidiary food etc. were included in the campaign. Besides strengthening its own machinery, the Government of India extended financial assistance to States for meeting the cost of additional staff and other measures connected with food production schemes. The concept of 'self-sufficiency' in foodgrains by the end of March 1952, was modified to that of 'relative self-sufficiency' which implied that some imports of foodgrains might be necessary for meeting emergencies, for building reserve stocks and to compensate the loss due to diversion from food to cash crops.

2.6.5 In view of the persisting stagnation in crop production the Government instituted a special enquiry into the working of the Campaign in early 1952. The Grow More Food Enquiry Committee headed by Shri V. T. Krishnamachari expressed the view that "The food problem is a much wider one than mere elimination of food imports. It is the problem of bringing about such a large expansion of agricultural production as will assure to an increasing population

1 1951. 'Towards Land Transformation', Part I, Evolution of Agricultural Policy, p. 152-53. Ministry of Food and Agriculture.

progressively rising levels of nutrition.”¹ The Committee felt that the lack of success of the programme was mainly due to its failure to arouse enthusiasm in the countryside. Important recommendations made by the Committee related to :

- (i) the setting up of countrywide extension service organisation;
- (ii) the acceleration of minor irrigation programmes; and
- (iii) the provision of adequate credit and quality seed, and development of local manurial resources.

The Committee also recommended that a sum of Rs. 10 crores a year might be placed at the disposal of the Ministry of Food and Agriculture over and above the plan allocations to be given as loans to States for undertaking special programmes for minor irrigation works

Agrarian Reforms

2.6.6 Alongside developmental measures in crop production, agrarian reforms were pushed through in various States. The notable among them during the pre-plan period was the Uttar Pradesh Zamindari Abolition and Land Reforms Act of January, 1951. By the end of 1953 all States had abolished the *zamindari* system. A number of States also enacted legislation to fix the shares of the produce between the landlord and the tenant to prevent unfair eviction of tenants and to confer ownership rights on them on specified conditions.

Education

2.6.7 Immediately following Independence, the Government of India appointed the University Education Commission (1949) under the chairmanship of Dr. S. Radhakrishnan to examine the entire spectrum of higher education in India and to make recommendations for improvement. Recognising the weakness of the traditional system and the need to link programmes of agricultural education with production programmes, the Commission suggested the establishment of ‘rural universities’.

Statistics

2.6.8 Measures were also taken by the Government to streamline collection of agricultural statistics and to improve their coverage and quality. The Directorate of Economics and Statistics was set up in

¹ 1952. Report of the Grow More Food Enquiry Committee, 50, New Delhi, Government of India.

January, 1948 in the Ministry of Agriculture, under the Economic and Statistical Adviser. In 1949, a Technical Committee on Co-ordination of Agricultural Statistics under the chairmanship of Shri W. R. Natu examined the existing system of reporting agricultural statistics and suggested measures for improving the data collection. Two significant developments took place during the forties in this field. An objective method for estimating crop yields suitable for application within the framework of the existing administrative structure was developed by the ICAR under the guidance of Dr. P. V. Sukhatme and Dr. V. G. Panse. This method came to be adopted by most of the States. Earlier, sample survey techniques for estimating area and production were evolved by the Indian Statistical Institute under the guidance of Professor P. C. Mahalanobis.

Food Policy

2.6.9 With Independence, pressures were mounting on the Government to do away with irksome controls on production, distribution and prices of foodgrains. Progressive decontrol had been suggested by the Foodgrains Policy Committee, 1947. A policy of gradual decontrol was announced towards the end of November, 1947, and in pursuance thereof States sought to reduce their rationing commitments by stages to match internal procurement. An incentive bonus scheme was also instituted with a view to augmenting the stock position with the Centre. However, the expectation that decontrol would lead to dehoarding of stocks, increase in procurement and stability in prices did not materialise and prices began rising fast. Government tried some partial measures like introduction of fair price shops with little or no effect. A reversion to controls was, therefore, decided upon in September, 1948 and all the State Governments were enjoined to implement the decision by October, 1949. With the return of controls, procurement of adequate stocks for public distribution assumed crucial importance. There was also lack of uniformity in various control measures in force in different States. In February, 1950 the Government appointed the Foodgrains Procurement Committee under the chairmanship of Shri M. Thirumala Rao to review the system of procurement and distribution of foodgrains and suggest improvements. The main recommendations of this Committee were monopoly procurement of foodgrains, abolition of the free market, imposition of complete statutory rationing in towns with a population of 50,000 and above and informal rationing elsewhere.

Food Imports

2.6.10 As compared to the average level of 2 million tonnes of
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foodgrains imported during the pre-War period, imports were about 2.9 million tonnes in 1948 and 3.8 million tonnes in 1949. In 1951 there was the new policy of Government to Government aid when the USA granted a long term loan for purchase of 2 million tonnes of foodgrains. Aggregate imports during that year were of the order of 4.8 million tonnes, the highest level on record till then.

The Planning Commission

2.6.11 Government of India had been giving thought to the problem of reconstructing the economy from the early days of the War and the first steps taken in this regard by the Reconstruction Committee of Council had been indicated earlier in this Chapter. Towards the close of 1946, the Interim Government appointed an Advisory Planning Board to examine and review the major problems of post-War economic reconstruction. The Board recommended that a permanent Planning Commission should be appointed at the Centre to devote continuous attention to the task of planning and development. The Planning Commission was set up in March, 1950, with the Prime Minister Shri Jawaharlal Nehru as Chairman and Shri V. T. Krishnamachari as Deputy Chairman. The following were some of the important functions assigned to the Commission :

- “(1) make an assessment of the material, capital and human resources of the country, including technical personnel, and investigate the possibilities of augmenting such of these resources as are found to be deficient in relation to the nation's requirements;
- (2) formulate a Plan for the most effective and balanced utilisation of the country's resources;
- ** ** ** **
- (6) appraise from time to time the progress achieved in the execution of each stage of the Plan and recommend the adjustments of policy and measures that such appraisal may show to be necessary.”

By July, 1951 the Commission drew up the draft of the First Five Year Plan and it was finalised in December, 1952.

The Constitution

2.6.12 India became a Sovereign Democratic Republic on January 26, 1950. According to the Constitution which came into force immediately, some subjects are to be handled exclusively by the Union Government, some exclusively by State Governments and still

some others concurrently by both. In the area of agriculture, subjects like agriculture including agricultural education and research, animal husbandry, irrigation including drainage and embankment, land tenure land improvement and colonisation, forestry and coastal and inland fishery are included in the State List. Central responsibility in this area is confined mainly to regulation and development of inter-State rivers and river valleys when such initiatives are approved by the Parliament, fishing beyond territorial waters, institutions for scientific and technical education declared as of national importance and coordination and determination of standards in scientific and technical institutions and those of higher education or research. Some entries in the Concurrent List, such as economic and social planning, social security and employment and price control facilitate action by the Centre covering the whole economy including agriculture. More specifically, the Third Constitution Amendment Act, 1954 relating to Entry 33 of the Concurrent List considerably widened the scope of action by the Centre in agriculture. It facilitated central intervention in trade and commerce, and production, supply and distribution of a large number of essential commodities, viz., food stuffs including edible oilseeds and oils; cattle fodder including oilcakes and other concentrates; raw cotton, cottonseed, and raw jute.

7 FIVE YEAR PLAN

Objectives and Strategy

2.7.1 The major objectives of the First Plan in the field of agriculture were to correct the imbalances caused by Partition in the supply of foodgrains and commercial crops, particularly cotton and jute and improve infrastructure facilities. Agriculture, including irrigation power, was therefore accorded the highest priority. Efforts to improve agriculture were spread over the entire country and every village was to be involved in it through the Community Development Programme. A land policy was also adumbrated, aimed at eliminating exploitation and extending security of tenure. In the Second Plan agriculture was accorded somewhat lower priority *vis a vis* industry. The shift in priorities was due to: (a) the smooth performance of agriculture during the First Plan period; (b) possibility of financing economic development through foreign aid in farm surpluses; and (c) heavy industry being considered as the leading sector of economic development. However, towards the close of the Second

Plan, a new approach to agricultural development based on selectivity of area and concentration of efforts gained acceptance. Accordingly under the Third Plan, Intensive Agricultural District Programme (IADP) and the Intensive Agricultural Areas Programme (IAAP) were launched. The main objectives of the Third Plan were to achieve self-sufficiency in foodgrains and increase in agricultural production to meet the requirements of industry and export. A number of new institutions were set up to extend support to development activities in different fields; these included the Food Corporation of India, the National Seeds Corporation, the Fertiliser Corporation of India, and the Agricultural Refinance and Development Corporation. However, the implementation of the Third Plan was hindered by three unexpected events; the Chinese incursion on the borders in 1962, the Pakistani incursion in Jammu & Kashmir in 1965 and the disastrous drought of 1965 and 1966. In 1966-67 a new strategy of agricultural development was launched. Its main planks were the High Yielding Varieties Programme and the Multiple Cropping Programme, both based mainly on the exotic, high yielding, short duration crop varieties. The other elements of the strategy were the new concepts of irrigation and water management, adaptive research and price guarantee to producers. While most of the programmes adopted under the new strategy were continued in the Fourth Plan, a new orientation was imparted to agricultural policy. To achieve growth with social justice a built-in-bias was introduced in agricultural programmes to help the weaker and vulnerable sections and backward areas. The role of technology as a major input in agriculture was accorded explicit recognition. Besides attainment of self-sufficiency, the Plan envisaged building up of a sizable buffer stock of foodgrains and stoppage of concessional imports of foodgrains. In the following paragraphs the main policy and institutional changes in the different aspects of crop production are discussed. Thereafter the developments in animal husbandry, fisheries and forestry have been dealt with.

Production Policies

2.7.2 Community Development Programme : The Community Development Programme launched in selected districts on October 2, 1952 played a significant role in agricultural development in the First Plan. Besides schemes supporting agriculture, the Community Development Programme included a number of other schemes like provision of better communications, improvement of health and education, measures for the welfare of women and children, development of

cottage and small scale industries etc. The main objective of the programme was to develop self-reliance in the individual and initiative in the community towards achieving general welfare, including appreciable increases in agricultural production. The National Extension Service was envisaged as the main agency for bringing about the desired economic and social changes. By 1955-56 about one-fourth of the villages were covered under the programme; the coverage progressively increased to 60 per cent in 1960-61 and all villages were covered by 1963-64. Panchayati Raj institutions introduced during the Second Plan were intended to provide democratic leadership to economic development. These institutions sought to democratise administration from the village to the district level and involve people in the development process at all these levels.

2.7.3 Intensive Agricultural District Programme : A major limitation of the Community Development approach was that scarce resources were dispersed over too wide an area, without achieving appreciable increases in crop production. Therefore, during the closing years of the Second Plan, the Intensive Agricultural District Programme (IADP) was formulated, which envisaged concentration of resources and efforts in specially endowed areas to achieve a quick breakthrough in production. This approach, tried earlier under the GMF Campaign, was merged into the Community Development Programme. The Agricultural Production Team (1959) of the Ford Foundation recommended the intensive approach anew. Supporting schemes were integrated with the main programme of crop production to make it more effective. The new programme was characterised by four major innovations : (a) it emphasised measures for immediate increase in agricultural production; (b) only districts with adequate production potential in terms of assured water and infrastructure facilities were selected; (c) emphasis was directed towards profitability at the farm level; and (d) stress was laid on adoption of package of improved practices evolved for individual crops which included use of improved seed, fertilisers and manures, pesticides, improved implements and proper soil and water management practices. The programme was launched, to begin with in three districts, in 1960-61 and was subsequently extended to cover at least one district from every State. A similar programme known as Intensive Agricultural Areas Programme (IAAP) based on the same area approach was launched in 1964 over 1,084 blocks drawn from 114 districts. It was to cover 1,410 blocks in the selected districts, by 1966-67. Two major points of difference between the two programmes were that the latter was crop oriented and the additional staff provided was on a reduced scale. These two programmes mark-

ed a significant beginning because for the first time a fairly large proportion of cropped area in the country, possessing adequate production potential was brought under intensive production efforts.

2.7.4 High Yielding Varieties Programme : The intensive area approach acquired new potency with the emergence of exotic high-yielding varieties of cereal crops and technological improvements. These were incorporated in the High Yielding Varieties Programme (HYVP) which became the kingpin of the new strategy of agricultural development launched in 1966-67. The IADP and IAAP districts, being better endowed than other districts, were readily taken up for implementing the new strategy. The programme, however, was not confined to these districts alone. Research support, essential to the success of the programme, was provided by the research institutes, Central and State, and the agricultural universities.

2.7.5 The new crop varieties, most of them early maturing made it possible to use land intensively. More crops could be raised on the same land in a year, where only one or at the most two could be grown earlier. The multiple Cropping Programme launched in 1967-68, was designed to take advantage of the short-duration characteristic of the high yielding cereal crops and the limited irrigation available.

2.7.6 The strategy of production in the Fourth Plan was primarily based on intensive agriculture, of which the major elements were the following :

- (i) full exploitation of possibilities of raising yields and production through high-yielding varieties;
- (ii) increasing gross area under crops by multiple cropping;
- (iii) expansion of major and medium irrigation and integrated use of ground and surface water;
- (iv) supply of inputs for plant nutrition and protection; implements and machinery for farm operations, and credit;
- (v) specific area development and crop development programmes;
- (vi) coordinated research in respect of all important crops, extension and education; and
- (vii) strengthening of rural infrastructure.

The HYVP was the most important single programme in the Fourth Plan, on which reliance was placed for achieving the target of additional foodgrains production of 21 million tonnes out of 31 million tonnes of total additional production. It was making good progress, particularly in regard to wheat. Progress in the case of other cereals was, however, comparatively slow. While new wheat varieties came to be accepted and adopted almost immediately in the major wheat growing States, the response to rice varieties in important growing

areas was lukewarm*. New paddy strains were found to be susceptible to pests and diseases. Lack of adequate drainage facilities posed serious problems in paddy areas. Besides, grain from these varieties was not popular with consumers. In view of the difficulties experienced research efforts were intensified through an All-India Coordinated Rice Improvement Project; further, a major extension effort was also undertaken during 1972-73 through a "Mini-Kit" Programme of supplying small 2 kilogram packets of seed of new varieties to a large number of farmers.

2.7.7 Programmes for Weaker Sections and Problem Areas : A major orientation was given to agricultural programmes during the Fourth Plan. Apart from the structural changes in the ownership and cultivation of land to be brought about through land reforms, emphasis was placed on reorienting the programme for agricultural credit, minor irrigation, animal husbandry etc. to benefit the weaker sections of the society. A new initiative was taken to improve their economic conditions and correct the income disparities in rural areas through special programmes for small and marginal farmers, agricultural labour, drought prone areas and dry farming areas. The main objective of the Small Farmers' Development Agency set up in 46 selected districts was to help small farmers withholding of 1 to 2 ha in irrigated areas and upto 3 ha in rainfed areas to improve their agriculture through supervised credit. Marginal farmers (with holdings upto 1 ha) and agricultural labourers deriving more than 50 per cent of their income from wages were sought to be helped through the Marginal Farmers and Agricultural Labour Agency Programme, launched in 41 selected districts. The main objective of the scheme was to increase the earning capacity of beneficiaries by providing supervised credit for purchase of inputs and also through a programme of rural works.

2.7.8 The scheme of Integrated Dry Land Agricultural Development was specially designed to benefit the backward dry farming areas in the country, which covered 68 Mha agricultural land. This programme was intended to deal with the problems of low productivity and high instability which characterise agriculture in these tracts, both by specially directed research and application of known advances in dry farming techniques.

Policy of Central Assistance

2.7.9 The implementation of agricultural programmes by State

More details of the progress of the New Strategy are indicated in Chapter 3 on Progress of Agricultural Development.

Governments was greatly impeded by the lack of financial resources. Since the forties the Government of India have been assisting the Provinces financially in the implementation of agricultural programmes. Under the GMF Campaign the assistance consisted of loans for permanent productive schemes like minor irrigation and land improvement, and subsidies on small private minor irrigation works, seeds, manures, staff and nonremunerative land improvement schemes. The subsidy or grant was shared between the Centre and States on an equal basis, except in the case of Assam and Orissa where the Centre met two-thirds of the share and in the case of Coorg and Part C States.

2.7.10 The policy of Central assistance acquired a new significance under the five year plans. Not only the magnitude of resources allocated for assistance increased, there was a new approach both in regard to priority among the projects assisted and the patterns and procedures in the sanction and disbursement of the assistance. The schemewise pattern of Central assistance followed in the First Plan was found delatory and was reviewed in 1958-59 and the assistance was allocated under broad heads of development. The rationalisation of the pattern of Central assistance greatly facilitated the implementation of numerous agricultural schemes by the State Governments. To prevent frequent diversion of funds from agriculture, it was decided in 1963-64 that Central assistance under the major head of agriculture could not be diverted to any other head of development. In order to provide adequate outlays under the five year plans for certain agricultural programmes which have special significance, particularly for demonstration, pilot projects, surveys and research, a new category of centrally sponsored schemes was introduced in the Second Five Year Plan. In the subsequent plan periods, the coverage and the allocation under these schemes were increased mainly under animal husbandry, forestry and fisheries. In the Fourth Five Year Plan, the procedure for release of Central assistance for State plan schemes was further simplified. States were given block loans and block grants in fixed proportion of 70 per cent and 30 per cent respectively. The subject of Central assistance is discussed in some detail in Chapter 8 'Centre-State Relations in Agricultural Development'.

Input Policies

2.7.11 Major and medium irrigation : During 1945-46 the Central Government took up work on a few multipurpose projects like Bhakra-Nangal, Damodar Valley and Hirakud and a number of major and medium projects, as part of the post-war reconstruction

programme. Besides continuing these schemes, a large number of new schemes were taken up in the First and the Second Plans. Important among them were Nagarjunasagar, Kosi, Chambal and Tungabhadra in the First Plan and Rajasthan Canal, Gandak, Tawa and Parambikulam-Aliyar in the Second Plan. The aggregate irrigation potentials of schemes included in the First and Second Plan were 8.9 million hectares and 6.1 million hectares respectively. Beginning from the Third Plan, greater emphasis was laid on completion of projects already taken up and utilisation of the created potential. As one of the main reasons for delay in utilisation of the potential created was noncompletion of field channels, Government departments and village panchayats were directed to take initiative in the matter, complete these on their own wherever necessary and recover the cost from the beneficiaries. Special attention was also paid to the problem of waterlogging which had become particularly acute in parts of Punjab and Uttar Pradesh.

2.7.12 Experience with intensive agricultural programmes showed that irrigation, as was practised in most of the command areas of canal projects, could not provide adequate support to intensive farming. Irrigation supplies very often were neither available in time nor adequate in quantity. Wasteful use of water was observed in certain areas, particularly where paddy was grown. All these emphasised the need for giving a new orientation to irrigation policy.

2.7.13 A centrally sponsored programme for ayacut development was formulated during the mid-sixties to facilitate fuller and more efficient utilisation of irrigation potential in major canal projects. The programme envisaged an integrated development of the command by undertaking land levelling, land shaping and consolidation of holdings; excavation of field channels so as to synchronise with completion of head-works and distribution system and building up of infrastructure facilities. A Water Utilisation Cell was set up at the Centre in 1967-68 to direct and coordinate all activities relating to water use and management which emerged as a critical area in modern farming. In the following year, a pilot water management project was launched in some States. Both these programmes were expanded in the Fourth Plan.

2.7.14 The emphasis in the Fourth Plan was on expeditious completion of continuing projects, expansion of irrigation facilities through better utilisation of the potential already created, construction of new projects preferably in drought areas integrated use of ground and surface water and re-orientation of irrigation practices so as to ensure optimum production. Under the new policy of Central assistance to States, a provision of 10 per cent of the total amount of Central

assistance allocated was made for the continuing irrigation and power schemes in advanced stage of construction to facilitate their early completion.

2.7.15 In April 1969 the Government of India appointed the Irrigation Commission under the chairmanship of Shri Ajit Prasad Jain to go into the question of future irrigation development in the country. Included in the terms of reference were formulation of an essential and minimum programme for irrigation development in drought areas and the drawing up of a broad outline of development of irrigation aimed at achieving self-sufficiency in cereals and maximum production in respect of other crops. The Report of the Commission was published in 1972. The Commission recommended that the irrigation policy should aim at maximum production per unit of area in areas where rainfall was abundant; maximum production per unit of water where water was the limiting factor; and maximum coverage of area in drought areas. It emphasised the importance of adopting an integrated approach to ayacut development and the need for conjunctive use of ground and surface water to achieve better irrigation efficiency. In regard to drought areas the Commission suggested that in view of the inadequate surface water resources in these areas, the aim should be to develop groundwater to the maximum extent possible. The Commission also proposed a detailed programme for doubling irrigated area in the country by 2000 AD with the object of achieving self-sufficiency in food and fibre. They also recommended the setting up of a high-powered National Water Resources Council to ensure integrated development of irrigation and seven River Basin Commissions for planning irrigation development on regional basis.

2.7.16 **Minor irrigation :** Development of minor irrigation, which received special attention from the early forties under the GMF Campaign was given a compact area approach in the First Plan in which installation of tubewells figured prominently. The Exploratory Tubewells Organisation (ETO) was set up in 1954 to intensify efforts at deep strata exploration. A substantial part of the Central assistance to States was allocated to minor irrigation works. In the Second Plan, allocations for such schemes were made under the Community Development Programme, with a view to mobilising public cooperation and involving the community development organisation. The Foodgrains Enquiry Committee 1957, which gave considerable thought to the problem of agricultural improvement suggested that greater reliance be placed on minor irrigation works for increasing production and that special financial provision be made for them, particularly their repair, renovation and maintenance. The allocation for minor irrigation was subsequently increased in the Third Plan and priority was given to

maintenance, repair, renovation and full utilisation of existing works. In the wake of the National Emergency, in November, 1962, plan targets for minor irrigation were revised upwards and central assistance to States was also raised.

2.7.17 Minor irrigation was recognised as a high priority programme in the Annual Plans 1966—69; it was given about one-third of the total allocation made for agricultural programmes. With increased emphasis on groundwater development, activities of the ETO were greatly intensified. Besides, the Department of Agriculture initiated in 1966-67 a Ground Water Survey and Investigation Programme, to provide assistance to States in this field. Special efforts were also made to organise institutional credit for development of minor irrigation and to link up area plans for minor irrigation development with programmes for rural electrification. These measures resulted in a significant increase in the number of wells, pump-sets, both diesel and electric, and tubewells.

2.7.18 The Government of India took measures to streamline the administrative set-up for groundwater development by re-organising the ETO into the Central Ground Water Board in 1970. From 1st August, 1972, the Ground Water Wing of the Geological Survey was also integrated with the Board. The Board thus emerged as the single unified organisation at the national level, dealing with all aspects of groundwater exploration, assessment, development and management. On the promotional side, the Rural Electrification Corporation was set up in July, 1969 with an outlay of Rs. 150 crores. It was intended to assist state electricity boards and rural electricity cooperatives with loans to take up rural electrification schemes. Efforts were also made to co-ordinate minor irrigation with programmes of rural electrification.

2.7.19 Improved seeds : The pace of progress in seed production over the years being unsatisfactory, the First Plan proposed a policy of decentralisation in production and distribution of improved seeds and recommended location of seed farms of an average size of 10 hectares in every block, that is, at the rate of one farm for a group of about 100 villages. The programme was vigorously pursued in the Second Plan and about 4,000 farms were set up. Steps were also taken to ensure strict supervision of the seed growing operations and to establish stores and testing stations. As the 10 ha seed farm was found to be inadequate from the efficiency point of view, large sized farms were encouraged to take up seed production. The idea of seed villages, namely, the entire village cooperating in growing a seed crop, was tried on a limited scale in some areas during the Third Plan period.

2.7.20 The problem acquired a new dimension with the introduction of the decentralised system of seed production, particularly

after the arrival of hybrids and exotic varieties. The Government, therefore, set up the National Seeds Corporation (NSC) in 1963 with the task of producing, stocking and supplying foundation seeds, particularly of hybrids. The Government also passed the Seeds Act, 1966, to ensure that seeds produced in the country were of requisite quality.

2.7.21 The existing production and distribution arrangements were subjected to a thorough scrutiny by the Seed Review Team in 1968. A number of shortcomings were brought to light which included non-availability of quality breeders' stock in adequate quantities; insufficiency and lack of appropriate storage facilities in seed farms and shortcomings in regard to processing of seeds and distribution arrangements. The recommendations made by the Team aimed at remedying some of these defects. In view of the increasing demand for quality seed, state farms were drawn into the programme. A measure of decentralisation of responsibility in seed production was introduced in 1967-68 when each State was made responsible for making its own arrangements to produce seed in accordance with the targets fixed.

2.7.22 During the Fourth Plan, in the context of intensive agriculture, particularly HYVP, availability of quality seeds on an adequate scale determined the pace and progress of all agricultural programmes, Multiplication and distribution of improved seeds, therefore, received special attention. The seed programme was streamlined in such a way that breeder's seed could be produced in adequate quantities with the help of the ICAR and the NSC and foundation seeds by the NSC and selected agricultural universities. In the production of certified seeds, however, a number of agencies were brought in, including state seed farms, central state farms, private seed producers and seed producers' cooperatives. Efforts were also made to provide the right type of storage facilities and to set up requisite number of seed processing plants. A significant development during the Fourth Plan period was the setting up of the Terai Seed Development Corporation in 1969-70 as a joint venture of the G. B. Pant University of Agriculture and Technology, the NSC and the seed growers of the area, with the aid of the World Bank.

2.7.23 Fertilisers : Chemical fertiliser was recognised as an important farm input and attention was directed towards its production and promotion. The Sindri fertiliser factory was completed in October, 1951 and three more factories came up in the Second plan at Neyveli, Nangal and Rourkela. Fertiliser promotion programme, however, encountered some difficulties. The general complaint was that farmers did not receive adequate supplies in time and there was no satisfactory arrangement for credit support.

2.7.24 The Fertiliser Distribution Enquiry Committee, appointed

in 1959, under the chairmanship of Dr. J. S. Patel to assess the demand for nitrogenous fertilisers and suggest improvements in distribution recommended greater use of fertilisers in the form of mixtures to facilitate balanced fertilisation, better arrangements for distribution attention to quality and reduction in cost of distribution. The UN Fertiliser Mission which also studied the problem highlighted the need for educational work among small farmers, extensive soil testing and continuous research into the use of fertilisers.

2.7.25 The Third Plan proposed a bigger programme for promoting use of chemical fertilisers. Specific targets were laid for nitrogenous, phosphatic and potassic fertilisers and a number of steps were taken to promote their use, which included reduction in the sale price of urea, subsidy on road transport from railhead to inaccessible areas, arrangements for intermediate bulk storage, grant of off-season rebates on the sale of urea, calcium ammonium nitrate and ammonium sulphate and intensification of programmes for fertiliser demonstrations on cultivators' fields. However, actual consumption of fertilisers did not go beyond 50 per cent of the targeted levels mainly because of the shortfall in domestic production and inability to arrange for imports. The main recommendations of the Committee on Fertilisers (1965) set up under the chairmanship of Shri B. Sivaraman related to the target of fertiliser consumption during the Fourth Plan period, credit and pricing policies, and arrangements for marketing, distribution and promotion. Most of the recommendations of the Committee were accepted and in pursuance thereof, the Government announced its new fertiliser policy in December 1965. The private sector was allowed to set up new plants with foreign collaboration; plants set up under the new policy, as well as those licensed before December 31, 1967, were given greater freedom for marketing their products for a period of seven years from the date of starting commercial production. To ensure equitable distribution of available supplies throughout the country, the Government reserved to itself the right to lift 30 per cent of production at negotiated prices.

2.7.26 With the launching of the HYVP, the fertiliser offtake was expected to increase steadily, but instead some deceleration was observed in 1968-69. The Fourth Plan, therefore, stressed on measures for stimulating demand for fertilisers and arranging speedy supply. These included improvement and extension of soil testing facilities, increased use of soil amendments, intensification of extension and sales promotion, increase in number of retail points and increased availability of distribution credit.

2.7.27 Side by side with measures seeking promotion of chemical fertilisers, stress was also laid on the increased use of cattle dung,

green manure, oilcake, bone and fish meal, compost etc. Green manure seeds were distributed in several States to enable cultivators to develop their own seed sources. Compost making was sought to be pushed up wherever possible. Municipalities were encouraged to turn night soil and town wastes into compost.

2.7.28 Plant protection : Plant protection work in the country was placed on a better footing during the First Plan period with the establishment of four regional plant protection centres. During the early years, however, locust control operations received greater attention as locust attacks were more frequent and India was taking part in the international efforts organised by the Food & Agriculture Organisation (FAO) of the United Nations for checking the breeding of desert locust. The regional centres were strengthened and new centres were set up during the Second and Third Plans for providing a broader base for plant protection operations. In the Third Plan prophylactic measures constituted the bulk of the programme. In view of the inadequacies in the supply of plant-protection chemicals and equipment, the distribution system was improved. A number of States enacted legislations relating to agricultural pests and diseases though these were not sufficiently effective. With the launching of intensive cultivation programmes, measures were taken to reorganise the regional plant protection centres. The Aerial Unit of the Directorate of Plant Protection, Quarantine and Storage (DPPOS) Ministry of Agriculture and Irrigation was strengthened by providing additional aircraft and staff.

2.7.29 The Fourth Plan envisaged more intensive measures for seed treatment, weed control and post-sowing prophylactic treatment. Steps were taken to strengthen agro-aviation arrangements both in the public and private sectors. Important measures taken during this period were the extension of aerial spraying operation; helping small farmers in the eradication of pests/diseases in endemic areas by agro-chemical operations; rodent control; technical guidance and central assistance to States under the Natural Calamities Relief Fund for control of sudden outbreak of pests/diseases etc. Consequent on the expansion of activities like aerial spraying the Aerial Unit of the DPPOS was reorganised into a separate Directorate of Agricultural Aviation in January, 1971. Insecticides Act, 1968 and the rules made thereunder came into force from August 1, 1971 to regulate the manufacture, distribution, sale and transport of insecticides in the country. The provisions of the Act were mainly aimed at preventing hazards to human and animal life.

2.7.30 Land reclamation : In the First Plan reclamation of arable land was an important project. The work of land reclamation and

land development was carried out mainly by the central and state tractor organisations. The Central Tractor Organisation, however, was in operation at field level only upto 1958-59. In August 1956, a large mechanised farm was set up at Suratgarh, mainly by reclaiming culturable waste lands with the help of agricultural machinery and equipment gifted by the Government of USSR. In view of the limited scope for reclamation, targets fixed in the plans were moderate, namely, 0.6 Mha during the Second Plan and 1.5 Mha in the Third Plan.

2.7.31 An Expert Committee on Waste Lands was constituted in June 1957, which in cooperation with the States was to survey and locate compact blocks of waste land. The survey completed by the end of sixties indicated that an area of 2.2 Mha was available for reclamation. The Fourth Plan proposed that 1.0 Mha out of this area would be brought under the plough during the five year period. However, with the establishment of state farms, large scale reclamation of culturable waste lands was undertaken. The second farm was located at Jetsar, and a third at Hirkud in 1967-68. More farms came up during the Fourth Plan at places like Hissar, Raichur, Cannanore and Chengam (Tamilnadu). In August, 1969 all state farms were brought under the State Farms Corporation with a view to ensuring better management and results.

2.7.32 Agricultural implements : Problems relating to agricultural implements and machinery did not receive due attention during the First and Second Plans. The Third Plan, however, proposed a number of measures for improvement. These included the following :

- (i) selection by experts of main implements suited to different regions;
- (ii) arrangements for demonstration and popularisation of selected implements at district and block levels;
- (iii) provision of credit;
- (iv) strengthening of agricultural engineering sections of State Departments of Agriculture; and
- (v) establishment of research centres in each State and also agricultural workshops.

A beginning was made in demonstration and propagation of improved agricultural implements. Government also approved a subsidy to the extent of 25 to 50 per cent on improved implements. A Board of Agricultural Machinery and Implements was set up with responsibility of expediting measures for manufacture of improved implements, popularising them, training personnel for these tasks and reviewing the progress periodically. Some progress was also made in the field of tractor manufacture.

2.7.33 A major development during the mid-sixties was the

setting up of agro-industries corporations in States as joint ventures of the Centre and States. These corporations generally attended to the work of procuring and distributing tractors, other agricultural machinery and implements, pump sets, spare parts and accessories etc.; setting up centres for servicing and repair of agricultural machinery, and organising custom service. They also undertook supply of inputs like seeds of high yielding varieties, fertilisers and pesticides. Functions assigned to these Corporations, however, varied from State to State. In some States they actively assisted development of irrigation from groundwater sources. The setting up of these corporations marked a significant step towards mechanisation of certain essential farm operations.

2.7.34 The Fourth Plan envisaged intensification of research in agricultural engineering and improvement in arrangements for fabrication and distribution of implements. Though stress was continued to be laid on programmes for animal drawn implements and hand tools, in view of the increased demand for tractors, efforts were intensified to increase production capacity. As there was considerable gap between indigenous production and demand, Government allowed some import of tractors; these were distributed mostly through agro-industries corporations. The Board of Agricultural Machinery and Implements was reconstituted to look into the various programmes connected with manufacture, servicing maintenance of agricultural machinery and implements, distribution arrangements, credit requirements etc. The agro-industries corporations, besides distributing tractors and agricultural machinery on hire-purchase basis took up new projects like establishment of agricultural machinery, hiring centres, agroservice centres, manufacturing plants for agricultural machinery and implements, manufacture of power tillers etc. Programmes for training on the use of machinery as well as testing and popularising implements were given due attention.

Land Improvement

2.7.35 The policy for land resource improvement in agriculture was pursued during the plan periods, mainly in three directions.

2.7.36 Soil conservation : Since the Second Five Year Plan a sustained policy for soil conservation and dry farming had been pursued. Besides a programme for soil conservation and dry farming in several States, an integrated All-India Soil Conservation and Land Use Survey was initiated. Forty five dry farming projects, each covering 400 ha, were undertaken for popularising dry farming techniques. A beginning was made with special soil conservation programmes in the catchment of river valley projects. During the Third Plan in 13 major

river valley projects such as Bhakra Nangal, Damodar Valley and Hirakud a catchment survey programme was taken up. Demonstration on dry farming was further strengthened in the Fourth Plan. An 'area saturation' approach was adopted in soil conservation work. Preparation of river basinwise master plans was taken in hand. To augment and strengthen the State Plan programmes, provision was made in the Central sector for a large number of projects such as treatment of badly eroded areas in the catchment of 21 river valley projects, pilot projects for reclamation of riverine lands, the setting up of a Resource Inventory Centre etc. Emphasis was laid on soil conservation measures in the Integrated Dry Land Agricultural Development Programme, the Drought Prone Areas Programme and the Crash Programme for Rural Employment.

2.7.37 Consolidation of holdings : The Programme of consolidation of holdings gained some momentum with the enactment of legislations by several States, enabling them to frame schemes on their own initiative. However, only a few States like Punjab, Haryana Uttar Pradesh and Gujarat made significant progress. In the Second Plan, consolidation work was undertaken as a task of primary importance in areas covered by the Community Development and National Extension Service. In the Third Plan a target of consolidating 12.5 Mha was fixed. However, only in areas where the scheme included rectangulation and reshaping of fields and provision for expansion of village *abadi*, it made some progress. The policy for consolidation was pursued vigorously in the Fourth Plan. The aim of the policy was to consider reorganisation of holdings in such a way that small and uneconomic holdings were reallocated in single blocks, facilitating special programmes for development of such holdings.

2.7.38 Cooperative farming : Cooperative farming offers an effective solution to the problems of size and management of small holdings by pooling the land, manpower and capital resources available with them for agricultural development. Under the Second Five Year Plan establishment of cooperative farms was encouraged through preference in the supply of improved seeds, fertilisers, construction materials and credit facilities. A Working Group on Cooperative Farming reviewed the progress in 1960. The National Development Council considered the proposals of the Working Group and recommended certain principles for guidance in organising the societies and provision of financial assistance. A National Cooperative Farming Advisory Board was set up for promotional work. In the Third Plan 318 pilot projects for demonstration were taken up. In 1963, a Committee of Direction headed by Professor D. R. Gadgil evaluated the performance of the pilot projects and concluded that by its very nature the programme of cooperative farming could produce some impact only over a period

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of time. In 1971 the State Ministers of Cooperation recommended a policy of promoting collective farming societies on Government lands or lands rendered surplus through land reform measures, on a selective basis in areas where conditions and circumstances for their success existed.

Credit

2.7.39 A comprehensive investigation into agricultural credit was carried out in 1951-52 by the Rural Credit Survey Committee at the instance of the Reserve Bank of India. The investigations revealed that the share of cooperatives in total agricultural credit was only 3.1 per cent, that of the Government 3.3 per cent, and the rest was provided by individuals including money lenders. The Committee, However, emphasised, that under Indian conditions, there was no alternative to the cooperative at the village level. It, therefore, recommended an integrated scheme of rural credit, the main objective of which was State partnership, including financial partnership in programmes for organising rural credit, cooperative marketing, processing and other similar services; development of storage and warehousing and State involvement in commercial banking. In furtherance of this objective, the Committee recommended :

- (i) the establishment of large sized primary credit societies;
- (ii) loans on crop-outlay basis, development of cooperative marketing, processing and other economic activities in close coordination with rural credit;
- (iii) establishment of the National Cooperative Development Warehousing Board, the All India Warehousing Corporation and State Warehousing Corporations;
- (iv) reconstituting the Imperial Bank of India and certain other State associated banks into the State Bank of India; and
- (v) the creation of special funds at the national, State and institutional levels for meeting specific credit needs.

2.7.40 These recommendations were generally accepted by the Government and programmes for development of cooperative credit, marketing etc. on the recommended lines were included in the Second Plan. Most of the recommendations bearing on institutional arrangements were implemented expeditiously. The State Bank of India began functioning from July, 1955 and the National Cooperative Development and Warehousing Board was established in 1956. Two special funds viz. the National Agricultural Credit (Long Term Operations) Fund and the National Agricultural Credit (Stabilisation) Fund were set up in the Reserve Bank of India in 1956. The former was intended to provide loans to State Governments for subscribing to the share

capital of cooperative credit institutions while the latter could be banked upon for converting part of short term loans into medium term loans in the event of large scale default following wide spread failure of crops etc. A Warehousing Development Fund and a Cooperative Development Fund were also set up. The Central Warehousing Corporation came into being in March, 1957, following which State warehousing corporations emerged one by one. With the main objective of mobilising rural savings for financing long term loans through land development banks, the Reserve Bank of India introduced a scheme of rural debentures in 1958.

2.7.41 In view of the wide range of activities contemplated for cooperatives large sized societies serving groups of villages were encouraged. The shift in policy came in for severe criticism and public opinion veered round in support of the basic concept "one village, one society". The result was that the programme for setting up large sized societies had to be abandoned during the middle of the Second Plan period. The National Development Council in its policy resolution of 1958 expressed the view that for the development of cooperation as a people's movement, it was essential to organise service cooperatives with broader functions on the basis of village community as the primary unit and that the responsibility and initiative for social and economic development at the village level should be placed on the village cooperative and the village panchayat.

2.7.42 During the Second Plan a beginning was made to advance loans to cultivators, on the basis of production programmes and anticipated crop outturn instead of land security. Recoveries were to be effected through marketing cooperatives. Credit and noncredit societies were to be linked to one another so that the agriculturist could be provided with credit for seed, manures, implements, and essential consumer goods and also help in the marketing of his produce. A tie-up between credit societies and marketing societies was considered particularly important as it facilitated smooth and immediate recovery of dues. Policy relating to agricultural cooperatives was generally oriented towards strengthening these organisations through State partnership at various levels.

2.7.43 The All India Rural Debt and Investment Survey conducted in 1962 by the Reserve Bank of India showed that the proportion of cooperative credit in the total borrowings of farmers had increased from 3.1 per cent in 1951-52 to 15.5 per cent in 1961-62. The Third Plan envisaged greater involvement of cooperative agencies in providing credit for agriculture. Efforts were directed to strengthen and revitalise the cooperative structure at the grass root level, mainly by increasing the membership and share capital of the existing societies, mobilising deposits and organising new societies wherever needed. The

main objectives set for credit cooperatives in the Third Plan were the extension of the cooperative movement to cover about three-fifths of the agricultural population by 1965-66, and the provision of short-term and medium term credit to the extent of Rs. 530 crores and long-term credit of the order of Rs. 150 crores, as against Rs. 203 crores and Rs. 38 crores respectively made available in 1960-61. The programme for revitalisation of cooperatives through amalgamation of weak units and winding up of dormant units which began during the Second Plan was pursued with vigour. Special promotional measures were taken in the eastern States of Assam, Bihar, West Bengal and Orissa and Rajasthan where the movement was found to be rather weak. Though stress was laid on linking credit with production programmes, there had been very little progress. In 1964-65, therefore, a special programme was launched in the IADP districts, attempting to link credit with production plans and to simplify loaning procedures.

2.7.44 In July, 1963, the Agricultural Refinance and Development Corporation (ARDC) was set up with an authorised capital of Rs. 25 crores for providing long-term loans to central land mortgage banks and other approved credit institutions to finance specific agricultural development schemes. A special scheme of development debentures was included subsequently for extending financial assistance to special projects. The ARDC was to subscribe 90 per cent of these special debentures, leaving the balance to be contributed either by the public or the concerned State Government.

2.7.45 In the context of the devastating drought and of implementing the HYVP two important steps were taken during 1966-67 for promoting short-term cooperative credit. First the Agricultural Credit Stabilisation Fund was established, with apex cooperative banks and secondly, special credit limits to cooperatives by the Reserve Bank of India were granted to meet the needs of HYVP. The object of the Stabilisation Fund was to afford relief to cultivators who were unable to repay their loans due to crop failure arising from widespread natural calamities. In such cases the outstanding short-term loans were to be converted into medium term loans so that cultivators might become eligible for fresh short-term loans for production purposes.

2.7.46 The spread of the new strategy of crop production based on input intensification required greater credit facilities for a larger number of people. However, bulk of the farming population could not secure adequate credit from cooperatives because of procedural rigidities and difficulties. In July, 1966 the All India Rural Credit Review Committee was appointed under the chairmanship of Shri B. Venkatapiah to look into the problem. The interim recommendations made by the Committee related to (a) setting up of Small Farmers' Development Agencies in different States, (b) establishment of Rural Electri-

fication Corporation and (c) expansion of activities of the ARDC. These recommendations were accepted by the Government. In the Final Report submitted in July, 1969 the Committee made a large number of suggestions relating mainly to problem areas where cooperatives were weak, promotion of units at the primary level and special problems of credit facilities for small farmers. It also made proposals in regard to commercial banks, the role of the Government and the Reserve Bank of India, and the different aspects of investment credit.

2.7.47 Commercial banks began taking some interest in financing agriculture after the new awakening. In April 1968, a consortium of commercial banks set up the Agricultural Finance Corporation with the object of helping commercial banks participate in the development of agriculture. Two important functions assigned in the Corporation were : (a) the financing of important priority projects which contributed to agricultural development and (b) promoting commercial banks advance to worthwhile agricultural projects and rendering them consultancy service.

2.7.48 The Fourth Plan envisaged that though cooperatives would continue to be the principal agency for agricultural credit, and would have to be strengthened for the purpose, the approach would be to ensure that agricultural production was not inhibited by the weakness of the cooperatives. The policy would aim at institutionalising agricultural credit to the maximum extent possible and reducing direct loaning by the Government to the minimum. The Plan proposed improvements in the working of the ARDC *vis a vis* borrowing institutions and a definite orientation in the policies and procedures followed by credit cooperatives and land development banks towards small cultivators.

2.7.49 On July 19, 1969, fourteen leading commercial banks were nationalised. They began taking greater interest in agricultural lending operations after this development. These banks introduced an experimental scheme of concessional finance at 4 per cent interest for weaker sections including agriculturists. A Credit Guarantee Corporation was set up in April, 1971 to operate a voluntary scheme of guaranteeing losses up to 75 per cent subject to certain upper limits in respect of loans advanced by the commercial banks to priority sectors. They were also drawn into agricultural development work at the district level through the "Lead Bank" scheme.

Marketing

2.7.50 In the integrated scheme of rural credit recommended by the Rural Credit Survey Committee marketing was an important element. Marketing societies were to be organised and linked with credit

societies to facilitate not only sale of produce but also recovery of dues on behalf of credit societies. Since the Second Plan, organisation of marketing societies was receiving increasing attention. The National Agricultural Cooperative Marketing Federation was set up during this period to promote inter-State trade, coordinate activities of apex marketing societies and provide market intelligence to them.

2.7.51 During the Third Plan, a large number of marketing co-operatives were set up so as to cover all important secondary markets in the country. Problems relating to cooperative marketing of jute in West Bengal, paddy in Andhra Pradesh, wheat in Rajasthan and plantation crops in general were investigated by special study teams. The State Bank of India also lent a helping hand by extending special credit facilities to cooperative marketing societies. For meeting possible losses in purchase operations, Government introduced a policy of special contribution to Price Fluctuation Fund. Marketing cooperatives could expand their business considerably as a result of various promotional measures adopted. A large number of cooperative processing and consumer societies were also organised during this period. A Committee on Cooperation under the chairmanship of Shri Ram Nivas Mirdha looked into the organisation and management aspects of cooperatives of different types during 1964-65 and made a number of suggestions for improved functioning and safeguarding them against vested interests.

2.7.52 During the Fourth Plan the policy was to strengthen the existing cooperative marketing structure especially at the primary level and to make the apex federation at the State and the national levels more efficient. This was achieved by introducing grading and pooling and other improved techniques in as many cooperatives as possible and maintaining the Price Fluctuations Fund. Besides handling a large volume of integral trade in agricultural produce, marketing cooperatives also made significant progress in inter-State trade and export trade with the support of National Agricultural Cooperative Marketing Federation. The Food Corporation of India, the Cotton Corporation of India set up in 1970 and the Jute Corporation of India established in 1971 envisaged some special role for marketing societies. Necessary steps were taken to coordinate the activities of marketing co-operative with the commodity corporations and similar bodies.

Price Policy

2.7.53 To give incentives to primary producers, the Government had been following a policy of price support to agricultural produce since June, 1957. The question of setting up a permanent agency for providing advice on price policy and price structure had also been

under its consideration for some time. In August, 1964, the Government of India appointed the Foodgrains Prices Committee under the chairmanship of Shri L. K. Jha to advise on the minimum prices of rice, wheat and coarse grains for 1964-65 season and to suggest a suitable organisation for the formulation of price policy. This Committee recommended that minimum prices should stimulate domestic production of foodgrains by assuring a reasonable margin of profit and induce more investment in farm inputs and infrastructure. The floor or support prices for important foodgrains recommended by the Committee for 1964-65 were generally higher than the average post-harvest prices during the preceding three seasons.

2.7.54 For formulating the agricultural price policy and maintaining a close watch on the general price situation, the Committee suggested that an Agricultural Price Commission (APC) might be set up as a permanent body. This body would advise the Government on the price policy for all agricultural commodities including cash crops like cotton, jute, sugarcane and oilseeds. Government took prompt action on this recommendation and set up the APC in January, 1965. The Jha Committee's recommendations on farm support prices marked the beginning of a production-oriented agricultural price policy in the country.

2.7.55 The Essential Commodities Act of 1955 empowered the Government to take appropriate measures for regulating production, supply, distribution and trade in essential commodities for securing equitable distribution. The commodities covered by the Act include cattle fodder including oilcakes and other concentrates; cotton and woollen textiles, food stuffs including edible oilseeds and oils; raw cotton, ginned or unginned; cotton seed; and raw jute. The Act also empowered the Government to regulate or ban various types of forward transactions in sensitive commodities like cotton, jute and oilseeds. State Governments had been making use of the provisions of the Act to ban or restrict movement of certain commodities with a view to conserving supplies during years of shortfall in production.

Economics and Statistics

2.7.56 Recognising the importance of economic intelligence in planning agricultural development programmes and monitoring them, the Ministry of Food and Agriculture began setting up from 1954 a number of agro-economic research centres and farm management centres at selected universities and research institutes. The former group of centres had been carrying out studies on changes in the rural economy and operational constraints in programme implementation. The farm management investigations undertaken by the latter group of centres in

typical agro-climatic regions yield valuable data bearing on important aspects of farm business including cost of production. From 1961, a Standing Committee on Improvement of Agricultural Statistics set up by the Ministry of Agriculture and Irrigation under the Economic and Statistical Adviser has been looking into various aspects of improvement of statistics including revision of basic and abstract land records forms. In December, 1969 a Data Improvement Committee was set up under the chairmanship of Dr. B. S. Minhas which looked into problems of improving the data base of the economy. In 1970-71, a Comprehensive Scheme for Studying the Cost of Cultivation of Principal Crops was launched by the Ministry in collaboration with agricultural universities and agro-economic research centres to obtain more reliable and representative data on farm costs and returns for basing decisions on price policy. A significant development in agricultural statistics was the introduction in 1969-70 of the Scheme for Timely Reporting of Estimates of Area and Production of Principal Crops. The objective of the scheme was to make available estimates of area and production of crops expeditiously to decision-making levels. The data and information gathered by these agencies and sources had been useful in policy formulation, agricultural planning and project implementation.

Land Reforms

2.7.57 The land policy set out in the First Plan recognised that the pattern of land ownership and cultivation was a fundamental issue in planned economic and social development. The adequacy of land policy was to be judged in the measure in which it "reduces disparity in wealth and income, eliminates exploitation, provides security for tenant and worker and finally promises equality of status and opportunity to different sections of the rural population". The principal programmes of land and tenancy reforms envisaged in the First Plan included abolition of intermediary rights, limitations on future acquisition of land and on resumption for personal cultivation, provision of security of tenure for tenant cultivators and fixation of reasonable rents. Distribution of available land among landless workers and encouragement to cooperative farming societies was also envisaged.

2.7.58 The Second Plan reiterated the stress on abolition of intermediaries and tenancy reforms. The Plan also suggested fixation of ceilings on land holdings. Significant progress was achieved in the direction of abolishing intermediary tenures. A number of States enacted legislation for providing security of tenure and placing ceiling on agricultural holdings. However, progress achieved in these areas was rather limited. Problems arising from the implementation of land

reform legislations enacted by the States were reviewed by the Panel on Land Reforms set up by the Planning Commission in 1959. It laid particular stress on the preparation of correct and up-to-date record of rights and on the need to strengthen revenue administration. A number of surveys on implementation of land reforms were also undertaken in different parts through the Research Programmes Committee of the Planning Commission to focus on the problems encountered in enforcing the legislation.

2.7.59 During the Third Plan period, State Governments were mainly preoccupied with the follow-up of various legislative measures. Some States enacted new legislation in place of old ones or amended them so as to plug loopholes and remove deficiencies some amendments to the Constitution were also undertaken to resolve the apparent contradiction between some Articles of the Constitution and some provisions of land legislation already enacted. Progress of implementation was slow in most of the fields except in regard to abolition of intermediary tenures. In several States the fair rent or the share of produce, as fixed by Law, was still one-third or one-half of the gross produce. In regard to legislation on ceilings, most of the States were taking only the preliminary steps for enforcing the provision and for determining the extent of surplus lands. There were several obstructions in the implementation of the land reforms measures. It was observed that up-to-date records of rights did not exist in several States. A considerable proportion of area in some regions was cultivated on informal crop-sharing basis but such tenants were neither recognised nor registered in the Record of Rights. They generally paid high produce rents but did not enjoy security of tenure and were not able to obtain financial assistance for programmes of agricultural production. The ceilings on holdings were evaded through transfers and partitions and not much land was made available for distribution. The administrative arrangements for supervisory action on implementation were generally inadequate.

2.7.60 NDC Committee on land Reforms : In November, 1963 the National Development Council (NDC) reviewed the progress made in the implementation of land reforms in different States. It noted that on account of legal and other factors, the laws had not been fully enforced and called upon all State Governments to complete their implementation before the end of the Third Plan. The Council constituted a Committee with the Minister of Home Affairs as Chairman and five Chief Ministers, the Minister of Food and Agriculture and Member incharge of land reforms in the Planning Commission as members to review the progress in different States and propose measure for securing the implementation of land reform legislations. Officers were deputed

to visit the States to study the situation and suggest solution to the difficulties encountered. Several States took steps to improve implementation on the lines recommended by these official teams.

2.7.61 Central Land Reforms Committee : In the field of land reforms, the main problem had been the growing divergence between accepted policy and legislation and between enacted laws and their implementation. The Fourth Plan sought mainly to bridge these gaps through suitable modifications in legislation and purposeful action. The State Governments were to focus attention particularly on enforcing ceiling laws, providing protection to tenants including share-croppers and updating land records. An important step taken in this regard was the setting up of the Central Land Reforms Committee in 1970 with the Minister for Food and Agriculture as Chairman, Ministers for Home Affairs, and Law and Social Welfare, and Deputy Chairman and Member (Agriculture) Planning Commission as Members and Secretary (Agriculture) as convenor. Chief Ministers of States or their representatives could be coopted to this Committee. It was to undertake a continuous study of problems relating to land reforms in the country, assist States in determining and carrying out programmes of land reforms, advise and assist the State Governments in formulating proposals and report from time to time on the operation, progress and effects of land reform measures. The Conference of Chief Ministers convened from time to time kept a constant watch over the progress of land reform implementation.

2.7.62 Guidelines on ceiling : Considerable attention was given to the problem of land ceilings during the Fourth Plan period. Although almost all States had passed legislation prescribing ceilings, because of faulty implementation and legal loopholes, the legislation had not led to any major redistribution of land. All that the Government could get by way of surplus for redistribution among the landless was about a million hectares. The Central Land Reforms Committee made a number of suggestions for improvement in ceiling laws of different States in August, 1971. These, in turn, were considered by the Government of India and the Chief Ministers' Conference in July, 1972. Based on the recommendations of the Committee and other relevant facts the Conference formulated a set of national guidelines on agricultural land ceilings. The purport of the directives was to bring about a certain measure of uniformity in the ceiling legislation currently being revised in various States and generally to reduce the level of ceilings. The ceiling on irrigated lands for a family of five members would be between 4.05 ha (10 acres) and 7.28 ha (18 acres) if the land was double cropped and 10.93 ha (27 acres) if single cropped. For all other categories of land including orchards, the family ceiling would

be 21.85 ha (54 acres). Area irrigated by private sources like tube-wells, pumpsets, etc., was to get some weightage, but only within the overall ceilings. Where the number of members in a family exceeded five, additional land might be allowed to each member subject to an overall maximum of twice the family ceiling. Besides, categories exempted from the purview of ceilings were drastically reduced. The revision of the existing ceiling laws in the light of these guidelines has been undertaken by almost all the States and the revised enactments have already become operative in a number of States.

2.7.63 In view of the importance of correct and up-to-date land records in the context of implementing land reforms the Fourth Plan suggested that steps should be taken to bring these records up-to-date in the next few years as part of resurvey and settlement operations.

Animal Husbandry

2.7.64 In an earlier section reference was made to the important policies, institutions and organisational frame work for the development of animal husbandry before the RCA. While the RCA recommendations were comprehensive, bearing on the various aspects of development of livestock, no substantial progress could be achieved mainly because of inadequate provision of financial resources. A policy for sustained development supported by financial allocation commenced only under the five year plans. The policy under the five year plans was to improve the quality and productivity of livestock through improved breeding practices, adequate feeding and control of diseases. The development of animal husbandry should result not only in raising the production of protective foods like milk, milk products, meat and eggs but also in increasing income and employment opportunities in backward areas and for small and marginal farmers.

2.7.65 Cattle and buffaloes development : The initiation of the Key Village Scheme in August, 1952 was the first systematic attempt to improve the quality and productivity of cattle and buffaloes. It represented a planned and comprehensive effort for increasing their productive capacity both in regard to milk production and draught capacity. Intensive development measures were undertaken in selected areas called key village blocks through controlled breeding, proper feeding and management, disease control and improvement of marketing arrangements for livestock and livestock products. Development of village grasslands and promotion of cultivation and conservation of fodder crops, especially legumes, were also encouraged in the key village areas.

2.7.66 During the Second Plan period, the Key Village Scheme was reviewed by an Expert Committee, which recommended that progeny

testing programmes be taken up at Government farms as well as at private farms where necessary facilities were available or could be provided. The progeny testing scheme with two units, one each for *Haryana* breed of cattle and *Murrah* breed of buffalo was taken up at Hissar. Private institutions like *gaushalas* were drawn increasingly into the programme of cattle development. During the Third Plan period the Key Village Scheme was reorganised in the light of the improvements suggested by the Expert Committee. The subject was considered in detail at the Gosamvardhana Seminar held at Bombay in October, 1963. It emphasised that cattle development programme should be taken up in an integrated manner over large and compact areas, supported by feed and fodder development, mass castration of scrub bulls, rural dairy extension, marketing and disease control.

2.7 67 A significant development during the period was the extension of intensive area development approach to animal husbandry. A new scheme known as Intensive Cattle Development Project (ICDP) was initiated during 1964-65. The objectives of the scheme were the same as that of the Key Village Scheme but much wider in scope. It envisaged provision of a package of improved practices to the cattle owner to effect a breakthrough in milk production. The package included the following :

- (i) cattle breeding;
- (ii) castration of scrub bulls;
- (iii) veterinary aid and disease control;
- (iv) registration and milk recording;
- (v) introduction of high yielding milch cattle;
- (vi) subsidies and incentives for milk production;
- (vii) feed and fodder development including demonstration, distribution of fodder seeds, silage making and popularisation of chaff cutters; and
- (viii) dairy extension.

The programme was launched in milk shed areas of major dairy plants so as to ensure increased and steady flow of milk to these plants.

2 7 68 In the sixties, a new breeding policy was introduced which laid emphasis on crossbreeding, particularly in areas covered by ICDP and in key village blocks in milk shed areas of existing or proposed dairies. To meet the requirements of exotic stock, a farm for maintaining a nucleus herd of Jersey animals was set up at Hessarghatta.

2 7.69 During the Fourth Plan, the approach to livestock development was based on three major national considerations, namely, increasing domestic production, improving nutritional levels and diversification of the economy of small farmers. The cattle breeding policy was modified to lay more emphasis on crossbreeding with exotic breeds

and improvement in milking qualities of recognised milch and dual-purpose breeds of cattle and important breeds of buffaloes. To achieve these objectives, besides the setting up of a frozen semen bank at Hessarghatta under the Indo-Danish agreement, a programme for establishing similar banks at five centres viz. Amritsar, Karnal, Indore, Bangalore and Lucknow was initiated. Five central cattle breeding farms were also set up at Suratgarh (Rajasthan) for *Tharparkar*, Chiplima (Orissa) for *Red Sindhi*, Korapur (Orissa) for *Jersey*, Ankleswar (Gujarat) for *Surti* buffalo and Alamadhi (Tamil Nadu) for *Murrah* buffalo. In order to support the cattle breeding programme in the country aimed at increasing milk production, the ICAR launched two all India coordinated research projects, one on cattle breeding and the other on buffalo breeding.

2.7.70 Dairy development : Dairy development programmes during the successive plan periods aimed at organising production, processing and distribution of milk so as to cater to the needs of expanding urban areas. Schemes for dairying and milk supply were initiated in the State sector during the First Plan period itself. During the Second Plan period, efforts were mainly directed to establish colonies of milch cattle in metropolitan cities on the Aarey pattern. However, in the Third Plan, the objective was to develop dairy industry with emphasis on milk production in rural areas and to link it up with dairy plants in urban centres for processing and marketing surplus milk. The collection of milk was to be undertaken by a network of producers' cooperatives in villages and the processing and distribution of milk and milk products to be organised as far as possible, on cooperative lines.

2.7.71 Operation flood project : The 'Operation Flood' Project started in 1970-71 could be considered the biggest milk drive launched so far in any country. The proceeds from milk powder and butter oil made available by the World Food Programme were to be invested to expand and restructure dairy schemes serving the four metropolitan cities of Calcutta, Bombay, Delhi and Madras so that they could provide the bulk of the milk supplied in these cities and extend organised procurement of milk from the rural producing areas. Funds were allocated by the Indian Dairy Corporation to various States for expansion of milk plants, establishment of cattle feed mixing plants and for new dairies. The major objectives of the scheme were to raise the capacity and throughput of dairy plants serving these cities, capturing the bulk of the urban market for these units, shifting cattle from the cities and settling them in rural areas, developing efficient milk procurement system in promising rural areas and improving standards of dairy farming. It was also intended that the current wastage through

premature slaughter of high yielding milch cattle and their calves in cities and the genetic drain caused by this practice would be effectively checked under the scheme. It was also ideally suited to serve the interests of small and marginal farmers and agricultural labourers.

2.7.72 Sheep and wool development : On the basis of experience gained in cross-breeding with Marino and selective breeding in important indigenous breeds of sheep, a long-term approach was adopted during the First Plan for sheep development. This included selective breeding of indigenous breeds in the plains, and where definite breeds existed, grading up of non-descript sheep with Bikaneri and cross-breeding with exotic breeds in selected hilly areas. For successful implementation of this programme, a number of State sheep breeding farms, sheep and wool extension centres and wool grading and marketing centres were set up during the successive plan periods. A Central Sheep and Wool Research Institute was set up at Avikanagar in 1963-64 to undertake research on sheep breeding, management, health and wool processing technology. The Fourth Plan envisaged setting up of one large sheep breeding farm in the Central sector and seven in the Centrally sponsored sector to produce quality stud rams of important indigenous and exotic breeds of sheep. In addition, two large exotic sheep breeding farms were set up in Gujarat and Maharashtra at the initiative of the woollen textile industry. An all India Coordinated Research Project for improvement of fine wool sheep was taken up by the ICAR. Research programme also envisaged the improvement of carpet wool breeds of sheep viz., Magra, Marwari, Pugal and Jaisalmeri to meet both the internal requirement of carpet wool and the export needs. A sheep breeding programme for evolving new mutton breeds suitable for different agro-climatic regions of the country was also initiated by the ICAR.

2.7.73 Poultry and piggery development : To popularise poultry farming as a subsidiary occupation in the rural areas, a pilot project was approved early in 1955 under which 50 extension centres were established with assistance under the Indo-US Technical Cooperation Programme. This was followed up during the Second Plan period by the setting up of five regional farms in different agro-climatic regions for acclimatisation and propagation of exotic stocks. During the Third Plan period an Intensive Poultry Production-cum-Marketing Programme was initiated at 53 centres with an area development and package approach, so as to make available all the required inputs and services. Introduction of deep litter system of management on an extensive scale, availability of balanced mixed feed, properly health cover and institutional finances were the major contributory factors to this development. Foundation was laid for commercial production of poultry

with the establishment of four franchise hatcheries in the private sector with foreign collaboration. These hatcheries produced on a mass scale hybrid chicks with excellent egg laying potentialities.

2.7.74 Poultry development programme was further intensified during the Fourth Plan period and major steps initiated to achieve self-sufficiency in quality hybrid stock. Poultry feed received greater attention during the period. Besides setting up a number of manufacturing units in public and private sectors research activities were intensified at the IVRI and the agricultural universities in exploring possibilities of using agricultural and industrial byproducts as poultry feed. The programme for manufacture of poultry equipment also made substantial progress. Two All-India Coordinated Research Projects on Poultry one for eggs and the other for meat were taken up in order to develop indigenous high producing strains capable of laying about 220 eggs per annum and meat strains of poultry which would attain over one kg body weight in 8 weeks.

2.7.75 Keeping in view the economic possibilities of pig rearing and the contribution it could make towards raising incomes, particularly of weaker sections of the village community, attention was being given during the plan period to piggery development. A special development programme initiated during the Third Plan period envisaged the setting up of pig breeding units for production of breeding boars, piggery development blocks and bacon factories for utilising the surplus stock. Greater attention is being given to pig rearing under SFDA and MFAL programmes.

2.7.76 Continuous efforts were made during the Plans to control diseases like *haemorrhagic septicaemia*, *anthrax*, *blackquarter*, *Ranikhet* disease among poultry, *fowl pox*, *enterotoxaemia* in sheep etc. A national programme for mass vaccination of cattle and buffaloes against rinderpest launched during the First Plan with the objective of complete eradication of the disease was vigorously pursued in the subsequent plans. As a result, the incidence of the disease got drastically reduced.

2.7.77 Schemes for modernisation and construction of slaughter houses received increasing attention beginning from the Third Plan. A modern abattoir was set up at Bombay during the Fourth Plan period. The Khadi and Village Industries Commission organised 200 intensive flaying units during the Third Plan.

Fisheries

2.7.78 Reference had been made earlier in this Chapter to the report of the Fish Sub-Committee and the steps taken by the Govern-

ment in pursuance of its recommendations. However, a substantial step forward in policy formulation, programme implementation and institution-building could be taken only under the five year plans.

2.7.79 Under the First Plan a number of measures were taken for the development of inland and marine fisheries. The following were the more important ones :

- (i) improvement in existing methods of fishing;
- (ii) bringing under fish culture large areas of water lying unutilised;
- (iii) introduction of scientific fish farming methods;
- (iv) introduction of improved forms of storage, transport and marketing; and
- (v) training of personnel and organising extension methods for assisting fishermen.

Programmes like surveys of culturable waters and reclamation of derelict tanks and their development, however, did not receive attention. But research on carp was given priority. Fishermen were supplied boats, yarn for nets, timber, sail cloths etc. at concessional rates. In 1952-53, a project for marine fisheries development was launched in collaboration with the Government of Norway. Substantial equipment support for exploratory fishing was given by the USA and technical assistance by FAO. Arrangements were made for starting training courses for different types of personnel. Marine fishery training centres were organised in 1954 in Kerala and Bombay, assisted by the Indo-Norwegian Project and the FAO respectively. A fisheries extension units was established under the Ministry of Agriculture and Irrigation.

2.7.80 In the Second Plan greater attention was given to the development of marine fisheries. A Central Institute of Fisheries Technology was set up in Cochin in 1957 for improving the design of fishing craft and fishing gear and developing fish processing technology. Besides the Deep Sea Fishing Organisation, Bombay, for exploring new fishing grounds, similar stations were established at Cochin, Tuticorin and Visakhapatnam. Boat-building yards were established in Gujarat, Maharashtra, Karnataka, Kerala, Tamil Nadu and Andhra Pradesh. A large number of boats were mechanised and synthetic fibre nets were made available. Fresh fish from producing centres were transported in refrigerated rail wagons to places like Calcutta and Delhi.

2.7.81 During the Third Plan period emphasis was laid on mechanisation of fishing boats, provision of refrigerated rail and road transport, establishment of fisheries cooperatives and arrangements for research and training facilities. Activities of the research institutes substantially increased and nine more extension centres were established. Work

commended on the development of fishing harbours. Pre-investment survey of 24 small harbours was completed and programmes for the development of 16 harbours were initiated. In accordance with the recommendations of the Committee on Fisheries Education (1959), the Government established the Central Institute of Fisheries Education in Bombay in 1961.

2.7.82 In the Third Plan high priority was attached to the development of export potential of fish and fish products. The pattern of export trade underwent a change : exports of frozen prawns became more important than that of cured fish. Some State Governments set up fisheries corporations to promote deep-sea fishing, exports of fish products and development of inland fisheries. A Central Fisheries Corporation was established in 1966 to promote regulated marketing of fish.

2.7.83 A Central Institute of Marine Fisheries Operatives was set up at Cochin in 1963 and was supplemented by another Unit at Madras. Two regional institutes were set up in 1968 at Agra and Hyderabad for training operatives of inland fisheries.

2.7.84 In the Fourth Plan, besides continuing the efforts for developing export potential, emphasis was laid on increasing fish production and also improving the economy of the fishermen. Greater importance was attached to development of marine fisheries, particularly deep-sea fishing. Measures were taken to meet the requirements of trawlers, infrastructure, storage and distribution. Port facilities like landing and berthing for fish vessels were augmented.

2.7.85 The Indo-Norwegian Project came to a close on March 31, 1972 consequent on the expiry of the agreement with the Government of Norway and the United Nations. However, in view of the important role played by the project in the development of fisheries, particularly deep-sea fishing, the project was continued as the Integrated Fisheries Project combining with it some of the deep-sea fishing and exploratory fishing activities at other centres.

Forestry

2.7.86 The main concern of forest policy during the post-Independence period was to regenerate the over-exploited forest resources and develop forest products on an adequate scale to meet the growing needs of the economy, particularly those of the rural population. In June 1950, the Central Board of Forestry was constituted as a supreme advisory body to formulate, implement and also review the forest policy. The new policy, announced in 1952, envisaged measures for evolving a system of balanced and complementary land use, checking denudation in mountainous regions, preventing soil erosion particularly along river banks, and stabilising sand dunes in desert areas. It also spelt

out measures for improving the outturn of timber and other forest produce, augmenting grazing and fodder resources, and establishing tree lands wherever possible. To the extent possible, policies, projects and programmes under the five year plans conformed to the objectives of the National Forest Policy.

2.7.87 During the First Plan period the focus was on rehabilitating the degraded forests by consolidation and conservation, improving communications, minimising felling and conversion losses and raising man-made forests of matchwood and other economic species. Large areas of forest land under private ownership or management were brought under State control. Towards the close of the Plan period a Timber Trends Survey was initiated in collaboration with the Economic and Social Commission for Asia and the Pacific (ESCAP) and the FAO and for collecting data relating to demand for timber and other important forest produce, their production, utilisation, and end-uses and for indicating future trends.

2.7.88 In the Second Plan stress was laid on :

- (i) afforestation and improvement of poorer areas in the forests and extension forestry;
- (ii) large-scale planting of species of commercial and industrial value;
- (iii) promotion of methods for increased production of timber and other forest produce in the immediate future;
- (iv) conservation of wild life;
- (v) increased tempo of forest research and provision to technical personnel; and
- (vi) central coordination and guidance in the implementation of forest development schemes all over the country.

2.7.89 During the Third Plan period there was a shift in forest development policy from conservation and biological management in favour of increasing production through man-made forests, which became more pronounced during the subsequent years. This was in accordance with a study to ascertain the dimensions of future requirements of forest products and the strategy to be planned to meet these requirements. A Pre-Investment Survey of Forest Resources and Industries was also launched during this period with assistance from the United Nations Special Fund. It was intended to facilitate formulation of a long-term programme for forestry development including planting of forest area with quick growing species; development of communications, and assessment of the economic prospects of forest based industries. In August, 1965, the Central Forestry Commission was set up with Inspector General of Forests as Chairman and four Members to represent the four regions for effecting technical coordina-

tion. dissemination of information and collection of statistics on forestry. It was also required to study the implementation of the National Forest Policy by State Governments and conduct market studies on timber and other forest products and their utilisation.

2.7.90 The main objectives of the Fourth Plan were to increase productivity, develop forests as a support to rural economy and link up forest development with various forest based industries. In pursuance of these objectives the most important schemes implemented during the Plan period related to raising of plantations of quick growing species and plantations for industrial and commercial uses. The earlier emphasis on farm forestry programme, development of forest communications, forest research and pre-investment survey of forest resources continued unabated.

2.7.91 Wild Life Protection Act : The Fourth Plan also laid stress on management of wild life in national parks and sanctuaries and preservation of flora and fauna. In furtherance of this objective, a comprehensive Wild Life (Protection) Act, 1972 was passed by Parliament and was adopted by all States and Union Territories except Jammu & Kashmir, Assam, Nagaland and Meghalaya. Other measures taken in this direction included a ban under the Export (Control) Order on wild life and their products in respect of many rare and endangered animals and execution of "Project Tiger" programme in nine compact areas for six years. India is a signatory to the Convention on International Trade in Endangered Species of Fauna and Flora.

Administrative Reorganisation

2.7.92 The Ministries of Agriculture and Food were combined in January, 1951 to form the Ministry of Food and Agriculture. A separate Division to look after cooperation and a Directorate of Extension were set up in February and May, 1955 respectively in the Department of Agriculture. The former, headed by a Cooperation Adviser, was to coordinate all development activities in the field whereas the latter was to formulate model schemes on agricultural extension, training and information. The integration of the two Ministries continued except for a brief spell of separation between October, 1956 and April, 1957. Meanwhile, the Ministry of Community Development and Cooperation had come into being in September, 1956 charged with considerable responsibilities in the field of agricultural development programmes. This resulted in some duplication of efforts in various fields and also lack of coordination. A Planning Division was created in the Directorate of Economics and Statistics, Ministry of Agriculture and Irrigation which became the

channel of communication between the States, the Ministry and the Planning Commission.

2.7.93 With a view to ensuring an integrated approach in formulation of agricultural policies and programmes, an Agricultural Production Board was constituted in November, 1963 at the Centre with the Union Minister for Food and Agriculture as Chairman. The Member (Agriculture), Planning Commission, Minister for Irrigation & Power and Finance Minister were represented on the Board. A Special Secretary was appointed as Secretary to the Board to enable it to function effectively. States also set up agricultural production committees at the Cabinet and Secretariat levels to coordinate and streamline activities of various departments.

2.7.94 A number of high level posts as also special sections were created in the Department of Agriculture for providing guidance and support to the programmes it was implementing. The Director General of Intensive Agriculture Areas was appointed in 1964 to look after the IADP and the IAAP. A Production Commissioner (Commercial Crops) was appointed at about the same time to supervise the execution of intensive production programmes for commercial crops. In September 1965, the Director General of State Farms was appointed to look after state farms like the Suratgarh Farm, Jetsar Farm and those which were being planned. In pursuance of the drive for export promotion, an Export Promotion Cell was set up in September, 1962 for dealing with the various aspects of export policy for agricultural commodities and food products and to ensure effective liaison with the concerned Ministries.

2.7.95 Reorganisation of Agriculture Department: The need for an integrated approach to agricultural production programmes, closer coordination among the departments concerned and better streamlining of functions and operations within the Department became more manifest when the new strategy of agricultural development was launched. A number of steps were initiated beginning from 1965 to reorganise the Ministry, particularly the Department of Agriculture. In January, 1966 the Ministry of Community Development and Co-operation was merged with the Ministry of Food and Agriculture to form the Ministry of Agriculture, Community Development and Co-operation. Within the Department of Agriculture the Production and Extension wings were reorganised and their functions streamlined. With the increasing importance of agricultural credit the subject was transferred from the Department of Cooperation to the Department of Agriculture. After the reorganisation of the Directorate of Extension it took over complete responsibility for the work relating to farmers' and village level workers' training, farm information and

special projects like the IADP. The subject of HYVP was transferred from that Directorate to the Production Wing in the Ministry as it was thought that this programme which was of national importance could be handled more efficiently at the Ministry level. An Economists Cell was set up in the Directorate of Economics and Statistics to undertake studies on the economic aspects of agricultural planning and policies. For effecting coordination between different Ministries, a Cabinet Committee for Food and Agriculture was constituted, as a result of which the Agricultural Production Board set up earlier became redundant.

2.7.96 The most significant outcome of the reorganisation was that for the first time the control of the Department of Agriculture, Co-operation and Community Development came to be vested in one Secretary. This arrangement indeed facilitated rationalisation of administration and coordination of policies in the three departments. The main objective of reorganisation was to utilise the services of technical officers more fully by giving them necessary status and powers and greater role in the formulation of policies and their implementation.

2.7.97 A new Department of Agricultural Research and Education was organised in the Ministry of Agriculture in December, 1973 with a view to providing a necessary Governmental linkage for the ICAR. The Director General of ICAR was designated as Secretary to the Government of India in that Department. Two major functions assigned to the Department were (a) to look after all aspects of agricultural research and education (including animal sciences and fisheries) involving coordination between Central and State agencies and (b) to attend to all matters concerning the development of new technology in agriculture.

2.7.98 In October 1974, the subject of irrigation was transferred from the Ministry of Irrigation and Power to the Ministry of Agriculture and the Ministry was redesignated as Ministry of Agriculture and Irrigation.

State Agriculture Departments

2.7.99 Under the centralised and unitary system of Government obtaining before 1920, the onus of developing Provincial Departments of Agriculture and directing them was mainly with the Centre. After the devolution of powers under the Constitutional Reforms of 1919 and 1935, the initiative passed to Provincial Governments. There was, however, no significant expansion in staff or activities because of budgetary constraints. The only development of some significance during the pre-War period was the setting up of marketing departments in the thirties. There was also some increase in research staff under

the aegis of the ICAR and commodity committees. The GMF Campaign launched in 1942-43 marked a turning point. Following the strengthening of the Central Department, steps were taken to strengthen Provincial Departments and district level administration. Central subsidy for staff under GMF led to some expansion in staff. District Agricultural Officers/District Food Officers were appointed to take charge of agricultural programmes at the district level. Most of the staff newly appointed was on a temporary basis.

2.7.100 Despite these developments, State Agriculture Departments, at the time of Independence were considered to be comparatively unimportant. The allocations given to agriculture in the budgets of major States in 1947-48 constituted hardly 2 to 7 per cent of the total provision. The picture changed rapidly, particularly following the introduction of Community Development Programme and National Extension Service. Expansion of these departments during the plan period exhibited some special features. Firstly, some new departments, allied to agriculture such as animal husbandry, community development, fisheries, minor irrigation etc. were added. Secondly, the Community Development Programme introduced the basic framework of agricultural extension organisation at the block and village levels. Thirdly, within the Agriculture Department new wholetime officers were appointed at the headquarter level to look after special fields like plant protection, soil conservation, agricultural engineering, planning etc. Fourthly, there was significant expansion of cooperatives following the recommendations of the Rural Credit Survey Committee and the restructuring of agricultural credit in the country. Seed production and extension training programmes also led to some staff expansion.

2.7.101 Two committees appointed in 1957, the Agricultural Personnel Committee of the Planning Commission headed by Shri P. N. Thapar and the Agricultural Administration Committee headed by Raja Surendra Singh of Nalagarh, recommended strengthening of State Departments of Agriculture. The former suggested additions to extension staff at village, block and district levels. The Agricultural Administration Committee recommended significant improvements in the terms and conditions of employment in Agriculture Departments like declaring temporary posts in existence for more than three years permanent, parity of scales of pay in agriculture services with administrative services, better status to key level officials and avenues of promotion to agricultural staff. It also suggested measures for ensuring better coordination and for effecting improvements in programme planning, budgeting, sanctioning and delegation of powers.

2.7.102 The adoption of intensive area approach marked the next

phase in the development of State Departments. The IADP introduced a large complement of staff at the district, block and village levels in the districts coming under the programme. Similar additions but on a reduced scale took place under the IAAP and HYVP. There was also some addition to specialist staff at the district level in other districts. Pay scales of agricultural staff were revised upwards.

2.7.103 However, the expansion of State Agriculture Departments in recent years was not according to any comprehensive design but took place mainly under stimulus of incentives in the form of Centrally sponsored schemes. This led to unbalanced growth of departments resulting in greater attention being given to some activities and neglect of some others. The emphasis on input supplies in production programmes resulted in burdening the developmental staff with responsibilities of distribution, accounting and store keeping, leaving little time for extension work. The problem of dual control on field staff of the Agriculture Department at the block level created problems in programme implementation. Alongwith increase in the tempo of development and diversification of agriculture, there was no systematic functional coordination in the various departments. There was also diffusion of responsibilities. To surmount these problems and secure effective implementation of agricultural programmes the Working Group on Inter-Departmental and Institutional Coordination for Agricultural Production (1963) headed by Shri Ram Subhag Singh recommended the establishment of an integrated Department of Agriculture and Rural Development with a common Secretary-cum-Commissioner. The Working Group envisaged two agricultural production coordination committees at the headquarters, one at the Ministerial level and another at the Secretariat level, presided over by the Chief Minister and the Chief Secretary respectively. Similar committees were to be set up at the *zilla parishad* and *panchayat samiti* levels. The Working Group's recommendations, though accepted by all States, were implemented only in part. According to the Fourth Evaluation Report on the IADP by the Expert Committee under the chairmanship of Dr. S. R. Sen, most of the problems faced in the field of agricultural administration continued to exist and hamper progress¹.

Research

2.7.104 The dominant trend in agricultural research so far was to

1 1969 Modernising Indian Agriculture, Report on the Intensive Agricultural District Programme (1960—68) Vol 1 : 24 Expert Committee on Assessment and Evaluation, New Delhi, Ministry of Food, Agriculture, Community Development & Cooperation, (Department of Agriculture).

organise efforts cropwise and institutionwise without achieving adequate coordination. Crop centred research was mostly confined to cash crops. This trend was grossly reversed by policies initiated during the plans. The ICAR was reorganised to assume the role of an effective coordinator, director and promoter of agricultural research. Agricultural research under the coordinated projects became a cooperative venture between a large number of institutions and involving different disciplines to focus attention on regional aspects and specific problems.

2.7.105 To introduce a measure of coordination in agricultural research, the First Plan stressed that all schemes of commodity committees should be examined by the ICAR, that the scientific staff with the research stations under commodity committees should carry out research in respect of crops other than the concerned commodity also, and that the ICAR should have the right to suggest to commodity committees what coordinated research in respect of other crops grown in the region should be undertaken by them. Thus, a comprehensive regional approach in agricultural research developed as against the cropwise compartmentalisation followed by the commodity committees.

2.7.106 Agricultural research activities were stepped up during the Second Plan period. Two important schemes launched were the Project for Intensification of Regional Research on Cotton, Oilseeds and Millets (1956) and the All-India Coordinated Maize Improvement Project (1957). With these projects a new policy emerged in the organisation of agricultural research.

2.7.107 Another development which had a profound impact on all aspects of agriculture including research was the setting up of the first agricultural university in the country at Pantnagar, Uttar Pradesh, in 1960. Subsequently such universities came up in other States.

2.7.108 Reorganisation of ICAR : The ICAR was set up in 1929 as a registered society to promote, guide and coordinate agricultural research. However, there were lacunae in the control and coordination of work of the central research institutes and research bodies under Commodity Committees which were under the Department of Agriculture. The need for coordination increased with the establishment of agricultural universities. Following the recommendation made by a high powered Agricultural Research Review Team in 1964 the ICAR was reorganised into an autonomous body for coordinating, directing and promoting agricultural research and education in the country. Practically all Central research institutes under the administrative control of the Departments of Agriculture and Food were transferred to the Council and were made constituent units. All the commodity committees were abolished and research institutes

under their control were transferred to the Council to be made constituent units. With a view to simplifying procedures for coordination of research schemes, separate boards were constituted for agricultural research and for animal husbandry research. A large number of *ad hoc* research schemes had already been sanctioned by the commodity committees these were, to the extent possible, brought into the pattern of all-India co-ordinated research projects. Thus, for the first time an apex organisation in agricultural research exercising complete control over a large number of constituent units came into being. The reorganisation of ICAR made it possible to impart to agricultural research, greater cohesion and a new direction.

2.7.109 Application of science and technology to agriculture being the key note of the strategy in the Fourth Plan, agricultural research was accorded high priority. The principal agencies involved in the research programme would be the Central research institutes, agricultural universities and, to some extent, research stations run by Agricultural Departments in some States. All-India coordinated research projects based on a multi-disciplinary approach as well as inter-institutional cooperation were the main instrument of agricultural research. The scope of these projects was widened so as to cover all important food and commercial crops and to take care of the various problems coming in the wake of introduction of high-yielding varieties. Neglected crops like pulses and millets and dry farming were brought under the coordinated programme of research. A recent development was the setting up of the International Crops Research Institute for Semi-Arid Tropics at Hyderabad in July, 1972 to investigate problems of tropical agriculture including dry farming. The Institute was set up with the assistance and active involvement of international agencies like FAO, UNDP, World Bank etc. Research activities carried out in the field of animal husbandry, fisheries and forestry were referred to in the relevant sections of concerned chapters.

Education and Extension

2.7.110 Reference was made to the setting up of agricultural colleges in the Provinces at the beginning of the century, following the reorganisation of Agriculture Departments. College level education in agriculture made some progress in terms of institutions and number of students benefited. By 1947 there were 17 agricultural colleges. However, the quality of education remained generally neglected. It was generally formal and bookish rather than seeking to develop practical skills and ability to solve field problems. The curricula were generally out of step with modern knowledge, lacking

integration with basic sciences. Research remained neglected. It was against this background that the University Education Commission (1949) recommended the setting up of rural universities. A rural university was envisaged as a ring of small, resident, undergraduate colleges, with specialised and university facilities at the centre. A common core of liberal education was recommended, which included substantial introduction to the fields of mathematics, physics, chemistry, geology, biology, physical education etc. The concept envisaged agriculture as a composite discipline having close links with basic sciences. Education in the rural universities was to be tempered with research and enriched from field experience. The recommendation was strongly supported by the Joint Indo-American Teams of 1954 and 1959. The first agricultural university came up at Pantnagar in Uttar Pradesh in 1960 followed by similar universities in Orissa, Punjab and Rajasthan in 1962-63. More universities came up thereafter. At present agricultural universities exist in all major States except Jammu and Kashmir. The ICAR with the help of agricultural universities has been making efforts to improve higher education in agricultural sciences.

2.7.111 Though some efforts were made for promoting agricultural education at the school level, particularly in the States of Uttar Pradesh, Gujarat and Maharashtra through the basic school system, results were not encouraging. After a review of past experience the Education Commission 1964-66 headed by Dr. D. S. Kothari disfavoured specialisation in agriculture at the high school level and recommended "a sound general education with particular emphasis on mathematics and sciences". They, however, suggested "that some orientation to agriculture should form an integral part of all general education . . .".¹

2.7.112 Agricultural extension generally refers to informal education of the farmers and members of the farm family. Demonstrations were considered to be an efficient method of teaching them about scientific ways of improving agriculture under existing conditions. The importance of demonstrations was stressed by the RCA Reliance was placed on this medium during the forties to achieve the objectives of the GMF Campaign. Under Community Development Programme, special importance was attached to demonstrations. However, demonstrations carried out in the forties and fifties did not generally succeed in impressing farmers, mainly because of the poor level of expertise of organisers, the inability to adopt a package approach

1 1971. Education and National Development—Report of the Education Commission, 1964-66, pp. 659-60, New Delhi, National Council of Education Research and Training.

to crop production and the failure to follow recommended practices. Determined efforts to improve the quality and content of demonstrations were made only under the IADP. In 1965 the programme of national demonstrations was launched. In the first two years these were confined to single crops of high yielding varieties to demonstrate their yield potential. In 1966-67 the programme was taken over by the ICAR to ensure better management by agricultural scientists. With the change over, the emphasis shifted from single crops to maximisation of production per unit area, per unit of time, by following multiple cropping and using high yielding cereal crops in conjunction with improved soil and water management practices. In 1968-69 the national demonstrations were extended to non-cereal crops and dry farming areas.

2.7.113 In view of the need for imparting new knowledge and extending training to farmers, a programme for farmers' education and training was initiated in 1966-67. Regular classes were organised, supported by farm work in attached farms. The objective was to train village leaders who could create an urge in their friends and neighbours to improve their agricultural practices, increase production and raise living standards. The training programme was subsequently integrated with the national demonstrations and the latter became Centres for farmers' training in the new technology. A programme of functional literacy was started in 1967-68 at the farmers' training centres. Other demonstrations conducted by local extension agencies of State Governments, input suppliers and voluntary organisations too were made use of as focal points for farmers' education. Farm broadcasts, television programmes on a limited scale, discussion groups and audio-visual aids were also used for the purpose. Agricultural information units at the Centre and the States and the press disseminated relevant information which was of interest to the farming community.

Food Policy

2.7.114 During the First Plan, the food policy was one of caution, based on the assumption that scarcity conditions would continue. However, following the Korean Truce and better crop prospects within the country, Government began relaxing controls from June, 1952 by stages. By March, 1956 all control measures on food had been withdrawn. Government policy shifted to the other extreme of fixing support prices for protecting the interests of farmers and reducing imports.

2.7.115 However, the holiday from controls was short lived and:

-danger signals started showing up almost immediately. The unique features of the food situation during the Second Plan period were the increasing demand for foodgrains and a steady decline in market arrivals despite higher production. Credit support by banks to grain trade also abetted speculative holding of stocks. These factors combined to make foodgrains scarce in the market and give a big push to prices, compelling the Government to reintroduce controls. The Government, nevertheless, opted for a policy of partial control, relying mainly on imports of farm surpluses under PL 480 from the USA.

2.7.116 Scheme of partial control of 1956 : The principal elements of the scheme of partial control which came into force in 1956 were the system of distribution of foodgrains through fair-price shops, restrictions on bank advances to trade against grain stocks, cordoning off of the big cities, formation of zones for rice and wheat with restrictions on the movement of grain outside the zone, licensing of wholesale trade and roller flour mills and greater reliance on imports. The Foodgrains Enquiry Committee headed by Shri Asoka Mehta, appointed to study the situation and suggest suitable measures, by and large, agreed with the policy of partial control. It did not consider either free trade or rigid controls as the right remedy but favoured a middle course wherein trade was allowed to function on a competitive basis within certain broad limits and at the same time public authority played an active regulatory role. It felt that annual imports of the order of 2 to 3 million tonnes would be required for some time to come. As long-term solutions to the problem, the Committee suggested open market operations in foodgrains, socialisation of part of the wholesale trade, control over trade through a system of licensing and maintenance of sizeable reserve stocks of rice and wheat. The Committee also recommended the setting up of a Price Stabilisation Board to formulate and implement price policies, a Central Food Advisory Council of non-officials to advise the Board, and a Foodgrains Stabilisation Organisation to undertake open market operations including purchase, sale, procurement and maintenance of stocks.

2.7.117 Experiment in State trading : There was a marginal improvement in food position in 1958 following some increase in crop output. In November 1958, the Government decided in favour of State trading in foodgrains, to be implemented through cooperatives. The move, however, proved to be self-defeating as it caused a sharp rise in prices in the deficit and marginally placed States. State trading was, therefore, suspended in deficit States in 1959, followed by suspension of levy and purchase of wheat and rice in most of the surplus areas. As the wheat situation greatly improved in 1960-61,

restrictions on the movement of wheat were withdrawn in April, 1961.

2.7.118 An important element in Government's food policy during the period was imports of foodgrains. During the Second Plan period a number of agreements were signed between the Governments of India and USA for import of foodgrains under PL 480. The various agreements provided for an aggregate import of over 28 million tonnes of foodgrains, mostly wheat. Besides these concessional imports small quantities of wheat were received under the Colombo Plan and some amounts were also purchased under the International Wheat Agreement. Commercial imports of rice were arranged from Burma. The average annual imports of foodgrains during the Second Plan period was about 3.5 million tonnes as against 2.5 million tonnes during the First Plan.

2.7.119 Food crisis of mid-sixties : The Third Plan period was marked by frequent shortfalls in production in 1965 and 1966 there were severe brought conditions. The situation was further aggravated by strong economic pressures caused by steady increases in population and income, growing urbanisation and two major conflicts. All these had a destabilising effect on the economy. From comparative freedom from controls the food policy moved towards rigorous restrictions on movement, prices and distribution of foodgrains. Government adopted a cautious approach to begin with and took steps to arrange more imports, intensify procurement efforts and streamline distribution. Restrictions on movement of wheat were reimposed in March, 1964. Important wheat growing States were constituted into separate zones and selective credit control was imposed on wheat. The large rice zones too were broken up into single State zones in November, 1964 with the exception of the Northern Zone and similar restrictions were imposed on the movement of coarse grains. Informal rationing was introduced in the chronically deficit State of Kerala in November, 1964. This was soon followed by statutory rationing in Calcutta and a number of other industrial towns. The Food Corporation of India was set up in January, 1965 with a view to securing for the Government a commanding position in the foodgrains market. But before it could organise its functions, the food situation came under severe strain from two unexpected developments, Pakistan's attack on Kashmir in September, 1965 and the droughts in 1965 and 1966. These developments necessitated further tightening of restrictions including extension of rationing and intensification of procurement. Even towns with population of a lakh and above were brought under informal rationing. A number of austerity measures were also introduced. The situation compelled the Government to seek more foreign assistance for food imports. The overall position

at the end of the Third Plan period was that control on foodgrains was almost total. The average level of imports during the Plan period was about 5.1 million tonnes, i.e., about one and a half times the imports arranged during the Second Plan period. Imports reached a peak level of 10.4 million tonnes during 1966. The average level of imports during the three years 1966 to 1968 was 8.24 million tonnes, the highest average level reached so far.

2.7.120 A Foodgrains Policy Committee headed by Shri B. Vengappiah was appointed in March 1966 to examine the zonal arrangement and systems of procurement and distribution, and to recommend modifications for achieving equitable distribution of foodgrains at reasonable prices. The Committee analysed the various factors responsible for the food situation and came to the conclusion that food controls were inescapable for a number of years to come and there should be long-term food planning coupled with prudent management of resources by the Central and State Governments. The Committee advocated the formulation of a National Food Budget, keeping in view the zonal restrictions, introduction of statutory rationing in bigger urban areas, intensification of procurement, building of buffer stock and a more important role for the Food Corporation of India in the inter State trade. They also favoured the discontinuance of the subsidy on foodgrains for consumers in general. The main recommendations of the Committee were broadly endorsed at a Conference of Chief Ministers held in November, 1966.

2.7.121 Relaxation of controls. The food situation started improving with the good harvests in 1967-68. For four years, crop production showed sustained increase as a result of which market availability and procurement increased and the offtake from public distribution system declined. Stocks with the Government were augmented and imports were reduced. Statutory rationing was withdrawn from some areas and elsewhere the quantum of ration was raised. In view of the general increase in market arrivals, restrictions on bank advances were relaxed. Inter-State restrictions on movement of coarse grains, pulses and wheat were liberalised from March, 1968 and the wheat zone was expanded in April, 1969 to include all major wheat growing States. The overall position at the close of the decade was that except for the control on rice which existed in most parts and rationing in some areas, most of the restrictive and regulatory measures disappeared. Greater attention was given to raising a 'buffer stock of adequate' size and augmenting storage capacity for grains at suitable locations.

2.7.122 The food situation during the fourth Plan period showed a steady improvement in the first three years leading to greater freedom

from Government superintendence. The trends in market arrivals, prices, procurement etc. observed towards the end of sixties continued during the first two years of the Plan. Procurement operations in wheat and coarse grains, as a result of increase in production, functioned as a price support programme. In 1971 procurement for the first time exceeded the quantity distributed through public distribution system. Government also brought about sizeable reduction in imports and decided that all concessional imports would be stopped from January, 1972. Total stocks with the Government at the end of 1971 was about 7.9 million tonnes which was double the size of stocks at the end of 1968. Policies relating to bank advances and movement control were further liberalised. Movement of wheat was made free practically all over the country from 1970. Restrictions on the movement of coarse grains were also relaxed by a number of States. However, those on rice and paddy continued in view of the vulnerable supply position. Statutory rationing was abandoned in more areas. Thus on the whole the food situation during the first three years of the Fourth Plan was fairly satisfactory.

2.7.123 Return to controls : The situation began to deteriorate following large scale failure of *Kharif* crop in 1972 particularly in the dry farming belt. As a result there was acute scarcity and sharp rise in prices. To check the rise in prices and meet the requirements of vulnerable sections, public distribution system was geared up. Procurement efforts were stepped up and restrictions were imposed on the movement of grain from State to State and also within the State. Movement of wheat, however, remained unfettered. The Reserve Bank of India also took prompt measures to tighten the credit policy of advancing loans against foodgrains stock. The stocks with the Government began to deplete at an alarming rate a sizable quantity was also given as aid to Bangladesh. To tide over the situation the Government decided to import about 2 million tonnes of foodgrains in 1972.

2.7.124 State trading in wheat : Towards the end of 1972 the Government decided that wholesale trade in foodgrains would be nationalised with effect from 1973-74 season. Besides imposing a total ban on private wholesale trade, the scheme provided for the licensing of retail trade and the institution of single State zones. The public agencies like the Food Corporation of India, State Departments of Food and Civil Supplies, state cooperative marketing federations etc. were to undertake purchase operations on behalf of the Government. In pursuance of the above decision, wholesale trade in wheat was taken over in major producing States during April-May, 1973. However, the efforts to procure adequate quantities of wheat to feed

the public distribution system were frustrated by powerful vested interests. About 3.6 million tonnes of foodgrains had to be imported during 1973.

2.7.125 A fresh look was taken of State trading in wheat in 1974-75 season and the policy was revised. Besides the public agency, wholesale trade was also permitted to deal in wheat under a system of licensing and control. In the surplus wheat States a levy of 50 per cent was imposed in the *mandis*/purchase centres on daily purchases made by traders including public agencies acting as wholesalers. In the other wheat producing States, State Governments were asked to undertake procurement by a graded levy on farmers. In order to provide further incentive to farmers, Government also decided to increase the procurement price of wheat for the 1974-75 season.

2.7.126 In February, 1974 the Government constituted a high level Cabinet Committee under the chairmanship of the Minister for Agriculture to coordinate the activities of the various departments in the effective implementation of procurement programmes for the 1974-75 *rabi* marketing season. In June, 1974 the Prime Minister assumed the chairmanship of the Committee. The new Committee was to concern itself not only with food distribution but also with all aspects of food production and assumed the responsibility of ensuring a cohesive all-India policy to meet the food situation developing in the country.

Foreign Aid Technical Assistance

2.7.127 A number of countries and organisations have been providing financial aid and technical assistance to certain programmes of agricultural development. In the earlier phase, a good part of assistance was on a bilateral basis but of late there had been an increased flow of multilateral assistance. As part of the financial aid there was commodity assistance from many countries which often took the form of concessional imports of foodgrains, fertilisers, pesticides, machinery and equipment, milk products etc. Bulk of the assistance received from the USA was in the form of imports of foodgrains under PL 480. Technical assistance was an integral part of aid received from most of the countries and organisations.

2.7.128 Technical assistance could be considered as the most significant contribution of the developed countries to the improvement of Indian agriculture. Research work of a pioneering nature such as application of nuclear energy to soil science and plant breeding, improvement of cereal crops and dairy technology received valuable support. Substantial assistance was provided in the field of agricultural education, particularly in the establishment and development of

agricultural universities by the USA and some American foundations. Ground water development and rice improvement were two other areas where assistance of USA was valuable. USSR's main contribution came in the organisation and management of state farms. German Federal Republic collaborated in schemes for diversified development of agriculture in hill areas. Japan assisted extension work in paddy cultivation and Canada and France associated in the research for evolving improved technology for dry farming areas.

2.7.129 A number of countries extended assistance to programmes of animal husbandry development which included upgradation of cattle and improvement in milk yields. Three projects for cross breeding of local cattle with exotic bulls were set up at different locations with the assistance of German Federal Republic, Denmark and Switzerland. Other countries providing assistance in this field included Australia, New Zealand, the UK and the USA. Technical support to forestry programmes came from Finland and Sweden and to development of marine fisheries from Norway and Sweden.

2.7.130 India had been a major beneficiary of the economic aid extended by the World Bank. An important feature of the World Bank assistance was that a good part of loans particularly extended through its affiliate, the International Development Association (IDA) was soft and long term. Development of command areas like Chambal and rural electrification were some of the programmes which received support. Assistance extended by international agencies like the FAO and United Nations Development Programme was mainly for agricultural education, training and research. United Nations Children's Fund (UNICEF) assisted India in dairy development and applied nutrition programmes. Considerable assistance was also received for livestock and dairy development from the World Food Programme (WFP). Operation Flood Project launched in 1970 was closely linked with the aid from WFP.

2.7.131 Among non-official organisations which provided technical assistance to agricultural development, mention might be made of the Rockefeller Foundation and the Ford Foundation. Besides helping to improve higher agricultural education, the Rockefeller Foundation played a crucial role in the evolution of several crop hybrids with high yield potential such as hybrid maize, hybrid sorghum and other hybrid millets. The pioneering programme of IADP which convincingly demonstrated the efficiency of package approach to agricultural development, promotion of technological improvements in agriculture and support to agricultural engineering were some of the more important contribution of the Ford Foundation.

PROGRESS OF AGRICULTURAL DEVELOPMENT

1 INTRODUCTION

3.1.1 In this Chapter we deal with the progress of agricultural development in two phases, viz., prior to the advent of planning and during the Plan periods. By and large, the first phase covers the period from 1931 to 1951, the year of commencement of the First Five Year Plan. The second phase covers the period up to 1974 when the Fourth Five Year Plan ended. A study of the trends in population, land use and consumption of foodgrains during the two periods provides a background to this review. By periods of major policy changes a review has been made of the growth rates in area, production and yield of important crops and groups of crops in relation to the various inputs in the country as a whole as also in the different regions. The production trends during the decade between 1964-65 and 1973-74 have been analysed in depth to focus on certain pertinent issues which have emerged in crop production under the 'New Strategy'. Since animal husbandry, forestry and fisheries received adequate attention only after the initiation of planning, assessment of progress of these sectors lays special emphasis on the impact of various Plan projects/programmes. The Chapter concludes with a study of the trends in imports and exports of important agricultural commodities and a synoptic view of the current agricultural situation.

2 TRENDS IN POPULATION, LAND USE AND CONSUMPTION OF FOODGRAINS

3.2.1 In Indian, population censuses have been conducted decennially since 1872. Table 3.1 shows the growth of population since 1901 :

TABLE 3.1
Population Growth in India-1901 to 1971*

Year	Undivided India		Indian Union †	
	Population (million)	decennial growth rate (Per cent)	Population (million)	decennial growth rate (Per cent)
1901	283.9	—	238.3	—
1911	303.0	(+)6.73	252.0	(-)5.73
1921	305.7	(+)0.89	251.2	(-)0.30
1931	338.1	(+)10.60	278.9	(+)11.00
1941	389.0	(+)15.05	318.5	(+)14.23
1951			361.0	(+)13.31
1961			439.1	(+)21.64
1971			547.9**	(+)24.80

* 1 Census of India, 1941—Vol. I.

2. Census Centenary 1972, Pocket Book of Population Statistics, Registrar General of India.

** As on 1st April, 1971.

3.2.2 It will be seen that during the first two decades, i.e. 1901 to 1921, the growth rate of population was low. In fact, in the areas which subsequently formed the Indian Union there was a fall in the total population in the decade 1911-1921. Due to famines, pestilence and epidemic diseases like plague and influenza mortality was very high. There was steady growth in the subsequent three decades from 1921 till Independence. After Independence there was a spurt in the population growth due mainly to better health conditions, effective control of epidemics and efficient handling of food scarcities. The improved public health measures made a significant impact on the death rate which declined from 47.2 per thousand prior to 1920s to 22.8 per thousand in 1961 and 18.1 in 1971. On the other hand, the birth rate which was about 48.1 per thousand prior to 1920s had hardly come down to about 40 by 1971. However, the steep decline in the death rate resulted in a population explosion so much so that in a period of four decades i.e. from 1931 to 1971, the country's population nearly doubled.

3.2.3 Compared with that of certain other under-developed countries, the growth rate of population in India has not been very high. For example, in countries like Iran, Ceylon, Taiwan, Mexico, Brazil, Egypt and certain African countries, growth rate of population has been even higher than that in India. In these countries the population doubled in less than four decades. However, compared with developed countries like USA, UK, France, Germany, Canada, USSR and Japan, population growth rate in India has been significantly high.

3.2.4 The acceleration in the rate of growth of population has brought into sharp focus the urgent need for controlling fertility so that the nation's aim of providing higher standards of living to the people may be achieved as early as possible. India, no doubt, has been one of the earliest to have had a definite policy of family planning.

3.2.5 In 1901, the expectation of life at birth of an average Indian was only 23 years. When India attained Independence, it was about 32 years. By 1971, the expectation of life at birth had shot up to 46 years. Under the Fourth Plan it was envisaged to reduce the birth rate by the end of the plan period to 32 and to 25 in another 5 to 7 years. However, the birth rate at the beginning of the Fifth Plan is still estimated to be around 35 per thousand population. In the light of the past trends, the Fifth Plan aims at reducing the birth rate to 30 per thousand population by the end of the Plan period and to 25 per thousand population by 1983-84.

3.2.6 In India, urban population increased from 33.5 million in 1931 to 109.1 million in 1971. In the case of rural population, growth has been from 245.4 million in 1931 to 438.8 million in 1971. Table 3.2 gives the estimates of rural and urban population since 1931 :

TABLE 3.2
Growth of Rural and Urban Population—Indian Union*+

Year	Rural population			Urban population		
	population (million)	percentage increase over the previous census	percentage of total population	population (million)	percentage increase over the previous census	percentage of total population
1931	245.4	—	88.0	33.5	—	12.0
1941	274.4	11.8	86.2	44.1	31.6	13.8
1951	298.5	8.8	82.7	62.5	41.7	17.3
1961	360.2	20.7	82.0	78.9	26.2	18.0
1971	438.8	21.8	80.1	109.1	38.3	19.9

* Census of India 1971 Part II(A)(1) General Population Tables Registrar General of India.

+ Due to changes in definitions of urban area, the figures of rural and urban population for different censuses are not strictly comparable.

3.2.7 Data on classification of workers in India are available for 1951, 1961 and 1971. However, these figures are not strictly comparable due to changes in concepts and definitions. or example, the 1961 definition of work was on the liberal side which had exaggerated participation rates. The deficiencies in the 1961 census concept were sought to be rectified by adopting a different approach at

the 1971 census. After adjusting the 1961 census figures of workers for conceptual differences, it is seen that as against 28.8 per cent of the total working force in non-agricultural occupations in 1961, the corresponding proportion in 1971 was 27.9 per cent.¹

Density of Population

3.2.8 Density of population in respect of cultivated area provides a rough indication of the requirements of food and agricultural resources of different areas. The deltaic areas of India such as West Bengal and the strip of fertile land between the Western Ghats and the sea along with the south western part of the Peninsula (Kerala) are all densely populated. On the other hand, arid areas of low rainfall and vast tracts of forests and mountains are sparsely inhabited. Appendix 3.1 gives the density of population on the basis of the cultivated area in different States. It will be seen therefrom that density of population for the country as a whole works out to 3,702 persons per thousand hectares of cultivated area. As against this, the population density per thousand hectares of cultivated area is as high as 9,937 in Kerala and 7,976 in West Bengal and as low as 1,558 in Rajasthan, 2,244 in Madhya Pradesh and 2,687 in Karnataka.

Population and Land-Use

3.2.9 The total geographical area of India is 328.0 Mha. Out of this, land utilisation statistics are available for 305.6 Mha constituting about 93.2 per cent of the total. According to land utilisation statistics for 1971-72 arable land (net area sown plus current and other fallow lands) covers 160.6 Mha or 52.6 per cent of the total reporting area. An area of 65.8 Mha or 21.5 per cent is under forests. Land put to non-agricultural uses is estimated at 16.4 Mha or 5.4 per cent of total and barren and uncultivable land at 29.3 Mha or 9.6 per cent of total. Permanent pastures and other grazing land is estimated at 13.1 Mha or 4.3 per cent of total, land under miscellaneous tree crops and groves not included in the net area sown comes to 4.4 Mha or 1.4 per cent of total and cultivable waste land to another 15.9 Mha or 5.2 per cent of total.

3.2.10 Taking into account the entire geographical area, the present per capita availability of land in India comes to only 0.60 ha as compared to 60.20 ha in Australia, 46.19 ha in Canada 9.05 ha in USSR, 4.62 ha in USA, 2.44 ha in Burma, 1.33 ha in Pakistan and 0.35 ha in Japan. Thus, the per capita availability of land in India is among the lowest in the world.

¹ Chapter 58 on Rural Employment (Appendix 58.1).

3.2.11 The proportion of area under agricultural use (including arable land, land under permanent meadows and pastures) to total geographical area in India is 53.0 per cent compared to 46.5 per cent in USA, 60.4 per cent in France, 27.1 per cent in USSR, 65.0 per cent in Australia, 6.9 per cent in Canada, 28.5 per cent in Burma, 30.1 per cent in Pakistan and 16.8 per cent in Japan.

3.2.12 Comparable figures of area under different land-use classes are not available over a long period of time due to changes in boundaries, extension of reporting area and changes in methods of estimation. An attempt has been made to work out estimates of net area sown for the Indian Union from 1931 onwards. These estimates along with the corresponding estimates of population and per capita net sown area for 1931 to 1972 are given in Table 3.3.

TABLE 3.3
Population and Net Area Sown—Indian Union*

Year	Population (millions)**	Net Area sown (Mha)	Per capita net area sown (ha)
1931	278.9	97.9	0.35
1941	318.5	98.3	0.31
1951	361.0	118.8	0.33
1961	439.1	133.2	0.30
1965	479.0	138.1	0.29
1966	489.6	136.3	0.28
1967	500.4	137.3	0.27
1968	511.6	139.9	0.27
1969	523.1	137.6	0.26
1970	534.8	138.7	0.26
1971	547.0	140.4	0.26
1972	558.6	139.4	0.25

* Census Centenary, 1972, Pocket Book of Population Statistics; Registrar General of India.

** As on 1st March of the census year.

Despite the fact that the net area sown figures prior to 1961 are likely to be under-estimates owing to incomplete coverage, the above figures show that pressure on Land has been increasing steadily. The per capita net area sown declined almost steadily from 0.35 ha in 1931 to 0.25 ha in 1972.

Population and Foodgrains Production

3.2.13 As in the case of land use statistics, estimates of foodgrains production published from time to time are not strictly comparable. As such it is not possible to give a precise account of the trends over a long period of time on the basis of official estimates. However, on the basis of studies conducted by the Directorate of Economics and Statistics, Ministry of Agriculture and Irrigation (DES) and various

research workers and organisations, it has been possible to compile reasonably comparable estimates of foodgrains production from 1936-37 for the Indian Union. Table 3.4 gives the adjusted figures of foodgrains production from 1936-37 and corresponding population from 1937 onwards :

TABLE 3.4
Foodgrains Production and Population—Indian Union

Period—	Population @ (million)	Adjusted es- timates of food- grains production (million tonnes)+	Per capita food grains pro- duction (kg)
Average			
1937 to 1941 . . .	310.2*	61.4	198
1942 to 1946 . . .	330.8*	62.1	188
1947 to 1951 . . .	352.1*	58.3	166
1952 to 1956 . . .	383.9	66.0	172
1957 to 1961 . . .	424.3	75.5	178
1962 to 1965 . . .	467.2	83.3	178
Annual			
1966	493.2	72.4	147
1967	504.2	74.3	147
1968	515.4	95.2	185
1969	527.0	92.4	175
1970	538.9	99.3	184
1971	550.8	108.2	196
1972	562.5	105.2	187
1973	574.2	97.0	169
1974	586.1	103.6	177

+ Production figures relate to agricultural year (July-June), 1967 figure corresponds for example to production of 1966-67 and so on for subsequent years.

@ As on 1st July

* As on 1st March.

It will be seen that per capita production of foodgrains in the country steadily declined during the three quinquennia preceding the planning era. During the First and Second Plan periods, per capita production showed some improvement but it remained below the levels obtaining in 1937-46. The last year of the Third Plan was characterised by severe drought in large parts of the country. Excluding this year, the average per capita production during the period was estimated at 178 kg. per year which was about the same as that during the Second Plan period. The year 1966-67 was also a drought year resulting in a low level of foodgrains production. In subsequent years, foodgrains production showed an improvement and in 1970-71 per capita production was 196 kg or about the same as in the quinquennium ending 1940-41. During 1971-72 and more so in 1972-73,

weather conditions were again unfavourable over large parts of the country and precipitated a decline of about 10 per cent in production of foodgrains over these two years. As a result, the per capita production of foodgrains declined in 187 kg. in 1971-72 and to 169 kg. in 1972-73. During 1973-74, even though foodgrains production staged a recovery, the per capita production was only 177 kg. i.e. perceptibly below the level achieved in 1970-71 or even during 1971-72.

Trends in Land Use

3.2.14 In India the scope for bringing new lands under cultivation is limited. In the first few years of planning, however, the net area sown in the country increased due to land reclamation by Central and State Tractor Organisations and the assistance given to farmers under different schemes for bringing new land under cultivation. But in the last few years there has been very little expansion in the net area sown. Table 3.5 indicates the progress during 1950-51 to 1971-72 in the area under cultivation :

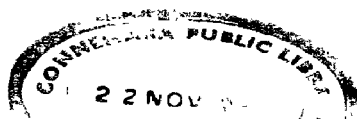
TABLE 3.5
Area Under Cultivation—Indian Union*

	1950-51	1955-56	1960-61	1965-66	1966-67	1968-69	1969-70	1970-71	1971-72@
Total geographical area	328.0								
Reporting area for land utilisations statistics	284.3	291.9	298.5	305.6	305.5	305.8	306.1	305.3	305.6
Net area sown	118.8	129.2	133.2	136.3	137.3	137.6	138.7	140.4	139.4
Area sown more than once	13.1	18.1	19.6	19.1	20.1	22.1	25.1	24.7	24.6
Gross area sown	131.9	147.3	152.8	155.4	157.4	159.7	163.8	165.1	164.0

* Information published by the Directorate of Economics and Statistics, in the various issues of Agriculture in Brief.

@ Provisional.

The figures given above show that while in five years from 1950-51 to 1955-56, the geographical coverage of land use statistics increased from 284.3 to 291.9 Mha, i.e. by 7.6 Mha, the net area sown increased by 10.4 Mha. On the basis of index numbers of net area sown issued by the DES after making allowances for changes in coverage, etc., it is estimated that the real increase in net area sown in these five years was 8.6 Mha, the rest being accounted for by the new areas brought under statistical coverage. This would mean that during the five years ending 1955-56, net area sown in the country increased by about 7 per cent. However, during the next five years, i.e. from



1955-56 to 1960-61 the real increase in net area sown was of the order of about 3 per cent only between 1960-61 and 1965-66 the increase was about 2.2 per cent. Subsequently, net area sown has been fluctuating within narrow limits.

3.2.15 Statewise index numbers of net area sown are not available. However, an analysis of the trends in the absolute figures reveals that between 1950-51 and 1965-66 net area sown moved up significantly in Rajasthan, Gujarat, Kerala, Madhya Pradesh and Tamil Nadu; the order of increase in these States being 45 per cent, 40 per cent, 19 per cent, 18 per cent and 16 per cent respectively : Other States viz., Andhra Pradesh, Assam, Haryana, Jammu & Kashmir, Karnataka, Maharashtra, Orissa, Punjab, Uttar Pradesh and West Bengal also registered an increase in the net area sown but the order of increase was moderate, being of the order of 6 to 12 per cent only. However, between 1965-66 and 1971-72 net area sown registered only marginal increases of 2 to 8 per cent in most of the States. Only in Madhya Pradesh net area sown registered an appreciable increase of 12 per cent over this period.

Trends in Irrigated Area

3.2.16 According to the data on irrigated area published by the Irrigation Commission, 1972, net area irrigated went up from 17.1 Mha during the quinquennium ending 1934-35 to 19.4 Mha during the quinquennium ending 1949-50 i.e. by 13.5 per cent. Area irrigated from government canals went up during the same period from 5.0 to 6.4 Mha or by 28.0 per cent. Area irrigated by wells increased from 4.8 to 5.3 Mha or by 10.4 per cent. The pace of progress of well irrigation was slow and unsteady during the period under reference due to lack of investment capacity on the part of the farmers. On the whole, the percentage of net irrigated area to net area sown increased from 17.6 in 1930-35 to 19.1 in 1945-50.

3.2.17 With the advent of planning greater emphasis was placed on increasing area under irrigation. By 1971-72 net area irrigated moved up to 31.6 Mha as compared to 24.7 Mha in 1960-61 and 20.9 Mha in 1950-51 showing thereby an increase of 27.9 per cent and 51.2 per cent respectively. This increase in net area irrigated was brought about mainly by an increase in area irrigated through Government canals and wells. The percentage area irrigated by these two sources of irrigation during 1971-72 worked out to 37.6 per cent and 38.1 per cent respectively as against 34.3 per cent and 28.7 per cent in 1950-51 and 37.2 per cent and 29.6 per cent in 1960-61. Table 3.6 gives source-wise irrigated area during the years 1950-51, 1955-56, 1960-61, 1965-66 and 1971-72.

TABLE 3.6
Area Irrigated by Sources—Indian Union†

Source	(thousand hectares)				
	1950-51	1955-56	1960-61	1965-66	1971-72@
Government Canals	7,158 (34.3)	8,025 (35.3)	9,170 (37.2)	9,825 (37.3)	11,890 (37.6)
Private canals	1,137 (5.5)	1,360 (6.0)	1,200 (4.9)	1,122 (4.3)	877 (2.8)
Total	8,295 (39.8)	9,385 (41.3)	10,370 (42.1)	10,947 (41.6)	12,776 (40.4)
Tanks	3,613 (17.3)	4,423 (19.4)	4,561 (18.5)	4,270 (16.2)	4,123 (13.1)
Wells	5,978 (28.7)	6,739 (29.6)	7,290 (29.6)	8,653 (32.8)	12,034 (38.1)
Other sources	2,967 (14.2)	2,211 (9.7)	2,440 (9.8)	2,473 (9.4)	2,660* (8.4)
Grand total	20,853 (100.0)	22,758 (100.0)	24,661 (100.0)	26,343 (100.0)	31,593 (100.0)

† Directorate of Economics & Statistics, Ministry of Agriculture and Irrigation (DES).

* Includes an area of 59 thousand hectares for which details are not available.
@ Provisional.

NOTE . Figures in brackets indicate percentage to total net irrigated area.

3.2.18 It will be seen that area irrigated by wells including tube-wells rose at a faster rate than that by government canals. The annual average linear rate of growth of net area irrigated during the period 1950-51 to 1971-72 is estimated at 2.36 per cent as compared to 0.98 per cent during the preceding 40 years. As against this in the case of government canals and wells the annual average linear rates of growth during 1950-51 to 1971-72 were 3.04 per cent and 4.35 per cent respectively as against 2.0 per cent and 0.54 per cent respectively during the preceding 40 year period.

3.2.19 The spread of irrigation is uneven in the country. In the States of Punjab, Haryana and Tamil Nadu the net area irrigated during 1971-72 was as high as 73 per cent, 44 per cent and 43 per cent respectively of the net area sown. On the other hand, in the States of Madhya Pradesh, Maharashtra, Karnataka, Gujarat and Rajasthan, the percentage of net area irrigated to net area sown varied between 8 and 14 only. The aggregate share of these 5 States in the total net area irrigated in the country during 1971-72 was hardly one fourth, but they together accounted for half of the net area sown. Rainfall being inadequate and highly variable over large areas in these States the development of irrigation is and has always been one of their pressing needs. Andhra Pradesh, Bihar, West Bengal and U.P. fall in the middle group and in these States the percentage of net area

irrigated to net area sown varied between 26 and 40 per cent.

3.2.20 During the Plan periods, alongwith an increase in the net area irrigated, the gross irrigated area, i.e. net irrigated area plus area irrigated more than once, also moved up significantly. In 1971-72, area irrigated more than once was estimated at 7.0 Mha as against 3.3 Mha in 1960-61 and 1.7 Mha in 1950-51 showing thereby an increase of 112 per cent and 312 per cent respectively. Out of the total gross irrigated area of 38.59 Mha in 1971-72, foodgrains accounted for nearly 80 per cent, the rest being accounted for by commercial and other crops. Among foodgrains, area irrigated under wheat increased from 3.4 Mha in 1950-51 to 10.3 Mha in 1971-72 thereby trebling itself in two decades. This increase was more pronounced in the last six years after 1965-66 when the rate of annual average increase worked out at about 15.2 per cent as compared to 3.9 per cent in the earlier 15 years ending 1965-66; the reasons being the growing use of new high yielding strains of wheat under the 'New Agricultural Strategy'. In the case of rice, the increase in irrigated area between 1950-51 and 1971-72 was hardly 50 per cent. In fact, its share in the total irrigated area declined from 43.6 per cent in 1950-51 to 37.9 per cent in 1971-72. Taking foodgrains as a whole, irrigated area increased from 18.3 Mha in 1950-51 to 30.5 Mha in 1971-72 or by about 67 per cent. In the case of commercial crops, irrigated area under sugarcane and cotton increased from 1.2 Mha and 0.5 Mha in 1950-51 to 1.7 Mha and 1.5 Mha respectively in 1971-72.

Trends in Consumption of Foodgrains—1901 to 1972

3.2.21 No reliable all-India statistics are available regarding the levels and composition of food consumption for the period prior to Independence. However, on the basis of studies conducted by the DES and other official and non-official organisations, it is possible to study the trends in consumption of foodgrains for which some estimates are available on a fairly comparable basis. Table 3.7 gives the estimates of per capita consumption of foodgrains for undivided India from 1901-02 to 1945-46 and for Indian Union from 1946-47 to 1973-74. The estimates are subject to the following limitations :

- (i) Coverage is not uniform throughout.
- (ii) Adjusted estimates of foodgrains production used in arriving at consumption figures are not strictly comparable for pre-Independence and post-Independence periods.
- (iii) Statistics of variation in stocks of foodgrains are not available. However, for Indian Union, the figures of consumption have been worked out after taking into account changes in Government stocks.

TABLE 3.7
For Capita Availability of Foodgrains—1901 to 1974*

Period	Per Capita availability	
	Kg per year [grams per day	
<i>Undivided India</i>		
<i>Quinquennium ending</i>		
1905-06	200.2	549
1910-11	198.4	543
1915-16	191.9	525
1920-21	195.1	534
1925-26	200.2	549
1930-31	179.9	493
1935-36	170.7	467
1940-41	158.6	434
1945-46	152.2	417
<i>Indian Union</i>		
1950-51	155.2	425
1955-56	155.3	425
1960-61	163.6	448
1965-66	164.1	449
1970-71	162.3	445
<i>Annual</i>		
1971-72	171.1	467
1972-73	155.0	452
1973-74**	163.7	449

* 1 J. P. Bhattarjee 1958—August. Trends in Consumption of Food and Foodgrains in India—Tenth International Conference of Agricultural Economists.

2 S. R. Sen 1967 January, 'Growth and Instability in Indian Agriculture—Agricultural Situation in India, DES.

3 1973 Bulletin on Food Statistics, DES—Twenty-third issue

** Provisional and subject to revision.

3.2.22 Data on composition of food availability in terms of cereals, potatoes, starchy and other staple foods, sugar, pulses, nuts and seeds, vegetables, meat, eggs, fish, milk, etc. are available from 1949-50. Table 3.8 gives the net availability of calories per capita per day in India from 1949-50 to 1969-70.

TABLE 3.8
Net Availability of Calories—Indian Union*

Items of consumption	(per capita per day)							
	1949-50	1950-51 to 1952-53	1953-54 to 1955-56	1956-57 to 1958-59	1959-60 to 1961-62	1962-63 to 1965-66 to 1967-68	1968-69	1969-70†
Cereals@	1,285	1,186	1,315	1,314	1,392	1,417	1,326	1,380
Potatoes, starchy & other staple foods	22	28	26	26	26	33	39	46

TABLE 3.8 (Contd.)

1.	2	3	4	5	6	7	8	9	10
Sugar and sweets .	124	116	138	144	181	189	163	170	186
Pulses, nuts, and seeds	200	218	238	231	230	199	181	175	187
Vegetables . . .	—	—	—	—	2	2	2	2	2
Fruits	20	20	19	17	26	26	27	27	27
Meat	5	5	6	7	4	5	6	6	6
Eggs	1	1	1	1	1	1	1	1	1
Fish	3	3	4	4	4	4	4	4	5
Milk	103	106	112	109	108	102	97	97	97
Fats and Oils . .	74	74	87	94	93	90	83	78	83
Total**	1,840	1,750	1,945	1,945	2,070	2,070	1,930	1,980	2,055

* FAO Production Year Book, 1971 for items other than cereals.

T Tentative data.

@ Based on adjusted estimates of production of cereals.

** Rounded figures.

It will be seen that the net available calories per capita per day in India increased steadily from 1,840 in 1949-50 to 2,070 in 1960-65 but declined to 1,930 during 1965-68 when production of foodgrains declined considerably due to widespread drought. Subsequently there has been an improvement in the calorie intake which touched the level of 2,055 in 1969-70. The composition of the Indian diet shows that cereals and pulses constitute the main source of calorie intake, accounting for over 75 per cent of the total. During the last few years there has been a fall in the per capita consumption of milk.

3 CROP PRODUCTION DURING PRE-PLAN PERIOD

3.3.1 A scientific study of long term trends in area under crops, production and yield is possible only if comparable data are available for a sufficiently long period. Such a comparability in data over a period of time is vitiated due to changes in scope, coverage and methods of estimation. Even though efforts have been made from time to time to bring about comparability in data as far as possible, the very process of improvement in scope, coverage and methodology has involved an element of non-comparability in the statistics published from time to time. It is in the background of these limitations that a study has been made of the trends in crop production in this and the subsequent sections of this Chapter.

Area, Production and Yield (1900—1930, Undivided India)

3.3.2 Area : Adjusted estimates of area under foodgrains, non-foodgrains and all crops as also of important crops in these groups are given in Appendix 3.2. It will be seen therefrom that between 1900 and 1930 while area under foodgrains increased by about 7 per cent that under non-foodgrains increased by as much as 35 per cent. Taking all crops together the increase in gross area sown was about 12 per cent. The relative share of foodgrains in the gross cropped area showed a steady decline. Among foodgrains, wheat and gram registered significant increases of over 20 percent while in the case of rice there was only a modest increase of nearly 7 per cent. Area under millet crops like jowar and bajra did not undergo any appreciable change. Commercial crops registered a significant increase in area except in the case of sugarcane; the extent of increase being as high as 55 per cent in the case of cotton and jute and over 30 per cent in the case of oilseeds and plantations. As already mentioned in Chapter 2 (paragraph 2.1.3) on Historical Review, the marked expansion in area under wheat and certain commercial crops was mainly due to their special importance to the colonial power.

3.3.3 Production : Index numbers of production of foodgrains, non-foodgrains and all crops as also of important crops in these groups are given in Appendix 3.3. It will be seen therefrom that during the 30 year period, production of foodgrains was rather stagnant. Even though between 1910 and 1920 there was some increase in production, during the last quinquennium the index was even lower than at the beginning of the period. On the other hand, production of non-foodgrains showed a constantly rising trend and moved up by 39 per cent during the period. The average compound rate of growth of production per year between 1900 and 1930 worked out to (—) 0.02 per cent for foodgrains, 1.25 per cent for non-foodgrains and 0.31 per cent for all crops. Dividing this period in two parts it is observed that during the first 15 years, production of foodgrains, non-foodgrains and all crops showed compound growth rate of 0.50 per cent, 2.06 per cent and 0.84 per cent per annum respectively. However, during the second period i.e. between 1915 and 1930 production of foodgrains and all crops indicated negative growth rates of (—) 0.79 per cent and (—) 0.22 per cent per annum respectively. Even in non-foodgrains the growth rate was lower, being 1.54 per cent per annum only.

3.3.4 Among foodgrains, production of rice remained stagnant and even showed a falling trend after 1910-15. Production of coarse cereals viz. jowar, bajra, maize and barley also remained more or less stagnant. Wheat and gram were the only two crops in this group

which recorded a rising trend in production. The record of commercial crops was, however, encouraging. Cotton, jute, sugarcane and tea recorded large increases in production. Production of sesamum and linseed also recorded impressive increases in the beginning but suffered some setback towards the close of the period. On the whole, while production of foodgrains during this period remained stagnant, in commercial crops there were definite signs of growth.

3.3.5 Yield : Estimates of yield of crops during the period under review were based on the traditional method involving normal yields and condition factors; both being subjective in character. This defect coupled with changes in coverage of estimates from year to year, renders a scientific assessment of long term trends rather difficult. However, on the basis of available data it is observed that for the country as a whole productivity showed a declining trend in foodgrains and an improvement in commercial crops. This upward movement in yield rates coupled with increase in area helped in pushing up production of commercial crops.

Growth Patterns—Selected Provinces and Crops

3.3.6 Due to vast differences in soils, topography, climate, irrigation facilities, cropping pattern, farm practices etc., performance on the agricultural front would not naturally be uniform in different parts of the country. For a proper assessment of progress in agricultural development, therefore, it is necessary to study the patterns of growth at levels lower than the all-India level as well. Comparable series of index numbers of agricultural production etc. are not available for different Provinces for the period under reference. As such, a study of trends in area, production and yield at the provincial level has been made only in respect of the temporarily settled Provinces of Bombay, Madhya Pradesh, Madras, Punjab (India) and Uttar Pradesh, where area estimates during the period under reference were by and large based on field to field enumeration and yield estimates compiled more systematically. Comparable estimates for rice, wheat, jowar, maize, cotton and sugarcane for the period 1900 to 1930 for such of these Provinces where the respective crops were grown to a considerable extent are given in Appendix 3.4. Trends in area, production and yields of these crops in selected Provinces are briefly discussed below :

- (i) Rice : It will be seen that, during the period under review, there was considerable increase in area and production of rice in Madhya Pradesh, Bombay and Madras, while in Uttar Pradesh it remained stagnant. As

regards yield, there were fluctuations in all the selected Provinces. However, in Madras and Bombay the trend was generally upward while in Uttar Pradesh, the yield depicted a perceptible tendency to decline.

- (ii) **Wheat :** On the whole, while in Madhya Pradesh and Punjab area under wheat at the end of the period was higher as compared to the initial levels, in Uttar Pradesh it was almost at the same level. The trend was uneven and in all the Provinces; area under the crop registered a decline after the peak levels attained during the quinquennium ending 1914-15. Trend in production was also uneven and in sympathy with the trend in area, in all the three provinces, it registered a decline after the peak levels attained during the quinquennium ending 1914-15. At the end of the period, yield rates of wheat showed a marginal improvement in Uttar Pradesh; a fall in Madhya Pradesh and an increase in Punjab.
- (iii) **Jowar :** Area under jowar showed an upward trend only in Bombay and that too after the quinquennium ending 1914-15. In Madras area showed a consistent decline, while in Uttar Pradesh and Madhya Pradesh the trend was uneven. In production there was a falling trend in Uttar Pradesh, Madras and Madhya Pradesh and an upward trend in Bombay. Yield rates too did not show any improvement in Uttar Pradesh and Madhya Pradesh whereas in Bombay there was an upward trend. In Madras also yield rates improved significantly after the decade ending 1914-15.
- (iv) **Maize :** Among the selected Provinces maize was appreciably grown in Punjab and Uttar Pradesh only. Area and production of maize reached peak levels in both these Provinces during the quinquennium ending 1919-20 and registered a fall thereafter. Yield of maize did not show any signs of growth in any of the Provinces and was rather stagnant.
- (v) **Cotton :** By and large both area and production of cotton showed a rising trend in Madhya Pradesh, Madras and Punjab. Though yield increased steadily in Madras and Punjab, it was more or less stagnant in Madhya Pradesh.
- (vi) **Sugarcane :** Area under sugarcane showed a steady increase in Uttar Pradesh and Punjab. In Madras, however, area under sugarcane remained more or less stagnant. Production and productivity of the crop did not show any

specific trend. On the whole, production of sugarcane, at the end of the period was higher in all the three Provinces. Yield also showed significant improvement in Punjab and Madras.

Factors of Change in Crop Output

3.3.7 Though traditional agriculture was fairly well established in all the areas in the country, as indicated in Chapter 2 on Historical Review, there was complete lack of any improvement in technology and investment in farming practices. The steps taken in organising agricultural research had hardly any impact on the stagnant farming economy. Indian agriculture was a gamble with monsoon characterised by occasional crop failures and bumper crops. However, irrigation began to play a role not only in arresting crop failures but also in making agriculture more intensive, raising the level of output and assisting in protecting soil fertility by diversifying established cropping patterns. Farm yard manure (FYM) and dung were used to bring about improvement in crop yields, but no statistics are available about the quantities used from year to year. Chemical fertilisers were available in small quantities and used only in coffee and tea plantations and for certain commercial crops. Production of ammonium sulphate in India was about 4.5 thousand tonnes in 1919 and all but 480 tonnes were exported and there were no imports. In 1925, of the estimated production of about 15 thousand tonnes only about 7 thousand tonnes were retained in India. During the quinquennium ending 1929-30, average imports of chemical fertilisers were of the order of about 48.5 thousand tonnes.

3.3.8 Quinquennial average of net area irrigated from Government and other sources since 1900 in British Provinces for which comparable data are available are indicated in Table 3.9.

TABLE 3.9

Net Area Sown and Area Irrigated—Undivided India* (1900—1930)

Quinquennium ending	Net area sown	Area irrigated by Government works	Net area irrigated	(Mha)	
				Percentage of col. 3 to col. 2	Percentage of col. 4 to col. 2
1904-05	78.1	7.5	13.2	9.6	16.9
1909-10	82.8	8.6	15.9	10.4	19.2
1914-15	84.1	9.5	18.0	11.3	21.4
1919-20	82.5	10.5	18.8	12.7	22.8
1924-25	84.3	10.4	18.6	12.3	22.1
1929-30	84.7	11.0	18.9	13.0	22.3

* First Five Year Plan (p. 344).

16—130 Deptt. of Agr./76.

The average net area irrigated during this period increased from 13.2 Mha to 18.9 Mha i.e. by 43 per cent. The increase was accounted for mainly by area irrigated from Government works, which moved up from 7.5 Mha to 11.00 Mha i.e. by 47 per cent. This was brought about due to the completion of some of the major irrigation projects such as Cauvery-Mettur Project in Madras, the Sutlej Valley Project in Punjab, the Nizamsagar Project in Hyderabad and Krishna-rajasagar Project in Mysore. However, progress in the extension of irrigation was rather slow after 1919-20 due to paucity of public sector investments and progressively emphasis was laid on productive rather than protective irrigation works.

3.3.9 Strictly comparable figures of irrigated area in different Provinces over a period of years are not available. However, on the basis of available data it is observed that extension in net area irrigated was not uniform in all the Provinces. The net area irrigated moved up significantly in Punjab* and Bengal* marginally in Central Provinces and Madras and remained more or less stationary in United Provinces and Bombay and Sind. At the end of the period, Punjab had the highest i.e. 52 per cent of net area sown under irrigation, while it was 27 per cent in Madras and United Provinces, 14 per cent in Bengal and Bombay & Sind and only 5 per cent in Central Provinces. From the available data no specific trend was discernible in area irrigated under different crops. In certain Provinces e.g., United Provinces and Bombay foodgrains received a preference over commercial crops in extension of irrigation, while in others e.g. Central Provinces and Punjab sugarcane and cotton respectively were the main beneficiaries.

Area, Production and Yield (1931—1947, Undivided India)

3.3.10 As mentioned in Chapter 2 on Historical Review, between 1931 and 1947 a series of developments took place which had a close bearing on agricultural performance. Before the outbreak of the Second World War agricultural progress was greatly hampered and output diminished on account of (a) the inability of agriculture to benefit from the boom period of 1925-29 due to technological handicaps, (b) the *laissez faire* policy followed by the Government during the Great Economic Depression of 1929-33 and (c) the reduction in the Government expenditure on agricultural research. However, after the outbreak of the War and before Independence, Government took several steps to bring about permanent improvements in agriculture. These included the launching of the Grow More Food (GMF) Campaign in 1942 to meet the grim food situation created by loss of

* As before partition.

imports from Burma alongwith measures taken for intensification and extension of cultivation, and the assumption of wider responsibilities assumed by the Central Government from 1943 with regard to the food production drive. These measures had a healthy effect on agricultural output, particularly foodgrains.

3.3.11 Area : Adjusted estimates of area under foodgrains, non-foodgrains and all-crops for quinquennial periods up to 1944-45 and for 1945-46 and 1946-47 are given in Table 3.10.

TABLE 3.10

Area under Foodgrains and Non-foodgrains in Undivided India
(1930 to 1947)*

Period	Foodgrains	Non-foodgrains	All crops (Mha)
quinquennium ending			
1934-35	104.0 (80.7)	24.8 (19.3)	128.8 (100.0)
1939-40	103.0 (79.7)	26.3 (20.3)	129.3 (100.0)
1944-45	106.4 (80.1)	25.5 (19.9)	312.9 (100.0)
Annual			
1945-46	105.5 (81.0)	24.7 (19.0)	130.1 (100.0)
1946-47	106.5 (81.0)	25.0 (19.0)	131.5 (100.0)

1 P. K. Mukherjee and S. Sivasubramanian, 1958 August—Agricultural Output and National Income, Tenth International Conference of Agricultural Economists.

2 Estimates of Area and Yield of Principal Crops in Undivided India 1936-37 to 1945-46, DES

3 Estimates of Area and Production of Principal Crops in India, 1951-52, DES.

NOTE : Figures in parenthesis represent percentages to gross area under all crops

Between 1930-31 and 1944-45 gross area sown under foodgrains increased by 2.3 per cent, under non-foodgrains by 6.9 per cent and under all crops by 3.2 per cent. A noteworthy feature was that after the quinquennium ending 1939-40 the area sown to foodgrains registered an increase while that sown to non-foodgrains depicted a reverse trend. This showed that the measures taken by the Government to restrict the cultivation of commercial crops, due to loss of export market for these crops, and efforts to increase the domestic production of foodgrains to meet the country's demand had borne fruit.

3.3.12 Area sown to major crops during this period is given in Appendix 3.5. It will be seen therefrom that among foodgrains bajra and gram recorded a fall in area during the quinquennium ending

1939-40 due mainly to diversion of area to commercial crops like cotton and oilseeds. The post-war period marked a reversal of the earlier trend with emphasis on increasing area under foodgrains by diversion of some area sown to oilseeds and cotton.

3.3.13 Production : Table 3.11 gives the indices of production of foodgrains, non-foodgrains and all-crops for the quinquennia ending 1934-35, 1939-40 and 1944-45 and the years 1945-46 and 1946-47.

TABLE 3.11

Index Numbers of Agricultural Production in Undivided India
(1930 to 1947)*

(Base : 1900-01 to 1904-05=100)

Period	Foodgrains	Non-foodgrains	All-crops
1930-31 to 1934-35	100.3	137.9	108.5
1935-36 to 1939-40	97.9	159.1	111.1
1940-41 to 1944-45	100.9	154.2	112.4
1945-46	93.5	141.4	103.6
1946-47	95.7	143.2	106.1

* Same source as cited in Table 3.10.

NOTES : 1 Foodgrains include rice, wheat, jowar, bajra, maize, barley and gram. Non-foodgrains include sesamum, rapeseed and mustard, linseed, sugarcane, cotton, jute, tea, coffee and tobacco.

2. Weights are based on the value of production during the quinquennium ending 1928-29.

As in the case of area, production of foodgrains too showed a fall during the quinquennium ending 1939-40 while production of non-foodgrains recorded a sizeable increase. During the next quinquennium, however, the trend was reversed when production of foodgrains showed an increase and that of non-foodgrains recorded a fall. Taking all crops together, agricultural production showed an improvement during the three quinquennia ending 1944-45. During the subsequent two years agricultural production recorded a set back partly due to political upheaval and communal riots and partly due to unfavourable weather.

3.3.14 Taking the 17 year period as a whole, it emerges that agricultural production remained stagnant with a compound rate of growth of only 0.03 per cent per annum. While foodgrains production recorded a fall of 0.02 per cent, that of non-foodgrains showed a growth of 0.44 per cent per annum. In a study on "Growth and Instability in Agriculture", Sen observed that "During the first 24 years of the century foodgrains production increased at an average annual (linear) rate of 0.3 per cent The next 24 years, however, presented a completely different picture. During this period, foodgrains production showed a declining trend of 0.02 per cent per annum (linear) on the average, in spite of the fact that droughts turned out to be relatively moderate and less frequent".

3.3.15 In the background of the above patterns of growth of the two major groups, it will be interesting to study the performance of some individual crops as well. Indices of production of certain principal crops are given in Appendix 3.6. It will be seen that production of rice, jowar, barley, maize and gram remained almost stagnant throughout the period. However, production of wheat and bajra showed an improvement up to the quinquennium ending 1944-45 and a fall thereafter. Among commercial crops, performance of oilseeds was rather poor. Production of sugarcane and tea depicted a continuous upward trend. Fibres showed an impressive increase during the quinquennium ending 1939-40. However, in the next quinquennium, under the impact of the GMF campaign, there was a fall in production due to diversion of area to foodgrains. During the subsequent period though cotton production continued to decline, production of jute rallied to the level reached during the quinquennium ending 1939-40.

3.3.16 Yield : As in the earlier period, estimates of yield during this period were based on the traditional eye-estimation method and cannot, therefore, be used for any rigorous study of trends. However, index numbers of agricultural productivity have been constructed to give a broad idea of the trends and are given in Table 3.12.

TABLE 3.12

Index Numbers of Agricultural Productivity in Undivided India
(1930 to 1947)

Period	(base : 1900-01 to 1904-05=100)		
	Foodgrains	Non-foodgrains	All crops
1930-31 to 1934-35	90.1	104.0	94.5
1935-36 to 1939-40	88.8	113.2	96.4
1940-41 to 1944-45	88.7	108.8	94.9
1945-46	82.9	107.0	89.3
1946-47	84.0	107.1	90.5

It will be seen that the declining trend in productivity of foodgrains in the earlier period continued, while in the case of non-foodgrains the rising trend gathered further momentum. During the quinquennium ending 1944-45, however, there was a decline in productivity. In view of the decline in the productivity of foodgrains, overall agricultural productivity did not record any tangible improvement. During 1945-47, productivity of both foodgrains and non-foodgrains was lower than that during 1940-45.

1 S. R. Sen, 1967 January, "Growth and Instability in Indian Agriculture", Agricultural Situation in India, DES.

Growth Patterns—Selected Provinces and Crops.

3.3.17 As in the earlier period, study of the trends in area, production and yield during this period at levels lower than the all-India levels has been confined to certain selected temporarily settled Provinces and important crops grown in these Provinces. Comparable estimates of area, production and yield in respect of these selected Provinces and crops are given in Appendix 3.7. Based on these data broad trends are briefly discussed below :

- (i) Rice : It will be seen that during the period under review there was considerable increase in area under rice in Madhya Pradesh, Bombay and Uttar Pradesh while in Madras area depicted a downward trend. Production of rice also showed an upward trend in Madhya Pradesh and Bombay. However, in Uttar Pradesh, rice production reached its peak during the quinquennium ending 1939-40 and showed a decline thereafter. In Madras, production did not show any specific trend and on the whole remained lower as compared to the level attained during the quinquennium ending 1934-35. The yield rates of rice showed a falling trend in Madhya Pradesh and Bombay. In Uttar Pradesh too yield rate depicted a downward trend, though it showed some improvement during the quinquennium ending 1939-40. In Madras, rice yield remained more or less steady.
- (ii) Wheat : In Uttar Pradesh and Punjab area under wheat remained stagnant up to the quinquennium ending 1944-45 but registered an increase thereafter. In Madhya Pradesh, area under wheat showed a declining trend. Production of wheat recorded an increasing trend in Punjab up to the quinquennium ending 1944-45 and a marginal decline thereafter. In Uttar Pradesh, there was some improvement in production during the quinquennium ending 1939-40 but thereafter there was a set back. In Madhya Pradesh, a continuous declining trend in wheat production was discernible. Up to 1944-45 yield rates of wheat remained more or less steady in Uttar Pradesh and picked up in Punjab, in the latter presumably due to GMF campaign. Thereafter, yield rates in both the Provinces registered a decline. In Madhya Pradesh, however, yield rates of wheat registered a continuous decline.
- (iii) Jowar : Area under jowar showed a rising trend in Bombay and Madhya Pradesh. In Uttar Pradesh and

Madras, the trend was uneven. By and large, production of jowar showed an upward trend in Madhya Pradesh up to 1944-45) and in Uttar Pradesh (up to 1945-46) while in Bombay and Madras a long term downward trend was discernible. Yield rates of jowar also showed a similar trend in the respective Provinces.

- (iv) Maize : Area under maize showed an increasing trend in both the selected Provinces. Production of maize also registered a steady increase up to the end of the reference period except for a little set back in 1945-46 in Punjab and in 1946-47 in Uttar Pradesh. While yield rates of maize were more or less stagnant in Uttar Pradesh, in Punjab they improved over the years and reached peak level in 1946-47.
- (v) Cotton : As a result of Government's policy to divert area from short staple cotton to foodgrains, area under cotton registered a considerable decline in all the three selected Provinces. In Punjab it came down to the average level prevailing during the quinquennium ending 1904-05. Production of cotton registered a decline in all the three Provinces. However, the fall was more pronounced in Punjab and Madhya Pradesh than in Madras. In Madras, yield rates remained more or less steady while in the other two Provinces they showed fluctuations.
- (vi) Sugarcane: Up to the quinquennium ending 1944-45, area, production and productivity of sugarcane continued to increase in Punjab and Madras, while in Uttar Pradesh production and productivity suffered slightly during the last quinquennium. The years 1945-47 witnessed an increase both in area and production of sugarcane in Punjab and Madras whereas in Uttar Pradesh they were lower. Punjab had the highest yield rate during 1945-46 and Madras during 1946-47. On the whole, area, production and yield of sugarcane fared much better as compared to other crops during the period under study.

Factors of Change in Crop Output

3.3.18 Besides irrigation, improved seeds and agricultural education were the other technological factors which had started making some impact on the agricultural economy of the country during 1931-47. In spite of increased imports, fertiliser use remained limited to plantations and commercial crops only which could fetch remunerative prices. Other factors like types of crops grown and manner of

farming remained traditional. Agricultural implements used remained largely conventional and whatever new types of iron ploughs were publicised were not widely accepted by the farmers. They were expensive and strenuous to oxen, there was lack of repair facilities, these were unsuitable for small fragmented holdings, and less effective in uprooting weeds and, at the same time, were prone to expose and dry out comparatively more of the under-soil.

3.3.19 Before discussing trends in irrigation, the role played by other factors in influencing the growth of agricultural output during this period is briefly discussed below :

- (i) Improved seeds : The work of multiplication and semination of improved varieties initiated by the Imperial (Indian) Institute of Agricultural Research in early twenties in collaboration with Provincial Agricultural Departments were further intensified to evolve improved strains to suit different agro-climatic regions. The Provincial Agricultural Officers were charged with the responsibility of demonstrating improved varieties so as to make them popular and acceptable. Research was also conducted with the object of introducing new crops, improving indigenous types and producing new and better varieties with regard to rice, wheat, gram, sugarcane, cotton, jute, tobacco and oilseeds. It is difficult to evaluate the impact of improved seeds on yield rates of individual crops. However, during this period substantial progress was achieved in bringing additional areas under improved varieties of commercial crops. According to the data published in the Famine Enquiry Commission (FEC) Report, 1945, between 1926-27 and 1938-39 out of the total area sown, the area under improved varieties increased from 7.2 to 68.2 per cent in the case of sugarcane, from 13.1 to 50.2 per cent in the case of jute and from 22.7 to 27.5 per cent in the case of cotton. In the case of foodgrains, significant increase was achieved only under wheat with percentage area sown to improved varieties moving up from 11.9 to 22.4. Progress under millets and pulses was slow due to lack of facilities for seed multiplication and distribution as well as due to less fertile and poorly manured areas on which they were grown as compared to the better quality lands and comparatively higher doses of fertilisers and manures available to cash crops.

- (ii) Education : From 1916 to 1946, the number of agricultural colleges increased from 5 to 9 and the number of

students in these colleges from 445 to 3,110. During the same period the number of lower level agricultural schools increased from one to nine and the number of students from 14 to 91. Progress in the spread of agricultural education was, thus, not very encouraging.

- (iii) Chemical fertilizers : Both the Royal Commission on Agriculture (RCA), 1928 and the FEC, 1945 had observed that the manurial problem in India was mainly the deficiency of nitrogen in the soil, though in parts of peninsular India, phosphates were also needed. The FEC estimated that only 40 per cent of the available farm yard manure was used as manure, that another 40 per cent was used as fuel and the remaining 20 per cent was lost due to difficulties of collection. A great part of the combined nutrient supplies like bones and oil cakes were exported or consumed by cattle. The benefits from the use of chemical fertilizers were generally not known and the amount used was insignificant relative to gross area under crops. Thus, in the first half of the twentieth century soils in India depended for recuperation almost exclusively on the natural process. To remedy the situation, imports of chemical fertilisers were increased, but it was only in 1925-26 when imports of sulphate of ammonia exceeded exports. During that year a greater part of the quantities produced in the country as a byproduct from coal fields by the Tata Iron and Steel Company at Jamshedpur and in Bengal, Bihar and Orissa were consumed in India. Imports of chemical fertilisers increased from 48.5 thousand tonnes during the quinquennium ending 1929-30 to the peak level of 115.3 thousand tonnes during 1939-40; comprising 94.9 thousand tonnes nitrogenous, 3.7 thousand tonnes potassic, 10.3 thousand tonnes phosphatic and 6.4 thousand tonnes of other compounds. Due to Second World War, imports came down considerably so much so that in 1942-43, only 3.6 thousand tonnes were imported. Indigenous production was then estimated at 20.3 thousand tonnes. Subsequently, as a result of GMF campaign, the Government felt that there was a potential demand for ammonium sulphate for crops like potatoes, vegetables, rice, wheat, and sugarcane, grown on irrigated lands. This demand was estimated at 3 million tonnes. As against this demand, imports during 1946-47 were 1.63 million tonnes only. As the FEC,

1945 observed even out of the total availability of chemical fertilizers the greater part was used for special commercial crops including plantation crops and only about 15.2 thousand tonnes were kept for manuring foodcrops like paddy.

3.3.20 Irrigation : Table 3.13 gives quinquennial averages of irrigated area source-wise in undivided India during 1931-45 and annual figures for 1945-46 and 1946-47.

TABLE 3.13

Area Irrigated Source-wise in Undivided India (1931-47) £

Period	Area Irrigated by		Net area irrigated	Net sown area	Percentage of col.(4) to col. (5)	Percentage of col. (2) to col. (4)
	Government canals	Other sources				
1930-31 to 1934-35	10.1	13.5	23.6	113.7	20.8	42.8
1935-36 to 1939-40	11.3	14.1	25.4	113.5	22.4	44.5
1940-41 to 1944-45*	12.3	15.1	27.4	116.7	23.5	44.9
1945-46*	12.6	15.5	28.1	116.6	24.1	44.8
1946-47**	12.6	15.5	28.1	116.6	24.1	44.8

£ Agricultural Statistics of India (Vol. I).

* Source-wise area irrigated figures for the period 1943-46 are not available. Break-up of the total irrigated area into various sources has been worked out on the basis of proportions for the period 1938-39 to 1942-43.

* 1945-46 figures repeated.

It will be seen that between the quinquennium ending 1934-35 and the year 1945-46 net irrigated area increased from 23.6 Mha to 28.1 Mha and percentage of net area irrigated to net area sown improved from 20.8 to 24.1. The share of Government canals in the net irrigated area rose from 42.8 to 44.8 per cent. Of the 4.5 Mha of area added to irrigation, 2.5 Mha was contributed by Government canals and 2.0 Mha by other sources.

3.3.21 In this context it would be of interest to know how far irrigation facilities had improved in major Provinces of British India during the reference period. The relevant data are given in Table 3.14.

TABLE 3.14

Percentage of Area Irrigated to Net Area Sown in Selected British Provinces (1930 to 1947)*

Period	Madras	United Provinces	Central Provinces	Bengal	Punjab	Bombay & Sind
1931-35	27.5	28.6	4.5	14.3	53.1	16.1
1936-40	27.4	31.2	5.0	15.3	60.4	18.0
1941-45	29.5	31.5	6.5	16.5	57.9	19.0
1945-46	30.3	31.2	6.6	17.0	58.9	20.3

George Blynn, 1966. Agricultural Trends in India, 1891 to 1947, Bombay Oxford University Press

It will be seen that the percentage of net area irrigated to net area sown showed an improvement in all British Provinces except in Punjab where some decline was noticed between the quinquennia ending 1939-40 and 1944-45, but thereafter there was some recovery in 1945-46.

Independence

3.3.22 As already mentioned, during 1930-47 foodgrains production recorded a fall of 0.02 per cent per year. However, India's population had begun to rise as a result of improvements in medical and sanitation facilities. Consequently, by 1947 undivided India's per capita production of both foodgrains and all-commodities had been declining for three decades. The position was aggravated with the partition of the country. Indian Union was apportioned only 77 per cent of the total geographical area and 73 per cent of the cultivated area but had to support 82 per cent of the total population of undivided India. In the field of irrigation, Indian Union could claim only 69 per cent of the net irrigated area in undivided India. While 48 per cent of net sown area in Pakistan was irrigated, in Indian Union the percentage was only 19.7. In agricultural production, Indian Union had as its share only 75 per cent of the total cereals, 65 per cent of wheat, 68 per cent of rice, 55 per cent of major oilseeds, 60 per cent of cotton and 19 per cent of jute produced in undivided India. The country had, therefore, to face an acute shortage of not only food but also of agricultural raw materials for her industries.

3.3.23 The National Government had, therefore, to give immediate attention to development of agriculture so as to alleviate widespread hunger and malnutrition and facilitate the nation's general economic progress. Though planned economic development started in 1951 with the launching of the First Five Year Plan, some special programmes mentioned in Chapter 2 on Historical Review were initiated between 1947 and 1951 for increasing agricultural production particularly of such crops in which country's deficit was rather large. Progress achieved during the interregnum is briefly discussed below.

Area and Production (1947—1950)

3.3.24 Land use and cropping pattern : There was a progressive increase in the geographical coverage of land use statistics and the methods of collection and estimation also underwent a progressive im-

provement. While the geographical coverage of statistics increased from 238.7 Mha in 1947-48 to 274.9 Mha in 1949-50 i.e. by 36.2 Mha, net area sown increased from 99.4 Mha to 114.6 Mha i.e. by 15.2 Mha. Roughly, the real increase in net area sown during the period was hardly of the order of 1 Mha. Area under foodgrains increased from 87.2 Mha to 100.6 Mha i.e. by 13.4 Mha, that under non-foodgrains from 25.4 Mha to 29.4 Mha i.e. by 4.0 Mha and under all crops from 112.6 Mha to 130.0 Mha i.e. by 17.4 Mha. If we allow for changes in coverage and methods of estimation, the real increase in cropped area over the period was marginal. The shares of area under foodgrains and non-foodgrains in the total cropped area remained constant at 77.4 per cent and 22.6 per cent respectively. Among foodgrains, increase in area was reported under rice, jowar, bajra, wheat and gram. There was no change in the area under maize and barley. In the case of commercial crops, cotton and jute recorded gains in area while sugarcane and groundnut recorded some fall.

3.3.25 Production : Based on the index numbers of agricultural production (base : triennium ending 1961-62=100) it is observed that in the case of foodgrains the index moved up from 73.9 in 1947-48 to 74.9 in 1949-50, while in the case of non-foodgrains it moved down from 68.8 to 68.1. The all-crops index registered only a marginal increase from 72.4 to 72.8 during this period. Among foodgrains, production of rice, bajra and wheat recorded an increase, while that of jowar, maize, barley and gram registered a fall. Wheat index improved from 53.1 in 1947-48 to 60.7 in 1949-50. However, barley index registered a fall from 96.0 to 82.2 and gram index from 75.4 to 66.2. Among non-foodgrains while production of cotton and jute improved significantly, that of oilseeds and sugarcane registered a decline. Cotton index moved up from 49.1 in 1947-48 to 58.9 in 1949-50 and jute index from 37.2 to 65.9. However, sugarcane index declined from 69.3 to 58.8 during this period.

3.3.26 As mentioned in Chapter 2 on Historical Review the Government of India decided to continue the GMF campaign on a planned basis for a period of five years from 1947-48 and to place it on an emergency footing. A target of 4 million tonnes of additional foodgrains production was to be achieved at the end of the five year period. However, the achievements during the first three years i.e. 1947-48 to 1949-50 placed at 2.34 million tonnes fell short of the target by 0.48

million tonnes. This was ascribed to unsatisfactory seasons over wide areas.

3.3.27 For attaining increased agricultural production emphasis was laid mainly on the extension of irrigation facilities particularly from minor sources. Between 1947-48 and 1949-50 the net irrigated area increased from 18.9 Mha to 20.2 Mha. This increase came about mainly through area irrigated by wells and other minor sources of irrigation, which increased from 7.7 Mha in 1947-48 to 8.7 Mha in 1949-50. Area irrigated by canals and tanks remained more or less static. The gross irrigated area moved up from 20.3 Mha to 21.7 Mha. Foodgrain crops continued to be the main beneficiaries and accounted for the whole of the increase in gross area irrigated.

4 CROP PRODUCTION DURING FIVE YEAR PLAN

3.4.1 As indicated earlier, despite certain measures taken for increasing agricultural production during the first three years after Independence no tangible progress was achieved. A breakthrough required sustained and coordinated efforts in various fields of agricultural development. With the advent of planning it became possible to undertake projects and programmes in a systematic and interrelated manner with the necessary financial, institutional and policy supports. The objectives and the strategy for planned agricultural development have already been discussed in Chapter 2 on Historical Review. While in the first decade of planning the basic approach to agricultural development was to implement individual schemes, in the sixties the package approach was developed. By 1965, a number of fertiliser responsive varieties of wheat and rice and hybrides of maize, jowar and bajra became available. Immediately after the crop failures of mid sixties, the "New Strategy" for agricultural development was initiated with emphasis on high yielding varieties and multiple cropping programmes. The details about policy and institutional supports have been indicated in the previous chapter.

Public Sector Outlay and Expenditure and Private Investment in Agriculture

3.4.2 In view of its crucial role in national economic development, agriculture was assigned a predominant place in the country's five year plans. Table 3.15 indicates the outlay and expenditure in the public sector and private investment on agriculture including irrigation and flood control.

TABLE 3.15

Public Sector Outlay and Expenditure and Private Investment in Agriculture*
(Rs. crores)

Period	Public sector outlay			Public sector expenditure			Private investment in agriculture and irrigation
	Plan as a whole	agriculture +	percentage of col (3) to col. (2)	plan as a whole	agriculture +	percentage of col (6) to col. (5)	
First Plan	2,069	753**	36.4	1,960	724	36.9	N.A.
Second Plan	4,800	996	20.8	4,600	949	20.6	625
Third Plan	7,500	1,755	23.4	8,577	1,754	20.5	800
Annual Plans	6,665	1,494	22.4	6,625	1,578	23.8	N.A.
Fourth Plan	15,902	3,815	24.0	16,201@	3,948@	24.4	1,600

N.A.—Not available.

* 1 1970 Indian Agriculture in Brief Tenth Edition and 1947 Thirteenth Edition, New Delhi, Manager of Publications, Government of India.

2 Report of the Irrigation Commission, 1972 Vol. I

+ Agriculture includes Agricultural Programmes, Cooperation, Community Development & Panchayat and Irrigation & Flood Control.

** Includes Rs. 80 crores incurred on major and medium irrigation during the pre-plan period.

@ Anticipated Expenditure.

From columns 3 and 6 of Table 3.15 it will be seen that only during the First and the Second Plan periods there was some shortfall in the public sector expenditure on agriculture as compared to outlay. While during the Third Plan period the outlay on agricultural was fully utilised, the actual expenditure during the Annual Plans and the anticipated expenditure during the Fourth Plan period far exceeded the outlay. In addition, there has been a significant increase in the private investment in agriculture which during the Fourth Plan period touched Rs. 1,600 crores.

3.4.3 Agricultural performance during the five year plans has been assessed by grouping the plans into two groups or periods; the first covering 1950-51 to 1966-67 and the second covering 1967-68 to 1973-74. During the earlier period efforts at increasing agricultural production proceeded more or less on traditional lines involving some increase in irrigated area, more widespread use of better agricultural practices of the traditional kind, popularisation of improved varieties of seeds and gradual increase in the use of chemical fertilisers. During the latter period, however, a 'New Strategy' for agricultural development was adopted in order to achieve a technological breakthrough in Indian agriculture. Before discussing the growth in agricultural output separately for the two periods, it would be appropriate to consi-

der an overall picture of agricultural growth during the period as a whole.

Growth Rates of Production, Area and Yield during Different periods

3.4.4 Table 3.16 gives the compound rates of growth in agricultural production, area and productivity for all crops taken together during the periods 1949-74, 1949-65 and 1960-74 as also during the First, Second, Third and Fourth Plan periods

TABLE 3.16
All India Compound Rates of Growth of Agricultural Production,
Area and Yield*+

Period	(percent per annum)		
	Agricultural production	Area under crops	Yield
1949-50 to 1973-74	2.7	1.1	1.3
1949-50 to 1964-65	3.2	1.6	1.6
1960-61 to 1973-74	2.1	0.5	1.2
First Plan (1951-52 to 1955-56)	4.1	2.6	1.4
Second Plan (1956-57 to 1960-61)	3.1	1.3	1.8
Third Plan** (1961-62 to 1964-65)	3.3	0.6	2.7
Fourth Plan (1969-70 to 1973-74)	2.2	0.8	1.0

*1 Growth Rates in Agriculture, New Delhi, DES.

2 Fourth Five Year Plan, 1969-74

** The Year 1965-66 has been excluded for purpose of calculating the growth rates due to its being an abnormal year.

+ Plan-wise growth rates have been calculated on the basis of triennial averages with the base and last year of each Plan as mid years except in the case of Third and Fourth Plans when instead of triennial periods the years 1964-65 and 1973-74 respectively were taken as end periods.

It will be seen that over the first three plan periods, crop yields showed a consistent increase, though the growth rate slowed down considerably during the Fourth Plan period. As against this, growth rate in cropped area registered a decline over the successive plan periods. Agricultural production attained the highest growth rate of 4.1 per cent per annum during the First Plan period, remained around 3 per cent per annum during the Second and the Third plan periods, and declined to barley 2.2 per cent during the Fourth Plan period. Taking the entire period from 1949-50 to 1973-74, the growth of agricultural production was 2.7 per cent per annum. Contribution of yield to this growth was marginally higher than that of area. If we consider the period upto 1964-65, the growth of agricultural production was higher at 3.2 per cent per annum contributed equally by area and yield. If the period 1960-74 is considered, it is seen that there was considerable deceleration in the growth rate of overall agricultural production to 2.1 per cent per annum. During this period expansion

of cropped area slowed down considerably and contribution of productivity to the overall growth of production was more than double of that of area.

3.4.5 As against the above patterns of growth for all-crops taken together, it would be useful to consider the behaviour of foodgrains production during the planning era. During the period 1950-51 to 1973-74 foodgrains production showed a rising trend at the linear rate of 3.37 per cent per annum (triennium ending 1952-53=100). In terms of compound growth rate, the growth of foodgrains production works out to 2.46 per cent per annum. During this period both the peak points and the trough points also showed rising trends but the gap between the trend lines was slightly diverging, as will be seen from Chart 3.1. The high rate of growth achieved during this period was however, not accompanied by stability in foodgrains production. During this period of 24 years there were seven occasions (i.e. 1 out of every 3 years) when there was decline from the peak points reached ranging between 2 per cent and 19 per cent, and on two occasions it was more than 6 per cent.

3.4.6 If the planning era is divided into two parts i.e. 1950-51 to 1960-61 covering the First and Second Plan periods and 1960-61 to 1973-74 covering Third Plan period, the Annual Plan periods and the Fourth Plan period, an interesting picture emerges. During the first period, the production increased at a linear growth rate of 4.2 per cent (triennium ending 1952-53=100). Both the peak as also the trough points showed an upward trend. But the rate of growth of peak points was significantly lower as against that of trough points. The trend lines fitted to these points were, therefore, converging as will be seen from Chart 3.2 (period I). Thus, during this period even with the comparatively higher rate of growth, the production of foodgrains was more or less stable. During this period there was a fall from the peaks reached on three occasions (i.e. 1 out of every 3 years), but only on one occasion the fall was of the order of 8 per cent while on the other two occasions it was of the order of 2.1 per cent only. As against this, the position during the second period i.e. 1960-61 to 1973-74 was different. During this period production rose at the linear rate of 2.6 per cent per annum only (triennium ending 1962-63=100). However, the trend lines fitted to the peak and trough points were diverging as will be seen from Chart 3.2 (period II). Thus, as compared to first period, the foodgrains production during this period was more unstable. On four occasions the production fell from the peaks reached and on one occasion the fall was as much as 19 per cent.

3.4.7 From the above study it emerges that the high rate of growth achieved in foodgrains production between 1950-51 and 1973-74 as

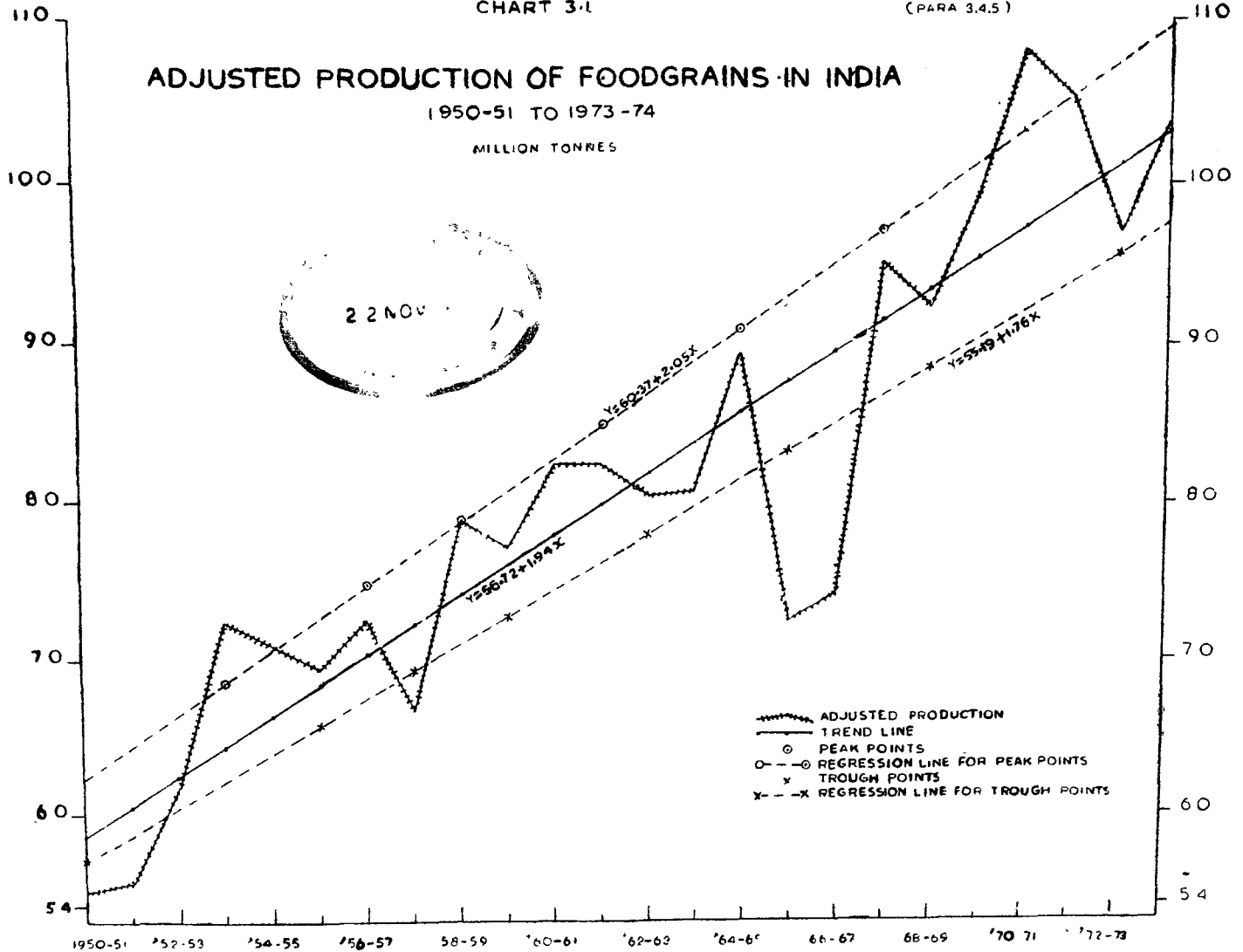
CHART 3-1

(PARA 3.4.5)

ADJUSTED PRODUCTION OF FOODGRAINS IN INDIA

1950-51 TO 1973-74

MILLION TONNES



22 NOV

CHART 3-2

(PARA 3,4,6)

ADJUSTED PRODUCTION OF FOODGRAINS IN INDIA

1950-51 TO 1973-74

MILLION TONNES

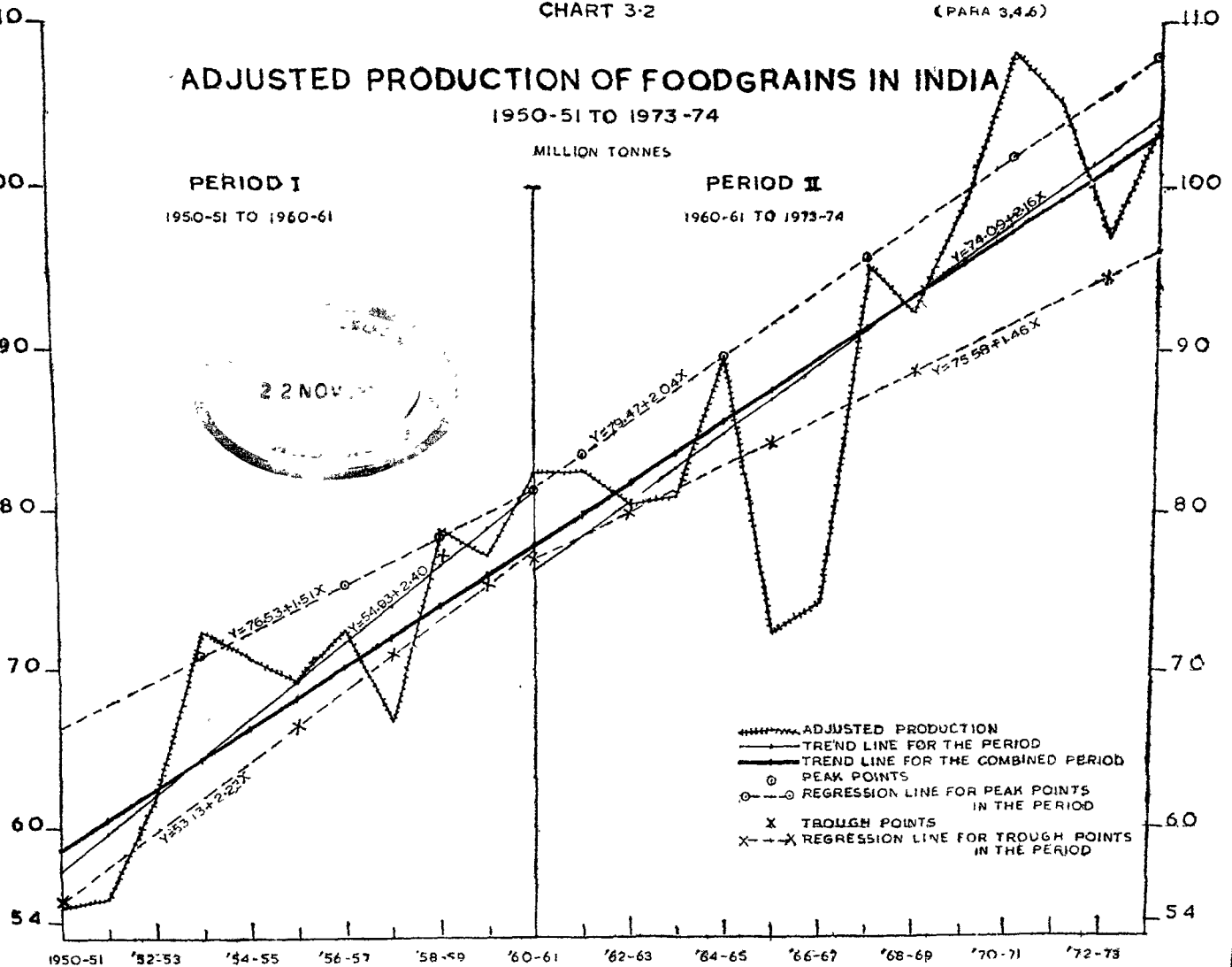
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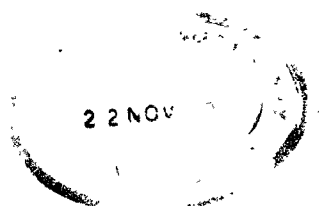
1950-51 TO 1960-61

PERIOD II

1960-61 TO 1973-74

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a result of planned development was not accompanied by stability. Various studies have been conducted on this phenomenon of foodgrains production in the country. In his Technical Address delivered to the Twentieth Conference of the Indian Society of Agricultural Statistics, Sen¹ observed "there should ordinarily be a tendency for an increase in the rate of growth to be accompanied by an increase in instability, especially if the growth comes about mainly as a result of extension of acreage and increase of inputs like fertilisers, rather than improvement in skills, unless sufficient corrective action is taken simultaneously. As acreage expands, relatively marginal land tends to be put under crops and such land is prone to be more adversely affected by weather hazards like droughts. Again, when more intensive doses of inputs like fertilisers are used, the risk of loss from factors like drought tends to increase considerably". Sen further observed "between 1924-25 and 1950-51, there was a general stagnancy in production, droughts were relatively less frequent and less severe and the extension of irrigation in certain areas of the country was also having a somewhat stabilising effect. There was hardly any increase in the use of inputs like fertilisers and the risk from this factor was absent. In the period 1951-52 to 1965-66, there was not only an unprecedented increase in the rate of growth but there was also a sharp increase in both acreage and use of inputs like fertilisers. There was, no doubt, an appreciable increase in irrigation also, but it was neither sufficient in volume nor utilised with sufficient care and economy so as to compensate for the destabilising effect of the first two factors. So when a widespread and severe drought struck the country in 1965, there was a sharp decline of as much as 17 million tonnes in foodgrains production, an order of decline which the country had not seen for over 40 years." Commenting upon the performance of foodgrains production in India between 1950-51 and 1968-69 Michael Lipton² observed "the 1960s have been less happy than the 1950s due to increasing cost of acreage expansion, a problem not wholly solved by the New Strategy with its dramatic improvements in yields" These observations focus attention on the present instability in foodgrains production in spite of a high growth rate achieved during the planning era.

1 S. R. Sen. "Growth and Instability in Indian Agriculture," Agricultural Situation in India, January, 1967.

2 1971 Michael Lipton. India's Agricultural Performance : Achievements Distortions and Ideologies, Background papers for discussions at the International Seminar on "Comparative Experience of Agricultural Development in Developing Countries since World War II", Bombay—The Indian Society of Agricultural Economics.

Area, Production and Yield (1950-67)

3.4.8 Area : All India index numbers of net area sown, gross cropped area and cropping intensity are given in Appendix 3.8. Under the impact of State schemes of land reclamation and the facilities offered to cultivators under various schemes for bringing new lands under cultivation, net area sown recorded some increase in the first few years of planning, but there was very little expansion in the subsequent years. During the First Plan period, net area sown increased by 7.2 per cent, corresponding increases during the Second and Third Plan periods (up to 1964-65) being 3.2 per cent and 3.6 per cent respectively. The declining rate of increase in net area sown over the period indicates that scope for extension of geographical coverage of cultivation to new areas is getting fast exhausted. However, gross cropped area recorded a higher rate of increase being 15.1 per cent, 5.1 per cent and 4.1 per cent during the First, Second and Third Plan periods respectively. This indicates that there is scope for increasing area under crops through multiple cropping.

3.4.9 Changes in physical, economic and institutional environments as a result of various programmes of development undertaken since the initiation of planning had an impact on the pattern of cropping. This is borne out by the index numbers of area under foodgrains and non-foodgrains during 1950-51 to 1966-67 given in Table 3.17.

TABLE 3.17

All India Index Numbers of Area under Crops*

(base : 1959-60 to 1961-62=100)

Year	Foodgrains	Non-food-grains	All crops
1950-51.	83.2 (76.7)	77.2 (23.3)	82.0 (100.0)
1955-56.	95.2 (75.6)	91.0 (24.4)	94.4 (100.0)
1960-61.	99.4 (75.6)	98.4 (24.4)	99.2 (100.0)
1964-65.	101.7 (74.4)	108.8 (25.6)	103.3 (100.0)
1965-66	99.1 (74.0)	107.2 (26.0)	100.9 (100.0)
1966-67.	99.3 (73.7)	105.6 (26.3)	100.7 (100.0)

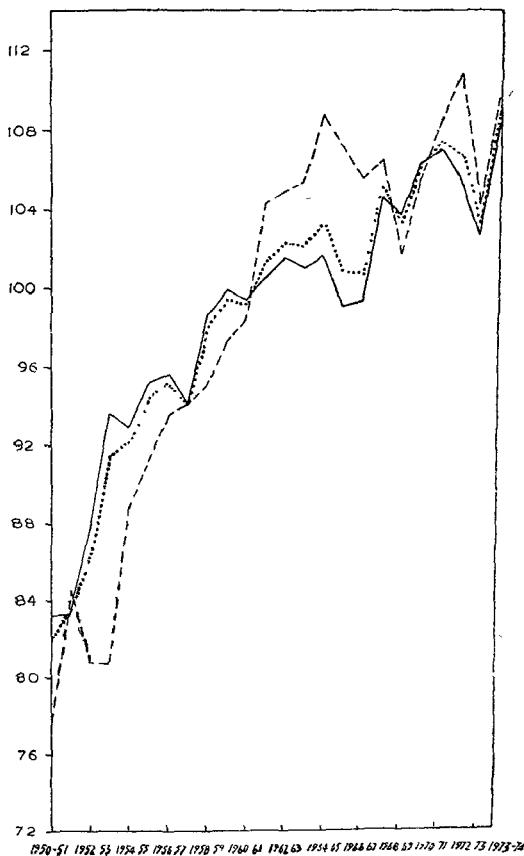
* Estimates of Area and Production of Principal Crops in India, 1973-74 DES.

NOTE. Figures in parenthesis represent percentage of area under each group to gross area under all crops.

INDEX NUMBERS OF AREA UNDER CROPS

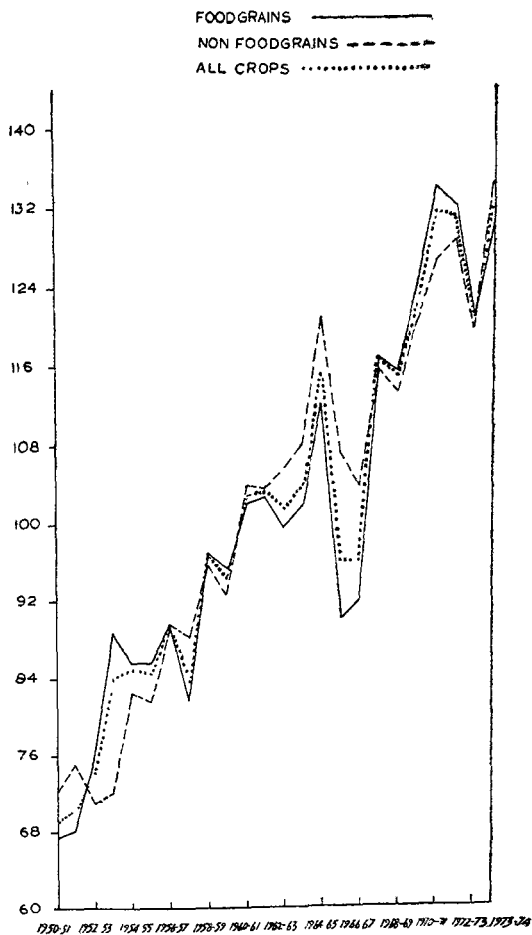
BASE: TRIENNium ENDING 1961-62=100

FOODGRAINS —————
NON FOODGRAINS - - - - -
ALL CROPS



INDEX NUMBERS OF AGRICULTURAL PRODUCTION

BASE: TRIENNium ENDING '961-62=100



The relative share of foodgrains in the gross cropped area declined from 76.7 per cent in 1950-51 to 74.4 per cent in 1964-65 and 73.7 per cent in 1966-67. In the pre-Independence period, percentage share of foodgrains to total cropped area was above 80 per cent. This was due to greater emphasis being placed on intensive cultivation and higher productivity. It would be seen from Table 3.17 and Chart 3.3 that growth in area under non-foodgrains has been much higher than in area under foodgrains. Between 1949-50 and 1964-65, area under foodgrains increased at a compound rate of 1.34 per cent per annum as against an annual growth rate of 2.52 per cent in area under non-foodgrains. Further, both within the foodgrain and non-foodgrain groups area sown to individual crops has not shown similar trends due to differences in physical and climatic conditions under which the different crops are grown. This is borne out by the all-India index numbers of area for individual crops published by DES.

3.4.10 During the period 1949-50 to 1964-65 wheat had the highest annual growth rate (2.7 per cent) in area among cereals followed by maize (2.63 per cent) and rice (1.26 per cent). Jowar and barja, which are mainly rainfed crops, had relatively lower growth rates of 0.91 and 1.01 per cent per annum respectively. Cereals sub-group had a lower growth rate of 1.22 per cent per annum as compared to pulses sub-group having an annual growth rate of 1.87 per cent. Among commercial crops, groundnut had the highest growth rate in area of 3.81 per cent per annum followed by sugarcane 3.26 per cent, jute 3.01 per cent, rapeseed and mustard 2.86 per cent and cotton 2.42 per cent. Sesamum had the lowest growth rate of 0.15 per cent per annum.

3.4.11 To provide a basis for assessment of changes in cropping pattern over time, the DES has compiled index numbers of cropping pattern. These are given in Appendix 3.8. It will be seen that as a result of changes in the cropping mix in different areas, the index has recorded an improvement during the later part of the period especially after 1960-61. This shows that there has been a shift towards high value crops like wheat, groundnut and cotton in preference to low value crops like millets.

3.4.12 Production : Despite year to year fluctuations, agricultural production showed sizeable improvement during this period. As will be seen from Chart 3.4, the all-India index of agricultural production (base : triennium ending 1961-62=100) at the end of the First Plan period reached the level of 84.4 as against 68.9 in 1950-51, showing thereby a growth rate of 4.1 per cent per annum. As a result of programmes undertaken during the Second Plan period the index of agricultural production attained the high level of 102.7

during 1960-61, the last year of the Second Plan. However, due mainly to unfavourable weather conditions over large parts of the country, agricultural production did not show any improvement during the first three years of the Third Plan period and the index of agricultural production stood at 103.9 during 1963-64. The year 1964-65 provided a welcome contrast in as much as due to favourable climatic conditions over major parts of the country, both during kharif and rabi seasons, the index of agricultural production spurted to 115.0. Due to unprecedented drought over large parts of the country during the next two consecutive years production index recorded a steep fall and stood at 95.8 in 1965-66 and 95.9 in 1966-67. It will be clear from Chart 3.1 that if these two abnormal years are ignored, the index of agricultural production during the period under review had each successive peak higher than the previous one and each successive trough less steep than the earlier one. This is indicative of the fact that development efforts during this period had provided some stability to agricultural production in the country. However, between 1949-50 and 1964-65 the annual rate of growth in production was higher (3.61 per cent) for non-foodgrains than for foodgrains (2.98 per cent). The rate of growth of population during the same period was 2.09 per cent per annum.

3.4.13 Based on the all-India index numbers of production of principal crops (base : triennium ending 1961-62=100) the DES have worked out the growth rates for important foodgrains and non-foodgrains crops. It is seen therefrom that during 1949-50 to 1964-65, compound growth rates of production of wheat (3.97 per cent), maize (3.79 per cent) and rice (3.37 per cent) were above the growth rate of 3.19 per cent per year for all crops taken together. Pulses had a relatively low growth rate of 1.62 per cent per annum. Growth rates of dry crops like jowar and bajra at 2.50 per cent and 2.23 per cent respectively were below the rates for wet crops like rice, wheat and maize. Among non-foodgrains, coffee, sugarcane, cotton and groundnut showed higher annual growth rates of 8.48 per cent, 4.59 per cent, 4.44 per cent and 4.18 per cent respectively. Output of jute had been increasing at a compound rate of 3.54 per cent per annum.

3.4.14 Targets of production fixed under the First, Second and Third Five Year Plans and for 1966-67 alongwith their achievements are given in Appendix 3.9. It will be seen that during the First Plan period the targets of foodgrains were exceeded by a comfortable margin of about 7 per cent. Production (unadjusted) of foodgrains during 1955-56 reached the level of 66.9 million tonnes against the target of 62.6 million tonnes. In the case of oilseeds too a higher level of

CHART 3.5

(PARAGRAPHS 3.4, 14 & 3.4.76)

TARGETS AND ACHIEVEMENTS OF AGRICULTURAL PRODUCTION UNDER THE PLANS

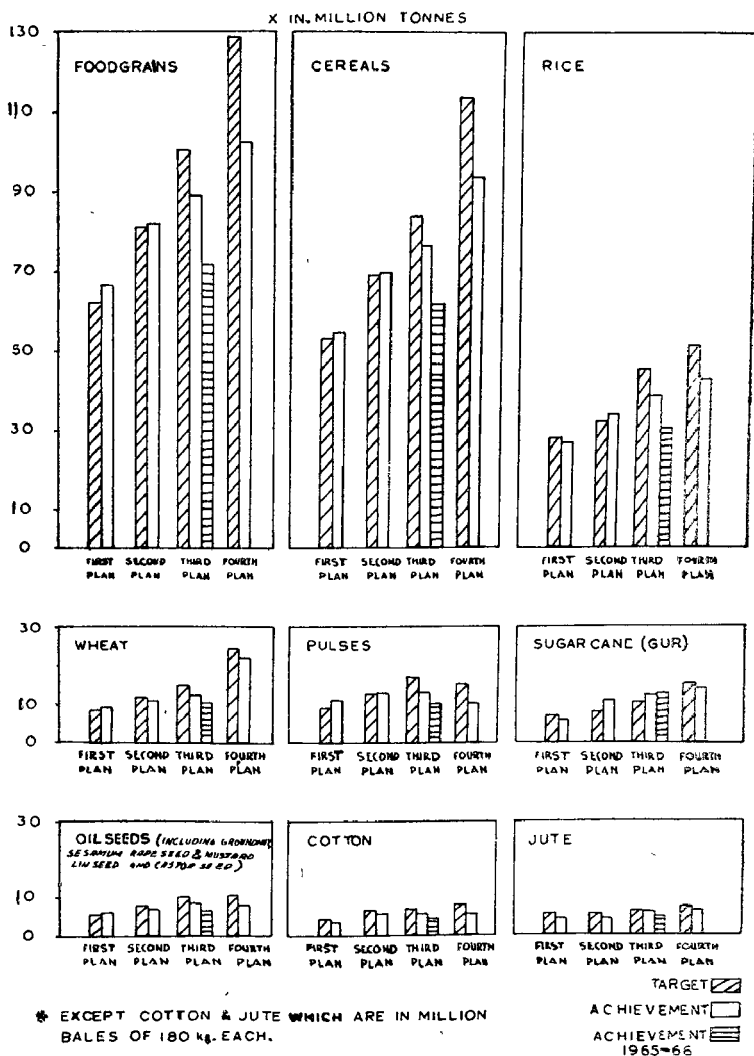
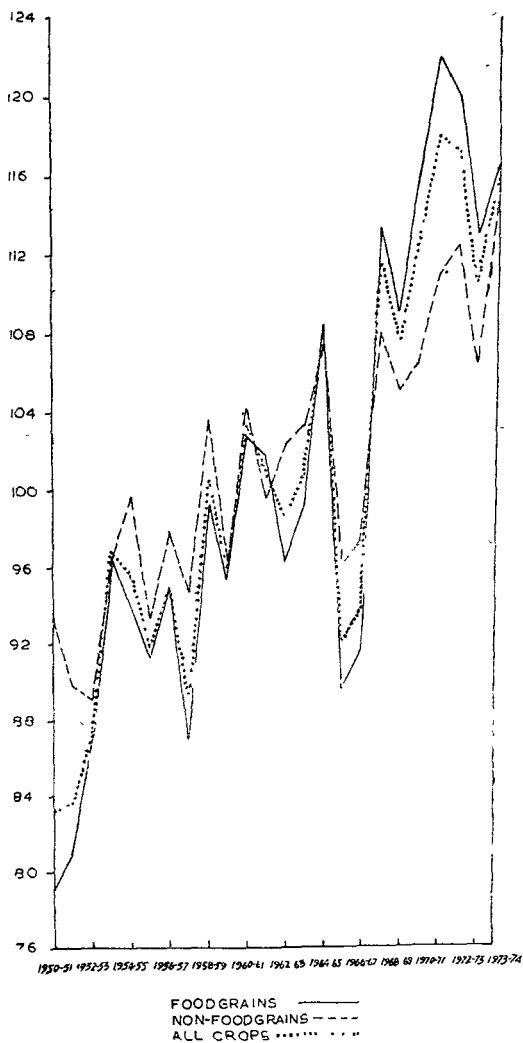


CHART 3.6

(PARAGRAPHS 3.4.15 & 3.4.64)

INDEX NUMBERS OF YIELD

BASE: TRIENNIUM ENDING 1961-62=100



production than envisaged was achieved. There was, however, marginal shortfall in the production of sugarcane and cotton and a substantial shortfall in jute production. During the Second Plan period achievements exceeded the targets in the case of foodgrains, sugarcane, tobacco, tea and cashewnuts, but there were shortfalls in the production of oilseeds, cotton, jute and pepper. During the Third Plan period as also during 1966-67 there were serious shortfalls in production of practically all the major crops. Targets and achievements of production of important crops and groups of crops over the plan periods are depicted in Chart 3.5.

3.4.15 Yield : The index of productivity per hectare of net area (base : triennium ending 1961-62=100) increased from 83.2 in 1950-51 to 108.1 in 1964-65, showing an increase of about 30 per cent in a period of 14 years. Index numbers of yield of foodgrains, non-foodgrains and all-crops are depicted in Chart 3.6. It will be seen therefrom that index of foodgrains yield increased from 79.1 in 1950-51 to 108.5 in 1964-65 and that of non-foodgrains from 93.5 to 107.5. Based on the all-India index numbers of yield of principal crops (base : triennium ending 1961-62=100) published by DES, the compound growth rate of overall agricultural productivity during 1949-50 to 1964-65 was 1.60 per cent per annum against 1.61 per cent in the case of foodgrains and 1.06 per cent for non-foodgrains. Among foodgrains, rice had the highest growth rate (2.09 per cent) followed by jowar (1.58 per cent) and wheat (1.24 per cent). Pulses had a negative growth rate of (—) 0.24 per cent. Among commercial crops, coffee had the highest growth rate (6.17 per cent). Cotton, sugarcane and tea yields also improved at fairly good rates of 1.97 per cent, 1.29 per cent and 1.48 per cent respectively. Oilseeds had a low growth rate of 0.64 per cent in yield. Among the competing crops of groundnut, jowar and cotton, growth in yield rate was the lowest in groundnut i.e. 0.36 per cent.

Regional Patterns of growth

3.4.16 The foregoing discussion highlights the growth in cropped area, production and productivity of different crops and groups of crops at the all-India level since the beginning of the planning era. Such a discussion would not be complete without an analysis of the agricultural growth in different regions of the country. In this connection it may be mentioned that the physical requirements for crop production vary from crop to crop and due to differences in soils, climate, topography, rainfall, irrigation facilities etc., cropping patterns will not be uniform in all the regions of the country. For example, in areas

having assured rainfall and/or controlled irrigation, it is possible to grow high yielding and high value crops like rice, sugarcane, jute, etc. and thus attain a steady and stable growth. On the other hand, in areas where rainfall is low or scanty and irrigation facilities are available only to a small proportion of the cultivated area, it is possible to grow only rainfed crops like jowar, bajra etc. which are generally low yielding and of low value. Progress in agricultural production in these areas is, thus, not only on a low ebb, but halting and unsteady and takes longer time to get stabilised around higher levels. For a study of the progress of agriculture in different regions/States, therefore, the types of crops grown there have to be taken into consideration.

3.4.17 Index numbers of area under crops, production and productivity are available at State level for 15 States for the period 1952-53 to 1964-65. Assessment of progress of agriculture at State level is, therefore, confined to the period 1952-53 to 1964-65.

3.4.18 Area-Statewise : Appendix 3.10 gives States index numbers of area for all crops, foodgrains and non-foodgrains for the years 1952-53, 1955-56, 1960-61 and 1964-65. It would be seen that between 1952-53 and 1964-65, area under all crops recorded a significant increase in the States of Rajasthan (51.7 per cent), Punjab including Haryana (34.5 per cent), Tamil Nadu (21.2 per cent), Madhya Pradesh (17.7 per cent), and Kerala (16.9 per cent). In Bihar, area under all crops in 1964-65 was lower than that in 1952-53 by 1.6 per cent, while in Andhra Pradesh, West Bengal, Orissa, Maharashtra and Gujarat, increase in area was marginal. Area under foodgrains recorded impressive increases in Rajasthan (47.1 per cent), Punjab including Haryana (28.4 per cent), Tamil Nadu (18.0 per cent) and Madhya Pradesh (15.9 per cent). In Gujarat area under foodgrains declined by 22.7 per cent in 1964-65 as compared to 1952-53. This decline in area in Gujarat was accounted for by diversion of area to commercial crops like groundnut and cotton. Accordingly area under non-foodgrains in Gujarat moved up by 85.4 per cent. Some other States which recorded impressive gains in area under non-food-grain crops are Rajasthan (102.4 per cent), Punjab including Haryana (76.3 per cent), Tamil Nadu (31.6 per cent), Himachal Pradesh (36.7 per cent), Madhya Pradesh (28.2 per cent), West Bengal (31.5 per cent), Kerala (23.7 per cent) and Orissa (21.9 per cent).

3.4.19 Available data regarding Statewise compound growth rates reveal that during this period Rajasthan had the highest annual growth rate in area under all crops of 2.85 per cent while Andhra Pradesh had the lowest growth rate of 0.26 per cent. Punjab (including Haryana) also had a high rate of growth of 1.90 per cent in cropped area. Kerala (1.30 per cent), Madhya Pradesh (1.28 per cent),

Assam (1.25 per cent) and Tamil Nadu (1.10 per cent) had moderate rates of growth. In other States, growth rate in cropped area was low. Under foodgrains, Rajasthan (2.68 per cent), Punjab including Haryana (1.53 per cent), Madhya Pradesh (1.22 per cent) and Assam (1.28 per cent) had fairly high rates of growth. Gujarat had a high negative rate of growth (-2.45 per cent) in area under foodgrains accompanied by a very high positive rate of growth (4.82) per cent in area under non-foodgrains. In Rajasthan and Punjab (including Haryana), high rates of growth in area under foodgrains were accompanied by higher rates of growth in area under non-foodgrains i.e. 4.36 per cent and 4.11 per cent respectively.

3.4.20 Area—cropwise : Among foodgrains growth rate of area under rice was the highest (6.82 per cent) in Punjab (including Haryana) followed by Rajasthan (5.15 per cent), Tamil Nadu (2.84 per cent) and Andhra Pradesh (2.80 per cent). Some of the major rice growing States like Bihar, West Bengal and Kerala had very low growth rates in area under the crop, being 0.23 per cent, 0.13 per cent and 0.52 per cent respectively. Among dry crops growth rate of area under Jowar and Bajra was either very low or even negative in most of the States. However, Rajasthan, a major bajra growing State, had a high rate of growth (3.26 per cent) in area under the crop. Punjab (including Haryana) and Rajasthan had high growth rates of 3.91 per cent and 3.36 per cent respectively in area under maize. However, the major maize growing States of Uttar Pradesh, Bihar and Madhya Pradesh had only moderate growth rates in area under the crop. Uttar Pradesh, the most important wheat growing State, had a low growth rate of 0.76 per cent per annum in area. However, Punjab (including Haryana), Madhya Pradesh and Rajasthan, the other three major wheat growing States, had high growth rates of 3.34 per cent, 3.74 per cent and 2.91 per cent respectively in area under the crop. In the case of barley all the major producing States had negative rates of growth in area under the crop. The most important gram producing State viz. Uttar Pradesh, had a negative growth rate of ($-$) 0.08 per cent in area under the crop. However, Punjab (including Haryana) and Rajasthan had high growth rates of 2.11 per cent and 5.08 per cent respectively in area under gram while Madhya Pradesh, another major gram producing State, had a low growth rate of 0.85 per cent.

3.4.21 Among commercial crops, area under groundnut had a very high growth rate of 10.08 per cent in Gujarat and 6.41 per cent in Madhya Pradesh followed by Tamil Nadu with an annual rate of growth of 3.29 per cent. On the other hand, Andhra Pradesh, a major groundnut growing State, had a high negative rate of growth

of (—) 3.54 per cent per annum. Karnataka and Maharashtra had low growth rates in area under groundnut. In the case of cotton, Punjab (including Haryana) had the highest growth rate in area (4.68 per cent) followed by Gujarat (2.45 per cent) and Rajasthan (2.43 per cent). Tamil Nadu, Karnataka and Maharashtra had low growth rates in area under cotton while Andhra Pradesh and Madhya Pradesh had negative rates of growth. Growth rates in area under jute were pretty high in almost all the producing States, viz. West Bengal (4.78 per cent), Uttar Pradesh (4.73 per cent), Orissa (3.22 per cent) and Bihar (2.17 per cent). As in the case of jute, growth rates in area under sugarcane were significantly high in practically all the major growing States. Gujarat recorded the highest growth rate of 9.97 per cent followed by Tamil Nadu (7.63 per cent), Madhya Pradesh (6.75 per cent), Andhra Pradesh (6.28 per cent), Maharashtra (6.02 per cent) and Karnataka (5.81 per cent).

3.4.22 Production—Statewise : State index numbers of agricultural production for all-crops, foodgrains and non-foodgrains for 1952-53, 1955-56, 1960-61 and 1964-65 are given in Appendix 3.11. It would be seen therefrom that between 1952-53 and 1964-65 there were vast differences in the growth of crop output in different States. The index of overall agricultural production recorded the highest increase of 123.5 per cent in Gujarat followed by Punjab including Haryana (84.7 per cent), Tamil Nadu (82.5 per cent), Karnataka (78.7 per cent), Rajasthan (63.9 per cent) and Himachal Pradesh (61.7 per cent). Maharashtra, Andhra Pradesh and Madhya Pradesh registered moderate increases of 57.6 per cent, 48.6 per cent and 48.2 per cent respectively. In other States viz. Bihar, Orissa, Kerala, West Bengal, Uttar Pradesh and Assam production indices showed only marginal increases. Similar differences in output growth in various States were observed in foodgrains and non-foodgrains. Between 1952-53 and 1964-65 production index of foodgrains recorded the highest increase of 87.9 per cent in Tamil Nadu and the lowest increase of 15.4 per cent in Assam. Production indices of non-foodgrains recorded the highest increase of 192.3 per cent in Gujarat and the lowest increase of 7.7 per cent in Bihar. To have a precise idea of output growth in different regions it will be of interest to study State-wise compound growth rates during this period.

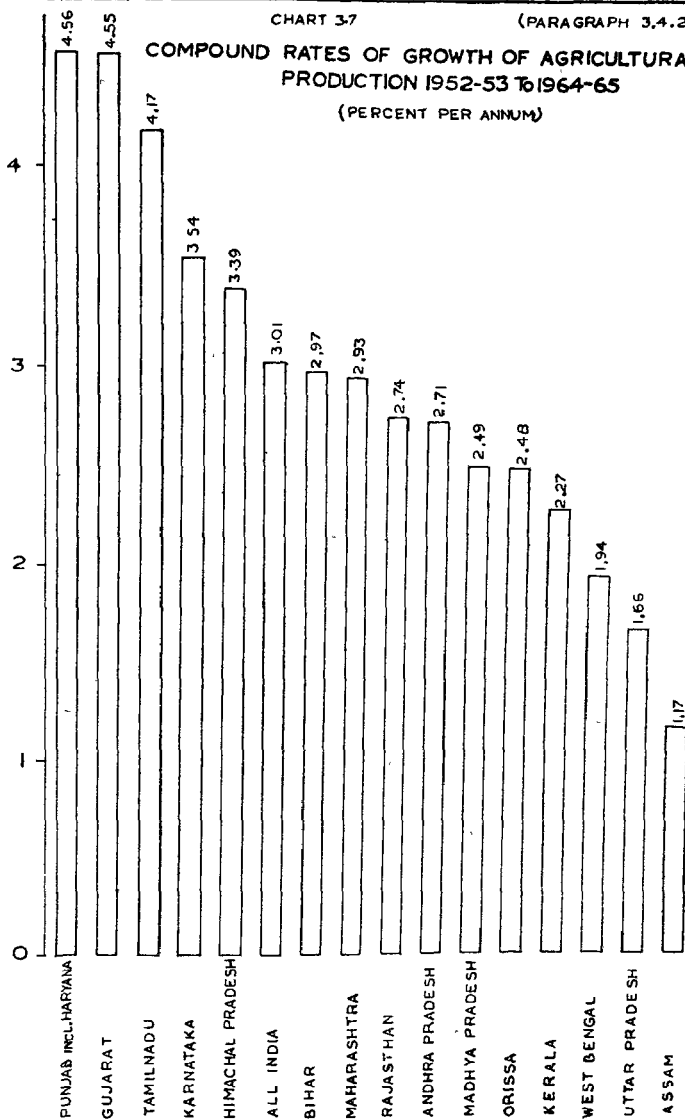
3.4.23 As will be seen from Chart 3.7, during the period under review, Punjab (including Haryana) had the highest annual growth rate of 4.56 per cent in overall agricultural production. In Gujarat, Tamil Nadu, Karnataka and Himachal Pradesh rates of growth were higher than the all-India level of 3.01 per cent. The States of Bihar, Maharashtra, Rajasthan, Andhra Pradesh, Madhya Pradesh, Orissa

CHART 3-7

(PARAGRAPH 3.4.23)

COMPOUND RATES OF GROWTH OF AGRICULTURAL
PRODUCTION 1952-53 TO 1964-65

(PERCENT PER ANNUM)



and Kerala showed moderate rates of growth in agricultural production varying between 2.3 and 3.0 per cent. West Bengal (1.94 per cent), Uttar Pradesh (1.66 per cent) and Assam (1.17 per cent) showed very low rates of growth, signifying sluggish pace of agricultural development in these States. As in the case of all-crops, there were considerable inter-State variations in the trends in production of the two major groups viz., foodgrains and non-foodgrains. Even within the same State, performance of the two groups was not the same. For example, in Gujarat rate of growth in foodgrains production was 2.06 per cent while that of non-foodgrains was as high as 6.62 per cent, almost double of the all-India rate of growth. Similarly, in the case of West Bengal and Uttar Pradesh, the growth rates in foodgrains production were very low being 1.14 per cent and 0.85 per cent respectively while in the case of non-foodgrains the growth rates were as high as 3.77 per cent and 3.61 per cent respectively. In the case of Himachal Pradesh, Andhra Pradesh and Kerala, on the other hand, growth rates in foodgrains production i.e. 3.63 per cent, 3.21 per cent and 3.68 per cent respectively were high compared to the growth rates in non-foodgrains production i.e. 1.50 per cent, 1.60 per cent and 1.70 per cent respectively. Taking all States, the growth rates in foodgrains production varied between 0.76 per cent per annum in Assam to 4.17 per cent per annum in Tamil Nadu, while for non-foodgrains, the growth rates varied between 1.49 per cent per annum in Assam to 7.04 per cent per annum in Punjab (including Haryana). Thus, both the lower and upper limits of the range were higher in the case of non-foodgrains as compared to foodgrains.

3.4.24 The States of Punjab (including Haryana), Tamil Nadu and Karnataka did well both in foodgrains and non-foodgrains production with growth rates higher than the all-India levels. On the other hand, in Madhya Pradesh, Orissa, West Bengal, Uttar Pradesh and Assam growth rates of production of both foodgrains and non-foodgrains were lower than all-India levels. The States of Kerala, Himachal Pradesh, Andhra Pradesh and Bihar did well in foodgrains production but not so well in non-foodgrains production, while in Gujarat, Maharashtra and Rajasthan non-foodgrains fared better than foodgrains.

3.4.25 Foodgrains production and population : At the all-India level domestic foodgrains production during the period 1952-53 to 1964-65 grew at a pace slightly higher than population. It would be useful to compare the position at the State Level Table 3.18 gives Statewise compound growth rates of foodgrains production and population during this period.

TABLE 3.18

Compound Growth Rates of Foodgrains Production and Population during 1952-53 to 1954-65*

State	(per cent per annum)	
	Foodgrains Production	Population
Tamil Nadu	4.17	1.25
Kerala	3.68	2.33
Punjab (including Haryana)	3.66	2.61
Himachal Pradesh	3.63	2.22
Karnataka	3.31	2.08
Andhra Pradesh	3.21	1.63
Bihar	3.05	2.12
Rajasthan	2.42	2.68
Orissa	2.39	2.16
Madhya Pradesh	2.32	2.51
Maharashtra	2.20	2.32
Gujarat	2.06	2.61
West Bengal	1.14	2.92
Uttar Pradesh	0.85	1.84
Assam	0.76	3.15
All-India	2.50	2.19

* Growth Rates in Agriculture, 1949-50 to 1964-65—DES.

It will be seen that Assam with highest growth rate of population had the lowest growth rate of foodgrains production and Tamil Nadu with lowest growth rate of population had the highest growth rate of foodgrains production. In Kerala, Punjab (including Haryana), Karnataka, Andhra Pradesh, Bihar, Himachal Pradesh and Orissa, the pace of growth of foodgrains production was higher than that of population, while in other States population growth outstripped the growth of foodgrains production.

3.4.26 Production—cropwise : State level analysis of growth rates of individual crops within the foodgrains and non-foodgrains groups also showed wide variations. Between 1952 and 1964-65, as against an all India annual growth rate of 3.18 per cent for rice production, the relatively minor rice producing State of Punjab (including Haryana) had a very high rate of growth of 8.68 per cent. Among eastern States, Orissa had a moderate growth rate of 2.63 per cent, while Assam and West Bengal had pretty low growth rates of 0.74 per cent and 1.38 per cent respectively. These States account for 30 per cent of all-India rice production. However, the southern States of Tamil Nadu, Karnataka, Andhra Pradesh and Kerala, accounting for another 30 per cent of all-India rice production, had high rates of growth of 4.89 per cent, 4.77 per cent, 4.32 per cent and 3.72 per cent respectively.

3.4.27 In the case of jowar as against an all-India growth rate of 1.96 per cent per annum, Tamil Nadu which accounts for only 5 per cent of total production had the highest growth rate of 4.20 per cent, while the most important jowar producing State of Maharashtra, accounting for over one-third of all-India production, had a moderately high growth rate of 2.76 per cent. The States of Madhya Pradesh and Karnataka also showed almost the same rates of growth, while Andhra Pradesh had a low growth rate of 1.54 per cent due mainly to low growth in area under the crop. Uttar Pradesh and Rajasthan had negative growth rates in jowar production.

3.4.28 In the case of bajra, Rajasthan, accounting for about one-fourth of the all-India production, had a very high annual rate of growth of 4.08 per cent as against the all-India growth rate of 1.38 per cent only. Tamil Nadu was the only other State with a high rate of growth (3.32 per cent). While Maharashtra had a moderate growth rate of 1.87 per cent, Punjab (including Haryana), Uttar Pradesh and Gujarat had negative growth rates of bajra production.

3.4.29 In the case of maize, Uttar Pradesh accounting for about one-fifth of the all-India production, had the lowest annual growth rate of 0.91 per cent, while Himachal Pradesh, a relatively minor maize producing State had a very high rate of growth of 5.62 per cent. The other important maize producing States of Rajasthan, Punjab (including Haryana), Madhya Pradesh and Bihar also had high rates of growth, being 5.21 per cent, 3.83 per cent, 3.40 per cent and 3.17 per cent respectively, compared to the all-India level of 2.80 per cent.

3.4.30 During 1952-53 to 1964-65, Uttar Pradesh accounting for about 30 per cent of all-India production of wheat had a low annual growth rate of wheat production of 1.44 per cent, while Punjab (including Haryana) which comes next to Uttar Pradesh had the highest annual rate of growth of 5.38 per cent. The relatively minor wheat producing States of Karnataka and Maharashtra, also had high rates of growth of 4.07 per cent and 3.80 per cent respectively. Madhya Pradesh, which accounts for a little less than one-fifth of all-India production had a growth rate of 3.16 per cent which was slightly lower than the all-India level of 3.30 per cent. In the case of barley all the important producing States had negative growth rates in production.

3.4.31 As against an all-India annual growth rate of 0.83 per cent for gram production, Uttar Pradesh, accounting for nearly one-third of the total production had a negative growth rate of (—) 0.09 per cent. Bihar too had a negative growth rate of (—) 0.13 per cent. On the other hand, Rajasthan had a high rate of growth of 4.52 per cent while Punjab (including Haryana) and Madhya Pradesh, im-

portant producing States, had low growth rates of 1.26 per cent and 1.83 per cent respectively.

3.4.32 In the case of groundnut, Gujarat which accounts for a quarter of the country's production, had the highest growth rate of 9.01 per cent per annum, achieved as a result of large expansion in area under the crop. Madhya Pradesh, Maharashtra and Tamil Nadu, accounting for about 40 per cent of the country's production too had high rates of growth, being 8.32 per cent, 5.31 per cent and 4.55 per cent respectively. Karnataka had a low growth rate of 0.72 per cent while Andhra Pradesh showed a negative growth rate of 2.13 per cent as against an all-India growth rate of 4.65 per cent.

3.4.33 In cotton also, as against an all-India annual growth rate of 3.32 per cent, Gujarat accounting for more than one-fourth of the all-India production, had a comparatively higher growth rate of 5.42 per cent. However, Maharashtra, an equally important cotton growing State, had a low rate of growth of 2.24 per cent only. Punjab (including Haryana), contributing about one-fifth of all-India production, had the highest growth rate of 7.06 per cent. Tamil Nadu (4.56 per cent) and Rajasthan (5.15 per cent), accounting for a small portion of the total output, had high rates of growth. While Andhra Pradesh had low growth rate of 0.72 per cent due mainly to decrease in area under the crop, Madhya Pradesh had a negative growth rate of (—) 1.39 per cent due to decline in both area and yield.

3.4.34 Between 1952-53 and 1964-65, West Bengal, the premier jute-growing State in the country, had a high growth rate of 5.81 per cent of production due to increase in area under the crop and Uttar Pradesh, with the lowest share in all-India production, recorded the highest growth rate of 7.74 per cent, as compared to the all-India level of 4.24 per cent. Bihar, accounting for about 18 per cent of the all-India production had a negative growth rate of (—) 0.91 per cent while Assam another important jute-growing State had a poor rate of growth of 0.04 per cent due to decline in yield.

3.4.35 In sugarcane, Gujarat was leading with a growth rate of 10.57 per cent per annum followed by Karnataka (9.50 per cent), Andhra Pradesh (8.69 per cent), Tamil Nadu (7.68 per cent), Maharashtra (7.06 per cent), Punjab including Haryana (6.72 per cent) and Madhya Pradesh (5.66 per cent). All these States had very high rates of growth in area under the crop. Uttar Pradesh, the premier sugarcane producing State, showed a relatively low rate of growth of 3.46 per cent, while Bihar had the lowest growth rate of 0.69 per cent per annum as compared to the all-India level of 5.91 per cent.

3.4.36 In tobacco again Gujarat, accounting for over one-fifth of the all-India production, had the highest growth rate of 6.51 per cent

while Andhra Pradesh, accounting for a little less than half of the country's production had a growth rate of 2.79 per cent, which was about the same as the all-India level of 2.96 per cent per annum. Tamil Nadu and West Bengal had very low rates of growth, while Uttar Pradesh and Maharashtra had negative growth rates of (—) 2.45 per cent and (—) 2.86 per cent respectively, due to a sharp decline in area under the crop.

3.4.37 Yield—Statewise : Regional differences in crop yields may be considered so as to assess how far these have contributed to the differences in crop output growth in various regions. Appendix 3.12 gives State index numbers of crop yields for all-crops, foodgrains, and non-foodgrains during 1952-53, 1955-56, 1960-61 and 1964-65. It would be seen that between 1952-53 and 1964-65 significant improvements in crop yields were achieved in some of the States. Taking all crops together the largest increase was recorded in Gujarat (105.5 per cent) followed by Karnataka (58.8 per cent), Tamil Nadu (50.7 per cent), Himachal Pradesh (46.8 per cent), Maharashtra (45.4 per cent) and Andhra Pradesh (43.8 per cent). Punjab (including Haryana) also recorded a moderate increase of 37.2 per cent in crop yields, while in Bihar (26.4 per cent), Madhya Pradesh (25.8 per cent), Orissa (22.1 per cent), Uttar Pradesh (21.3 per cent) and West Bengal (19.3 per cent), the increase in crop yields was low. In Assam, Rajasthan and Kerala, yields of all crops taken together were rather stagnant. In foodgrains, impressive increases in yields were realised in Gujarat (112.5 per cent), Tamil Nadu (59.2 per cent), Karnataka (54.1 per cent) and Himachal Pradesh (54.8 per cent). In non-foodgrains, yields showed significant improvements in Karnataka (69.1 per cent), Andhra Pradesh (62.3 per cent), Gujarat (57.6 per cent), Madhya Pradesh (53.7 per cent), Maharashtra (52.6 per cent), and Punjab including Haryana (39.3 per cent). As against this the index numbers of yield of non-foodgrains recorded a fall in Himachal Pradesh, Rajasthan, West Bengal and Kerala.

3.4.38 According to Statewise compound growth rates of productivity for the period 1952-53 to 1964-65 published by DES, Gujarat had the highest growth rate of yield of foodgrains i.e. 4.64 per cent per annum against the all-India growth rate of 1.51 per cent. In Tamil Nadu, Kerala, Himachal Pradesh, Karnataka, Andhra Pradesh and Bihar also growth rates of productivity of foodgrains were pretty high varying between 2.4 and 3.4 per cent per annum. However, Rajasthan and Assam had negative growth rates of productivity of foodgrains signifying a fall in yield levels in these States. Growth rate of yield of non-foodgrains was fairly high in Karnataka (3.46 per cent) Andhra Pradesh (3.37 per cent), Maharashtra (3.24 per cent), and

Punjab including Haryana (2.81 per cent) as against an all-India growth rate of 1.66 per cent. Himachal Pradesh, Rajasthan and Kerala had negative growth rates of yield of non-foodgrains, while the eastern States of West Bengal, Assam, Bihar and Orissa had low rates of growth. The performance of individual crops within these groups is discussed below.

3.4.39 Yield—cropwise : As against an all-India annual growth rate of 1.68 per cent of rice yield, Gujarat, a minor rice producing State, had the highest growth rate of 4.43 per cent while West Bengal with the highest contribution to all-India production had a low growth rate of 1.24 per cent only. Compared to West Bengal, Bihar which is another important rice producing State had a pretty high growth rate of 3.08 per cent. Karnataka (2.88 per cent), Uttar Pradesh (2.36 per cent), Kerala (3.18 per cent), Tamil Nadu (1.99 per cent), Punjab including Haryana (1.74 per cent) and Himachal Pradesh (3.41 per cent) also had growth rates of rice yield higher than the all-India average. Assam had a negative growth rate of (—) 0.51 per cent.

3.4.40 Improvement in yield was a major factor contributing to the increase in jowar production during this period; though in absolute terms, the all-India annual growth rate of productivity of jowar i.e. 1.56 per cent was lower than that of rice. Tamil Nadu, an important producer of jowar, had the highest growth rate of 4.08 per cent per year. Madhya Pradesh (2.82 per cent), Gujarat (2.78 per cent) and Maharashtra (1.90 per cent) accounting for over one-half of the country's production of jowar also had high growth rates of jowar yield. Rajasthan and Uttar Pradesh had negative growth rates of productivity of jowar.

3.4.41 As against the all-India average of 1.58 per cent per annum, Tamil Nadu had the highest growth rate of 6.0 per cent in bajra yield followed by Gujarat (4.88 per cent) and Maharashtra (3.09 per cent). Andhra Pradesh had a moderate growth rate of 1.74 per cent while Rajasthan, the most important bajra producing State, had a low growth rate of 0.79 per cent only. Uttar Pradesh was the only State to record a negative growth of (—) 0.40 per cent in bajra yield.

3.4.42 In maize, Uttar Pradesh and Punjab (including Haryana), important producing States, had a negative growth rates of (—) 0.46 per cent and (—) 0.08 per cent respectively. On the other hand, Himachal Pradesh, a minor producing State, had the highest growth rate of 4.87 per cent as against the all-India annual growth rate of 0.51 per cent. Other important producing States viz. Bihar (1.67 per cent), Rajasthan (1.79 per cent) and Madhya Pradesh (1.74 per cent) had moderate rates of growth.

3.4.43 During 1952-53 to 1964-65, wheat yields in Uttar Pradesh, Madhya Pradesh and Rajasthan had negative growth rates of (—) 0.67 per cent, (—) 0.56 per cent and (—) 0.87 per cent respectively. However, Punjab (including Haryana), Gujarat and Maharashtra had moderately high growth rates of 1.98 per cent, 2.93 per cent and 1.83 per cent respectively while Bihar had a low growth rate of 1.52 per cent. Karnataka, a minor wheat producing State, recorded the highest growth rate of 3.11 per cent against the all-India growth rate of 0.97 per cent per year.

3.4.44 Barley had an overall negative rate of (—) 0.16 per cent of yield. Uttar Pradesh, Rajasthan and Punjab accounting for over 80 per cent of the all-India production too had negative growth rates. Only Bihar and Himachal Pradesh recorded positive but low growth rates of 1.32 per cent and 0.97 per cent respectively.

3.4.45 Gram too had an overall negative growth rate of (—) 0.31 per cent of yield. This being the result of negative growth rates recorded in the important producing States of Uttar Pradesh, Punjab (including Haryana) and Rajasthan. However, Madhya Pradesh and Bihar had low rates of growth of 0.97 per cent and 0.71 per cent respectively.

3.4.46 Groundnut yield recorded the highest annual growth rate of 4.0 per cent in Maharashtra while in Tamil Nadu, Andhra Pradesh and Madhya Pradesh only moderate growth rates of 1.22 per cent, 1.46 per cent and 1.79 per cent respectively were achieved. On the other hand, Gujarat and Karnataka, contributing more than one-third to overall production had negative growth rates of (—) 0.97 per cent and (—) 0.13 per cent respectively resulting in a low all-India growth rate of 0.84 per cent per year.

3.4.47 Tamil Nadu recorded the highest annual growth rate of 3.38 per cent in productivity of cotton. Gujarat (2.90 per cent), Punjab including Haryana (2.28 per cent) and Rajasthan (2.66 per cent) also had growth rates higher than the all-India average of 2.08 per cent. Some important producing States such as Maharashtra, Karnataka and Andhra Pradesh had lower growth rates than the all-India level while Madhya Pradesh had a negative growth rate of (—) 0.46 per cent.

3.4.48 During 1952-53 to 1964-65 West Bengal and Orissa, accounting for over 60 per cent of the all-India jute production had low rates of growth of jute yield of 0.98 per cent and 0.48 per cent respectively, while Bihar and Assam contributing about one-third to country's production, had negative growth rates of (—) 3.02 per cent and (—) 1.09 per cent respectively. As a result the all-India annual growth rate of jute yield was low at 0.83 per cent only. However, Uttar

Pradesh with the lowest share in all-India production, had the highest growth rate of 2.95 per cent. The negative or low growth rates of productivity of jute may be explained by the fact that jute crop is relatively more labour and capital intensive as compared to its competing crops and requires a higher degree of technological skill.

3.4.49 In sugarcane, the highest growth rate of yield was recorded by Karnataka (3.49 per cent) followed by Andhra Pradesh (2.25 per cent) and Punjab including Haryana (2.01 per cent). Uttar Pradesh, the most important producing State, recorded a low growth rate of 0.28 per cent while Bihar, Madhya Pradesh, Rajasthan and West Bengal recorded negative growth rates. As a result, the overall annual growth rate of sugarcane yield stood at 1.82 per cent only.

3.4.50 Tobacco yields recorded high rates of growth in Gujarat and Karnataka, being 3.59 per cent and 3.62 per cent respectively, while Andhra Pradesh, accounting for a little less than half of the all-India tobacco production, had a low growth rate of 0.62 per cent only. Maharashtra, Tamil Nadu, West Bengal and Uttar Pradesh also recorded very low growth rates and Assam had a negative growth rate of (—) 0.51 per cent. As a result, the all-India annual growth rate of tobacco yield stood at 1.48 per cent only.

Area, Production and Yield (1967—74)

3.4.51 Area : During the period under review, there was some increase both in the net as well as gross cropped area. While the index (base . triennium ending 1961-62=100) of net area sown increased from 102.5 in 1966-67 to 105.4 in 1970-71, the corresponding increase in gross area sown was from 100.7 to 107.3. In the case of the latter the index moved up further to 108.8 in 1973-74. Table 3.19 gives the index numbers of area under 'foodgrains', 'non-

TABLE 3.19
All-India Index Numbers of Area under Crops*

Year	(base . triennium ending 1961-62=100)		
	Foodgrains	Non-foodgrains	All-crops
1967-68	104.6(74.3)	106.5(25.7)	105.0(100.0)
1968-69	103.7(74.9)	101.7(25.1)	103.3(100.0)
1969-70	106.4(75.0)	105.6(25.0)	106.2(100.0)
1970-71	107.0(75.4)	108.4(24.6)	107.3(100.0)
1971-72	105.5(74.8)	110.8(25.2)	106.7(100.0)
1972-73	102.6	104.2	103.0
1973-74	108.5	109.6	108.8

* Estimates of Area and Production of Principal Crops in India, 1973-74, DES.

NOTE : Figures in parentheses represent percentage of area under each group to gross area under all-crops.

foodgrains' and 'all-crops' during 1967-68 to 1973-74. These are also depicted in Chart 3.3 referred to earlier in paragraph 3.4.9. During the earlier period cropped area under foodgrains and non-foodgrains was the highest in 1964-65 with their indices touching the levels of 101.7 and 108.8 respectively. After the set back during 1965-66 and 1966-67, the indices again registered an upward trend, more so in the case of foodgrains. Thus, for foodgrains the peak index of 108.5 recorded in 1973-74 was 6.7 per cent higher than the level attained in 1964-65, while for non-foodgrains the peak level of 110.8 attained in 1971-72 was only 1.8 per cent higher than the 1964-65 level. As a result, there has been a shift, though marginal only, in favour of area cropped to foodgrains as compared to non-foodgrains.

3.4.52 Within the two groups, cropped area under individual crops has not shown any uniform growth pattern. Between 1967-68 and 1973-74, area under wheat recorded the highest increase of 26.8 per cent among cereals, followed by maize 7.6 per cent, bajra 6.6 per cent and rice 4.4 per cent. Except in the case of bajra, area cropped to other three cereals showed a steady increase. Area under jowar, however, showed a decline. Among pulses, area under gram and tur recorded a decline while that under other pulses moved up. As a result, the overall area under pulses remained more or less unchanged. The downward trend in area under gram, a rabi crop, is attributable to diversion of area to wheat in northern States after the introduction of high yielding dwarf varieties. Even though area under oilseeds as a group showed a fluctuating trend there was a significant decline in area under groundnut and sesamum. Index numbers for these two oilseeds moved down from 114.3 and 120.9 in 1967-68 to 104.4 and 107.5 respectively in 1973-74. Fibres too recorded a fall in area with the index for cotton moving down from 104.8 to 99.7 and for jute from 118.4 to 106.6. Index number of area sown to sugarcane recorded a remarkable improvement from the lowest level of 87.6 in 1967-68 to 118.3 in 1973-74. Area under tea, coffee, rubber and tobacco also moved up during this period.

3.4.53. As in the earlier period, there have been changes in cropping pattern during this period as well. As a result, the index of cropping pattern (base : triennium ending 1961-62=100) showed an improvement from 99.7 in 1967-68 to 104.2 in 1973-74.

3.4.54 Production : Implementation of development programmes envisaged under the 'New Strategy' made a significant impact on agricultural production after 1966-67. The index of agricultural production (base : triennium ending 1961-62=100) which had slumped to 95.8 in 1965-66 from the peak level of 115.0 attained in 1964-65 again moved up and reached an all-time high level of 131.6 in 1973-74.

Table 3.20 gives the index numbers of production for the two main groups viz. 'foodgrains' and 'non-foodgrains' as also for 'all-crops' from 1964-65 onwards. These are also depicted in Chart 3.4 referred to earlier in Paragraph 3.4.12.

TABLE 3.20
Index Numbers of Agricultural Production*
(base, triennium ending 1961-62=100)

Year	Foodgrains	Non-food-grains	All-crops
1964-65	112.0	120.9	115.0
1966-67	91.9	103.7	95.9
1967-68	117.1	115.6	116.6
1968-69	115.7	113.2	114.8
1969-70	123.5	120.5	122.5
1970-71	133.9	126.6	131.4
1971-72	132.0	128.9	130.9
1972-73	121.2	119.4	120.6
1973-74	130.3	134.1	131.6

Estimates of Area and Production of Principal Crops in India, 1973-74, DES

During the period of 1960-61 to 1973-74, the average annual compound growth rate of agricultural production worked out to 2.07 per cent. The average annual rate of growth of foodgrains production during the same period was 2.28 per cent while that of non-foodgrains was 1.68 per cent.

3.4.55 Based on the index numbers of production of principal crops published by DES performance has varied from crop to crop. Production index of wheat moved up from 110.1 in 1964-65 to 237.3 in 1971-72 (i.e. by 115.5 per cent) when the Fourth Plan target of wheat production was exceeded by 2.4 million tonnes. However, during the two subsequent years wheat production recorded some decline and the index receded to 198.4 in 1973-74. Compared to wheat, progress in rice production was extremely slow. Production index of rice moved up from 115.7 in 1964-65 to 129.0 in 1973-74 i.e. an increase of 11.5 per cent only. Among coarse cereals, the performance of bajra was encouraging. Production index of bajra touched the peak level of 230.6 in 1970-71 when the Fourth Plan target of bajra production was exceeded. Compared to the index of 129.8 in 1964-65 it showed an increase of 77.7 per cent. There was, however, a setback to bajra production during 1971-72 and 1972-73 due to adverse seasonal conditions, but during 1973-74 the index again moved up to 203.6 as against 112.9 in 1972-73. Production of maize also recorded good progress with the index moving up from 112.0 in 1964-65 to 175.3 in 1970-71 i.e. by 56.5 per cent. However, the progress was not maintained during the subsequent years and the index again

receded to 132.0 in 1973-74. Compared to bajra and maize, production index of jowar declined from the peak level of 114.0 in 1967-68 to 79.0 in 1972-73 i.e. a fall of 30.7 per cent. However, during 1973-74 jowar production staged some recovery and the index again moved up to 101.9.

3.4.56 As compared to cereals, production of pulses showed a secular trend of decline during the recent years. However, production during the decade fluctuated within a narrow range of 10 to 12 million tonnes. Production index of pulses as a group declined from 102.6 in 1964-65 to 80.5 in 1973-74 i.e. a fall of 21.5 per cent. In the case of gram, the index declined from 98.0 to 68.1 i.e. by 30.5 per cent while in the case of *tur* the decline was from 109.1 to 78.7 i.e. 27.5 per cent. A number of factors contributed to this situation. Firstly, pulses are grown under rainfed conditions. Secondly, high yielding varieties of pulses were not available. Thirdly, with the introduction of high yielding varieties of wheat especially in north India, area under pulses, mainly gram, was diverted to wheat.

3.4.57 Among commercial crops, production of five major oilseeds, viz., groundnut, sesamum, castorseed, rapeseed & mustard and linseed was marked by large year to year fluctuations. Production index of groundnut moved up from 123.8 in 1967-68 to 133.5 in 1971-72 but declined to 125.3 in 1973-74. For sesamum and rapeseed & mustard the indices attained the peak levels of 158.2 and 158.0 in 1970-71, while for linseed the peak level of 122.2 was attained in 1971-72. Production of castorseed recorded a phenomenal increase with the index moving up from 81.4 in 1967-68 to 157.9 in 1973-74. Taking all the five major oilseeds together their production attained a record level of 9.26 million tonnes in 1970-71 but declined again to 8.68 million tonnes in 1973-74. The bulk of area under oilseeds is at present rainfed and failure or deficiency of rains produces adverse effects on oilseeds production. Further, there has been no varietal breakthrough in oilseeds.

3.4.58 Production of cotton recorded a decline between 1967-68 and 1970-71 with the index falling from 123.9 to 102.2. However, during 1971-72 the index registered a phenomenal increase and attained the peak level of 149.1. During 1972-73 and 1973-74 cotton production was lower as compared to 1971-72, though the index of 132.1 for 1973-74 was higher as compared to the earlier peak level of 129.0 attained in 1964-65. Evolution of new varieties with better yielding capacity has been largely responsible for the increase in cotton production during recent years. Hybrid-4 has given excellent performance by giving additional yields ranging between 1.5 and 2.0 bales (180 kg each) per hectare. The quality of fibre is also comparable

to superior varieties. MCU-5 is another variety which has proved quite promising in some of the cotton producing areas. A new hybrid 'Varalakshmi' has also shown good promise. As a result of the measures taken there has been a substantial increase in the production of superior long staple cotton in the country. Between 1969-70 and 1973-74 for which adjusted figures according to staple lengths have been worked out by DES, production of superior long staple cotton has increased from 4.0 lakh bales (180 kg each) to 15.6 lakh bales. Though firm production estimates for 1974-75 are not yet available, according to the available indications, production of these varieties is likely to go up further and if this trend continues, country will move fast towards self-sufficiency in superior cotton.

3.4.59 Production of jute was marked by considerable ups and downs during the period under review. In fact during recent years the highest production of jute was recorded in 1967-68 with the index touching the level of 126.6, while 1973-74 happened to be the next best year in jute production with the index at 123.9. Several factors contributed to erratic trends in jute production. Firstly, jute crop is predominantly a rainfed crop and as such yields are subject to large fluctuations depending upon weather. Secondly, in the eastern States where jute is mostly grown, infrastructural facilities in the form of water and space for retting, grading, processing, storage, regulated marketing etc. as also the availability of credit and inputs, were inadequate; and finally, no significant breakthrough was achieved in evolving high yielding shorter duration varieties of jute.

3.4.60 Sugarcane production too recorded large year to year fluctuations. In 1965-66, index of sugarcane production touched the highest level of 121.0. After considerable set-back to sugarcane production during the two subsequent years, the index regained the 1965-66 level during 1968-69 and moved up to 130.6 in 1969-70. During the three subsequent years, particularly in 1971-72, sugarcane production again suffered a set-back. However, in 1973-74 production made a substantial recovery with the index touching the peak level of 132.4. The main reason for the lack of sustained growth in sugarcane production has been the neglect of development work in non-factory areas specially in the northern parts. As mentioned in Chapter 22 on Commercial Crops, the seed in circulation is degenerated and disease-ridden and acts as a drag on improvement of production.

3.4.61 Among plantation crops, production of tea recorded a steady increase with the index moving from 115.2 in 1967-68 to 141.4 in 1973-74. However, production of coffee, particularly of robusta variety, showed large year to year fluctuations. During recent years coffee production was the highest in 1970-71 with the index touching

the level of 198.5 as against 103.2 in 1967-68. During 1972-73 and 1973-74 also coffee production was significantly higher as compared to 1967-68. Planting of selected high-yielding disease-resistant varieties, assistance in the form of short and long term credit and supply of certain equipment on hire purchase basis to the growers has contributed to the increase in coffee production during recent years.

3.4.62 Among fruits and vegetables, production of bananas remained more or less stagnant. Prior to 1967-68, banana production was the highest in 1966-67 with the index touching 122.7. Thereafter production showed a downward trend and the index moved down to 104.2 in 1970-71. During 1971-72 there was a sharp increase in banana production with index touching 121.4 i.e. almost the 1966-67 level. However, during 1972-73 (latest available) the index again receded to 114.8. Compared to bananas, production of cashewnuts showed a better performance. Index of production of cashewnuts moved up from 123.8 in 1964-65 to 157.8 in 1969-70 (latest available). With some ups and downs production of potatoes, an important vegetable crop, more or less maintained an upward trend after 1964-65. During 1964-65 production index of potatoes stood at 128.7, the highest till then. However, during 1971-72 it touched the peak level of 179.5. During 1972-73, the index dropped to 165.9 but again moved up to 172.4 in 1973-74. Keeping in view the paramount need for stepping up production of supplementary foods in the country to relieve pressure on cereals, the production performance of potatoes was not quite upto expectation. The comparatively slow progress in potatoes production was due to the fact that the crop is quite exacting in its requirements of inputs such as seed, fertilisers, pesticides, assured irrigation etc. Besides, the facilities for storage of the crop are also inadequate which lead to temporary gluts and crash in prices at the harvest time, thereby acting as a disincentive to the producers. The low yield per unit area is also ascribed to non-availability of disease-free seed of the most suitable varieties adapted to different agro-climatic regions.

3.4.63 Appendix 3.9 gives the targets and achievements of major crops during 1967-68 and 1968-69 as also during the Fourth Plan period. It will be seen that achievements during 1967-68, 1968-69 and 1973-74 in respect of almost all the major crops were significantly below the targets fixed. In the case of foodgrains, actual production during these years was 95.1, 94.0 and 103.6 million tonnes as against the targets of 100.0, 102.0 and 129.0 million tonnes respectively. Among commercial crops performance of sugarcane was better as compared to oilseeds, cotton and jute. Production of sugarcane (gur) during 1968-69 was 12.8 million tonnes as against the target of 12.5 million tonnes. During 1973-74, however, as against the target of

15.4 million tonnes, only 14.0 million tonnes were actually produced.

3.4.64 **Yield :** Under the New Strategy, stress was laid on increasing use of science and technology for raising agricultural productivity and with the introduction of fertiliser responsive high yielding varieties and other programmes the pace of improvement in productivity got accelerated. The index of productivity per hectare of net area increased from 94.0 (base : triennium ending 1961-62=100) in 1966-67 to 124.8 in 1970-71. According to the all-India index numbers of yield of principal crops published by DES, index of yield per hectare of wheat increased consistently from 130.7 in 1968-69 to 164.7 in 1971-72 but declined to 151.7 in 1972-73 and further to 138.2 in 1973-74. Index of yield of rice showed a modest increase from 104.2 in 1967-68 to 115.6 in 1973-74. Indices of yield of bajra and maize attained peak levels of 199.3 and 132.5 respectively in 1970-71 but got a setback thereafter. Bajra yield staged a recovery in 1973-74 with the index touching the level of 166.3, but in the case of maize the index declined to 97.1 in 1973-74. Index of jowar yield showed a consistent decline from 112.2 in 1967-68 to 92.5 in 1972-73 but moved up to 109.2 in 1973-74. In the case of gram, yield index declined from 118.7 in 1967-68 to 85.6 in 1973-74. Among commercial crops, cotton yield had a breakthrough in 1971-72 with the index increasing to 144.9 from 118.1 in 1967-68. However, the index declined to 121.9 in 1972-73 but moved up again to 132.5 in 1973-74. Yields of other commercial crops showed year to year fluctuations though levels achieved in 1973-74 were generally higher as compared to those in 1967-68. As will be seen from Chart 3.6 referred to earlier in paragraph 3.4.15, the index of crop yield for all crops taken together, increased from 111.5 in 1967-68 to 118.0 in 1970-71, but declined to 110.7 in 1972-73 mainly due to adverse weather conditions in some parts of the country. During 1973-74 index again moved up to 116.0.

3.4.65 Taking the period of 1960-61 to 1973-74, the average annual compound growth rate of agricultural productivity works out to 1.24 per cent per annum against the growth rate of 0.47 per cent per annum of area under crops. Thus, a larger proportion of the increase in agricultural production during this period was due to improvement in yield rates rather than increase in area under crops.

Regional Patterns of Growth—Crops-wise

3.4.66 In the absence of State series of index numbers of area, production and yield for the period under review assessment of progress of agriculture at the State level has to be made on the basis of

absolute figures for individual crops/groups of crops. Such an analysis based on year to year movement in crop production shows some glimpses of progress in some crops but it is not sharp enough to highlight and to quantify achievements. A major limitation in this analysis is that frequent fluctuations make it difficult to focus on the direction of change as also its magnitude. Besides it is also necessary to relate changes in production to changes in area and productivity. These limitations have been sought to be overcome by taking triennial averages of relevant data. For the sake of convenience triennia ending 1964-65 and 1973-74 have been selected for the purpose as base and terminal periods respectively. It may be pointed out here that the base period reflected peak production performance of crops before the introduction of the high-yielding varieties of cereals in Indian agriculture. The latter triennium, however, included two indifferent years, one of which was definitely abnormal. To this extent, it should be admitted, the comparison between the two triennia would show a downward bias, underestimating achievements to some extent, which might be kept in mind as an obvious limitation. Be that as it may, the triennial figures reveal the direction and magnitude of major changes in agricultural production in various States during recent years. It may also be pointed out here that among foodgrains, cereals account for 90 per cent of the total production; while only 10 per cent is contributed by pulses. In cereals group also, rice, wheat, jowar, bajra and maize taken together account for nearly 85 per cent of the total foodgrains production. As such, sizeable variations in production wherever occurring should be considered as due mainly to fluctuations in production of these five major cereals. Besides, the main efforts to improve foodgrains production in the country in recent years have been confined to these crops. It is, therefore, but logical if analysis of regional patterns of growth is confined to these crops only among the foodgrains group. Statewise estimates of area, production and yield of important crops for the triennia ending 1964-65 and 1973-74 are given in Appendix 3.13.

3.4.67 It will be seen from Appendix 3.13 that production of wheat recorded significant increases in all the major wheat producing States, the order of increase being 77.5 per cent in Rajasthan, 109.9 per cent in Uttar Pradesh, 143.8 per cent in Haryana and 165.4 per cent in Punjab and as much as 433.4 per cent in Bihar. Madhya Pradesh, also an important wheat producing State, however, recorded an increase of 33.5 per cent only. In the case of wheat more than half the cropped area is irrigated; furthermore, the new high-yielding strains covered nearly 60 per cent of the area in 1973-74. All the major wheat growing States were favourably placed in respect.

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of these two crucial variables, with the exception of Madhya Pradesh where irrigation and coverage under high yielding varieties were limited to only 14 per cent and 19 per cent respectively. The performance data from Bihar, however, are somewhat too optimistic. Spectacular increases in wheat production upto 1971-72 were the result of sustained growth in area under the crop in important wheat producing States of Punjab, Haryana, Uttar Pradesh, Madhya Pradesh and Bihar as also in the minor producing State of West Bengal. During the next two years, there was some set back to wheat production. Besides unfavourable weather conditions, other factors responsible for the shortfall appeared to be the frequent interruptions in power supply in Punjab, Haryana and Uttar Pradesh which upset irrigation schedules, incidence of rust diseases in certain areas, failure to make available fertiliser supplies in time and deficiency of certain micro-nutrients like zinc. It was also alleged that there was some deterioration in the quality of high yielding varieties seeds.

3.4.68 As for rice, taking together the first ranking five States from the point of view of area under the crop, viz. Bihar, West Bengal, Orissa, Uttar Pradesh and Madhya Pradesh, and also Assam (accounting for about 70 per cent of the paddy area in the country) it is observed that increase in production of some magnitude during the triennial interval was reported only from West Bengal (16.2 per cent), Uttar Pradesh (11.9 per cent), Madhya Pradesh (12.7 per cent) and Assam (13.9 per cent). In Bihar, there was virtual stagnation in production while Orissa reported a marginal decline. Only about one-third of the paddy area was irrigated in Bihar and Assam and about 30 per cent in West Bengal; it was even less in the other three States, being about 15 to 20 per cent. Also high-yielding varieties of paddy did not make headway; the coverage achieved in 1973-74 was 22 per cent in Uttar Pradesh, 15 per cent in West Bengal and 8 to 18 per cent in the other four States. Thus increase in rice production reported from these States was less than 20 per cent during the decade. In another group of States, comprising Andhra Pradesh, Tamil Nadu, Haryana and Punjab as much as 90 per cent or more of the paddy area was irrigated; and together these States accounted for about 17.6 per cent of the total rice area. Spread of new varieties was found to be quite impressive in these States; they covered about 80 per cent of the paddy area in Tamil Nadu and Punjab, 56 per cent in Andhra Pradesh and 43 per cent in Haryana. Except in Andhra Pradesh increases in rice production achieved in these States appeared to follow broadly the same pattern as the spread of high-yielding varieties. Punjab and Haryana reported 241 and 142 per cent increase in production respectively, Tamil Nadu an increase of

38 per cent but Andhra Pradesh only 5.4 per cent. The higher order of increase reported in the northern States compared to Tamil Nadu was due mainly to significant increase in area under the crop in the former and deficient rainfall in the latter in all the three years of the terminal triennium during the period of growth of the crop. In Andhra Pradesh, besides a fall of over 10 per cent in area under paddy during the decade the monsoon was also unfavourable in 1971-72 and 1972-73. Kerala and Karnataka formed another group where about three-fifths of the cropped area had irrigation and one-fourth area was under high-yielding strains. Increases in production achieved in these States during the period were moderate to appreciable; 22 per cent in Kerala and 24 per cent in Karnataka. Performance of Maharashtra was indeed very poor. The State had 23 per cent of its paddy area under irrigation and about 30 per cent under high-yielding varieties and yet it sustained a loss of 11 per cent in production. Weather factor, the crucial south-west monsoon, was largely responsible for the unsatisfactory situation. The quantum of rainfall received during the south-west monsoon season in the paddy growing areas of Konkan and Vidarbha regions was about 27 per cent short of the normal in 1971-72 and 36 per cent short in 1972-73 resulting in sizeable reduction in crop out-turn. Thus, the three crucial variables, viz. irrigation, high-yielding varieties and rainfall, seemed to explain a good deal of regional variations in the performance of paddy. On balance, the slow progress in rice production as compared to wheat was due to the fact that some of the major paddy growing States faced the problems of spells of excessive rainfall causing floods and waterlogging, of drainage and periods of droughts during the period of growth of the crop. Further, most of the available high yielding varieties were not adaptable to varying agro-climatic conditions in different regions.

3.4.69 Among cereal crops, the most disappointing performance was that of jowar. Except Karnataka, all the other major jowar producing States recorded a fall in production during the period under review ranging between 5.1 per cent in Tamil Nadu and 38.4 per cent in Maharashtra, Karnataka, however, recorded an increase of 7.1 per cent in production. In most of these States viz., Maharashtra, Karnataka, Andhra Pradesh and Madhya Pradesh, irrigation facilities available to the crop were negligible or nil. Only in Tamil Nadu, which accounted for just 4 per cent of the total area under jowar, 17 per cent of the crop was irrigated; elsewhere this proportion was less than 7 per cent. Except in some areas such as parts of Karnataka the hybrid jowar programme did not make any worthwhile progress. Heavy incidence of pests especially shoot

fly, in the late sown crops, lower consumer acceptability as compared to good quality traditional improved varieties; lesser output of fodder in the hybrids so far released and absence of hybrids suitable for rabi season were mainly responsible for this slow progress of the programme. Coverage under high-yielding varieties achieved at the national level in 1973-74 was only 6.8 per cent of the total area under the crop. In Tamil Nadu, which had comparatively more irrigated area under the crop, the coverage achieved was around 2 per cent. Slightly better coverage ranging from 8 to 12 per cent was, however, reported from Maharashtra, Karnataka and Madhya Pradesh but without irrigation support the new varieties failed to make any impact in the face of adverse weather. Incidentally it was only Karnataka which reported the highest proportion of area under hybrids. Besides, in this State where jowar cultivation is confined mainly to the northern region, and where the crop is raised both during kharif and rabi season, weather was generally favourable during the terminal triennium. These two factors helped the crop to a considerable extent.

3.4.70 About 40 per cent of the all-India area under bajra is in Rajasthan, 15 per cent in Gujarat and an equal extent in Maharashtra. Uttar Pradesh, Andhra Pradesh and Haryana also have some area under the crop and together these six States account for about 90 per cent of the total area. Significant increases in production were recorded in Haryana (103.8 per cent), Gujarat (68.3 per cent), and Rajasthan (44.7 per cent). While Uttar Pradesh recorded only a marginal increase. Andhra Pradesh and Maharashtra registered a fall in production. Irrigated area under the crop was negligible in the major growing States; only in Haryana and Andhra Pradesh about one tenth of the crop was irrigated. In spite of lack of irrigation, hybrid varieties of bajra had gained considerable ground in Gujarat and Maharashtra and to a lesser extent, nevertheless appreciable, in Haryana and Andhra Pradesh. General performance of hybrid bajra had been quite unlike that of jowar and maize. Appreciable increase in production reported from Gujarat and Haryana could be attributed to the progress made by the high yielding varieties programme. Weather, no doubt, is the crucial element in the case of this crop as could be seen by its very poor performance in 1972-73, which was marked by an acute shortfall in rainfall. In the following year, Rajasthan with little irrigation and very little area under hybrid strains, recorded an impressive increase of 153 per cent in production mainly due to the good monsoon in 1973-74. In the other major growing States of Gujarat, Maharashtra, Uttar Pradesh and Haryana too, the south west monsoon was quite favourable, facilitating good growth of bajra and bumper harvests.

3.4.71 Major maize growing States in the country are Uttar Pradesh with 25 per cent of the total area, Bihar and Rajasthan with about 15 per cent each and Madhya Pradesh and Punjab about 10 per cent each. Together these States account for 75 per cent of total area sown to maize crop. Among these States, Punjab recorded the highest increase of 74.8 per cent in maize production, while Uttar Pradesh recorded an increase of 23.9 per cent only. In Madhya Pradesh, there was no change in production during the period under consideration. The other two States recorded a fall in production during the period under consideration. Among coarse grains, maize claimed comparatively more area under irrigation; about 16 per cent at the all-India level. However, hybrid varieties were not found to keep pace with even the extent of irrigation available and hardly 13 per cent of maize area was under the new hybrids in 1973-74. There was no evidence either that availability of irrigation facilitated the spread of high yielding varieties. In Punjab where nearly 70 per cent of maize area was irrigated, high yielding varieties covered 4 per cent of the crop area. Similar was the case in Uttar Pradesh where 14 per cent of the maize area was irrigated but hybrid strains accounted for only 1.1 per cent of the total area. Neither did spread of hybrid varieties show any correspondence with increase in yields. The maximum spread under hybrids was reported from Bihar where they covered 26 per cent of maize area. But production during the triennium ending 1973-74 was even less than that in the base triennium by 20 per cent. While all major maize growing States reported appreciable increase in area during this period, there was no commensurate increase in production. The main factor influencing production of this crop appeared to be weather, as much of its performance depended upon the timeliness of rainfall and sunshine. The crop is also highly demanding of proper drainage facilities to give good results.

3.4.72 In cotton, Maharashtra accounting for nearly 31 per cent of cropped area registered a decline of 26.4 per cent in production. This was about equally contributed by fall in area and per hectare yield. Madhya Pradesh which is also an important cotton growing State registered a decline of 25.8 per cent in production mainly due to a fall of 16 per cent in yield. Perceptible improvements in yield were, however, recorded in the other important cotton producing States of Andhra Pradesh, Karnataka, Punjab, Rajasthan and Tamil Nadu and marginal increases in Gujarat and Haryana. But for the severe setback it suffered in Maharashtra and Madhya Pradesh, the overall performance of the crop would have been more impressive. It may, however, be mentioned that as against the all-India average

irrigated area under cotton of about 17 per cent, area irrigated under the crop was the lowest in these two States, being about 1.5 per cent in Madhya Pradesh and 2.7 per cent in Maharashtra.

3.4.73 West Bengal, Bihar and Assam are the three important jute producing States. Taken together these account for more than 90 per cent of cropped area. Both West Bengal and Bihar recorded a fall in jute production between the two triennial intervals. In West Bengal, decline in production was marginal (2.2 per cent) due to an improvement of nearly 5 per cent in per hectare yield. However, Bihar registered a decline of as much as 37.5 per cent in production contributed by a decline of 29 per cent in area and 12 per cent in yield. On the other hand, Assam recorded an increase of 25.6 per cent in production mainly due to an increase of 18.5 per cent in yield.

3.4.74 Gujarat, Maharashtra, Andhra Pradesh, Tamil Nadu and Karnataka are the major groundnut producing States and account for more than 80 per cent of the total area. In Maharashtra, over the period under review, production declined by 52.7 per cent as a result of a fall of nearly 36 per cent in area and 26 per cent in yield. In Gujarat too production declined by 23.2 per cent mainly due to a fall of over 19 per cent in area. In Madhya Pradesh, another important groundnut producing State, production declined by 11.3 per cent mainly as a result of a fall in yield. On the other hand, in Karnataka inspite of a marginal decline in area, production moved up by 7 per cent due to an increase in yield. Andhra Pradesh was the only State to record a significant increase of 49.4 per cent in production due to an increase of over 44 per cent in area and about 4 per cent in yield, while in Tamil Nadu even though area under groundnut increased by about 19 per cent, production increased by only 11.5 per cent due to a fall of 6 per cent in yield. It may be mentioned here that 14 per cent of the area under groundnut in Andhra Pradesh and 17 per cent in Tamil Nadu is irrigated as against the all-India average of 7 per cent.

3.4.75 In sugarcane, Uttar Pradesh accounting for nearly 55 per cent of the all-India area recorded an increase of 14 per cent in production contributed mainly by an increase of about 9 per cent in yield and about 5 per cent in area. In Maharashtra, another important sugarcane producing State, production moved up nearly 20 per cent due to an increase of about 13 per cent in area and about 6 per cent in yield. On the other hand, in another group of States viz., Andhra Pradesh, Karnataka and Tamil Nadu, increase in production was mainly the result of increase in area under the crop. In fact, while in Tamil Nadu per hectare yield showed some increase, in Karnataka and Andhra Pradesh, it remained more or less stagnant. In Punjab,

increase in production was mainly due to increase in productivity. Bihar was the only major producing State to show a decline of nearly 15 per cent in production due mainly to a fall of nearly 10 per cent in area and 6 per cent in yield. The more satisfactory performance of sugarcane vis-a-vis other commercial crops could be attributed to the fact that nearly three-fourths of the area sown to the crop is irrigated. In Bihar, however, only about 30 per cent of area under sugarcane is irrigated.

3.4.76 Before concluding the crop-wise analysis comparison is made briefly between performance of different crops vis-a-vis the Fourth Plan targets. Chart 3.5 referred to earlier in Paragraph 3.4.14 shows the performance at the all-India level. Appendix 3.14 gives State-wise estimates of production of foodgrains, major oilseeds, cotton (in terms of lint), jute and sugarcane (in terms of gur) for the year 1967-68 to 1973-74 alongwith the Fourth Five Year Plan targets. It will be seen therefrom that there is considerable unevenness in the achievements of production targets among different States.

Regional Patterns of Growth-State-wise.

3.4.77 In the earlier sections performance of individual crops/groups of crops in different regions of the country has been studied. It is, however, important to know how different States fared in the field of crop production as a whole. In the absence of State level index numbers of agricultural production and consequently the growth rates of agriculture in different States for the period under review, this study has been made by taking weighted average of variations in absolute production of important crops grown in a State between the triennia ending 1964-65 and 1973-74; the weights being assigned in proportion to the value of production of each crop in that State. The weighted percentage variations during the interregnum were finally reduced to an annual basis to arrive at the annual rate of increase in crop production in a particular State. Appendix 3.15 gives the triennial averages of area and production of selected crops in each State alongwith the percentage increase in 1971-74 over 1962-65 and annual growth rates of area, production and yield.

3.4.78 Table 3.21 gives the annual rates of increase in crop production in different States between the triennia ending 1964-65 and 1973-74. The State-wise growth rates are also depicted in Chart 3.8.

TABLE 3.21
Statewise Growth Rates of Crop Production—1962-65 to 1971-74
(per cent per annum)

State	Growth rate
Above 5 per cent per annum	
1. Punjab	8.35
2. Haryana	6.66

TABLE 3.21 (Contd.)

State	Growth rate
2.5 to 5.0 per cent per annum	
3. Kerala	4.96
4. Tripura	4.34
5. Rajasthan	3.80
6. Manipur	3.73
7. Himachal Pradesh	3.68
8. Uttar Pradesh	3.28
9. West Bengal	3.14
10. Tamil Nadu	3.12
11. Assam	2.63
1.0 to 2.5 per cent per annum	
12. Karnataka	1.88
13. Gujarat	1.75
14. Bihar	1.67
15. Madhya Pradesh	1.29
16. Andhra Pradesh	1.17
Less than 1.0 per cent per annum	
17. Jammu & Kashmir	0.69
18. Orissa	(—)0.19
19. Nagaland	(—)2.33
20. Maharashtra	(—)2.42

The States which fared exceedingly well during the decade were Punjab and Haryana. Annual rate of increase of 8.35 per cent was recorded by the former and 6.66 per cent by the latter. These were well above the overall rate of growth of 5 per cent envisaged in the Fourth Five Year Plan. Among various crops grown, wheat undoubtedly provided the main thrust for this momentous growth in both the States. Other cereal crops like paddy, bajra and maize also lent good support to the growth process. Cotton, which is the main cash crop of the region, also did well in both the States but due to the sizeable expansion of area under this crop in Haryana it made a better impression on overall agricultural production in that State. Performance of most of the major crops grown was generally good, with very few exceptions like rapeseed and mustard in Haryana and gram in both the States. Drop in production of gram which was quite appreciable, as much as 43 per cent in Haryana and 52 per cent in Punjab, was brought about mainly by reduction in area.

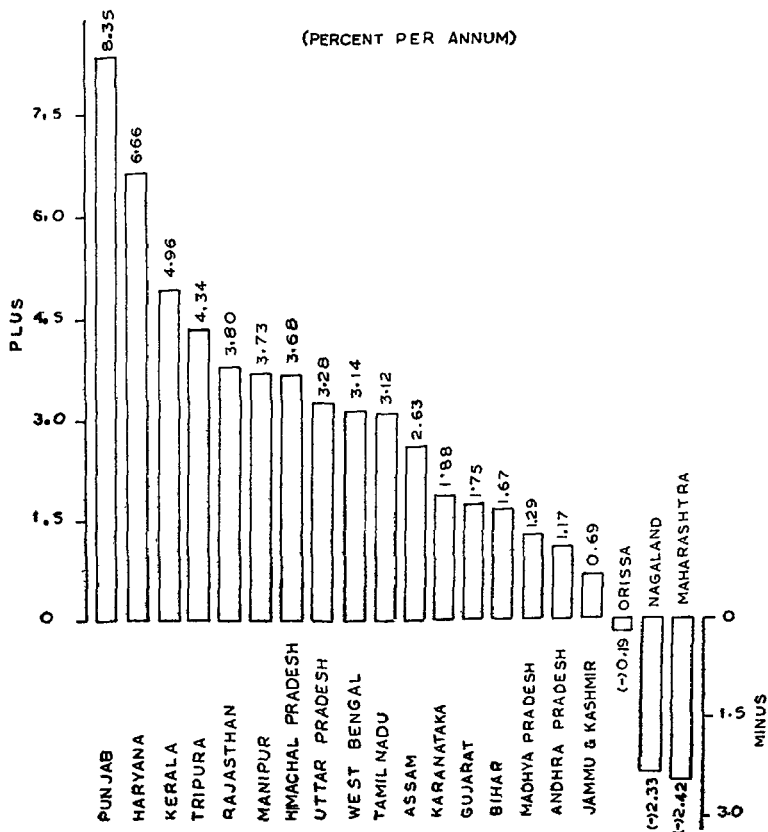
3.4.79 It was observed that about 75 per cent of the cropped area was irrigated in Punjab and 45 per cent in Haryana. All the crops which performed well had over 70 per cent area under irrigation. These crops covered about 65 per cent of the cropped area in Punjab and over 30 per cent in Haryana. Further the HYV programme had also made rapid strides; coverage achieved under new wheat strains in Haryana and Punjab being 87 per cent and 83 per cent and in the case of paddy 43 per cent and 81 per cent respectively. Thus, agriculture in these

CHART 3.8

(PARAGRAPH 3.4.7b)

GROWTH IN AGRICULTURAL PRODUCTION 1962-65 To 1971-74

BASED ON AVERAGE PRODUCTION DURING THE TRIENNA ENDING 1964-65 & 1973-74



States appeared to have attained a measure of independence from the all pervasive weather factors.

3.4.80 In another group of nine States, comprising Kerala, Tripura, Rajasthan, Manipur, Himachal Pradesh, Uttar Pradesh, West Bengal, Tamil Nadu and Assam, agricultural production grew at rates ranging between 2.5 and 5 per cent per annum and in all of them except Assam, rate of increase realised was more than 3 per cent *i.e.*, well above the rate at which population has been growing in recent years. These States accounted for about 37.7 per cent of the cropped area and 44.2 per cent of the population in the country; when Punjab and Haryana are also included these percentages increase to about 44 and 49 respectively. Wheat crop was the principal element of agricultural growth in Himachal Pradesh, Uttar Pradesh and Rajasthan, paddy crop in Tamil Nadu, Tripura, and Manipur and both the crops more or less in equal measure in West Bengal. Good support was provided by barley and maize in Himachal Pradesh, sugarcane and rapeseed and mustard in Uttar Pradesh, sugarcane in Tamil Nadu and bajra and gram in Rajasthan. In Kerala where the rate of increase was 4.96 per cent, the most important factor of increase was tapioca, a tuber crop followed by rubber. In the case of Assam, the main sources of increase were tea, jute and rapeseed and mustard. Paddy is the main cereal crop grown in Kerala, Assam, Manipur and Tripura. Some qualification about the performance of West Bengal would, however, be in order. As pointed out earlier the two crops contributing roughly in equal measure to agricultural growth in that State were wheat, which occupied only about 5 per cent of the total sown area, and paddy which occupied as much as 70 per cent of the cropped area. While there was only moderate increases of 11 and 16 per cent in area and production of paddy compared to the base triennium of 1962-65, there was a phenomenal increase of about 7 times in area and 24 times in production in the case of wheat which pulled up the annual rate of increase from 1.51 (excluding wheat) to 3.14 (including wheat) per cent.

3.4.81 In this second group of States, irrigation available was 20 per cent of the cropped area in Kerala, Rajasthan, Himachal Pradesh, West Bengal and Assam, 35 per cent in Uttar Pradesh, 45 per cent in Tamil Nadu, 51 per cent in Manipur, and only 6 per cent in Tripura. Besides, Kerala, Assam, West Bengal, Manipur and Tripura receive copious rainfall. Main crops grown under irrigation covering more than 50 per cent of cropped area were wheat in Uttar Pradesh and Rajasthan, paddy in Tamil Nadu, Kerala, Manipur and Himachal Pradesh, barley in Uttar Pradesh and Rajasthan and sugarcane in Uttar Pradesh and Tamil Nadu. Other crops had very little or no irrigation. The irrigated crops accounted for about 30 to 40 per cent of cropped area in Tamil

Nadu, Kerala and Uttar Pradesh and around 10 per cent of the area in Rajasthan and Himachal Pradesh. Besides a major proportion of area under paddy in Tamil Nadu and Himachal Pradesh and wheat in Uttar Pradesh, Himachal Pradesh and West Bengal was under high yielding varieties. As increases occurring in wheat production were very substantial, States where wheat accounted for a sizeable proportion of cropped area could forge ahead of other States. This explained the better performance of Himachal Pradesh, Uttar Pradesh and Rajasthan.

3.4.82 The performance of Tamil Nadu with good irrigation facilities was not quite satisfactory. Rice recorded an annual increase of about 4.2 per cent in production. But keeping in view that the crop was almost wholly irrigated in the State and consisted mostly of new strains, the increase achieved was neither commensurate with the resources employed nor comparable to the increases obtained in wheat production in the wheat producing States. On the other hand, agricultural production in the State suffered a positive set back as a number of important crops like jowar, bajra and ragi sustained losses in production due to deficient rainfall during the kharif season in all the three years of the terminal triennium.

3.4.83 Comparatively better progress recorded by Rajasthan was mainly due to the weather factor being more favourable. In Rajasthan bulk of the contribution to increase in agricultural production came from wheat and bajra and partly from barley, gram and rapeseed and mustard. While cultivation of wheat, barley and rapeseed and mustard was confined to the eastern parts, that of bajra was mainly in the western parts. Wheat received irrigation support; besides, south west monsoon was favourable in two out of the three years of the terminal triennium, which had a salutary effect on crop activity in general in this region. West Rajasthan had very little rains during kharif season of 1971-72 and 1972-73 but received abundant rains during 1973-74 resulting in a bumper bajra crop, which helped to level off the losses of preceding years. Rainfall also explained the good yields of gram in that State. Thus, weather played the crucial role in the agricultural growth in Rajasthan and Tamil Nadu.

3.4.84 A general factor that could be considered as inhibiting progress in some of these States was the very slow pace at which high-yielding varieties programme was moving. It was observed that staple crops grown over very large areas like paddy in West Bengal, Uttar Pradesh, Kerala and Assam, bajra in Rajasthan and jowar in Tamil Nadu consisted mostly of traditional varieties. The new high-yielding strains could not make much headway in these areas partly due to lack of irrigation and drainage facilities and absence of varieties suited to the area and partly due to other reasons. The inability to effect the

much desired varietal changes in crop activity, on a sufficiently large scale, impeded agricultural growth.

3.4.85 Karnataka, Gujarat, Bihar, Madhya Pradesh and Andhra Pradesh constituted another group where annual rate of increase in agricultural production was lower, in the range of 1 to 2.5 per cent. Generally performance of all crops was sluggish; very often increases recorded by some crops were off-set by decreases in some others. Position in this regard was a shade better in Karnataka and Gujarat. In the former almost all important crops recorded moderate increases and in the latter some of the crops recorded moderate to good increases and some a decline. As a result, there was comparatively better growth in these two States within the entire group. It may be noted that wheat crop buoyed up the rate of increase in Gujarat, Madhya Pradesh and in a very special way in Bihar. In Bihar, but for the phenomenal increase reported in wheat production there would have been retrogression.

3.4.86 In this group of States paucity of irrigation was, no doubt, the most important limiting factor. Proportion of cropped area receiving irrigation was as low as 8 per cent in Madhya Pradesh and 13 per cent in Karnataka and Gujarat. The position, however, was better in Bihar and Andhra Pradesh where 25 per cent and 31 per cent of the cropped area respectively were irrigated. The few crops grown under irrigated conditions were paddy in Andhra Pradesh and wheat in Gujarat and Bihar. Paddy crop in Assam, Bihar and Gujarat also had about one-fourth to one-third of its area under irrigation. However, progress in regard to introduction of new varieties was limited to wheat and bajra crops in Gujarat and to wheat only in Bihar. Elsewhere very little headway had been made by the new varieties.

3.4.87 As regards the agricultural growth in individual States, increase in agricultural production in Karnataka was due to the good performance of paddy, bajra, cotton and sugarcane crops. Considering that irrigation available in Karnataka was inadequate, the overall performance of the State was quite satisfactory. In Bihar, the growth in agricultural production was wholly due to extraordinary performance in wheat. In Madhya Pradesh, the main crops influencing overall performance was undoubtedly rice, wheat, and gram. Just as irrigation available to these crops was limited, increase in production recorded by them was also moderate. Besides, these limited increases were to a very considerable extent offset by reverses suffered by crops like jowar, cotton and groundnut. Agricultural production in Andhra Pradesh and Gujarat received severe set back during recent years mainly on account of indifferent or poor performance of paddy, jowar, bajra, ragi, small millets and chillies in Andhra Pradesh and paddy, maize, jowar, cotton and groundnut in Gujarat. These crops

accounted for 55 to 60 per cent of the cropped area. Very little irrigation was available to all crops except paddy in both the States. South west monsoon was unfavourable over the entire Andhra coast during all the years of the terminal triennium and over the rest of the State during the first two years, resulting in poor performance by crops. However, rainfall received in Telangana and Rayalaseema regions during 1973-74 was normal, and its beneficial effects were fully reflected in the outturn of kharif crops. Besides, the severe shortfall in precipitation in the upper reaches of Krishna and Godavari rivers in 1971-72 and 1972-73 presumably led to reduced availability of water in the irrigation systems serving the delta area of Andhra Pradesh where paddy cultivation is concentrated. The increase in production of rice in the State in 1973-74, inspite of persisting shortfall in precipitation in coastal Andhra Pradesh is suggestive of improvement in the efficiency of irrigation systems following good rains in the Krishna and Godavari catchments lying in Maharashtra. In Gujarat, complete failure of south west monsoon in 1972-73 had a totally depressing effect on crop production and no crop could escape from the impact of this failure. But for this natural calamity the State could have put up a better performance. On the whole it was irrigation and rainfall that explained the production performance of these States.

3.4.88 Jammu & Kashmir, Orissa, Nagaland and Maharashtra stand in the lowest echelon of States' agricultural growth pyramid. In Jammu & Kashmir, rice, maize and wheat are the main crops. Production of maize recorded a fall while that of rice was stagnant during the two triennial intervals. Even though production of wheat recorded good progress despite stagnancy in area under the crop, on the whole, the State had a very low rate of growth of crop production. There was virtual stagnation in crop production in Orissa. Moderate increases recorded by crops of secondary importance like sesamum and jute were more than wiped off by the failure of the paddy crop, accounting for 66 per cent of the cropped area in the State. In Maharashtra, major crops like jowar, bajra, rice, tur, cotton and groundnut sustained heavy losses in production during the terminal triennium. Only two crops, viz. wheat and sugarcane, grown under irrigation, showed any increase. But the small gains by these two crops were more than obliterated by the loss sustained by major crops. On balance there was a net loss in agricultural production in recent years compared to the base triennium of the mid-sixties. In Nagaland, rice is the only crop grown and it recorded a decline in both area and yield.

3.4.89 In Jammu & Kashmir, rice is raised as an irrigated crop but

maize and wheat are mainly rainfed. In Orissa only one-fourth of area under paddy received irrigation. Though the State receives abundant rainfall it is often neither steady nor timely. As for Maharashtra, except sugarcane and to some extent wheat and rice which account for only one-seventh of the cropped area, all crops are grown with very little or no irrigation. Following the failure of south west monsoon both in 1971-72 and 1972-73 all the major crops including paddy suffered severe losses in production. In most cases production fell below the benchmark, levels. Meteorologists opined that Maharashtra had not witnessed such a devastating failure of monsoon of many years. Orissa and Maharashtra provide two typical examples of how agriculture and agricultural development programmes in many parts of the country are still hopelessly dependent on fortuitous elements.

3.4.90 Besides irrigation, varietal improvement and rainfall, levels of fertiliser application reached could also provide some explanation for the varying performance by States. This factor is discussed in detail in the next section.

5 FACTORS OF CHANGE IN CROP OUTPUT (1950—74)

3.5.1 A review of the trends in production over the plan periods in Section 4 has revealed that the index of overall agricultural production has moved up from 68.9 in 1950-51 to 131.6 in 1973-74 (base : triennium ending 1961-62=100). Provision of increased irrigation facilities, introduction of high yielding varieties of cereals and cotton, increased use of fertilisers and provision of plant protection facilities were the main factors responsible for the growth in agricultural output. Measures such as land reclamation during the earlier plan periods and multiple cropping during the later plans also partly contributed to the growth, through increase in cropped area. Other supporting measures such as soil conservation and land development, consolidation of holdings, agricultural credit, agricultural marketing, research and education and price incentives also directly or indirectly influenced agricultural growth. A broad picture of the developments in respect of some of the above factors since the beginning of the planning era is indicated below :

Area irrigated (Mha)						Net	Gross
1950-51	.	.	.	.	.	20.9	22.6
1971-72	.	.	.	.	.	31.6	38.6
Consumption of fertilisers (thousand tonnes)						K	Total
				N	P		
1950-51	.	.	.	.	55	8	69
1973-74	.	.	.	.	1829	650	2839

Area under HYV of cereals (Mha)

1973-74 25.9

area covered by plant protection measures
(Mha)

1955-56 2.4

1973-74 60.5

3.5.2 Irrigation is basic to the adoption of other improved practices such as HYV, fertiliser application and plant protection measures. Every hectare of extra irrigation normally gives 0.5 tonnes of extra foodgrains output. Fertilisers are expected to add 10 tonnes for every tonne of plant nutrient applied. The yardstick in the case of high yielding varieties of paddy, wheat, maize, jowar and bajra are as under :

	(tonnes per hectare)
Paddy (in terms of rice)	1.48
Wheat	1.65
Maize	1.24
Jowar	1.24
Bajra	0.62

The above yardsticks are inclusive of the effect of fertilisers and other management practices including plant protection. The composite effect of irrigation, fertilisers and HYV are known to be higher than the sum of the effect of the individual factors. Studies conducted by the IARS have shown that whereas in the case of wheat, the yardsticks are more or less realised, in the case of rice, for reasons referred to in Paragraph 3.5.12 the yardsticks have not been realised in practice. An idea of the progress under the individual factors is given in the succeeding Paragraphs.

3.5.3 Land reclamation : In the initial years of planned development increase in cropped area was a major input source of growth in crop output. As already mentioned, increase in area sown was achieved mainly through State schemes of land reclamation and the facilities offered to the cultivators for bringing new lands under cultivation. During the First Plan period, an area of 1.1 Mha was reclaimed against a target of 1.5 Mha. During the Second Plan period, an area of 0.9 Mha was reclaimed as against a target of 0.6 Mha. During the Third Plan period, an area of 1.8 Mha was reclaimed against a target of 1.5 Mha. Thus the total area reclaimed during the first three plan periods was 3.8 Mha. During the subsequent years very little emphasis was placed on bringing new lands under cultivation as a means of increasing the production. An area of only 0.4 Mha was reclaimed during 1966-69 while another 0.4 Mha was anticipated to be covered during the Fourth Plan period. For the reclamation of ravine lands

pilot projects were undertaken in the Central sector in the States of Uttar Pradesh, Madhya Pradesh and Gujarat. The object of these projects was to find out the economics and technical feasibility of large scale reclamation of ravine eroded lands in Central India.

3.5.4 Multiple cropping : Besides extension of cultivation to new lands, increase in area under multiple cropping also contributed to crop output growth during this period. Area sown more than once increased from 13.1 Mha or about 11 per cent of net area sown during 1950-51 to 21.1 Mha or about 15 per cent of net area sown during 1964-65. However, in the absence of short duration varieties, multiple cropping could not be made a focal point of agricultural strategy upto 1966-67. From 1967-68, systematic efforts were made to increase the intensity of cropping through extension of irrigation, more judicious use of available water resources, replacement of long duration varieties by short duration varieties, use of fertilisers and manures and modifications in cropping pattern. During the Fourth Plan period it was envisaged to increase the gross cropped area by 9 Mha through multiple cropping. However, between 1968-69 and 1971-72, i.e., during the first three years of the Fourth Plan period, area sown more than once increased from 22.1 Mha to 24.6 Mha showing thereby an increase of 2.5 Mha only. Area under multiple cropping during 1971-72 formed 17.7 per cent of net area sown during that year. In order to accelerate the tempo of multiple cropping, a new scheme for setting up of 57 pilot projects in selected blocks in different parts of the country has been taken up. Under these projects special attention is being given to adaptive research, water use management, scientific demonstrations and training and audio-visual education. Supply of inputs, credit and marketing facilities and other infrastructural aspects are also being given due attention under these projects.

3.5.5 Irrigation : About four-fifths of the country's cropped area depends exclusively on rainfall, most of it concentrated in a few months of the year. In large parts of the country rainfall is so low and uncertain in distribution that it does not permit intensive cultivation even during the main crop season. Even where the overall annual precipitation is high, the available moisture in the winter and summer months is not adequate to support multiple cropping. Since the beginning of the planning era expansion of irrigation facilities to ensure timely and adequate water supply has been the kingpin in the country's programme of agricultural development. Trends in area irrigated, both net as well as gross, between 1950-51 and 1971-72 (latest available) have already been discussed in Section 2 (Paragraphs 3.2.17 to 3.2.20) of this Chapter. It may, however, be added here that in order to provide adequate water supplies for supporting double or

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multiple cropping, the supplementing of canal irrigation with tubewell irrigation in the command of irrigation projects and exploitation of groundwater resources in other areas received adequate attention during the plan periods. The programme of minor irrigation, more particularly lift irrigation, was substantially stepped up as would be evident from the figures given in Table 3.22.

TABLE 3.22
Progress of Minor Irrigation Programmes*

	(number in thousands)				
	1955-56	1960-61	1965-66	1968-69	1973-74
Wells in use	3,624	4,474	5,111	5,908	6,841
diesel pumps	123	230	465	721	1,752
electric pumps	56	199	513	1,089	2,442
private tubewells and filter points	30	49	113	246	782
state tubewells	7	10	13	15	21

* Data obtained from Ministry of Agriculture & Irrigation

It will be seen that there has been a remarkable progress in the energisation of pumpsets made possible by a massive programme of rural electrification undertaken during the plan periods. The gross additional area benefited by minor irrigation works during the First, Second and Third Plan periods was 3.8 Mha, 3.6 Mha and 5.3 Mha respectively. Gross additional area benefited during 1966-69 was 4.0 Mha. The Fourth Five Year Plan laid down a target of 7.2 Mha (gross) to be benefited by minor irrigation. Measures taken to extend irrigation facilities to the unirrigated areas and stabilising irrigation in canal irrigated areas paid good dividends. This is borne out by the fact that even though the foodgrains production in unirrigated areas continues to show a vacillating trend, in irrigated areas production has not only stabilised but is also showing an upward trend. During 1970-71, out of the total foodgrains production about 108 million tonnes, irrigated areas are estimated to have contributed about 46 million tonnes and unirrigated areas about 62 million tonnes. During 1971-72, as a result of unfavourable weather conditions, the overall foodgrains production declined by 3 million tonnes. However, production in irrigated areas was estimated to have moved up to about 48 million tonnes showing thereby an increase of 2 million tonnes over 1970-71. On the other hand, in unirrigated areas production is estimated to have declined to 57 million tonnes i.e. a fall of 5 million tonnes over 1970-71.

3.5.6 Development of selected command areas : An irrigation potential of 21.4 Mha is expected to have been created by the end of the Fourth Plan period through various major and medium projects. As against this the estimated level of actual utilisation is likely to be 19.6

Mha. The problem of under-utilisation of irrigation potential received due attention during the Fourth Plan period and an integrated programme for development in command areas of 16 irrigation projects was taken up. Items of development taken up under the scheme included land formation and levelling, provision of irrigation outlets and feeder channels and the attendant drainage and water scheduling, creation of market complexes and link roads, etc. In addition, twentyfive soil management pilot projects were proposed to be taken up during the Fourth Plan period in selected irrigation commands to demonstrate all aspects of efficient water management on the cultivators' fields with farmers' full participation and also to train both farmers and technicians in new irrigation practices. Twentythree such projects were sanctioned upto the end of the Fourth Plan period.

3.5.7 Fertilisers : Consistent efforts to introduce fertiliser use through trials, demonstrations and propaganda constituted an integral part of agricultural development during this period. A number of measures were taken by the Government of which a mention has already been made in Chapter 2 on Historical Review. High priority was given to production of fertilisers in the country. As a result, production of nitrogenous fertilisers rose from 16 thousand tonnes in 1951-52 to 145 thousand tonnes in 1961-62 and to 1060 thousand tonnes in 1973-74. To meet the gap between requirement and internal production, imports of fertilisers were stepped up. During 1973-74, total imports of plant nutrients amounted to 1,242 thousand tonnes as against 332 thousand tonnes in 1961-62 and only 29 thousand tonnes in 1951-52. Table 3.23 gives the progress of consumption of fertilisers since 1950-51.

TABLE 3 23
Consumption of Fertilisers in India *

Year	Total nutrients** (N+P ₂ O ₅ +K ₂ O)	Gross cropped area	Consumption per hectare of gross cropped area
(1)	(2) (thousand tonnes)	(3) (thousand ha)	(4) (kg)
1950-51	69	131,893	0.52
1955-56	148	147,311	1.00
1960-61	306	152,772	2.00
1965-66	784	155,364	5.05
1966-67	1,101	156,837	7.02
1967-68	1,540	163,078	9.44
1968-69	1,760	159,662	11.02

(1)	(2)	(3)	(4)
1969-70	1,982	163,782	12.10
1970-71	2,256	165,119	13.66
1971-72	2,656	164,002(p)	16.19
1972-73	2,769	164,002(a)	16.88
1973-74	2,839	164,002(a)	17.31

* (i) Ministry of Agriculture and Irrigation (Fertiliser Division).

(ii) Directorate of Economics & Statistics.

** For detail please refer to chapter 48 on Fertiliser and Manures Appendix 48.7

(p) provisional

(a) 1971-72 data repeated.

It will be seen that consumption of fertilisers increased from 0.52 kg per hectare of cropped area in 1950-51 to 17.31 kg in 1973-74. Despite this sharp increase in fertiliser consumption, use of fertilisers in India was among the lowest in the World and in 1972-73 worked out to about 17 kg per hectare of total cropped area as against 716 kg in Netherlands, 600 kg in Belgium, 602 kg in New Zealand, 387 kg in Japan, 256 kg in UK, 155 kg in Egypt, 85 kg in USA, 45 kg in USSR, 38 kg in China, 24 kg in Canada 23 kg in Pakistan, 22 kg in Bangladesh and the World average of 52 kg. Introduction of high yielding varieties under the new strategy together with increase in irrigation resulted in a rapid growth in the consumption of fertilisers in the country after 1966-67. The rate of growth, however, varied from year to year. The consumption of nitrogen in 1967-68 was 40 per cent higher than that in the previous year. The next three years registered a growth of 17, 12 and 9 per cent respectively. The consumption in 1971-72 was 22 per cent higher than the preceding year showing a welcome upswing in the growth rate. With an increase of only 2 per cent in consumption of nitrogenous fertilisers during 1972-73 and practically no increase during 1973-74 the position during these years was indeed very unsatisfactory. The main reasons for this sharp decline in the growth of consumption were poor availability due to low capacity utilisation of some of the existing plants and delay in commissioning some of the plants and limitations on stepping up imports considerably due to high prices of fertilisers in foreign markets and high freight rates. Severe drought conditions in Maharashtra, Gujarat, Rajasthan, and parts of Tamil Nadu, Karnataka, Andhra Pradesh, Uttar Pradesh, West Bengal, Punjab and Haryana during 1972-73 also proved a drag on consumption of fertilisers.

3.5.8 Table 3.24 gives the consumption of plant nutrients per hectare of cropped area in different Zones and States during 1966-67 and 1973-74.

TABLE 3.24
Consumption of Fertilisers (N+P₂O₅+K₂O)*

(kg per hectare of cropped area)

Zone/State	1966-67	1973-74
South Zone	15.8	26.4
Andhra Pradesh	17.5	22.2
Kerala	21.5	28.1
Karnataka	7.9	17.7
Tamil Nadu	22.0	44.6
West Zone	7.1	17.3
Gujarat	6.5	21.3
Maharashtra	7.3	14.9
Goa	12.9	28.8
Central Zone	3.2	11.2
Madhya Pradesh	0.8	6.7
Uttar Pradesh	6.4	20.2
Delhi	11.3	33.9
Rajasthan	1.2	4.4
North Zone	10.2	37.6
Haryana	3.3	22.8
Himachal Pradesh	2.4	7.8
Jammu & Kashmir	18.3	16.3
Punjab (incl Chandigarh)	16.3	58.5
East Zone	6.1	9.8
Assam	1.8	3.5
Bihar	9.0	9.1
Orissa	3.6	8.9
West Bengal	7.1	13.6
Manipur	1.6	13.6
Tripura	0.3	5.6

* Based on consumption figures published in Fertiliser Statistics, 1966-67 and 1973-74 and gross cropped area in 1966-67 and 1971-72 respectively

It will be seen that consumption of fertilisers showed large inter-zonal as also intra-zonal variations. Fertiliser consumption was the highest in the North Zone which included the States of Punjab and Haryana where growth in agricultural production during the recent years was the highest. On the other hand, fertiliser consumption was the lowest in East Zone which included the States of Bihar and Orissa where agricultural production remained more or less stagnant.

3.5.9 Coupled with low consumption there is also considerable lack of balance between the use of nitrogen, phosphate and potash in the country. It was envisaged that the ratio of N, P, K at the end of the Fourth Plan period would be 4 : 2 : 1. As against this the ratio during 1973-74 was 5.1 : 1.8 : 1. Ratios of N, P, K consum-

ption vary widely from State to State and region to region as would be seen from the figures given in Table 3.25.

TABLE 3.25
Consumption Ratio of N, P_2O_5 and K_2O in 1973-74*

Zone/State	N	P_2O_5	K_2O
South Zone.	3.2	1.4	1.0
Andhra Pradesh	5.8	2.8	1.0
Kerala	1.4	0.9	1.0
West Zone	5.2	2.4	1.0
Gujarat	10.6	4.6	1.0
Maharashtra	3.6	1.8	1.0
Central Zone	7.5	2.3	1.0
Rajasthan	13.8	3.3	1.0
Uttar Pradesh	6.6	1.7	1.0
North Zone	11.6	3.1	1.0
Haryana	20.9	3.7	1.0
Punjab	10.3	3.2	1.0
East Zone	3.7	1.0	1.0
Bihar	6.5	1.5	1.0
West Bengal	2.0	0.7	1.0

* Production and Consumption of Fertilisers, Annual Review, 1974-75, Fertiliser Association of India.

Lopsided fertiliser use and scant attention to balanced fertilisation have already resulted in widespread phosphate and potash deficiencies in Indian soils thereby inhibiting optimum productivity. Balanced fertilisation is needed for sustaining high yields and receiving the optimum benefits from the use of a given quantity of nutrients. This is particularly important in the context of limited availability of fertilisers in the country.

3.5.10 Soil testing has an important contribution to make in determining the right use of fertilisers for increasing crop yields and maintaining soil fertility. During the period under review, a number of laboratories were established under the over-all coordination of the IARI. Soil samples from farmers' fields were analysed in the soil testing laboratories set up in different States for their nitrogenous, phosphatic and potassic nutrient content as also for their reaction (acid, alkali, etc.) and their contents of soluble salts, so as to help in suggesting proper fertiliser application practices. At present there are 235 laboratories in the country with an annual capacity of analysing over 3 million soil samples, but even this capacity is inadequate. Besides, due to various technical difficulties mentioned in Chapter 48 on Fertiliser and Manures the existing capacity of most of the laboratories was not fully utilised.

3.5.11 Improved seeds : During the successive plan periods special attention was given to meet the demand for improved seeds. The various programmes undertaken for multiplication of improved seeds and their distribution to growers have already been discussed in Chapter 2 on Historical Review. As a result of the efforts made by the Central and State Governments, area using improved seeds of foodgrains increased from 1.9 Mha at the end of First Plan period to 19.8 Mha at the end of Second Plan period and to 48.6 Mha at the end of the Third Plan period.

3.5.12 High yielding varieties : As mentioned earlier, the 'New Strategy' for agricultural development sought to achieve a technological break-through in Indian agriculture. One of the main planks of this strategy was to exploit fully the possibilities of raising yields and production through high yielding varieties. Efforts at evolving high yielding varieties, were mainly concentrated on five major cereals viz., paddy, jowar, bajra, maize and wheat. Table 3.26 gives the total area covered under high yielding varieties of these cereals during 1968-69 to 1973-74 alongwith the Fourth Plan targets.

TABLE 3 26
Area covered High Yielding Varieties*
(1968-69 to 1973-74)

Crop							(Mha)
	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	Fourth Plan target
Paddy	2.60	4.34	5.59	7.41	8.17	9.72 (25.6)	10.10
jowar	0.70	0.56	0.80	0.69	0.87	1.16 (6.8)	3.20
bajra	0.70	1.16	2.05	1.77	2.50	3.28 (24.1)	2.80
maize	0.40	0.42	0.46	0.44	0.60	0.78 (13.0)	1.20
wheat	4.80	4.92	6.48	7.86	10.18	10.91 (57.3)	7.70
TOTAL	9.20	11.40	15.38	18.17	22.32	25.85 (27.6)	25.00

* Draft Fifth Five Year Plan and Annual Plans, 1974-75 and 1975-76

NOTE : Figures in paranthesis denote area under high yielding varieties as per cent of total area under the crop.

Chart 3.9 (p. 285) shows targets and achievements of area under high yielding varieties of the five major cereals during 1973-74. It will be seen that in the case of wheat the achievement exceeded the target by 3.21 Mha, a spectacular increase indeed due mainly to the popularity gained by the high yielding strains among farmers all over the country. The progress of area covered under rice was also satisfactory. However, its impact on production was not proportionate to area expansion. The main bottleneck was traced to bad water management mainly in the irrigation commands of major and medium irrigation projects in the country during the monsoon season, lack of location specific varieties and susceptibility of the new strains to pests

and diseases. Coverage under bajra also exceeded the target inspite of certain inhibiting factors like prevalence of pests and diseases. However, coverage under maize and jowar was much below the plan targets mainly due to susceptibility of the available high yielders to pests and diseases, lack of suitable varieties for different agro-meteorological zones/seasons.

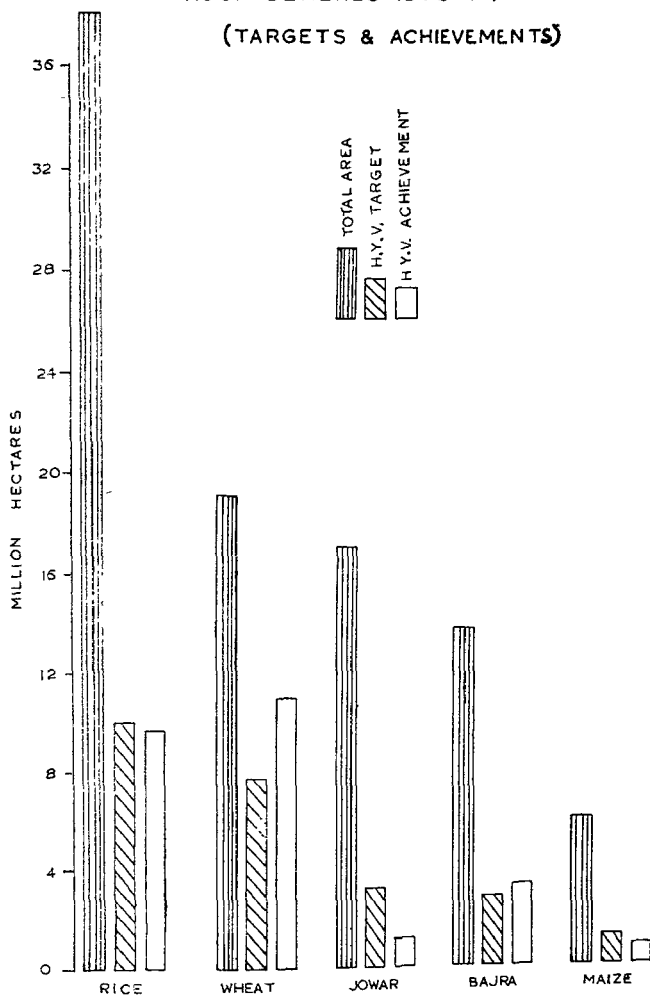
3.5.13 Appendix 3.16 gives state wise break-up of the total area covered under HYV of paddy, maize, jowar, bajra and wheat during 1968-69 to 1973-74 alongwith the Fourth Plan targets. It will be observed that in Punjab, Uttar Pradesh, Tamil Nadu, Madhya Pradesh and Himachal Pradesh area covered under high yielding varieties during 1973-74 was significantly above the targets fixed. In Andhra Pradesh, Assam, Haryana, Jammu and Kashmir and Karnataka also the Fourth Plan targets were more or less achieved. However in Gujarat, Maharashtra, Orissa, West Bengal, Bihar, Kerala and Rajasthan achievements lagged behind the targets considerably. In order to achieve a breakthrough in production of foodgrains, these States too will have to accelerate the pace of implementation of the HYV programme.

3.5.14 As already mentioned no progress has been achieved in evolved high-yielding varieties of pulses. However, even the limited research work done so far has helped to develop pulse varieties which by virtue of their early maturity or non-photo sensitiveness can be grown in non-conventional seasons or inserted in the present day pattern of agriculture adopted in well-endowed lands without disturbing the high-yielding cereal or other economically dominant components of the rotation.

3.5.15 Among commercial crops, area covered under high yielding varieties is available only in the case of cotton. Between 1969-70 and 1973-74 the area under main high-yielding varieties of cotton viz., Hybrid-4, Varalaxmi and MCU-5 increased from 6 thousand hectares to as much as 1.75 Mha, which formed about 23 per cent of total area under the crop during 1973-74. Evolution of Hybrid-4 and MCU-5 constitutes a significant milestone in cotton research. However, Hybrid-4 usually takes about ten months and it is necessary to develop improved varieties which can be harvested within six months under irrigated conditions. In oilseeds, groundnut is the major crop in which there has yet to be a significant breakthrough in varietal improvement. However, in the later half of the Fourth Plan period Centrally sponsored schemes for development of sunflower and soyabean, the two non-traditional oilseeds, have been taken up. While cultivation of sunflower has shown promising results, that of soyabean has not been widely established for a variety of reasons. Research on

CHART 3-9 (PARAGRAPH 3.5.12)
 AREA UNDER HIGH YIELDING VARIETIES OF FIVE
 MAJOR CEREALS 1973-74

(TARGETS & ACHIEVEMENTS)



Jute is also in progress, but no significant breakthrough has been achieved.

3.5.16 Plant protection : As an integral part of the agricultural development programme, plant protection measures, such as seed treatment, prophylactic spraying, weed control, rat control, locust control, control of epidemics, etc., received increasing attention. Commendable work was done for locust control. Area benefited by plant protection measures increased from 2.4 Mha (gross) in 1955-56 to 17.2 Mha in 1965-66. With the introduction of high yielding varieties, adoption of plant protection measures assumed added importance. Thus, the gross area benefited by plant protection measures gradually increased from 29.3 Mha in 1968-69 to 50.9 Mha in 1972-73. Initially the Fourth Plan had visualised a target of 80 Mha (gross) to be brought within the purview of various plant protection measures during 1973-74. Even though the target was subsequently scaled down to 72 Mha, the achievement was only 60.5 Mha; main shortfall being in respect of seed treatment and weed control operations.

3.5.17 A major portion of the current requirements of pesticides and plant protection equipment are being met from indigenous production. Effective adoption of plant protection measures on the part of cultivators is often inhibited by lack of technical skill in the use of pesticides and ineffectiveness of individual operations. To overcome these handicaps official plant protection services were strengthened and training facilities expanded. Steps were also taken to strengthen the agro-aviation arrangements.

3.5.18 Agricultural implements and machinery : Improved farm implements and tools to meet the needs of scientific agriculture received adequate attention only during the Third Plan period. By 1965, manufacture of improved ploughs, harrows, seed drills, levellers and hand tools was undertaken by a large number of small manufacturing firms in addition to 6 State-owned factories and 120 organised major industrial units. However, shortage of high grade iron and steel, lack of distribution and service facilities, lack of adequate and timely credit at reasonable rates for purchase of implements, and lack of competent extension machinery for demonstrating the effectiveness of improved implements were the major limiting factors to a more rapid development of the farm implement industry.

3.5.19 In the context of emphasis on intensive cultivation especially during the sixties, use of tractors for farm operations and use of oil engines and electric pumpsets for irrigation started gaining popularity. From about 9 thousand tractors in use in 1951, their number rose to the level of 21 thousand in 1956 and to 54 thousand in 1966. With the introduction of HYV and multiple cropping programmes, which involve a

tight scheduling of various farm operations, the demand for motive power has also increased considerably. With the spread of the programmes, the number of tractors in use has gone up to 170 thousand in 1972. However, this growth has not been uniform in the different States as will be seen from the data given in Table 3.27 :

TABLE 3.27
Number of Tractors in Use*

State	1966 (thousand)	1972 (thousand)	Cultivated 1971-72** area in (thousand hectares)	No. of tractors per thousand hectares of cultivated area in 1972
Andhra Pradesh	3	6	13,601	0.44
Assam	1	6	2,350	2.55
Bihar	2	7	10,123	0.69
Gujarat	3	8	10,118	0.79
Haryana	5	20	3,726	5.37
Karnataka	3	6	11,181	0.54
Kerala	(a)	2	2,211	0.90
Madhya Pradesh	3	5	19,147	0.26
Maharashtra	3	6	17,837	0.34
Orissa	1	2	6,742	0.30
Punjab	11	47	4,202	11.19
Rajasthan	4	12	17,025	0.70
Tamil Nadu	3	11	7,209	1.52
Uttar Pradesh	10	30	18,216	1.65
West Bengal	2	1	5,712	0.18
Other States and Union Territories	—	1	2,523	0.40
All India	54	170	151,923	1.12

* Eleventh All-India Livestock Census 1972 (provisional figures), DES.

(a) below 500.

**provisional.

It will be seen that as against an all-India average of one tractor per thousand hectares of cultivated area, Punjab has the highest i.e. 11 tractors followed by Haryana with over 5 tractors per thousand hectares. On the other hand the figures for West Bengal and Madhya Pradesh are significantly below the all-India average. It may be mentioned here that in addition to tractors, the use of other agricultural machinery such as power tillers, threshers etc. has also shown an upward trend during recent years.

3.5.20 In order to spread the benefits of mechanisation to a larger number of farmers, particularly those who are not able to afford costly machinery, agro-industries corporations were set up in all States for distributing tractors and other agricultural machinery on cash as well as hire-purchase basis and also to provide repair, servicing and custom hiring facilities to the farmers.

3.5.21 Soil conservation : Agricultural development largely depends on efficient use of land and water resources so as to get optimum production from them, preserving them from deterioration and improving their utility in future. To achieve this end various soil conservation measures were undertaken during the plan periods. Upto the end of 1968-69, 9.4 Mha of agricultural lands were treated with soil and water conservation measures. During the Fourth Plan period soil conservation programmes were further strengthened, greater stress being laid on area saturation approach so as to treat all types of land on a complete water shed basis. Against the Fourth Plan target of 5.4 Mha of agricultural lands and 0.5 Mha of non-agricultural lands to be covered by soil conservation measures, estimated achievement was around 6 Mha.

3.5.22 The most important programme in the Central sector is soil conservation in catchment areas of river valley projects so as to reduce the silting of reservoirs. Upto 1968-69, nearly 0.7 Mha were treated with soil conservation in the catchment areas of 13 projects. During the Fourth Plan period the programme was further intensified so as to cover critical areas in 8 additional river valley projects. As against a target of 0.60 Mha, the likely achievement was 0.48 Mha.

3.5.23 Dry farming : There are 128 districts in the country which have low to medium rainfall, i.e., less than 1125 mm annually, and very limited irrigation facilities. These districts account for nearly 68 Mha or about one half of the total net sown area. Out of these 128 districts, 91 districts spread out mainly in Madhya Pradesh, Gujarat, Maharashtra, Andhra Pradesh, Karnataka, Uttar Pradesh, parts of Haryana and Tamil Nadu represent the typical dry land farming tract. The total net sown area in these districts is estimated at about 42 Mha of which about 5 Mha are irrigated. A large part of these areas receive an annual rainfall ranging from 750 mm to 1125 mm. It is these dry lands farming areas which hold good promise of responding to a new package of technology.

3.5.24 An important objective of the Fourth Five Year Plan was to make a significant impact on dry farming and promote the economy of the farmers in dry areas. For this purpose, an All-India Coordinated Research Project was initiated with a view to developing a technological package involving water harvesting through farm ponds,

mulching, appropriate tillage, fertiliser application, crop substitution, varietal planning, plant protection and post harvest technology. In addition, 24 dry land farming projects were taken up during the Fourth Plan to test the application of new techniques for dry farming based on soil management, harvesting of water, introduction of new varieties of crops which are drought escaping and new agronomic practices.

3.5.25 Consolidation of holdings : For improving the agricultural productivity, consolidation of fragmented and scattered holdings of farmers plays an important role. With this end in view the successive five year plans laid great stress on the consolidation of holdings in different States. According to the figures given in Appendix 68.1 of Chapter 68 on Consolidation of Holdings, out of a total area of 176.6 Mha fit for consolidation, an area of 39.3 Mha or 22.3 per cent was estimated to have been consolidated upto the end of the Fourth Plan period. However, the progress of consolidation was not uniform in different States. In Punjab and Haryana the work has more or less been completed and in Uttar Pradesh good progress has been made. Maharashtra and Himachal Pradesh have also made substantial progress in consolidation work though total coverage is not yet contemplated. In Madhya Pradesh, Rajasthan, Gujarat and Karnataka progress has been rather slow. However, in Jammu & Kashmir and Bihar consolidation work is still in an experimental stage. In Andhra Pradesh (Telangana area), West Bengal, Assam and Orissa even though the necessary legislations have been enacted, there has been no progress in consolidation work. In Tamil Nadu, Kerala and Andhra area of Andhra Pradesh even the legislation for effecting consolidation of holdings has not yet been passed.

3.5.26 Agricultural credit : The various measures taken by the Government during the plan periods to step up the supply of cooperative and other institutional credit to the farmers have been indicated in Chapter 2 on Historical Review. In 1950-51, there were 1.05 lakh agricultural cooperative credit societies with a membership of 4.41 million and working capital of Rs 37.25 crores. In 1968-69 while the number of societies increased to 1.68 lakhs their membership increased to as much as 29.17 million and working capital to Rs 812.22 crores. Loans advanced by these societies to individuals rose from Rs 22 90 crores in 1950-51 to Rs 503 97 crores in 1968-69. These societies played a major role in providing short and medium term credit. While during 1950-51 these societies covered only 9 per cent of the agricultural population, the coverage increased to 42 per cent in 1968-69. The long-term credit needs of the farmers were taken care of by cooperative land development banks. The number of these banks increased from 5 in 1950-51 to 19 in 1968-

69. The quantum of fresh long-term loans advanced by such banks also rose from a paltry figure of Rs 1.38 crores in 1950-51 to Rs 148.16 crores in 1968-69. While the loans outstanding in 1950-51 amounted to Rs 6.59 crores, in 1968-69 the level rose to Rs 402.15 crores. Over 90 per cent of the loans advanced by these banks were for productive purposes; a substantial portion being accounted for by loans for minor irrigation.

3.5.27 During the Fourth Plan period a high priority was accorded to the reorganisation of agricultural credit societies into viable units. It was also decided to undertake suitable programmes directed towards the rehabilitation and re-organisation of the large number of district central cooperative banks in rural areas to stimulate the flow of adequate cooperative credit. The States of Rajasthan, Orissa, Madhya Pradesh and Kerala are reported to have nearly completed the process of re-organisation of credit societies, while Punjab and Haryana were expected to convert most of the societies into viable units by the end of the Plan period. With the re-organisation of the credit societies their number declined to 1.57 lakhs in 1971-72 but the membership increased to 32.01 million and the working capital to Rs 1276.17 crores. Cooperative credit was expected to grow to Rs 750 crores in 1973-74, as against which the loans actually advanced amounted to Rs 735 crores. Even though for the country as a whole the targets of short and medium term cooperative credit were more or less achieved, the progress was strikingly uneven between different States. According to the available data for 1971-72, five States viz., Gujarat, Madhya Pradesh, Maharashtra, Punjab and Tamil Nadu accounted for over 61 per cent of the total volume of cooperative short and medium term credit. In fact, between 1968-69 and 1972-72 the share of cooperatively underdeveloped States such as Assam, Orissa, Rajasthan and West Bengal in the total volume of cooperative credit deteriorated further. The main bottleneck was reported to be the continued existence of a high level of overdues. In the case of primary credit societies, the percentage of overdues to outstandings increased from 39 on the eve of the Fourth Plan period to 41 on 30th June, 1972. During the same period the percentage of overdues to outstandings in the case of central cooperative banks increased from 27 to 36.

3.5.28 Longterm loans advanced by cooperative land mortgage banks also recorded a further increase. During 1969-70 to 1973-74 loans advanced by these banks amounted to Rs 832 crores as against the Fourth Plan target of Rs 700 crores. However, the position regarding these loans also showed wide inter-State variations. Six States viz. Andhra Pradesh, Gujarat, Maharashtra, Punjab,

Tamil Nadu and Uttar Pradesh accounted for 72 per cent of the total ordinary loans sanctioned by the banks during 1971-72. In some States such as Punjab and Haryana the overdues were negligible while in some other States such as Assam, Gujarat, Himachal Pradesh and Orissa the overdues were over 50 per cent of the demand. In quite a number of States there was a steady deterioration in this position.

3.5.29 The Reserve Bank of India catered to the farmer's credit needs indirectly through its financing of central cooperative banks and primary cooperative societies. As against about Rs 3 crores of credit funds provided to agriculture during 1950-51, as much as Rs 618.7 crores were made available during 1973-74 for financing the credit needs of agriculture.

3.5.30 Next to cooperatives, the Fourth Plan stressed the role of commercial banks in provision of agricultural credit. As a result, the total agricultural advances of Rs 188 crores of scheduled commercial banks in June, 1969 went up to Rs 618 crores in June, 1974. There was a sharp increase in the number of agricultural loan accounts which went up to 13.73 lakhs by December, 1972 and to 18.06 lakhs by December, 1973. However, growth of advances by commercial banks to agriculture was quite uneven between different States. Six States viz., Maharashtra, Tamil Nadu, West Bengal, Karnataka, Uttar Pradesh and Andhra Pradesh accounted for as much as nearly 65 per cent of the total outstandings in December, 1973. Generally, States which are weak from the point of view of cooperative credit, also failed to attract adequate loans from commercial banks.

3.5.31 An analysis of agricultural lending by the public sector banks as on 30th March, 1973¹ revealed that nearly 60 per cent of the amount advanced was against medium and long term loans. Secondly, farmers having holdings above 2.02 ha got 74 per cent of the total credit from this source. In terms of short term advances, i.e., crop loans, 69 per cent of the accounts pertained to holdings upto 2.02 ha with a share of 45 per cent in the amount. Big holdings received 55 per cent of the amount. The average outstanding amount of short term advance came to Rs 900 per account of holdings upto 2.02 ha as against Rs 3,500 per account in the case of others. In respect of medium and long term loans, holdings upto 2.02 ha constituted 36 per cent of the total accounts with only a share of 17 per cent in the total amount. The average outstanding for these loans was Rs 2,165 per account for the small holdings as against Rs 6,161

¹ 1974 April, Reserve Bank of India Bulletin.

for others. Table 3.28 gives an idea of the growth of short term and term loans to farmers according to size classes of holdings, by public sector banks.

TABLE 3.28
Direct Finance to Farmers from Public Sector Banks (Short Term
and Term loans)*

Size of holding	(Rs in crores)			
	Amount outstanding as on			
	December, 70	December, 71	March, '73	March, 74
Upto 1.01 ha . . . }	41.30	46.72	26.76	39.65
1.01 ha to 2.02 ha . }	(22.00)	(22.72)	(11.23)	(12.24)
			35.13	45.77
			(14.74)	(14.13)
2.02 ha to 4.05 ha . . }	146.40	158.88	49.59	64.00
Above 4.05 ha . . . }	78.00	(77.28)	(20.81)	(19.76)
			126.84	174.50
			(53.22)	(53.87)
TOTAL	187.70	205.60	238.32	323.92
	(100.00)	(100.00)	(100.00)	(100.00)

* Data from Reserve Bank of India (Department of Banking Operations and Development).

NOTE : Figures in brackets represent percentages to total

According to the latest available information direct finance to farmers from the public sector banks increased to Rs 478 crores in December, 1974. It will be seen from the above table that the share of small and marginal farmers in the outstandings of loans from public sector banks rose from 22 per cent in December, 1970 to 26 per cent in March, 1974.

3.5.32 In the sphere of agricultural credit, one of the significant developments has been the increasing role of Agricultural Refinance and Development Corporation. Upto the end of 1968-69, the corporation had sanctioned 225 schemes involving an outlay of Rs 179 crores. The number of such schemes increased to 1,457 by 31-7-1974 involving a financial outlay of Rs 806.90 crores. Majority of these schemes and a very substantial part of the Corporation's commitment continued to be for minor irrigation purposes. However, the share of different States in the expansion of refinance facilities from the Corporation was extremely uneven. Six States viz., Andhra Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu and Uttar Pradesh shared nearly 70 per cent of the schemes sanctioned and about 63 per cent of the financial assistance agreed to by the Corporation. This is a reflection on the under-developed stage of land-development banking institutions in other States particularly in the eastern region of the country.

3.5.33 Education and research :- In 1951, there were 19 agricultural colleges in India turning out about 1,000 graduates per year. By 1971-72 the number of agricultural colleges went up to 71 and among them they had facilities for admitting more than 7 thousand students annually. The programme of agricultural education at the college and graduate school level was greatly improved by the development of several agricultural universities patterned along the lines of land grant universities in USA and the strengthening of the graduate training programme in the IARI. Agricultural universities combining research, resident teaching and extension were set up in all the States except Jammu & Kashmir. As already mentioned in Chapter 2 on Historical Review, ICAR was also reorganised into an autonomous body to give agricultural research greater cohesion and a new dimension. Besides, a number of research institutes were set up to undertake research in agriculture and allied fields in cooperation with agricultural universities, State Departments of Agriculture, etc.

3.5.34 Extension and training : During the plan periods greater stress was laid on extension of the findings of research to the field and training of the farmers in the adoption of these results to increase agricultural productivity. The main programmes undertaken for the purpose included setting up of extension agencies such as the Village Level Workers (VLW) and Agricultural Extension Officers (AEO); trainer's training; farmer's training and demonstration on the farmer's fields. As mentioned in Chapter 2 on Historical Review, the National Extension Service was envisaged as the main agency for bringing about the desired economic and social changes. Upto March, 1974, 95,247 VLWs were trained at 87 gram-sevaks training centres, functioning all over the country for imparting two year pre-service training. Having met the initial needs of trained VLWs, attention was given to the qualitative aspects of training with a view to improving their professional competence. By March 1974 two months refresher training had been imparted to 45,255 VLWs, while 12,824 VLWs had received one year higher training at the upgraded training centres initiated in 1964-65. Besides, arrangements were also made for imparting pre-service and in-service training to Gram Sevaks. The other training programmes undertaken included the refresher courses for AEOs, Mukhyasevikas and higher categories of district, regional and State level officers as also the training of the instructional staff. Under the scheme for farmer's training and education, 6,191 specialised short courses have been initiated for farmers and 3,161 specialised short courses for farm women. Upto 31st March, 1975 about 1.83 lakh farmers and about 0.94 lakh farm women who participated in these courses were trained in improved

farming practices. During the Fourth Plan period, farmer's education and training was sought to be given a new orientation consistent with the requirements of a complex and technology based production programme. The principal element in this was a programme of National Demonstration with 15 demonstrations in each of 100 selected HYVP districts by a team of four subject-matter specialists in soils, agronomy, plant protection and agricultural engineering. However, upto the end of the Fourth Plan period the coverage did not exceed 80 districts. By and large, due to a number of factors indicated in detail in Chapter 54 on Extension the agricultural extension work has remained inadequate.

3.5.35 Agricultural marketing : Adequate facilities to the producer for marketing the produce provide a great incentive for increasing the agricultural output. Over the successive plan periods various measures were taken to improve the marketing of agricultural produce. These included regulation of markets, market surveys, standardisation of weights and measures, grading and standardisation of agricultural produce, improvements in market intelligence etc. Upto the end of the Fourth Plan period, 17 States and 3 Union Territories had enacted legislations for the regulation of markets. The number of markets and sub-markets yards regulated on the eve of the Fourth Plan period were estimated at 1,616. The Fourth Plan laid the target of regulating all the remaining 2100 markets/sub-market yards during the period. However, as on 30th June, 1974 the total number of regulated markets in the country was 2,936 only. Progress in the regulation of markets has been uneven between different States. In Uttar Pradesh, Andhra Pradesh, Punjab and Haryana practically all the markets have been regulated. In Karnataka, Maharashtra, Gujarat, Madhya Pradesh, Orissa and Rajasthan also notable progress has been achieved while in the other states progress has been slow. Substantial progress has also been achieved in the grading and standardisation of agricultural commodities. According to the available information, on the eve of the Fourth Plan period commodities graded for internal trade numbered twenty while 33 commodities were being compulsorily graded under 'Agmark' prior to export. Grading at the farmers' level was also introduced during the Third Plan period and on the eve of the Fourth Plan period 450 agricultural produce grading units were being operated by various agencies such as regulated markets, cooperative societies, Central and State warehouses etc. Against the target of 600 grading units to be added during the Fourth Plan period, the likely achievement is 500 units. However, despite the progress made in the setting up of grading facilities, the share of agricultural produce sold after grading to the total

marketable surplus continues to be negligible.

3.5.36 Price incentive : The level and stability of prices paid to cultivators has an important influence on agricultural production. To give an incentive to the primary producers, the Government of India had been following a policy of price support since June, 1957. Further measures taken during this period to make the price policy producer oriented have already been discussed in Chapter 2 on Historical Review.

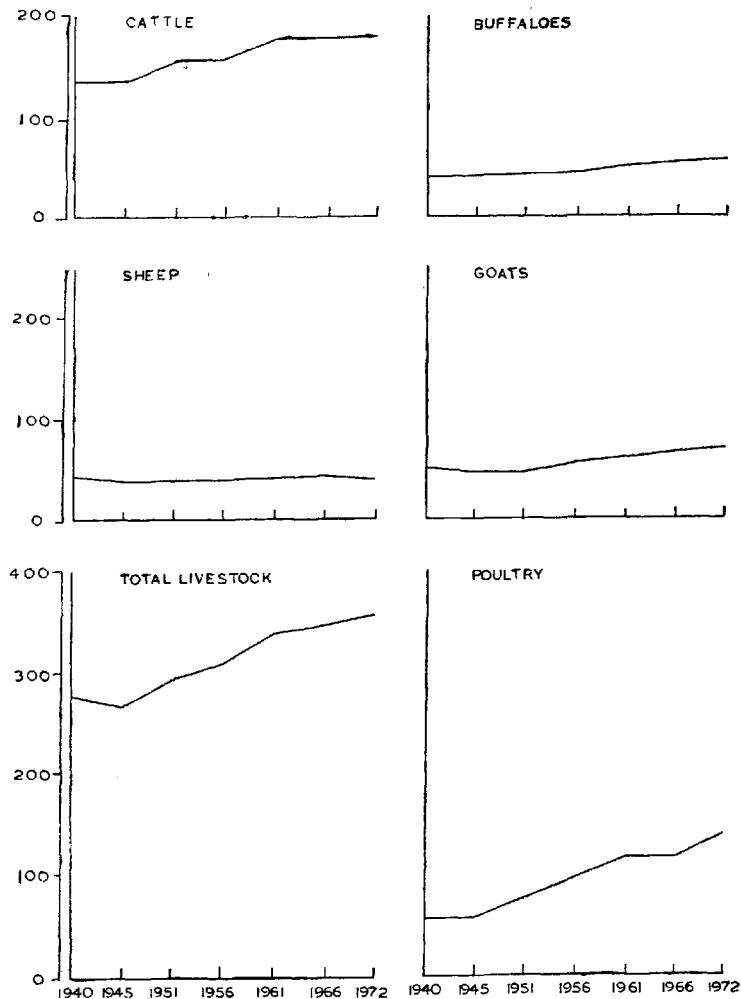
6 ANIMAL HUSBANDRY

Pre-Plan Period

3.6.1 Livestock rearing in India during the period had been carried on under a variety of adverse environmental conditions. This was generally pursued by small cultivators for whom livestock raising was an occupation subsidiary to crop production. Enormity of numbers coupled with poor quality of stock contributed to low productivity. Institutional development and policies for animal husbandry development followed during the pre-plan period have been indicated briefly in Chapter 2 on Historical Review. Broadly these aimed at better breeding and feeding and protection of stock against diseases. Implementation of the various programmes undertaken during this period was undoubtedly slow, and any progress achieved could not be properly assessed due to non-availability of required data. Except for the quinquennial census of livestock population initiated in 1919-20, no other data were regularly or systematically collected. Even data on livestock numbers collected through various censuses during the earlier period were not comparable over time due to changes in coverage, period of enumeration, classification, concepts, etc. As such, an objective assessment of the trends in numbers of different categories of livestock over a long period is not possible.

3.6.2 Livestock numbers and products : Livestock population showed a decline during 1945 as compared to that in 1940 while the number of poultry showed an increase. However, in 1951 there was an increase in almost all categories of livestock and an appreciable increase in the number of poultry. In the 11-year period from 1940 to 1951 the population of cattle and buffaloes recorded an increase whereas sheep, goats, horses and ponies registered a decline with the result that total livestock population went up only by 6 per cent. However, the number of poultry went up by as much as 28 per cent. Chart 3.10 depicts the growth of livestock and poultry

GROWTH OF LIVESTOCK AND POULTRY POPULATION (MILLION NUMBERS)



population during this period. According to the estimates published by the Central Statistical Organisation (CSO), annual production of milk (cow, buffalo and goat) was placed at 17.1 million tonnes in 1940, 18.0 million tonnes in 1945 and 17.4 million tonnes in 1951. In per capita per day terms the availability of milk worked out to 150g of milk in 1940, 147g in 1945 and 132g in 1951. Thus, in spite of a large bovine population in the country, the per capita availability of milk was not only low but also showed a decline. Production of hides and skins was estimated at 50.7 million pieces in 1945 and 50.6 million pieces in 1950-51. Production of eggs was placed at 1054 million during 1950-51. The total production of raw wool was estimated at 24.7 thousand tonnes in 1945 and 27.5 thousand tonnes in 1951.

3.6.3 Improvement of cattle breeds : As a sequel to the recommendations of RCA for improvement in cattle breeds, work was initiated by ICAR on pedigree registration and recording of milk production for different breeds of cattle. As an improvement to this system Herd Books were introduced in 1941 for important improved breeds of cattle like *Hariana*, *Kankrej*, *Gir*, *Tharparkar*, etc. and one breed of buffalo, viz. *Murrah*. However, progress in registration of cattle and buffaloes under this scheme was very slow. Also, the Council's efforts in launching selective breeding projects on draught breeds like *Hariana* and *Kangayan* and in putting milk into these breeds without affecting the draught quality also proved inadequate to meet the growing difficulty caused by unchecked breeding in the country. An answer to the difficulty posed by the scarcity of sires for breeding purposes was provided by introduction of artificial insemination following trials carried out since 1942 at the Indian Veterinary Research Institute (IVRI), Izatnagar. The desirability of adopting artificial insemination method to Indian conditions was also advocated by the Famine inquiry Commission, 1945. Progress regarding castration of inferior bulls varied from Province to Province. The proportion of uncastrated bulls continued to be large.

3.6.4 Feed and fodder : For improving the fodder for cattle new types of grasses viz., elephant grass and guinea grass were introduced in some places in Uttar Pradesh where conditions were suitable. Rotational grazing was also adopted in some forest areas. Cultivation of fodder crops like berseem and lucerne was on the increase in Bihar, Orissa, Bombay and Uttar Pradesh. Bombay had introduced soyabean in some areas and *dhaincha* in marshy and partly water-logged soils.

Five Year Plans

3.6.5 Public sector expenditure : As little progress was made during the pre-plan period, increasing attention was given under the five year plans to the development of the livestock sector. For successful implementation of the various developmental measures, public sector expenditure on animal husbandry and dairying was considerably stepped up as indicated in Table 3.29.

TABLE 3.29
Public Sector Expenditure*

Period	(Rs. in crores)		
	Animal husbandry including dairying and milk supply	Total agriculture including irrigation and flood control	Col. (2) as per cent of col. (3)
First Plan	16	724	2.2
Second Plan	33	949	3.5
Third Plan	77	1,754	4.4
Annual Plans	60	1,578	3.8
Fourth Plan**	166	3,948	4.2

* Indian Agriculture in Brief, Tenth and Thirteenth Editions, DES.

** Anticipated expenditure.

3.6.6 Livestock and poultry population : Estimates of number of livestock and poultry in India since 1951 are given in Table 3.30. These are also depicted in Chart 3.10 referred to earlier in Paragraph 3.6.2.

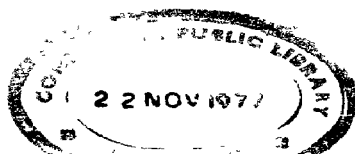


TABLE 4.36
Number of Livestock and Poultry—Indian Union*

Livestock/poultry	1951	1956	1961	1966	1972	(million)			
						Percentage		increase decrease (-) of	or
						col. (4) over col. (2)	col. (5) over col. (4)		
cattle	135.30	158.67	175.56	176.18	178.87	(+13.0	(+0.4	(+)	11.5
buffaloes	43.40	44.95	51.21	52.96	57.94	(+18.0	(+3.4	(+)	9.4
sheep	39.05	39.26	40.22	42.01	40.39	(+3.0	(+4.5	(-)	3.9
goats	47.15	55.45	60.86	64.59	68.02	(+29.1	(+6.1	(+)	5.3
horses and ponies	1.51	1.48	1.33	1.15	0.97	(-11.9	(-13.5	(-)	15.7
other livestock	6.37	6.81	7.25	7.22	8.79	(+13.8	(-0.4	(+)	21.7
total									
livestock	292.78	306.62	336.43	344.11	354.98	(+14.9	(+2.3	(+)	3.2
poultry	73.55	94.76	114.25	115.45	136.77	(+35.3	(+11.1	(+)	18.5

* (i) Statistical Abstract India 1970—CSO

(ii) Eleventh All India Livestock Census 1972 (Provisional Figures), DES.

The above data reveal that the total livestock population increased by as much as 15 per cent between 1951 and 1961 but after 1961, there was deceleration in the growth of population. However, number of buffaloes registered significant increase, particularly between 1966 and 1972. Population of sheep did not register any significant increase; in fact between 1966 and 1972 their number registered a decline of nearly 4 per cent. The number of poultry registered an increase of 55 per cent between 1951 and 1961. Between 1961 and 1966 the number of poultry remained more or less steady, but between 1966 and 1972 their number again increased by nearly 19 per cent.

3.6.7 A slow change is noticed in the composition of bovine population in the country. From the point of view of milk production, buffalo has remained the predominant milch animal. Though male cattle and buffaloes continue to retain their position as the main source of draught power, female cattle and buffaloes used for work have declined in importance.

3.6.8 Output of livestock products : During the pre-plan period efforts that were made were not adequate either to increase the productivity of animals substantially or to develop the animal husbandry enterprise on a commercial basis. However, efforts made in this direction during the successive plan periods had some impact on the output of the various livestock products, as will be seen from the data given in Table 3.31.

TABLE 3.31
Output of Livestock Products*

Item	Unit	Average 1948-52	Average 1961-65	1973	Percentage increase (+) or decrease (-)	
					col (4) over col (3)	col (5) over col (4)
Milk (cow, buffalo, goat)	thousand tonnes	17,406	20,149	24,670 (F)	(+)15.8	(+)22.4
per capita availability						
meat (beef, mutton, pork)	grams/day	133	119	118	(-)10.5	(-)0.8
	thousand tonnes	469	561 (F)	623 (F)	(+)19.6	(+)11.1
per capita availability	kg/year	1.3	1.2	1.1	(-)7.7	(-)8.3
eggs	million number	1,832 (a)	2,881 (d)	7,700**	(+)57.3	(+)167.3
per capita availability	number/year	5.1	6.6	13.1	(+)29.4	(+)98.5
hides and skins	thousand tonnes	N.A.	657	1,737	N.A.	(+)164.4
wool (raw)	Do	27.5(a)	35.0(b)	39.3(c)	(+)27.3	(+)12.3
edible pig fat	Do	1.9(F)	3.4(F)	4.0(c)	(+)78.9	(+)17.6
tallow and inedible pig fat	Do.	27(F)	31(F)	33(F)	(+)14.8	(+)6.4

* (i) FAO Production Year Book, 1971, 1972 and 1973.

(ii) Statistical Abstract India, 1972 (CSO).

(iii) Data from Ministry of Agriculture and Irrigation, Government of India.

N.A.—not available (F)=FAO estimates

** relates to the year 1973-74

(a)—relates to the year 1951

(b)—relates to the year 1966

(c)—relates to the year 1969

(d)—relates to the year 1961

(e)—relates to the year 1971

Thus, over a period of two decades production of milk has increased by about 42 per cent, of meat by nearly 33 per cent and of eggs by nearly 320 per cent. However, in spite of this increase in production the per capita availability of milk and meat registered a decline. In the case of milk the per capita availability declined from 133g during the quinquennium ending 1952 to 118g during 1973. It will be seen from Table 3.31 that during the past two decades the per capita availability of meat has declined from 1.3 kg to 1.1 kg per year. Even though the per capita availability of eggs per year increased from 5.1 during 1951 to 13.1 during 1974, the present availability is still far short of requirements.

3.6.9 During the plan periods, the output of other livestock products viz hides and skins, wool, edible pig fat and tallow and inedible pig fat registered an increase. During 1973 production of hides and skins was nearly 164 per cent higher as compared to the average production of 657 thousand tonnes during the quinquennium ending 1965. The production of wool (raw) was about 43 per cent higher in 1971 as compared to that in 1951. Whereas the production of edible pig fat has nearly doubled, that of tallow and inedible pig fat has increased by over 22 per cent.

3.6.10 Policies and programmes followed during the successive plan periods for the development of animal husbandry have been indicated in Chapter 28 on Cattle and Buffaloes. For improving the quality of cattle and buffaloes, the 'Key Village Scheme' was taken up in August, 1952. The scheme envisaged simultaneous attention to all factors having a bearing on the productivity of cattle and buffaloes; the ultimate object being to increase milk production and their working efficiency. This was sought to be achieved by setting up of a number of key village blocks in selected areas with provision for controlled breeding by superior bulls either by natural service or by artificial insemination. The scheme also envisaged castration of scrub bulls and increased production of feeds and fodder. In all by the end of 1960-61, 407 key village blocks comprising about 2000 key village units were established. By 1960, 670 artificial insemination centres had been set up. The key village scheme was reorganised during the Third Plan period in the light of the improvements suggested by an Expert Committee appointed by the Government of India. By the end of 1965-66, the number of key village blocks increased to 498 and by the end of 1973-74 to 621.

3.6.11 Intensive Cattle Development Project : During the First and the Second Plan periods as also the major part of the Third Plan period, Key Village Scheme constituted the main programme for cattle development. However, key village blocks set up under the

scheme covered only a limited area and did not make sufficient impact on cattle improvement. Area approach to provide *inter-alia* technical inputs and marketing facilities was adopted in the field of animal husbandry during 1964-65 when a new scheme known as Intensive Cattle Development Project was initiated. The objectives of this scheme have been indicated in detail in chapter 28 on Cattle and Buffaloes. At the beginning of the Fourth Plan period 31 intensive cattle development projects were in operation. Their number increased to 55 by the end of 1972-73 and 7 more projects were taken up during 1973-74. A review of the progress made of the selected items of work under these projects at the beginning of the Fifth Plan period revealed some encouraging achievements under the programme, though there was also a marked gap between the progress envisaged and actual performance. In particular, these projects did not seem to have made desired impact on the level of milk production in the selected areas. It was noted that most of the technical inputs provided to these projects were far below the desired levels.

3.6.12 Successful implementation of cattle breeding programmes depends largely on the availability of adequate number of bulls of superior breeds. At the beginning of the Third Plan period 125 Government cattle breeding farms were functioning in the various States but the total production of bulls was in the neighbourhood of about 5,000 which was only a fraction of the number actually needed. The Third and the Fourth Five Year Plans, therefore, laid emphasis on increasing the number of cattle breeding farms and provided for the setting up of 19 bull rearing farms. According to the available information, 143 cattle breeding farms were established in various States up to the end of 1973. In addition to the cattle breeding farms in the State sector it was decided to set up 6 large sized farms, two for cattle breeds of all-India importance, two for exotic breeds and two for buffaloes in the Central Sector. Upto the end of the Fourth Plan period five of these farms were established. Also to meet the requirements of bulls of exotic breeds for the cross breeding programme, semen of superior exotic bulls is being used for artificial insemination of local cows.

3.6.13 The scheme for progeny testing of bulls required for key village areas and cattle farms was initiated during the Second Plan period and two units set up for testing *Hariana* breed of cattle and *Murrah* breed of buffaloes. During the Fourth Plan period progeny testing units were proposed to be set up at 10 state farms under a Centrally sponsored progeny testing programme initiated in 1971-72. Certain other breeds like *Jersey*, *Red Dane*, *Sahiwal*, *Gir*, and *Red Sindhi* were also proposed to be covered. During the period, however,

the programme could be taken up only at 9 selected farms.

3.6.14 A scheme for milk recording was initiated during the Third Plan period as an important means for securing cattle improvement. Under the scheme one unit was set up at Rohtak (Haryana) for registration of *Hariana* breed of cattle and *Murrah* breed of buffaloes. During the Fourth Plan period, another unit was set up at Ahmedabad for registration of *Gir* and *Kankrej* breed of cattle. By the end of Fourth Plan period, 60 milk recording centres were functioning under the unit at Rohtak and 30 under the unit at Ahmedabad.

3.6.15 One of the serious problems affecting cattle development is the presence of a large number of uneconomic cattle which constitute a heavy drain on the scarce feed and fodder resources. Weeding of this inferior stock was, therefore, a necessary complement to the programme of cattle improvement and systematic breeding. The *Gosadan* scheme which was worked out by the Cattle Preservation and Development Committee in 1948 was, therefore, introduced during the First Plan period as a partial answer to this problem. By the end of the First Plan period only 25 *gosadans* were set up. The number of *gosadans* increased to 61 by the end of 1960-61 and to 79 by the end of 1970-71. These included 2 *gosadans* in the Central sector run by the Central Council of Gosamvardhana. The progress made in the implementation of this scheme has not been up to expectations due to non-availability of suitable sites in the interior of forest areas where necessary grazing facilities were available, lack of adequate transport facilities over long distances and in some States the absence of legislative sanction for removing unproductive and stray cattle to *gosadans*. However, during the last two decades there has been a progressive decline in the number of unwanted cattle and buffaloes, the proportion of which in the total bovine population has declined from 2.3 per cent in 1951 to 1.2 per cent in 1972.

3.6.16 An important scheme for salvaging *Murrah* buffalo calves from milk colonies for distribution all over the country was undertaken during the Second Plan period. During the Fourth Plan period, an All-India Coordinated Research Project on buffaloes was initiated with the object of increasing their production potential.

3.6.17 Feed and fodder: An important pre-requisite of livestock development is the availability of adequate feed and fodder resources. The effects of better breeding can be largely negated if animals are not properly fed. The First Five Year Plan laid stress on improving the supply of feeds and fodders by introduction of leguminous fodders such as lucerne, berseem, cow peas, field peas etc. in crop rotations in irrigated areas; by exploring the possibility of growing kudzu vine and clovers etc.; hay making; and laying emphasis on rotational graz-

ing in improved pastures. The Second Plan stressed the need for growing most of the fodder on the holdings of the farmers. An important development during the period was the setting up of a Fodder Bank to meet the requirements of fodder at times of scarcity. During the Third Plan period, emphasis was laid on forage improvement at livestock farms, establishment of forage demonstration plots in villages, distribution of fodder seeds/planting materials, and establishment of fodder demonstration-cum-training centres. A Forage and Grassland Research Institute was set up at Jhansi (Uttar Pradesh) in 1962. However, schemes for the development of feed and fodder resources, mixed farming and fodder banks, did not make much headway.

3.6.18 Possibilities of increasing area under fodder crops in the country being limited the development of fodder resources depended largely on the multiplication of high quality seeds of different forage crop varieties. With this end in view, 16 fodder seed production farms were set up in various States upto 1968-69. The Fourth Plan envisaged setting up of another 23 seed farms and during the first three years of the Plan period 14 farms were set up in different States. During 1972-73 and 1973-74, work on the setting up of another eight farms was also taken up. In the Central sector, seven regional forage demonstration stations were set up with the objective of evolving a fodder calendar suitable to the various regions and demonstrating the economics of fodder crop cultivation. Several livestock feed compounding plants were established for providing balanced feed to livestock particularly cattle and poultry.

3.6.19 Dairying and milk supply : Poor quality of cattle and buffaloes high incidence of diseases, insufficiency of feeds and fodders, lack of organised production and marketing facilities and improper handling of milk and milk products are the main constraints in the development of dairy industry. The First Plan estimated that about 60 to 70 per cent of the fluid milk requirements of urban areas were met from cattle and buffaloes maintained within the municipal limits and only 30 to 40 per cent from the villages situated within 30 miles of these areas. A few *pinjrapoles*, *gaushalas* and cooperatives were engaged in dairy farming for the supply of milk to urban areas but these met only a fraction of the total demand. There were about 75 organised dairy farms in the Indian Union in 1949, most of which belonged to the military and civil departments of Governments.

3.6.20 Dairy development in India received a fillip after Independence. The First Five Year Plan provided for 27 schemes for dairying and milk supply in the State sector at a cost of Rs 7.81 crores. Though organisation of milk supply to Bombay and Calcutta constituted the major programmes undertaken during this period, dairy

development was also initiated in other States such as Andhra Pradesh, Bihar, Madhya Pradesh, Orissa, Tamil Nadu and Uttar Pradesh. During the Second Plan period seven liquid milk plants were established and 8 pilot schemes were initiated as a prelude to the establishment of more dairy plants. Further, work was initiated on the establishment of three creameries, two milk product factories and 31 liquid milk plants. As a result of the measures taken during the Third and the Annual Plan Periods, 48 liquid milk plants, 7 milk product factories and 37 pilot milk schemes were in operation on the eve of the Fourth Five Year Plan.

3.6.21 The Fourth Five Year Plan envisaged a multipronged drive towards development of dairy industry. These included measures for improving the functioning of the projects already set up, completion of the schemes spilling over from the earlier period, extension of organised dairy industry to smaller towns by taking up new schemes in towns with a population of about 50,000 and setting up of rural dairy centres in areas with a population of less than 50,000 so as to provide chilling and marketing facilities in isolated pockets of milk production. By the end of the Fourth Plan period, while all the 35 spill-over schemes and 7 new schemes were likely to be commissioned, out of the balance of 34 new schemes, work was initiated on 24. As regards milk-product factories, 7 spilled over and 4 new factories were likely to be commissioned by the end of the Plan period and 3 factories to spill-over to the Fifth Plan.

3.6.22 One of the important programmes taken up during the Fourth Plan period was the 'Operation Flood'. The broad objectives of the programme have been indicated in Chapter 29 on Dairy Development. Under an agreement signed in March 1970, the World Food Programme (WFP) authorities agreed to supply free of cost 1.26 lakh tonnes of skimmed milk powder and 0.42 lakh tonnes of butter oil, which when constituted into liquid milk by the four metropolitan dairies at Bombay, Calcutta, Delhi and Madras would generate funds worth about Rs 95 crores. The generated funds were to be utilised for providing grant (30 per cent) and loan (70 per cent) assistance to the State Governments for the expansion of milk processing facilities and for enhancement of milk production and procurement programmes. It was planned to increase milk processing facilities of the metropolitan dairies from 1.00 million litres in 1970-71 to 2.75 million litres per day in 1973-74. To implement this programme Government of India set up the Indian Dairy Corporation (IDC) and between July, 1970 and May, 1973 the Corporation generated funds of the order of Rs 17.8 crores by the sale of commodities received from WFP and incurred an expenditure of Rs 14 crores.

3.6.23 Sheep and wool development : In spite of the fact that India possesses a large sheep population of around 40 million, the indigenous production of fine wool is far short of requirements. The clip is generally of coarse quality and the bulk of it is classified as 'carpet wool'. Fine quality wool has, therefore, to be imported. The average yield of wool from a *Rajasthan* sheep is 1.4 kg while exotic fine wool breeds produce about 5 to 6 kg of wool annually. There is, thus, considerable scope for improvement both in quality and quantity of wool produced in the country. Since the advent of planning, efforts have been made for improvements in both these directions. During the First Plan period a programme for development of sheep on regional basis was drawn up by the ICAR. Under this programme three regional centres were established in important wool producing areas viz. hilly regions of Uttar Pradesh and the area of the then Punjab and Rajasthan and the Deccan Plateau. It was envisaged that improvement in the quality of sheep in the plains would be achieved through selective breeding where distinct breeds existed and through cross breeding with *merino* breed in the hills. Cross breeding with *merino* sheep gave valuable results both in respect of the quantity and quality of wool produced. Encouraging results were also obtained from selective breeding and from grading up local inferior sheep.

3.6.24 During the Second Plan period, four sheep breeding farms for the production of superior rams were started and rams produced in these farms distributed to 305 sheep and wool extension centres in the established breeding tracts for the improvement of local stock. In addition to providing breeding facilities, these centres also demonstrate improved methods of shearing, grading and marketing. By the end of the Third Plan period the number of sheep breeding farms increased to 24 and that of sheep and wool extension centres to 461. Sheep and wool development programmes were continued during the three Annual Plans with the result that on the eve of the Fourth Plan period, 35 state sheep breeding farms, 547 sheep and wool extension centres and 9 sheep shearing, wool grading and marketing centres were in existence. Programmes undertaken during the Fourth Plan included the setting up of eight large sheep breeding farms in the Central and Centrally sponsored sectors, expansion and reorganisation of 35 existing state farms and the establishment of 9 new state farms. In addition, two large exotic sheep breeding farms have been established in Gujarat and Maharashtra in the private sector. The Fourth Plan also visualised establishment of 64 additional sheep and wool extension centres. As against this target, the achievement was around 288 centres. However, out of the 14 wool grading-cum-

marketing centres proposed to be set up, only 4 are likely to become operative.

3.6.25 Piggery development : Swine husbandry, by tradition, has been a subsidiary occupation of *harijans* and other weaker sections who are socially backward and economically poor. However, despite the importance of the species, pig production did not receive any attention till recently. Efforts were made from the Second Plan period onwards to promote piggery development. The number of stations/units/farms/blocks/and bacon factories set up during the different periods were as under :

	Bacon factories	Regional pig breeding stations	Pig breed- ing units/ farms	Piggery development blocks
Second Plan	2	2	15	33
Third Plan	6	5	37	107
Fourth Plan	—	—	3	—
Total	8	7	55	140

The primary objective of regional pig breeding stations was to acclimatise and further improve the breeding stock of exotic pigs through selective breeding for distribution to pig breeding farms/units for further multiplication. A secondary objective was to supply pigs to the bacon factories from culled or surplus stock. The pigs produced at the breeding farms units were distributed in compact rural areas for grading up the local stock.

3.6.26 Poultry development : Before the planning era no organised efforts were made to develop poultry industry in the country. The average indigenous hen produced about 50 eggs per year. Poultry breeders suffered heavy losses by frequent outbreaks of diseases such as *Ranikhet*, *Fowlpox*, etc

3.6.27 Policies and programmes of poultry development pursued during the plan periods have been briefly indicated in Chapter 31 on Poultry. Broadly the aim was to improve the poultry breeds, educate the farmers in regard to modern poultry farming and supply them with good seed material and other inputs for increasing the production of eggs in the country. As a first step in this direction 33 extension centres were set up during the First Plan period. During the Second Plan period besides increasing the number of these centres to 269, five regional Central Government Poultry Farms were established in different agro-climatic regions for acclimatisation and propagation of improved stocks. For improving the breeds, 30,000 day-old chicks of *White Leghorn* and *Rhode Island Red* breeds drawn from reputed firms in USA were received under Technical Cooperation Mission aid alongwith poultry farming equipment. In national extension

and community project areas vaccination of poultry against various diseases was also taken up on an increasing scale.

3.6.28 As a result of the measures taken during the First and the Second Plan periods, poultry farming became lucrative and instead of being continued as a subsidiary enterprise was taken up on a commercial basis. This helped in the growth of ancillary industries such as organised poultry feed, poultry equipment and sales organisations for eggs and dressed birds. During the Third Plan, 53 Intensive Poultry Production-cum-Marketing Centres were set up with an area development and package approach. During the sixties private entrepreneurs were encouraged to establish franchise hatcheries for production of high egg producing hybrid chicks. Essential facilities for broiler production were also created during this period.

3.6.29 During the Fourth Plan period the Coordinated Poultry Breeding Programme for evolving high egg producing strains of births was continued at the three central poultry breeding farms set up at Bangalore, Bhubaneswar and Bombay and 10 state farms. In addition, 19 new poultry breeding farms were set up and 92 existing ones expanded. Further 28 intensive egg and poultry production-cum-marketing centres were established raising the number of such centres by the end of 1973-74 to 81. During the period a number of poultry feed manufacturing units were set up both in the private and public sectors. However, due to the shortage of essential feed ingredients and high cost of maize and fish meal, the price of feed remained high.

3.6.30 As a result of the measures taken during the successive plan periods, the poultry sector has made encouraging progress in increasing the national production of eggs and providing employment to people. Using imported breeding material from USA and Australia as foundation stock, the coordinated breeding programme launched at 29 Central and State farms has evolved strains/strain crosses, which have given production at the Random Sample Laying Test Unit, Bangalore equal to or even higher than that of the hybrid stock propagated by the foreign collaborating industries. The highest hen-housed average production recorded so far is 232.8 eggs over a laying period of 11 months. These stocks are now being tested at different locations in varying agro-climatic conditions. However, considering the per capita availability of eggs, the country's production is still far short of requirements.

3 6 31 Animal health : Alongwith the improvements in breeds and feeds, steps were also taken during the successive plan periods to insure the livestock population in the country against diseases and epidemics with the help of various preventive as well as protective measures

During the First Plan period eradication of *rinderpest*, which accounted for as much as 60 per cent of total cattle mortality received high priority. The programme made good progress and by the end of 1962-63 about 92 per cent of total inoculable bovine population was vaccinated against the disease. In addition to the main campaign a follow-up programme was also undertaken to set up (a) immune belts stretching to a depth of about 20 km along the inter-State borders and (b) quarantine and check-up stations at important points of entry of animals. Both the main campaign as also the follow-up programme continued during the Third and Fourth Plan periods. As recommended by the Central Rinderpest Control Committee, by the end of the Fourth Plan period 60 vigilance units and 64 check-posts were set up on important cattle routes at the inter-State and inter-national borders. Further, with a view to checking the introduction of diseases into the country through import of livestock and to ensure disease-free exports of livestock and livestock products a beginning has been made to set up animal quarantine stations at Delhi and Madras. Another station is being set up at Bombay. Alongwith the control of *rinderpest*, steps were also taken for controlling other animal diseases, particularly *foot and mouth disease*, *Haemorrhagic Septicaemia*, *Black quarter* and *Anthrax* by making suitable provisions in the State plans. The State biological products centres were strengthened and steps were taken to improve the disease investigation and diagnostic units.

3.6.32 Along with the aforesaid preventive measures, steps were taken to protect the animals against diseases by improving veterinary facilities. Veterinary hospitals and dispensaries which numbered about 2,000 on the eve of the First Plan increased to 2,650 by the end of the period and to 4,000 by the end of the Second Plan period. The Third Plan envisaged to cover every development block with at least one veterinary hospital or dispensary by increasing their number to 8,000. By the end of the Fourth Plan period the number of such hospital/dispensaries increased to about 9,500.

3.6.33 Modernisation of slaughter houses : For development of meat industry one of the important pre-requisites is that all slaughter houses should be properly equipped. According to the available information there are at present about 2,800 slaughter houses in the country operating under local bodies, but excepting a few, these do not have even the minimum facilities required to produce wholesome meat. In addition, there are a number of clandestine slaughter houses all over the country upon which there is no strict control due to lack of proper infrastructure to regulate meat hygiene practices.

3.6.34 In Order to create conditions conducive to the adoption of humane methods of slaughtering and the production of clean and

wholesome meat, proper *ante-mortem* and *post-mortem* examination, and for the utilisation of the valuable by-products, a scheme for modernisation of slaughter houses was taken up during the Third Plan period with an outlay of Rs. 3.03 crores. The scheme did not make much headway as many of the State Governments and municipal corporations were unable to meet the capital investment involved therein. Besides, slaughter house expertise was also not adequately available in the country.

3.6.35 The Fourth Five Year Plan envisaged setting up of 14 slaughter houses as commercial corporations and modernising the existing ones. However, due to certain socio-economic factors and various bottlenecks in organising commercial corporations, the progress was very slow. Only a few such corporations were set up in Goa, Bangalore, Hyderabad, Durgapur and Madras. The Greater Bombay Municipal Corporation has established a modern abattoir in Deonar with an investment of Rs 4.2 crores for catering to the needs of the Greater Bombay Metropolitan area. Ministry of Defence Production has also constructed a modern meat plant in Hazaratpur near Tundla for the manufacture of freeze dried meat for the army. Preliminary schemes have been worked out for the modernisation of abattoirs at Surat, Poona, Nagpur and Jaipur.

3.6.36 Education and training : Facilities for veterinary education and training also received impetus during the plan periods. At present 21 veterinary colleges are offering Bachelor's degree level education in veterinary science. Post-graduate and Doctoral level education is also imparted at most of these institutes. Besides there is a post-graduate college at the IVRI and a post graduate institute at the Punjab Rao Krishi Vidyapeth, Akola. In the field of dairying, besides the facilities for Bachelor's degree courses, facilities for training at Master's and Doctorate degree levels in a large number of subjects have been created at the National Dairy Research Institute (NDRI), Karnal. Master's degree programme in dairy technology is offered by the Allahabad Agricultural Institute. Post graduate training in dairy engineering can be obtained from the Indian Institute of Technology, Kharagpur. At the NDRI, IVRI and some agricultural universities facilities have been created for post-doctoral research work.

7 FISHERIES

Pre-Plan Period

3.7.1 Most of the Provincial Governments looked upon fisheries as a source of revenue and paid little attention towards research and

development aspects. The RCA recommended that a longer view should be taken of the possibilities of developing the fisheries of the country to improve the diet of the Indian people. As already mentioned in Chapter 2 on Historical Review, a Fish Sub-Committee (1945) of the Policy Committee No. 5 on Agriculture, Forestry and Fisheries was constituted to suggest measures for increasing fish production. The Sub-Committee's main recommendation was that the Government of India should provide the necessary funds, staff and machinery for affording assistance in the comprehensive programme based on all-India policy for survey of fishery resources, initiation and coordination of research development and exploitation of varied fishery resources, improving the socio-economic conditions of fishermen, providing modern and efficient craft and gear and organising the fish trade.

3.7.2 Before the commencement of planning, several schemes had already been undertaken to help the fishermen and their cooperative societies to purchase cotton yarn for fishing nets, salt for curing fish, small boats for fishing and other equipment, and raising the seedfish for stocking of ponds and tanks. These activities resulted in a steady growth in fish production, preservation and marketing. Fish production during the triennium preceding the First Plan was of the order of 628 thousand tonnes, contribution from marine and inland fisheries being 446 and 182 thousand tonnes respectively.

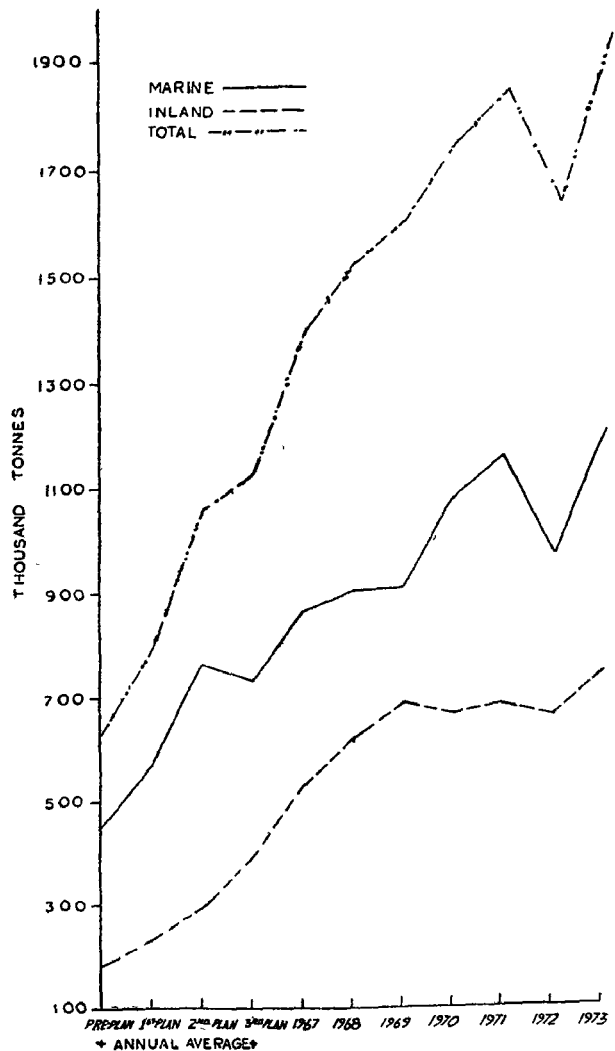
3.7.3 Before the establishment of the three national fisheries research institutions, research in fisheries was mainly confined to some aspects of systematics, biology of aquatic animals and fundamentals of hydrobiology of aquatic resources conducted in the State Fisheries Departments and in the universities as *ad hoc* schemes with grants from the ICAR.

3.7.4 With regard to education and training in fisheries, training for the licentiates in fisheries technology and navigation courses was organised at the Central Polytechnic by the erstwhile Madras Government at Kakinada (now in Andhra Pradesh) in 1946 and the Polytechnic of the Kerala State at Kalamassery. Institutional training in inland and marine fisheries was organised in 1948 at the respective Central research institutes, and the graduate trainees were mostly nominated by the Governments in the Provinces and in the States.

Five Year Plans

3.7.5 Public sector expenditure : As very little progress was made during the pre-plan period, a number of schemes for raising production of marine and inland fish to meet the minimum nutritional requirements in the country; to develop export potential as well as reduce

PRODUCTION OF MARINE AND INLAND FISH



wastage by introduction of improved forms of storage, transport and efficient processing and marketing and to improve the economy of fishermen were undertaken under the five year plans. For successful implementation of the various developmental measures, public sector expenditure on fisheries was considerably stepped up from plan to plan as indicated in Table 3.32.

TABLE 3.32
Public Sector Expenditure on Fisheries Development*

Period	Expenditure on fisheries	Total expenditure on agriculture including irrigation and flood control	(Rs. crores)
			Col. 2 as per cent of col. 3
First Plan	2.7	724	0.4
Second Plan	9.1	949	1.0
Third Plan	22.5	1,754	1.3
Annual Plans	36.9	1,578	2.3
Fourth Plan**	59.4	3,948	1.5

* Indian Agriculture in Brief 10th and 13th Editions, DES.

** Anticipated expenditure.

3.7.6 Production : The average annual fish production, both marine and inland, during each plan period is given in Table 3.33. Chart 3.11 (p. 315) also depicts the growth in production of fish in the country since the pre-plan period.

TABLE 3.33
Fish Production in India—Planwise*

Period	Average annual production (thousand tonnes)		
	marine	inland	total
Pre-Plan	446	182	628
First Plan	565	231	796
Second Plan	762	296	1,058
Third Plan	734	393	1,127
Three Annual Plans	886	546	1,432
Fourth Plan**	1,210	748	1,958

(i) 1974, January, Ninth meeting of the Central Board of Fisheries Statistical Supplement.

(ii) Data from Fisheries Division, Ministry of Agriculture and Irrigation.

** Relates to 1973.

It will be seen that production of inland fisheries, which had large unexploited potential at the beginning of the First Plan period increased

at a faster rate than that of marine fisheries. Statewise estimates of production of marine and inland fish for the years 1967 to 1973 are given in Appendix 3.17. It will be seen that in the case of marine fish, the States of Kerala, Maharashtra and Tamil Nadu accounted for over two-thirds of the total catches in 1973. In Kerala, the most important marine fish producing State, marine fish catches increased from 200 thousand tonnes in 1963 to 445 thousand tonnes in 1971 but declined to a low level of 292 thousand tonnes in 1972. There was some recovery in 1973 when production increased to 351 thousand tonnes. In Maharashtra and Tamil Nadu, marine fish catches increased from 130 thousand tonnes and 110 thousand tonnes respectively in 1963 to 292 and 183 thousand tonnes respectively in 1973. In the case of inland fish, the States of West Bengal, Tamil Nadu, Andhra Pradesh and Bihar accounted for over 70 per cent of all-India production. In the case of West Bengal, production of inland fish increased from 34 thousand tonnes in 1963 to 235 thousand tonnes in 1973. In the other three States of Tamil Nadu, Andhra Pradesh and Bihar, inland fish production has been rather stagnant during the last decade.

3.7.7 Mechanisation : In marine fisheries, mechanisation of boats either by converting existing suitable sailing crafts or by introduction of new boats, has been the most significant aspect of development as the means of increasing production. The programme of mechanisation gained considerable momentum after the method of bottom-trawling was established as a commercial feasibility in the initial phase of the First Plan. The number of mechanised boats at the beginning of First Plan was only 13. Another 850 were added during First Plan period, 1,273 during Second Plan, 3,070 during Third Plan, 2,494 during 1966—69 and 4,000 during the Fourth Plan. However, the progress was not satisfactory in the schemes for the introduction of larger mechanised fishing vessels for distant water fishing and in the construction of fishery harbours, both minor and major.

3.7.8 Refrigeration facilities : The refrigeration facilities, comprising ice factories, cold storages, freezing plants and freezing storages, were practically non-existent for fisheries prior to 1951. The capacity developed during each Plan period is given in Table 3.34.

TABLE 3.34
Development of Refrigerated Plants—Planwise*

Period	(capacity in tonnes)					
	Ice plants		Cold storage		Freezing plants	
	no.	capacity	no.	capacity	no.	capacity
Pre-Plan	—	—	1	42	1	0.75
First Plan	6	39.00	8	300	2	14.00
Second Plan	13	74.50	21	735	3	21.00
Third Plan	33	170.75	31	686	4	20.50
Annual Plans (1966-69)	23	118.00	32	640	5	23.50
Fourth Plan	20	162.00	19	861	6	52.50
Total	95	564.25	112	3,264	21	132.25
					22	2,359

* (i) 1974, January. Ninth Meeting of the Central Board of Fisheries statistical Supplement.

(ii) Fifth Five Year Plan, Working Group on Fisheries, Ministry of Agriculture and Irrigation.

Besides, refrigerated rail vans and road vans were also introduced in the fish transport system. A handicap has, however, been reported in economically operating the refrigerated rail vans because of inadequate utilisation of the reefer space on the onward and return trips.

3.7.9 Extension service : The extension services, which were absent before the plans, were gradually developed during the first three plans. The Union Department of Agriculture had organised 10 extension units in different regions of the country and had supervisory staff at the headquarters, to assist fish farmers and Fisheries Departments in the development of inland fisheries. Subsequently these units were handed over to the State Governments who either closed them down or merged them with their Fisheries Departments.

3.7.10 Research stations : Realising the need for a research institute at the national level in fisheries technology, both regarding craft and gear as well as fish processing, the Central Institute of Fisheries Technology was set up in 1957. With a view to expanding the research activities all over the country, the Central fisheries research institutes established several sub-stations, units and centres in different places of fisheries interest, the respective number of which for each institute established up to 1972 is given below :

	Regional centre	Sub- stations	Research units	Survey units
Central Marine Fisheries Research Station, Cochin	1	8	4	29
Central Inland Fisheries Research Station, Barrack- pore (Calcutta)	—	3	11	15
Central Institute of Fisheries Technology, Cochin	—	3	5	—

3.7.11 Inland fisheries research : Research work on culture fisheries constituted the most significant feature in increasing inland fish production. While extending the fish culture in the entire country, primarily in ponds and tanks, additional centres for seedfish collection were located in the riverine systems for increased supplies of seedfish. The success in induced breeding of major carps with pituitary hormones injections led to the new process of seedfish production at the fish seed farms in all the States. Research work on improved management practices in fish nurseries and rearing tanks, including finding out the requisites types of feeds and manuring schedules, on improved packaging methods for long distance transport of seedfish and on the eradication of predators and weeds from water resources, has been followed by their successful application in fish culture. Research was also undertaken on methods of stocking reservoirs, both irrigation and

multi-purpose with fish so as to utilise them as additional resources of fish production. The results of research on maximising per hectare fish production with judicious increase of inputs have been encouraging and have given to this programme an orientation of intensive fish culture.

3.7.12 Fisheries technology : The construction of a large number of mechanised fishing boats in the country, following the standard designs developed as a result of research of craft and gear, constituted the most significant contribution of the Central Institute of Fisheries Technology. The identification of substitute materials such as cheaper and easily available types of wood for fabrication of hulls and aluminium and its alloys in place of imported copper sheets for sheathing of wooden hulls was another significant contribution. Researches on processing led to improvements in the quality of fresh and processed products of fish and shell-fish and the utilisation of waste from fish processing factories. Development of cheaper and efficient insulated containers for packing ice or frozen fish have opened up possibilities of long distance movement without resorting to refrigerated transport. Besides the Institute, the processing wing of the integrated fisheries project under the Union Department of Agriculture (formerly known as the Indo-Norwegian Project) demonstrated the possibilities of utilising trash fish as frozen "pikedmeat" or fillets.

3.7.13 Survey work : For location of suitable fishing grounds for, bottom-trawling, the Deep Sea Fishing Organisation of the Union Ministry of Agriculture and Irrigation organised fisheries surveys from the operational bases at Bombay, Cochin, Tuticorin and Visakhapatnam. This was supported by the work carried out by the Indo-Norwegian Project off the coasts of Kerala, Karnataka and Tamil Nadu and by the Governments of these maritime States. The survey work led to the progressive exploitation of demersal fisheries by trawling, which method was non-existent in Indian fisheries prior to the First Plan. This exploitation has helped considerably in developing export trade of fish and fishery products, particularly of prawns.

3.7.14 Education and training : The Central Institute of Fisheries Education (CIFE), Bombay, was established in 1961 for imparting post-graduate instruction in the composite discipline of fisheries science to district level fisheries officers. The Central Institute of Fisheries Operatives (CIFO), was established in Cochin in 1963 for giving organised institutional training to operatives of marine fisheries at various levels of skills, particularly required for manning the larger fishing vessels which have to be registered under Merchants Shipping Act (1958). The Inland Fisheries Training Unit at Barrackpore, established in 1947 came under the control of CIFE in 1967. For

giving training to inland fisheries operatives, two centres were organised in 1967 at Agra and Hyderabad, under the administrative control of CIFE. From July 1973, the training centre at Hyderabad has been converted into Central Fisheries Extension Training Centre for imparting specialised training in extension techniques and methods in fish culture practices at post-graduate level mainly for in-service personnel from various States for a period of ten months. Considering the need for increasing the training capacity for marine fisheries operatives, an additional centre under CIFO was organised at Madras in 1969. Till the end of 1972, 265 persons completed the post-graduate diploma course in fisheries science (2 years duration) at the Central Institute of Fisheries Education, Bombay. Another 637 persons were trained in the post-graduate certificate course (one year duration) at the Inland Fisheries Training Unit, Barrackpore. During the same period 917 fisheries operatives were trained as engine drivers, boat building foremen, shore mechanics, etc. and 329 as inland fisheries operatives at the central/regional institutes of fisheries operatives.

3.7.15 At the State level, the Governments in the maritime States had organised 27 fishermen training centres to equip marine fishermen with sufficient working knowledge so that they could operate the small mechanised fishing boats themselves. At these centres, 6,286 fishermen were trained till 1972. In some of the States, training centres were organised for inland fisheries operatives. Several States had staff training centres to provide training to middle level workers. Degree courses in fisheries have been started in the University of Agricultural Sciences, Bangalore (Mangalore College) and the Calicut University.

8 FORESTRY

Pre-Plan Period

3.8.1 Scientific forestry in India is over 100 years old. Progress of developments in this vital sector of the country's economy during the closing period of the nineteenth century and the earlier period of the present century was reviewed by the Royal Commission on Agriculture in its Report submitted in 1928. Important among the measures taken till then included the enactment of Indian Forest Act in 1865 for affording protection to forests, bringing them under proper management and empowering the local Governments to draft rules for enforcement in the respective regions. A revised Indian Forest Act was passed in 1878 which besides overcoming the inadequacies in the earlier Act also provided for the constitution of reserved and protected forests.

For laying down general principles for management of forests in the country a National Forest Policy was enunciated in 1894. As a result of the implementation of this policy, there was a steady development of forests in the country which were continuously conserved.

3.8.2 After 1930 two important developments took place which had a close bearing on the development of forestry in the country. With the passing of the Government of India Act, 1935, forests became entirely the concern of the Provinces and the role of the Centre was limited to the common or general aspects of forestry, viz., forest research, forest education, soil conservation, etc. As a result the Government of India ceased to have any direct authority or control over the administration of forests in the Provinces. During World War II enormous quantities of timber of different species were extracted from both Government and private forests, with the result that forest capital decreased considerably. Programmes and policies followed during the pre-plan period particularly after the Second World War have been indicated in Chapter 2 on Historical Review. Broadly these aimed at rehabilitation of depleted forests, prevention of soil erosion, extension of afforestation and setting up of forest based industries. These post-War development schemes continued till 1951 when the First Five Year Plan was launched.

3.8.3 Before Independence, forest statistics were available in respect of 12 administrative units of the Indian Union comprising 9 Part 'A' States and 3 Union Territories. After the political integration of the country that followed Independence, the remaining States also gradually started reporting forest statistics. Thus, statistics for pre-Independence and the post-Independence periods are not strictly comparable.

3.8.4 During the pre-Plan period area under forests in the reporting States did not undergo any specific change. It constituted 24.7 per cent of the total geographical area during the triennium ending 1938-39 and 24.3 per cent of the total geographical area during 1947-48.

3.8.5 Working plans : Well thought out working plans are necessary for protection of physical features and exploitation of forests in a systematic manner so as to ensure a steady and continuous supply of timber, fuel and other forest produce. The working plans are revised periodically to keep them up-to-date in the light of changed conditions of the forest or the demand. During the triennium ending 1938-39 i.e. the pre-War period, an area of 149 thousand sq km or 65.7 per cent of the total forest area under the control of forest departments was under working plans. The Second World War gave a set-back to the progress of working plans. The working plans which expired could not be revised. Further, in many valuable forests fellings were carried out in total disregard of the working plans' prescriptions. How-

ever, during the post-War period preparation of working plans showed some progress and during the triennium ending 1947-48 an area of 160 thousand sq. km. or 70 per cent of the total area under the control of Forest Departments was under working plans.

3.8.6 Outturn of forest produce : The total outturn of timber and fuelwood increased from 6.20 million cubic metres during the triennium ending 1938-39 to 9.21 million cubic metres during the triennium ending 1947-48. During the same period, the value of outturn of minor forest produce increased from less than Rs 1 crore to over Rs 2 crores.

Five Year Plans

3.8.7 Policies and programmes of forest development during the Five Year Plans have been indicated in Chapter 2 on Historical Review. Most of the programmes initiated under the plans followed the recommendations of the Central Board of Forestry constituted in June, 1950. Attempts were made to realise most of the objectives outlined in the 1952 National Forest Policy through these development plans.

3.8.8 During the First Plan period man-made forests (plantations) of matchwood and other economic species were raised over an area of 52 thousand hectares. Some of the important schemes initiated during the Second Plan period related to creation of plantations of economically important species on an area of 164 thousand hectares and establishment of several wild life sanctuaries. Degraded forests over nearly 147 thousand hectares were rehabilitated, 16,200 km of forest roads were constructed and 5.9 Mha of forests were consolidated by demarcation and settlement of rights. As mentioned in Chapter 2 on Historical Review, a Timber Trends Survey was also initiated.

3.8.9 During the Third Plan period a skeleton programme of forestry and forest industries development was presented in the Report on Integration of Forests and Forest Industries by J. A. Von Monroy. The salient features of the recommendations were : (a) selection of nearly 0.6 Mha or nearly 1 per cent of the country's forest area in the most productive zones for a 10 year programme of plantations with fast growing species at the rate of 60 thousand hectares every year under a modern system of intensive management which would ensure at least 4.5 million tonnes of additional uniform industrial raw-material from 1975 onwards; (b) development of Himalayan coniferous forests on an integrated basis; (c) improved utilisation of low-grade timber for industries; and (d) changing the pattern of raw material consumption of the pulp and paper industry from predominantly bamboo to predominantly hardwoods with some long

fibre component. Implementation of these programmes also involved intensified research in the field of silviculture, forest utilisation forest economics and pre-investment surveys in selected forest areas. To attain self-sufficiency in industrial timbers, fuelwood and other forest products, large scale plantation of industrially valuable species was undertaken during the Third Plan period. Also, to encourage the State Governments to undertake plantations of quick growing species, a new scheme with 100 per cent assistance from the Centre was introduced. As a result, plantations of quick growing species were raised over an area of 87 thousand hectares. To increase the output of timber through better techniques of timber extraction training was imparted to forest officers and field executives of State Governments and also to lessees and contractors in the use of basic logging tools and logging planning with the help of experts from the UN. The Third Plan also laid stress on the development of village and extension forestry.

3.8.10 Public sector expenditure : Table 3.35 gives the public sector expenditure on forestry over the successive plan periods.

TABLE 3.35
Public Sector Expenditure on Forestry Development*

(Rs. crores)

Plan period	Expenditure on forestry	Expenditure on forestry as percentage of total expenditure on agriculture including irrigation and flood control
First Plan	8.5	1.2
Second Plan	21.2	2.2
Third Plan	45.9	2.6
Annual Plans	42.1	2.7
Fourth Plan	93.0**	2.4

* 1972 August, Bulletin No. 14, Central Forestry Commission, Ministry of Agriculture and Irrigation.

** Anticipated expenditure.

It will be seen that there has been a significant increase in public sector expenditure on forestry development. However, in terms of percentage of total public sector expenditure, the increase was not very impressive. In fact during the Fourth Plan the percentage share of forestry in the total expenditure on agriculture declined to 2.4 from 2.7 during 1966-69.

3.8.11 Forest area : Appendix 3.18 gives the area under forests according to ownership, legal status, composition and exploitability. It will be seen therefrom that during 1970-71, the latest year for which forest area statistics are available, area under forests was 748 thousand sq km or 23 per cent of the total geographical area as against 718 thousand sq km or 22 per cent of total geographical area in 1950-51. The bulk of this increase was contributed by the transfer of forest area from private to public ownership and their inclusion in forest area statistics. Thus, forest area managed by the State increased from 83 per cent of the total forest area during 1950-51 to 93 per cent during 1970-71. Forests owned or managed by corporate bodies and private individuals constituted 4 per cent and 2 per cent respectively of total forest area during 1970-71 as compared to 0.3 per cent and 16.7 per cent respectively during 1950-51. The reserved and protected forest maintained for producing timber and other produce according to working plans and for protective purposes increased from 462 thousand sq km or 64 per cent of the total forest area in 1950-51 to 603 thousand sq. km or 81 per cent of the total during 1970-71. Area under unclassified forests on the other hand declined from 256 thousand sq km in 1950-51 to 115 thousand sq km in 1970-71.

3.8.12 From composition point of view, forests are classified broadly into coniferous and non-coniferous (broad-leaved). Area under broad-leaved forests was 700 thousand sq km in 1970-71 as compared to 682 thousand sq km in 1950-51. Out of the total area under broad-leaved species, area under teak-wood and *sal* in 1970-71 was 82 thousand sq km and 118 thousand sq km respectively. From the point of view of exploitability, forests are classified into 'merchantable' and 'inaccessible or unprofitable'. Merchantable forests are those which are within the reach of economic management or exploitation as sources of forest products including immature forests and 'managed' forests, where fellings are prohibited. Inaccessible forests are those which are not yet exploited owing to their inaccessibility or lack of demand for their produce. The proportion of such unprofitable forests to the total forests area during 1970-71 was 22 per cent as compared to 19 per cent in 1950-51. Statewise figures of area under forests during 1970-71 are given in Appendix 3.19.

3.8.13 Regeneration and afforestation : Regeneration and afforestation activities covered an area of 1,555* thousand hectares in

* Excludes figures for Karnataka, Manipur, Meghalaya, Nagaland, Orissa, Tamil Nadu (area regenerated), Tripura and for Union Territories other than Andamans and Nicobar Islands.

1968-69 compared to 1,091 thousand hectares in 1950-51 and 266 thousand hectares in the pre-Independence period. Area under working plans increased from 259.1 thousand sq km in 1950-51 to 357.7 thousand sq km in 1968-69.

3.8.14 Revenue and expenditure of forest departments : Before the initiation of planning, expenditure on forestry and forest administration was limited only to part of revenues derived from the forests. In fact, the measure of good administration of any forest tract was the annual net surplus over expenditure. As a result, poorer forest areas suffered for lack of funds for rehabilitation and development. However, during the post-War period due mainly to increase in the demand for forest produce and the funds made available in the post-War reconstruction schemes both the gross revenue and expenditure showed a significant increase. As a result gross revenue of Forest Departments (including FRI and Colleges) increased from Rs 2.54 crores during the triennium ending 1938-39 to Rs 10.22 crores during the triennium ending 1947-48. During the same period the expenditure increased from Rs 1.91 crores to Rs 4.96 crores and the surplus from Rs 0.63 crores to Rs 5.26 crores.

3.8.15 During the Plan periods, besides all-round development of forests, there was a large increase in expenditure on roads, buildings, cultural operations, demarcation, etc. in the erstwhile private forests. Gross revenue also recorded a significant increase due to increase in demand for forest products as also the upward movement in their prices. Table 3.36 gives data on progress of revenue and expenditure of forest departments since 1950-51.

TABLE 3.36

Progress of Revenue and Expenditure of Forest Departments*

(Rs. crores)

Year	Gross revenue	Expenditure	Surplus	Surplus as per cent of gross revenue
1950-51	23.62	9.49	14.13	60
1955-56	31.09	13.65	17.44	56
1960-61	57.62	24.26	33.36	58
1965-66	83.67	40.84	42.83	51
1968-69	117.92	59.03	58.89	50
1971-72**	150.77	80.05	70.72	47
1972-73**	168.41	92.57	75.84	45

* (i) 1971 November, Indian Forest Statistics 33rd, 36th and 37th Issue, Directorate of Economics and Statistics.

(ii) Forestry in India 1969-70 and 1970-71 (Summary Tables), Directorate of Economics and Statistics.

(iii) Forest Statistics Bulletin No. 12, Central Forestry Commission, Ministry of Agriculture and Irrigation.

** Provisional.

It will be seen that the surplus of revenue over expenditure came down from 60 per cent of gross revenue in 1950-51 to around 45 per cent in 1972-73. State-wise details of gross revenue and expenditure of Forest Departments for 1972-73 are given in Appendix 3.20.

3.8.16 Outturn of forests produce : Table 3.37 gives the estimates of outturn of major and minor forest produce during 1950-51, 1960-61 and 1970-71.

TABLE 3.37

Outturn of Major and Minor Forest Produce*

quantity : thousand cubic metres
value : Rs. crores

Forest product	1950-51	1960-61	Per cent increase in col. 3 over col. 2	1970-71 (p)	per cent increase in col. 5 over col. 2
* A. Minor Forest Produce					
(i) timber**					
quantity . . .	3,843	5,451	41.8	9,655	151.2
value . . .	15	38	153.3	84	460.0
(ii) fuelwood					
quantity . . .	11,948	11,947	—	12,090	1.2
value . . .	4	10	150.0	14	250.0
(iii) total					
quantity . . .	15,791	17,398	10.2	21,745	37.7
value . . .	19	49(a)	157.9	108(b)	468.4
B. Minor Forest Produce					
(i) bamboos and canes	2	2		4	
(ii) fodder and grazing	2	2		1	
(iii) gums and resins .	(c)	2		6	
(iv) bidi leaves . . .	—	2		13	
(v) others . . .	3	3		10	
Total	7	11		34	

* (i) Indian Forest Statistics 33rd and 36th Issue, Directorate of Economics and Statistics.

(ii) Forestry in India 1969-70 and 1970-71 (Summary Tables), Directorate of Economics and Statistics.

(p) provisional.

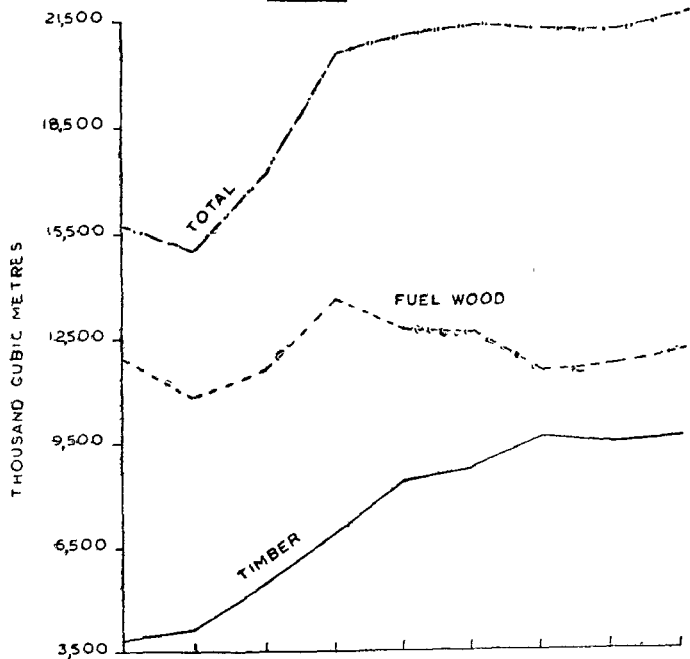
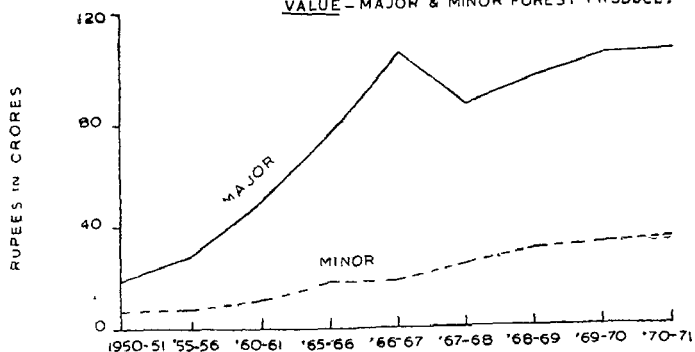
** Includes timber, roundwood and pulp and match wood.

(a) Includes Rs. 1 crore for which details are not available.

(b) Includes Rs. 10 crores for which separate break-up is not available.

(c) Less than Rs. 50 lakhs.

OUTTURN OF MAJOR AND MINOR FOREST PRODUCE

QUANTITY—MAJOR FOREST PRODUCE.VALUE—MAJOR & MINOR FOREST PRODUCE.

It will be seen that the total quantity of industrial and fuelwood (including charcoal wood) produced in 1970-71 was 21.7 million cubic metres valued at Rs 108 crores as against the outturn of 15.8 million cubic metres valued at Rs 19 crores during 1950-51 showing thereby an increase of 37.7 per cent in the quantity and 468.4 per cent in value in a period of 20 years. The total value of output of minor forest products, some of which earn sizeable foreign exchange, during 1970-71 was estimated at Rs 34 crores as against Rs 7 crores during 1950-51. Chart 3.12 on p. 329 depicts the growth in outturn of major and minor forest produce in the country since the beginning of the planning era.

3.8.17 Plantation and communications : Physical achievements of a few important forestry schemes are given in Table 3.38.

TABLE 3.38
Physical Achievements of Selected Forestry Development Schemes*

Scheme	Unit	First Plan (1951-56)	Second Plan (1956-61)	Third Plan (1961-66)	Annual Plans (1966-69)	Fourth Plan (1969-74)
Plantation of quick growing species	thousand ha	—	—	87	169	251
economic and commercial plantations	Do.	40	164	236	156	289
farm forestry-cum-fuelwood plantations	Do.	—	—	33	40	80**
Communications	thousand km	5	16	17	5	8

* (i) 1972 August, Bulletin No. 14, Central Forestry Commission, Ministry of Agriculture and Irrigation.

(ii) Draft Fifth Five Year Plan, Vol. II.

** Relates to Farm Forestry.

3.8.18 Forest research : Research in forestry is carried out by the Forest Research Institute (FRI) and Colleges, Dehra Dun and its two regional centres located at Coimbatore and Bangalore. The present functions of the Institute and its centres are to undertake both basic and applied research in various problems relating to forestry, forest biology, utilisation of forest products etc. and to disseminate the results of the research. The States also undertake research in forestry but their activities are mainly field oriented and FRI renders them necessary technical assistance. For tackling local problems, largely of a routine nature, forest research laboratories have been established by the States of Madhya Pradesh, Maharashtra and Uttar Pradesh.

3.8.19 The Expert Committee on FRI and Colleges constituted by Government of India in 1964 for assessment of Institute's work was not satisfied with the performance of the Institute and made some valuable observations on how research problems were to be identified. The Committee further felt that the Institute should appreciate fully

the seriousness of the situation arising out of the low productivity in the Indian forests and the urgency to keep pace with industrial requirements for wood and other forest products. In its meeting held in November, 1972, the Court of FRI and Colleges, Dehra Dun (the representative high powered body for guiding and supervising the work of the Institute) decided to convene two conferences at five yearly intervals, one on forestry and forest biology and other on forest products. The conferences were to indicate the areas in which research should be initiated and intensified.

3.8.20 Forest education : Inservice training and education for higher services comprising members of the Indian Forest Service and the State Forest Services and for forest rangers is imparted by the Indian Forest College, Dehra Dun and two forest rangers colleges located at Coimbatore and Dehra Dun. The training and education courses run by the FRI and Colleges are recognised by the FAO as a training centre for the South East Asia Region.

3.8.21 Wildlife preservation and management : Upto close of the 19th century and the early period of the 20th century no specific measures were taken for the preservation of the wildlife in the country with the result that indiscriminate hunting and senseless killing led to the extinction of a few species and some to the verge of extinction. In 1935, a conference on wildlife was held which resulted in some concrete measures for the protection of the wildlife. A number of sanctuaries were established in some of the Provinces e.g. Corbett's in Uttar Pradesh; Taroba and Kanha in Central Provinces (Madhya Pradesh); and Mudumalai in Madras Presidency (Tamil Nadu).

3.8.22 After Independence, wildlife received considerable attention. The revised National Forest Policy of 1952 emphasised the need for affording protection to the animal kingdom and particularly to the rare species such as lions and one horned rhinoceros which were fast disappearing. With this end in view, Indian Board for wildlife was set up by the Government of India in 1952. There are at present five national parks and 126 sanctuaries in the country covering an area of over 23,000 sq km. The other important measures taken include the passing of a comprehensive Wild Life (Protection) Act, 1972 and the execution of 'Project Tiger' programme of which mention has been made in Chapter 2 on Historical Review.

9 FOREIGN TRADE

3.9.1 Recent trends in exports and imports of agricultural commodities have been discussed in detail in Chapter 12 on Export Possibilities

and Import Substitution. Appendix 3.21 gives the value of imports and exports of agricultural commodities by groups for the period 1950-51 to 1973-74. On balance, judging by the total value of exports as compared to the total value of imports, India is a net exporter of agricultural commodities. Since 1950-51 this position has remained unchanged except during 1966-67 and 1967-68 when massive imports of cereals reversed the trend.

3.9.2 Among the crop-based commodities, the value of exports of coffee, tea, cocoa and spices recorded a steady increase and touched the peak level of Rs 248.1 crores during 1973-74 compared to Rs 107.3 crores in 1950-51. Value of exports of oilseeds, oilnuts and oil kernels registered a decline from Rs 17.3 crores in 1950-51 to Rs 0.23 crore during 1965-66. Thereafter, exports recorded a steady increase and touched the level of Rs 6.8 crores during 1972-73. However, during 1973-74 there was a sudden spurt in the exports of this group with the value recording the peak level of Rs 37.3 crores. The value of exports of crude vegetable materials has registered a phenomenal increase from Rs 13.6 crores in 1950-51 to Rs 58.4 crores in 1973-74. Similarly the exports of crude rubber and rubber manufactures rose from Rs 0.22 crore in 1950-51 to as much as Rs 10.5 crores in 1973-74 and that of feeding stuff for animals from Rs 1.7 crores in 1955-56 to as much as 187.4 crores in 1973-74. The value of exports of textiles yarn fabrics, made up articles and related products more than doubled between 1950-51 and 1973-74. Exports of sugar and sugar preparations increased from Rs 0.17 crore to Rs 43 crores while those of fruits and vegetables moved up from Rs 12.8 crores to Rs 90.6 crores.

3.9.3 Among the crop-based commodities, cereal and cereal preparations constituted the major item of imports. Due to increase in food-grains production during the First Plan period the value of these imports recorded a significant decline, but thereafter cereal imports registered an upward trend and touched the peak level of Rs 651 crores in 1966-67. The sustained increase in wheat production between 1967-68 and 1971-72 and the bumper crop of 108.4 million tonnes of food-grains harvested in 1970-71 were instrumental not only in curtailing the imports but in building up a reserve stock of 7.9 million tonnes at the end of 1971. The value of imports of cereals and cereal preparations, therefore, recorded a steady decline and during 1972-73 amounted to Rs. 80.8 crores only. However, due to set back to wheat production during 1972-73 and 1973-74, the value of cereals imports during 1973-74 again mounted to Rs 473.2 crores. Between 1957 and 1971 bulk of the cereals imports were made under PL-480. Table 3.39 gives the quantity and value of PL-480 imports vis-a-vis the total imports of cereals from 1956 onwards.

TABLE 3.39
....Imports of Cereals+

Year	Under PL -480		Total imports**	
	quantity (million tonnes)	value* (Rs. in crores)	quantity (million tonnes)	value* (Rs. in crores)
1956	0.15	5.72	1.44	56.34
1957	2.71	120.91	3.65	162.39
1958	2.01	74.12	3.22	120.51
1959	3.20	114.74	3.87	141.41
1960	4.35	162.03	5.14	192.84
1961	2.34	89.53	3.50	129.56
1962	2.89	113.43	3.64	141.09
1963	4.20	168.57	4.56	183.60
1964	5.59	236.60	6.27	266.25
1965	6.31	245.02	7.46	290.32
1966	8.21	386.02	10.36	523.13
1967	5.84	348.73	8.67	532.16
1968	4.10	243.29	5.69	361.20
1969	2.56	160.92	3.87	253.01
1970	2.45	137.04	3.63	207.55
1971	1.21	76.22	2.05	123.46
1972	—	—	0.54	24.29
1973	—	—	3.61	319.52
1974	—	—	4.87	463.04
TOTAL	58.12	2,682.89	86.04@	4,491.67@

+ Data from Ministry of Agriculture and Irrigation, Department of Food, Government of India. The value figures from 1966 onwards are not comparable with those for the earlier years due to the devaluation of rupee on 6th June, 1966.

* Estimated

** Includes imports on account of commercial transactions, PL-480, other concessional transactions and gifts.

@ Includes a quantity of 6.35 million tonnes and a value of Rs. 311 crores in respect of concessional transactions and gifts during 1966-67 to 1973-74.

It will be seen that the quantity and value of PL-480 imports declined after 1966. Due to stoppage of concessional imports after 1971, no imports were made under PL-480 during 1972 to 1974.

3.9.4 Among animal husbandry products, imports are higher than exports in the case of live animals, dairy products, wool and animal oils and fats, while for certain other products such as meat and meat preparations, hides and skins and leather and leather manufactures, exports far exceed imports. Taken as a whole, livestock products make a significant contribution to country's foreign exchange resources. The increase in imports has been accounted for mainly by dairy products and wool and other animal hair. Among exports, meat & meat preparations, and leather, leather manufactures & dressed furskins have registered significant increases. In 1950-51, meat and meat prepara-

tions did not at all figure in the country's exports while in 1973-74 the value of their exports has been around Rs 7 crores. In the case of leather, leather manufactures and dressed furskins, the value of exports has gone up from nearly Rs 26 crores in 1950-51 to as much as Rs 175 crores in 1972-73 i.e., nearly seven times. In 1973-74 the value of these exports was Rs 172 crores. It may be pointed out in this connection that though the exports of leather, leather manufactures and dressed furskins have increased, there has been a significant fall in the exports of hides, skins and undressed furskins, as such export is being discouraged so as to encourage their processing within the country itself and export the finished leather products. Consequently, the value of exports of hides, skins and undressed furskins has declined from Rs 9.6 crores in 1950-51 to Rs 1.5 crores in 1973-74.

3.9.5 In the case of fisheries, improvements in production and refrigeration and storage facilities had a significant impact on the exports of fish and fish preparations. As a result, value of their exports increased from Rs 2.5 crores in 1950-51 to as much as Rs 88.1 crores in 1973-74.

3.9.6 Among forestry products, exports of wood, lumber and cork and manufactures thereof moved up from Rs 1.14 crores in 1950-51 to as much as Rs 22.2 crores in 1973-74. On the other hand, imports of derivative products such as pulp and waste paper, and paper, paper board and manufactures thereof registered a significant increase. The value of their imports was Rs 9.3 crores and Rs 29.2 crores during 1973-74 as against Rs 0.41 crore and Rs 10.14 crores respectively during 1950-51.

3.9.7 To support the intensive cultivation programme, imports of plant nutrients had to be considerably stepped up. Thus, imports of fertilisers (manufactured) increased from Rs 9.6 crores in 1960-61 to Rs 162.8 crores in 1973-74 and that of crude fertilisers from Rs 2.5 crores in 1960-61 to Rs 21.3 crores during 1973-74. Imports of agricultural machinery and implements registered a decline from Rs 7.3 crores in 1950-51 to Rs 0.5 crore in 1955-56. Thereafter, their imports moved up significantly and touched the peak level of Rs 27.9 crores in 1970-71. During 1973-74 the value of these imports declined to Rs 17.0 crores.

10 CURRENT AGRICULTURAL SITUATION

3.10.1 The foregoing review of the progress of agricultural development reveals that the current agricultural situation in the country neither evokes pessimism nor optimism. There is no denying the fact that

as a result of more than two decades of planning significant advances have been made in all the fields of agriculture including animal husbandry, forestry and fishery. Diverse factors have been responsible for bringing forth this change.

3.10.2 In foodgrains production the annual compound rate of growth during 1949-50 to 1973-74 at 2.7 per cent exceeded the population growth at 2.1 per cent. In spite of this, the food deficit apparently persists. Several reasons may be advanced to explain this anomaly. For example, as a result of the increase in per capita incomes, the demand for foodgrains has gone up; the per capita consumption of foodgrains during 1973-74 was 163.7 kg per years as against 144.1 kg per year in 1950-51. Further, although the overall availability of foodgrains, particularly cereals, is adequate, it is the shortage of other components in the food basket that has led to increased cereals consumption. More importantly, the available quantities are not equitably distributed over different areas and among people of different income levels.

3.10.3 In 1970-71, production of foodgrains touched a record level of 108.4 million tonnes—68.9 million tonnes in *kharif* and 39.5 million tonnes in *rabi*—because of good weather in both the seasons. The general feeling was that solution to the food problem had either been found or was round the corner. Record productions were harvested during the recent years in the case of five major cereals also. For example, 8.0 million tonnes of bajra and 7.5 million tonnes of maize were harvested in 1970-71, 26.4 million tonnes of wheat in 1971-72, 43.7 million tonnes of rice in 1973-74 and 10.0 million tonnes of jowar in 1967-68. In August, 1970 when the Commission was set up the atmosphere was one of optimism. The Resolution of the Government under which the Commission was set up mentioned that while notable breakthrough had been achieved in respect of one or two crops, there was promise of a similar breakthrough in respect of other cereal crops and some non-food crops. The emphasis was, therefore, put on diversification of agriculture between crops and to extend the new technology to horticultural crops also. Thus, the Commission was mainly to examine comprehensively the current progress of agriculture in India and to make recommendations for its improvement and modernisation with a view to promoting the welfare and prosperity of the people. In June, 1972 the Government had built up the record stock of about 9 million tonnes, both operational and pipeline. Concessional imports were done away with and it was hoped that the country would do without any imports of foodgrains in future.

3.10.4 Improved, early maturing and high yielding varieties of seeds constituted the main plank on which rested the 'New Strategy' of the country's intensive cultivation programme. The introduction of high

yielding varieties made a significant impact on production of cereals. However, several problems cropped up. For example, in the case of rice, the yields in the main kharif season did not pick up, whereas they did so in the summer season when good water management and disease free conditions could be assured, thereby enabling improved varieties of rice crop to realise their full potential. In the case of wheat yields of high yielding varieties moved up steadily between 1968-69 and 1971-72. Encouraged by the success of these varieties of wheat in the northern belt of the country, farmers in the non-wheat growing States took up its cultivation in a big way. However, the rate of progress could not be maintained after 1971-72 with yields per hectare showing a downward trend. Deterioration in the purity and quality of seeds due to lack of systematic seeds renewal programme; lowered resistance to rust of the widely grown variety, viz. *Kalyan/sona*; heavy infestation with weeds like wild oats and phalaris; inadequate attention to balanced fertilisation (particularly phosphorus application); deficiency of micronutrients like zinc; inability to irrigate properly owing to shortage of power supply are some of the reasons for the fall in wheat yields in different areas. Besides, the 1972-73 and 1973-74 *rabi* seasons were too dry and too cold and, therefore, not favourable for wheat crop.

3.10.5 As we have already mentioned, during recent years wheat production has shown a better performance as compared to rice. This is so because more than two-thirds of the area under wheat in the fertile Indo-Gangetic Plains are irrigated. Lands being consolidated, farm operations are more mechanised and inputs optimised. Rapid success has made the peasantry progressive and responsive to new ideas. On the other hand, rice is grown mostly in wet humid climates at relatively high temperatures. Excessive rainfall creates problems of drainage; in addition, cyclones and visitations of flood are not uncommon in rice growing areas. The conditions are ideal for incidence of pests and diseases. The holdings are by and large small and scattered, which stand in the way of optimising operations and inputs. Moreover, it took long to realize that the same varieties of rice would not be suitable for the varied conditions of soil and climate under which rice is grown. In order, therefore, to achieve a breakthrough in rice production as in the case of wheat it is necessary to take up extensive land improvement measures including consolidation and drainage, to develop efficient methods of water use and to evolve varieties suited to different agro-climatic regions and different seasons. In fact, some location specific varieties have already been evolved and are being tried extensively on farmers' field. A breakthrough in rice is likely if this strategy is systematically pursued.

3.10.6 The present low yields underline the scope and urgency for exploiting the potential for improvement in several directions. In the first instance, the scientists should evolve varieties suited to different areas. In the case of wheat, particularly, there is a need to multiply new high yielding strains rapidly to replace the *Kalyan/Sona* variety and renew seeds after every 3-4 years. Secondly, necessary inputs such as water, fertilisers, pesticides and credit should be made available to farmers in time, within easy reach and at reasonable prices. Thirdly, infrastructure by way of facilities for storage, processing, marketing and price incentive should be ensured to encourage production. Above all, knowledge about the improved cultural practices has to be transferred as a package to the cultivators through appropriate extension measures. In the extension programme management aspects are equally important. For the purpose of minimising the use of pesticides and preventing pollution, an integrated pest control system should be adopted.

3.10.7 The fact that some of the improvements outlined above have been achieved in practice in some areas and with some crops, promises possibilities of their extension to other areas and crops as well. Potentialities for increasing crop production in irrigated areas where the water supply is assured and perennial are enormous and easy of attainment through the adoption of a package of measures. Potentialities also exist for areas with assured and adequate rainfall. In heavy rainfall areas, control of excessive water in certain seasons is the only answer. But, by and large, problems of areas with low rainfall and high variability still remain to be tackled. Even for these areas attempts are being made through dry farming research and development projects to modify the existing technologies and to evolve new ones, where necessary, suited to these areas. Breakthrough in crops grown in such moisture deficit areas would further enhance production possibilities. These aspects are discussed in the succeeding chapters.

3.10.8 Significant advances have been made in the field of animal husbandry. These have been brought about mainly as a result of integrated measures taken to improve the breeds, feeds and health of cattle and promoting sheep, piggy and poultry development. The extension of intensive area approach to the field of animal husbandry in 1964-65 and the emphasis laid on cross-breeding during the Fourth Plan period have been important milestones in increasing the number of animals of improved breeds. Thus, according to the base level assumed for the Fifth Five Year Plan the number of cross-bred cows in production during 1973-74 was estimated at one million and the total number of inseminations with exotic semens was placed at 1.40 million per annum. For multiplication of high quality seeds of different forage

crops varieties, 38 fodder seed production farms were estimated to have been set up and nearly 9,500 veterinary hospitals/dispensaries and 178 mobile veterinary units provided the necessary health cover to the animals. As a result of large scale vaccinations the incidence of *inderpest* was considerably reduced and in 1974 total morality due to the disease was only 1,559. Setting up of large sheep breeding farms both by the Central Government and States and the initiation of a co-ordinated poultry breeding programme at the various Central and State farms were mainly instrumental in bringing about considerable improvements in sheep and poultry breeds.

3.10.9 As a result of these integrated measures, output of various livestock products has shown definite signs of growth. Thus, production of milk (cow, buffalo and goat) in 1973 (the latest year for which data are available) was 42 per cent higher as compared to the average production during 1948—52. During the same period production of meat (beef, mutton and pork) increased by 33 per cent. Production of eggs registered a phenomenal increase of 320 per cent between 1951 and 1974. Despite this increase in production the per capita availability of these important nutrients continues to be abysmally low. In the case of milk the per capita availability during 1973 worked out to 118 g only as against the requirements of 284 g per capita per day recommended by the Nutrition Advisory Committee. The per capita availability of meat and eggs worked out to 1.1 kg and 13 per year during 1973 and 1974 respectively. Even though the production of raw wool during 1971 was 43 per cent higher than that in 1951, the average yield of wool from the local sheep continued to be significantly low as compared to that of exotic fine wool breeds.

3.10.10 Production of both marine and inland fish during 1973 was estimated at 1.96 million tonnes as against 0.63 million tonnes during the pre-plan period. Production of inland fisheries, which had large unexploited potential at the beginning of the First Plan period, increased at a faster rate than that of marine fisheries. However, the progress was not equally shared as between different producing States. In fact, among the four important inland fish producing States of West Bengal, Tamil Nadu, Andhra Pradesh and Bihar, production in the last three States remained rather stagnant during the last decade. In marine fisheries, mechanisation of boats has been the most significant aspect of development as the means of increasing production. The number of mechanised boats increased from nearly 13 at the beginning of First Plan period to as many as 11,700 by the end of Fourth Plan period. However, progress in the introduction of larger mechanised fishing vessels for distant water fishing

and in the construction of fishery harbours, both major and minor, has not been satisfactory.

3.10.11 The total area under forests in the country during 1970-71 is placed at 748 thousand sq km representing 23 per cent of the total geographical area. Between 1950-51 and 1970-71 the outturn of industrial and fuelwood (including charcoal wood) increased by 38 per cent in terms of quantity and by as much as 468 per cent in terms of value. During the same period the total value of output of minor forest products, some of which earn sizeable foreign exchange, also moved up from Rs 7 crores to Rs 34 crores. However, outturn per hectare of forest area is very low. As mentioned in the Commission's Interim Report on Production Forestry-Man-Made Forests, "it is true that at present with an average plan and non-plan expenditure of Rs 10 per hectare, we are getting a gross revenue of Rs 21.50 and a net return of Rs 11.50 per hectare from our forest. As against this, if we adopt progressive methods, we expect a much higher net return as in other countries, for example, in West Germany where an expenditure of Rs 435 brings a gross income of Rs 565 and a net return of Rs 130 per hectare". The success of the programme for plantation of quick growing species has been rather limited. In a number of States the programme has either not been successful or has tended to be converted into a programme of plantations of economic and commercial uses. On the other hand, programmes of economic and commercial plantations and farm-forestry-cum-fuelwood plantations have made good progress.

APPENDIX 3-1

(Paragraph 3-2-8)

Density of Population per Thousand Hectares of Cultivated Area—1972*

State	Cultivated area in 1971-72 (thousand hectares)	Population—mid year 1972 (thousand persons)	Density per thousand ha of cultivated area
Andhra Pradesh	13,601	44,571	3,277
Assam@	2,397(a)	15,526	6,477
Bihar	10,123	57,649	5,695
Gujarat	10,118	27,544	2,722
Haryana	3,726	10,317	2,769
Himachal Pradesh	608	3,506	5,766
Jammu & Kashmir	796(a)	4,735	5,948
Karnataka	11,181	30,042	2,687
Kerala	2,211	21,971	9,937
Madhya Pradesh	19,147	42,959	2,244
Maharashtra	17,837	51,815	2,905
Manipur	140	1,102	7,871
Meghalaya	162(b)	1,038	6,407
Nagaland	62	526	8,484
Orissa	6,742(a)	22,522	3,341
Punjab	4,202	13,874	3,302
Rajasthan	17,025	26,533	1,558
Tamil Nadu	7,209	42,216	5,856
Tripura	243(a)	1,598	6,576
Uttar Pradesh	18,216	90,216	4,953
West Bengal	5,712	45,560	7,976
All India	151,923	562,467	3,702

* Directorate of Economics & Statistics, Ministry of Agriculture and Irrigation, Government of India (DES).

@ Includes figures for Mizoram also.

(a) Relates to the year 1970-71.

(b) Relates to the year 1969-70.

APPENDIX 3.2

(Paragraph 3.3.2)

Area under Foodgrains, Non-Foodgrains and Selected Crops in
Undivided India (1900 to 1930)*

area : million hectares

index : quinquennium ending 1904-05=100 as base.

Crop	Quinquennium ending					
	1904-05	1909-10	1914-15	1919-20	1924-25	1929-30
Foodgrains						
Area	93.48 (83.3)	97.86 (82.5)	100.61 (81.7)	100.89 (82.6)	100.12 (81.9)	100.16 (79.8)
Index	100.0	104.7	107.6	107.9	107.1	107.1
Non-foodgrains						
Area	18.70 (16.7)	20.80 (17.5)	22.54 (18.3)	21.21 (17.4)	22.10 (18.1)	25.29 (20.2)
Index	100.0	111.2	120.5	113.4	118.2	135.2
All crops						
Area	112.18 (100.0)	118.66 (100.0)	123.15 (100.0)	122.10 (100.0)	122.22 (100.0)	125.45 (100.0)
Index	100.0	105.8	109.8	108.8	108.9	111.8
Rice						
Area	27.8	29.1	29.9	30.4	30.1	29.7
Index	100.0	104.7	107.6	109.4	108.3	106.8
Wheat						
Area	10.6	11.1	12.3	12.3	12.2	13.0
Index	100.0	104.7	116.0	116.0	115.1	122.6
Jowar						
Area	14.6	14.6	14.1	14.9	15.3	14.7
Index	100.0	100.0	96.6	102.1	104.8	100.7
Bajra						
Area	7.9	8.5	8.7	8.0	8.2	8.0
Index	100.0	107.6	110.1	101.3	103.8	101.3
Gram						
Area	6.1	6.1	7.0	7.1	7.6	7.3
Index	100.0	100.0	114.8	116.4	124.6	119.7
Oilseeds						
Area	7.6	7.6	8.9	7.7	8.7	10.0
Index	100.0	100.0	117.1	101.3	114.5	131.5
Cotton						
Area	6.7	8.5	9.3	8.7	8.9	10.4
Index	100.0	126.9	138.8	129.9	132.8	155.2
Jute						
Area	0.9	1.3	1.3	1.1	0.9	1.4
Index	100.0	144.5	144.5	122.2	100.0	155.6
Plantations (tea & Coffee)						
Area	0.3	0.3	0.3	0.4	0.4	0.4
Index	100.0	100.0	100.0	133.3	133.3	133.3
Sugarcane						
Area	1.1	1.1	1.1	1.1	1.1	1.1
Index	100.0	100.0	100.0	100.0	100.0	100.0

* P. K. Mukherjee and S. Siva Subramonian. Agricultural Output and National Income in India (Table V. p. 13) in Tenth International Conference of Agricultural Economists, 1958.

NOTE : Figures in parentheses represent percentages to gross area under all-crop.

APPENDIX 3 3

(Paragraph 3.3.3)

Index Numbers of Production of Foodgrains, Non-foodgrains and Selected Crops in Undivided India (1900 to 1930)*

(base : quinquennium ending 1904-05=100)

Crop	Quinquennium ending					
	1904-05	1909-10	1914-15	1919-20	1924-25	1929-30
Foodgrains	100.0	97.5	105.6	107.2	101.8	97.3
Non-foodgrains	100.0	106.8	121.7	122.8	124.7	138.7
All-crops	100.0	99.6	109.1	110.5	106.8	106.3
Rice	100.0	93.2	103.1	102.7	95.6	93.2
Wheat	100.0	105.1	125.3	119.0	116.5	115.2
Jowar	100.0	100.0	94.9	107.7	89.7	93.6
Bajra	100.0	109.4	106.3	106.3	109.4	103.2
Maize	100.0	103.4	96.5	106.9	96.5	96.5
Barley	100.0	109.4	106.3	115.7	103.2	87.5
Gram	100.0	100.0	114.6	117.1	131.7	107.3
Sesamum	100.0	100.0	120.0	140.0	100.0	100.0
Linseed	100.0	100.0	150.0	125.0	125.0	100.0
Cotton	100.0	125.7	140.0	137.1	165.7	191.4
Jute	100.0	115.7	130.0	114.3	91.4	147.1
Sugarcane	100.0	92.0	104.0	120.0	120.0	124.0
Tea	100.0	120.4	144.1	185.9	167.1	197.9

* P. K. Mukherjee and S. Siva Subramonian, *Agricultural Output and National Income in India* (Table VI and X, pp 16 and 24) in *Tenth International Conference of Agricultural Economists*, 1958.

NOTE : (i) Foodgrains in the statement include rice, wheat, jowar, bajra, maize, barley and gram and non-foodgrains include sesamum, linseed, cotton, jute, sugarcane and tea.

(ii) Weights are based on the value of production during the quinquennium ending 1928-29.

APPENDIX 3.4

(Paragraph 3.3.6)

Area Production and Yield of Principal Crops in Selected Provinces
(1900 to 1930)*

area : thousand hectares
production : thousand tonnes
yield : kg/ha.

Province			Quinquennium ending					
			1904-05	1909-10	1914-15	1919-20	1924-25	1929-30
			4	5	6	7		
Rice								
Uttar Pradesh	.	A	2,783	2,653	2,457	2,762	2,805	2,911
		P	2,196	1,983	1,836	2,304	2,072	1,892
		Y	789	747	747	834	739	650
Madhya Pradesh	.	A	1,688	1,819	1,979	2,084	2,079	2,171
		P	1,196	1,199	1,544	1,443	1,316	1,606
		Y	709	659	780	692	633	740
Bombay	.	A	602	694	751	759	692	795
		P	611	732	815	779	774	905
		Y	1,015	1,955	1,085	1,026	1,118	1,138
Madras	.	A	3,997	4,066	4,336	4,576	4,455	4,482
		P	4,344	4,185	4,467	5,215	5,059	5,201
		Y	1,087	1,029	1,030	1,140	1,135	1,160
Wheat								
Uttar Pradesh	.	A	2,886	2,438	2,911	2,678	2,823	2,862
		P	2,618	2,311	2,876	2,836	2,576	2,626
		Y	907	948	988	1,059	913	918
Madhya Pradesh	.	A	1,179	1,272	1,403	1,393	1,182	1,382
		P	697	790	868	886	749	681
		Y	591	621	619	636	634	493
Punjab (India)	.	A	1,121	1,264	1,335	1,236	1,265	1,318
		P	872	1,099	1,152	923	1,033	1,076
		Y	778	869	863	747	817	816
Jowar								
Uttar Pradesh	.	A	1,000	1,060	870	899	954	928
		P	555	530	477	472	506	499
		Y	555	500	548	525	530	538
Madhya Pradesh	.	A	1,983	1,898	1,642	1,779	1,801	1,678
		P	1,252	1,161	1,056	1,051	1,038	969
		Y	631	612	643	591	576	577
Bombay	.	A	2,871	2,723	2,689	3,112	3,299	3,100
		P	1,262	1,267	1,460	1,738	1,422	1,577
		Y	440	465	543	558	431	509
Madras	.	A	2,232	2,185	2,143	2,084	2,067	1,947
		P	1,422	1,320	1,224	1,418	1,429	1,371
		Y	637	604	571	680	691	704

APPENDIX 3.4 (Contd.)

1		2	3	4	5	6	7
Maize							
Uttar Pradesh	A	848	936	865	944	743	768
	P	829	881	874	946	679	730
	Y	978	941	1,010	1,002	914	951
Punjab (India)	A	314	302	293	327	296	292
	P	276	281	261	294	259	242
	Y	879	930	891	899	875	829
Cotton@							
Madhya Pradesh	A	1,602	1,805	1,866	1,756	1,937	2,047
	P	875	834	926	856	966	1,063
	Y	98	83	89	88	90	93
Madras	A	776	834	985	1,004	960	994
	P	253	298	313	420	440	493
	Y	59	64	57	75	83	89
Punjab (India)	A	133	152	216	166	179	269
	P	70	85	131	100	131	192
	Y	95	101	109	108	132	129
Sugarcane							
Uttar Pradesh	A	479	508	518	559	536	592
	P	1,172	1,121	1,153	1,310	1,247	1,450
	Y	2,447	2,207	2,226	2,343	2,326	2,449
Punjab (India)	A	78	73	86	96	92	85
	P	124	132	172	214	194	167
	Y	1,590	1,808	2,000	2,229	2,109	1,965
Madras	A	40	40	37	45	47	42
	P	262	252	196	282	322	290
	Y	6,550	6,300	5,297	6,267	6,851	6,905

A : area

P : production

Y : yield

* (i) George Blyn 1966. Agricultural Trends in India, 1891 to 1947 (Appendix 3A) Bombay, Oxford University Press.

(ii) V. G. Panse, Yield Rates of Principal Crops in India in Census of India, 1951, Vol. I, Part. I-B (Tables 2.1 to 2.6).

@ Production in thousand bales of 180 kg each of lint.

APPENDIX 3.5

(Paragraph 3.3.12)

Area under Major Foodgrains and Commercial Crops in Undivided India
(1930 to 1947)*

(million hectares)

Crop	Quinquennium ending				
	1934-35	1939-40	1944-45	1945-46	1946-47
Foodgrains					
Rice . . .	30.3	31.2	32.6	34.2	35.4
Wheat . . .	14.0	14.2	14.3	14.4	14.4
Jowar . . .	15.1	15.6	16.1	16.0	15.8
Bajra . . .	8.3	7.5	9.6	10.3	9.7
Gram . . .	8.1	7.4	6.9	9.1	8.1
Commercial Crops . . .					
Oilseeds . . .	10.7	11.2	9.8	9.9	9.9
Cotton . . .	9.4	9.8	8.3	5.9	6.1
Jute . . .	0.9	1.4	1.2	1.0	1.0
Sugarcane . . .	1.3	1.6	1.7	1.5	1.7

- * (i) P. K. Mukherjee and S. Siva Subramonian; Agricultural Output and National Income in India (Table V, pp. 13-14) in Tenth International Conference of Agricultural Economists, 1958.
- (ii) Estimates of Area and Yield of Principal Crops in Undivided India, 1936-37 to 1945-46, DES.
- (iii) Estimates of Area and Production of Principal Crops in India 1951-52, DES.

APPENDIX 3.6

(Paragraph 3.3.15)

Index Numbers of Production of Principal Crops in Undivided India
(1930 to 1947)*(base : quinquennium ending
1904-05 = 100)

Crops	Quinquennium ending				
	1934-35	1939-40	1944-45	1945-46	1946-47
Foodgrains					
Rice	96.9	92.2	94.2	92.8	99.0
Wheat	121.5	130.4	131.6	116.4	101.4
Jowar	92.3	96.1	94.9	72.9	69.8
Bajra	103.2	93.8	125.0	102.3	98.0
Barley	87.5	75.0	78.1	74.5	90.6
Maize	100.0	89.6	96.6	94.3	93.4
Gram	112.2	104.9	97.6	91.3	102.4
Non-Foodgrains					
Linseed	100.0	125.0	100.0	85.3	79.9
Sesamum	100.0	100.0	100.0	71.3	65.6
Sugarcane	184.0	212.0	228.0	240.8	256.9
Cotton	162.9	191.4	165.7	92.0	92.0
Jute	104.3	137.1	117.1	138.2	135.7
Tea	198.9	211.0	256.2	278.4	278.4

*Some sources as cited in Appendix 3.5.

APPENDIX 3.7

(Paragraph 3.3.17)

Area, Production and Yield of Principal Crops in Selected Provinces
(1930 to 1947)*

area : thousand hectares
production : thousand tonnes
yield : kg/ha.

Province	Quinquennium ending				
	1934-35	1939-40	1944-45	1945-46	1946-47
1	2	3	4	5	6
Rice					
Uttar Pradesh					
A	2,576	2,881	2,836	2,915	3,051
P	1,766	2,112	1,669	1,892	1,837
Y	686	733	589	649	602
Madhya Pradesh					
A	2,261	2,325	2,673	3,252	3,248
P	1,686	1,665	1,722	2,195	1,855
Y	746	716	644	675	571
Bombay					
A	815	786	974	1,271	1,282
P	921	790	959	1,202	1,218
Y	1,130	1,005	985	946	950
Madras					
A	4,655	4,084	4,327	4,129	4,446
P	5,377	4,746	5,035	4,011	4,997
Y	1,155	1,162	1,163	1,044	1,124
Wheat					
Uttar Pradesh					
A	3,160	3,131	3,132	3,306	3,288
P	2,657	2,757	2,681	2,366	2,406
Y	841	881	856	716	732
Madhya Pradesh					
A	1,386	1,331	1,153	1,114	1,174
P	699	650	482	451	116
Y	504	488	418	405	99
Punjab (India)					
A	1,257	1,268	1,279	1,353	1,260
P	963	1,131	1,167	1,072	1,034
Y	766	892	912	792	821

APPENDIX 3.7 (Contd.)

1	2	3	4	5	6
Jowar					
Uttar Pradesh					
A	1,002	902	943	1,040	930
P	509	463	538	578	433
Y	508	513	571	556	466
Madhya Pradesh					
A	1,773	1,793	2,059	2,045	2,030
P	994	1,014	1,136	1,035	840
Y	560	566	552	506	414
Bombay					
A	3,184	3,369	3,857	5,229	5,183
P	1,656	1,412	1,556	1,328	1,498
Y	520	419	403	254	289
Madras					
A	1,917	2,006	1,958	1,708	1,860
P	1,309	1,305	1,222	933	910
Y	683	649	624	546	489
Maize					
Uttar Pradesh					
A	872	824	931	1,045	971
P	815	725	873	991	768
Y	935	880	938	948	791
Punjab (India)					
A	298	307	344	351	354
P	239	257	326	305	338
Y	802	837	948	869	955
Cotton@					
Madhya Pradesh					
A	1,768	1,537	1,348	1,196	1,201
P	736	699	718	538	480
Y	75	82	96	81	72
Madras					
A	871	966	900	657	639
P	433	479	494	365	348
Y	89	89	99	100	98
Punjab (India)					
A	265	292	213	156	140
P	207	290	196	148	128
Y	141	179	166	171	164

APPENDIX 3.7 (Concl'd.)

1	2	3	4	5	6
Sugarcane					
Uttar Pradesh					
A	677	839	859	745	841
P	2,266	2,942	2,498	2,280	2,483
Y	3,347	3,507	2,908	3,060	2,952
Madras					
A	49	47	57	65	82
P	343	337	410	443	600
Y	7,000	7,170	7,193	6,815	7,317
Punjab (India)					
A	91	92	108	125	137
P	176	188	279	398	418
Y	1,934	2,043	2,583	3,184	3,051

A : Area

P : production

Y : yield

*(i) V. G. Panse, Yield Rates of Principal Crops in India in Census of India 1951, Vol. I, Part I B (Table 2.1 to 2.6 pp 61-66).

(ii) V. S. Menon 1958 July, Agricultural productivity in India (1910-11 to 1956-57) in Agricultural Situation in India (pp. 8-9).

@Production in thousand bales of 180 kg each of lint.

APPENDIX 3.8

(Paragraphs 3.4.8 and 3.4.11)

All India Index Numbers of Net Area Sown, Area Under Crops
Cropping Intensity, Cropping Pattern, Productivity per Hectare of
Net Area, Yield and Agricultural Production*

(base, triennium ending 1961-62=100)

Year	Net area sown	Area under crops	Cropping inten- sity	Cropping pattern	Pro- ductivity per ha. of net area	Yield	Agri- cultural production
1949-50	89.2	82.1	96.0	98.0	84.6	89.8	72.8
1950-51	89.9	82.0	94.9	100.2	79.9	83.2	68.9
1951-52	90.4	83.5	95.9	99.9	80.8	83.7	70.3
1952-53	92.1	86.5	95.5	98.2	83.1	87.5	74.1
1953-54	94.6	91.3	97.1	95.3	89.6	96.8	83.9
1954-55	95.4	92.2	97.3	96.8	90.1	95.6	84.8
1955-56	96.4	94.4	97.9	98.4	88.4	91.9	84.4
1956-57	97.6	95.2	98.4	99.4	93.4	95.1	89.5
1957-58	96.5	94.2	96.9	100.2	87.3	89.4	83.7
1958-59	98.5	98.0	98.8	98.8	97.9	100.5	96.6
1959-60	99.3	99.4	100.1	99.2	95.0	95.7	94.3
1960-61	99.5	99.2	99.7	100.2	103.2	103.3	102.7
1961-62	101.2	101.4	100.2	100.6	101.8	101.0	103.0
1962-63	101.8	102.3	100.5	100.6	99.6	98.5	101.4
1963-64	101.9	102.1	100.2	101.1	102.1	100.8	103.9
1964-65	103.1	103.3	100.2	102.2	110.7	108.1	115.0
1965-66	101.7	100.9	99.2	103.5	94.7	92.2	95.8
1966-67	102.5	100.7	98.2	102.1	94.0	93.8	95.9
1967-68	104.4	105.0	100.6	99.7	111.8	111.5	116.6
1968-69	102.7	103.3	100.6	103.6	112.1	107.6	114.8
1969-70	103.6	106.2	102.6	102.5	118.5	112.7	122.5
1970-71	105.4	107.3	101.8	103.8	124.8	118.0	131.4
1971-72	N.A.	106.7	N.A.	104.4	N.A.	117.3	130.9
1972-73	N.A.	103.0	N.A.	105.7	N.A.	110.7	120.6
1973-74	N.A.	108.8	N.A.	104.2	N.A.	116.0	131.6

* Estimates of Area and Production of Principal Crops in India—1973-74,
DES.

N.A.=not available.

APPENDIX 3.9

(Paragraphs 3.4.14 and 3.4.63)

Targets and Achievements of Agricultural Production under the Plans*

Crop	Unit	First Plan		Second Plan		Third Plan		
		Target 1955-56	Achievements 1955-56	Target 1960-61	Achievements 1960-61	Target 1965-66	Achievements 1964-65	1965-66 +
1	2	3	4	5	6	7	8	9
Rice	million tonnes	27.7	27.6	32.5	34.6	45.7	39.3	30.6
Wheat	Do.	8.4	8.8	11.7	11.0	15.2	12.3	10.4
Other Cereals	Do.	17.4	19.4	24.9	23.7	23.4	25.4	21.4
Total Cereals	Do.	53.5	55.8	69.1	69.3	84.3	77.0	62.4
Total Pulses	Do.	9.1	11.1	12.7	12.7	17.3	12.4	9.9
Total Foodgrains	Do.	62.6	66.9	81.8	82.0	101.6	89.4	72.3
Oilseeds@	Do.	5.6	5.7	7.7	7.0	10.0	8.6	6.4
Sugarcane (Gur)	Do.	6.4	6.1	7.9	11.1	10.2	12.5	12.8
Cotton (lint)	million bales of 180 Kg each	4.1	3.9	6.4	5.3	6.9	5.7	4.6
Jute	Do.	5.4	4.2	5.5	4.1	6.3	6.1	4.5
Tobacco	thousand tonnes	N.F.	303.0	254.0	307.0	330.2	356.0	293.0
Tea	Do.	N.F.	285.0+	317.5	321.0+	408.2	372.0+	366.0
Coffee	Do.	N.F.	34.4	N.F.	43.2	81.3	47.1	63.9
Rubber	Do.	N.F.	22.5+	N.F.	25.4+	45.7+	43.5+	50.0+
Coconut	million nuts	N.F.	4,226	N.F.	4,639	5,275	5,043	5,035
Areca nut	Thousand tonnes	N.F.	N.A.	100.8	N.A.	101.6	113.0	119.0
Cashew nut	Do.	N.F.	82.0	81.3	124.0	152.4	154.0	159.0
Pepper	Do.	N.F.	28.0	32.5	28.0	27.4	24.0	23.0
Lac	Do.	N.F.	44.2	59.7	52.8	63.0	17.7	23.5

* (i) Estimates of Area and production of Principal Crops in India, 1970-71, 1972-73 and 1973-74—DES.

(ii) Indian Agriculture in Brief, Eleventh, Twelfth and Thirteenth Editions, DES.

(iii) Fourth Five Year Plan, 1969-74.

(iv) Fourth Plan Mid-Term Appraisal—Volume II.

(v) Annual Plans—1966-67, 1967-68 and 1968-69.

APPENDIX 3.9—Contd.

Annual Plans						Fourth Plan	
Target 1966-67	Achievement 1966-67	Target 1967-68	Achievement 1967-68	Target 1968-69	Achievement 1968-69	Target 1973-74	Achievement 1973-74
10	11	12	13	14	15	16	17
N.A.	30.4	N.A.	37.6	N.A.	39.8	52.0	43.7
N.A.	11.4	N.A.	16.5	N.A.	18.7	24.0	22.1
N.A.	24.1	N.A.	28.9	N.A.	25.1	38.0	28.1
N.A.	65.9	N.A.	83.0	N.A.	83.6	114.0	93.9
N.A.	8.3	N.A.	12.1	N.A.	10.4	15.0	9.7
97.0**	74.2	100.0**	95.1	102.0**	94.0	129.0	103.6
9.9	6.4	9.0	8.3	10.0	6.8	10.5	8.7
12.7	9.5	12.0	9.8	12.5	12.8	15.4	14.0
6.3	5.0	7.0	5.5	6.7	5.1	8.0	5.8
6.9	5.4	7.5	6.3	6.9	2.9	7.4	6.2
N.F.	353.0	N.F.	369.0	N.F.	361.0	450.0	441.4
N.F.	376.0+	N.F.	385.0	N.F.	402.0	N.F.	N.A.
N.F.	79.5	N.F.	57.3	N.F.	73.4	N.F.	N.A.
N.F.	54.8+	N.F.	64.5	N.F.	71.1	N.F.	N.A.
N.F.	5,192	N.F.	5,321	N.F.	5,546	6,600	N.A.
N.F.	130.0	N.F.	135.0	N.F.	140.0	150.0	N.A.
N.F.	167.0	N.F.	173.0	N.F.	175.0	236.0	N.A.
N.F.	27.0	N.F.	26.0	N.F.	26.0	42.0	26.3
N.F.	29.7	N.F.	38.8	N.F.	29.6	45.0	N.A.

NOTE : The estimates of production are the unadjusted estimates published from time to time and do not account for the changes in coverage, etc.

@ Includes groundnut, castorseed, sesamum, rapeseed & mustard and linseed.

** Grainwise details not available.

+ Relates to calendar year.

++ The year 1965-66 being an exceptionally bad year for agricultural production, achievements during 1964-65 have also been given.

NA—Not available.

NF—Target not fixed.

APPENDIX 3.10

(Paragraph 3.4.18)

State Index Numbers of Area under Crops*

(base: triennium ending 1961-62=100)

State	1952-53	1955-56	1960-61	1964-65
1	2	3	4	5
All Crops				
Andhra Pradesh	100.2	102.9	98.7	103.5
Assam	91.3	93.1	99.4	* 103.5
Bihar	100.3	92.8	100.7	98.7
Gujarat	90.9	96.2	98.6	98.8
Himachal Pradesh	91.7	97.3	98.4	101.1
Karnataka	86.2	97.6	99.8	97.0
Kerala	88.1	92.2	100.9	103.0
Madhya Pradesh	87.9	94.5	99.4	103.5
Maharashtra	92.4	98.5	99.6	100.0
Orissa	96.0	96.2	94.9	103.8
Punjab (including Haryana) .	76.8	97.1	100.5	103.3
Rajasthan	69.0	86.9	96.1	104.7
Tamil Nadu	85.4	95.9	101.4	103.5
Uttar Pradesh	91.4	96.6	99.8	100.5
West Bengal	97.3	97.0	100.5	104.3
Food Grains				
Andhra Pradesh	92.1	96.1	98.4	99.9
Assam	90.8	92.6	99.7	103.9
Bihar	100.4	93.6	101.3	99.2
Gujarat	124.1	113.9	95.8	95.9
Himachal Pradesh	92.2	97.8	98.6	100.6
Karnataka	86.8	95.9	100.2	96.5
Kerala	95.4	99.8	101.5	104.0
Madhya Pradesh	88.2	93.7	100.1	102.2
Maharashtra	93.5	97.1	100.3	98.9
Orissa	94.9	95.5	94.3	101.5
Punjab (including Haryana)	78.9	98.2	100.7	101.3
Rajasthan	70.3	86.5	96.7	103.4
Tamil Nadu	86.7	96.4	101.3	102.3
Uttar Pradesh	92.4	97.5	99.8	98.6
West Bengal	98.6	98.1	102.1	103.4

APPENDIX 3.10 (Concl'd.)

1	2	3	4	5
Non-Foodgrains				
Andhra Pradesh	137.3	134.0	99.7	120.0
Assam	92.9	95.1	98.4	102.3
Bihar	98.8	83.0	93.8	94.2
Gujarat	54.9	76.9	101.7	101.8
Himachal Pradesh	82.8	85.7	93.4	113.2
Karnataka	84.6	102.6	98.8	98.4
Kerala	82.6	87.1	100.5	102.2
Madhya Pradesh	86.1	99.2	95.3	110.4
Maharashtra	89.0	102.9	98.0	103.4
Orissa	113.3	108.0	103.2	138.1
Punjab (including Haryana)	65.3	90.6	99.6	115.1
Rajasthan	58.1	90.8	89.9	117.6
Tamil Nadu	81.7	94.6	101.8	107.5
Uttar Pradesh	87.5	92.9	100.1	107.6
West Bengal	87.1	89.4	87.8	114.5

*State index numbers of area under crops are based on "Growth Rates in Agriculture, 1949-50 to 1964-65" published by DES. For purposes of comparison with the all-India series, the comparison base period has been shifted to the triennium ending 1961-62.

APPENDIX 3.11

(Paragraph 3.4.22)

State Index Numbers of Agricultural Production*

(base : triennium ending 1961-62=100)

State	1952-53	1955-56	1960-61	1964-65
1	2	3	4	5
All Crops				
Andhra Pradesh . . .	79.02	90.09	95.48	117.43
Assam	91.46	72.92	96.02	109.81
Bihar	87.75	82.36	105.08	109.22
Gujarat	60.39	80.99	102.73	134.95
Himachal Pradesh . . .	66.86	81.99	91.33	108.13
Karnataka	64.71	90.70	97.41	115.65
Kerala	80.46	88.84	100.73	104.61
Madhya Pradesh	74.81	84.67	104.59	110.84
Maharashtra	65.98	78.99	113.84	104.01
Orissa	90.81	87.07	99.28	119.77
Punjab (including Haryana)	66.56	74.42	103.21	122.92
Rajasthan	66.19	83.05	93.40	108.48
Tamil Nadu	59.10	83.56	101.40	107.84
Uttar Pradesh	83.54	84.82	103.40	111.45
West Bengal	93.34	90.01	105.30	119.39
Food Grains				
Andhra Pradesh	72.39	82.32	93.90	110.11
Assam	94.48	92.90	99.41	109.07
Bihar	85.61	83.04	104.91	108.73
Gujarat	85.31	93.08	90.74	140.09
Himachal Pradesh . . .	64.17	79.64	91.09	108.44
Karnataka	66.80	91.97	97.40	114.45
Kerala	69.79	85.32	102.92	106.61
Madhya Pradesh	75.71	84.48	103.67	108.11
Maharashtra	68.90	83.68	112.39	102.03
Orissa	89.29	84.62	99.64	116.58
Punjab (including Haryana)	71.92	78.85	102.97	119.62
Rajasthan	69.86	86.03	89.63	112.03
Tamil Nadu	57.73	84.01	99.38	108.50
Uttar Pradesh	87.02	88.76	103.85	106.78
West Bengal	89.88	93.95	112.30	117.88

APPENDIX 3 11 (Concl'd.)

1	2	3	4	5
Non-Foodgrains				
Andhra Pradesh	96.16	110.32	99.40	136.38
Assam	89.08	92.82	93.20	110.25
Bihar	105.54	76.91	106.42	113.64
Gujarat	45.06	73.47	109.99	131.71
Himachal Pradesh	92.08	104.05	94.15	105.67
Karnataka	60.22	87.90	97.49	118.30
Kerala	85.19	90.34	99.82	103.78
Madhya Pradesh	67.28	86.27	111.48	132.73
Maharashtra	60.40	70.25	116.58	107.80
Orissa	99.83	102.02	97.11	138.72
Punjab (including Haryana)	53.33	63.33	103.64	130.93
Rajasthan	53.02	72.04	107.54	95.30
Tamil Nadu	61.53	82.75	105.14	106.72
Uttar Pradesh	75.78	76.14	102.28	121.67
West Bengal	100.21	82.15	91.35	122.36

* State index numbers of agricultural production are based on "Growth Rates in Agriculture, 1949-50 to 1964-65" published by the DES. For purposes of comparison with the all-India series, the comparison base period has been shifted to the triennium ending 1961-62.

APPENDIX 3.12

(Paragraph 3.4.37)

State Index Numbers of Agricultural Productivity*

(base : triennium ending 1961-62=100)

State	1952-53	1955-56	1960-61	1964-65
1	2	3	4	5
All Crops				
Andhra Pradesh	78.87	87.58	96.76	113.44
Assam	100.27	99.96	96.64	106.29
Bihar	87.78	89.05	104.67	110.05
Gujarat	66.65	84.40	104.40	136.78
Himachal Pradesh	72.89	84.33	92.79	107.03
Karnataka	75.09	92.96	97.63	110.28
Kerala	91.40	96.43	99.81	101.64
Madhya Pradesh	85.23	89.73	105.37	107.21
Maharashtra	71.49	80.29	114.21	103.94
Orissa	94.37	90.33	104.42	115.22
Punjab (including Haryana).	86.65	76.60	102.66	118.92
Rajasthan	96.00	95.72	97.30	103.72
Tamil Nadu	69.20	87.13	100.00	104.25
Uttar Pradesh	91.40	87.76	103.55	110.84
West Bengal	96.06	92.83	104.94	114.62
Foodgrains				
Andhra Pradesh	78.39	85.54	95.66	110.04
Assam	104.14	100.35	99.72	105.09
Bihar	85.30	88.68	103.63	109.63
Gujarat	68.61	81.53	94.53	145.78
Himachal Pradesh	69.62	81.45	92.31	107.80
Karnataka	76.94	95.81	97.18	118.53
Kerala	73.21	82.43	101.29	102.48
Madhya Pradesh	85.94	90.18	103.63	105.85
Maharashtra	73.68	86.15	112.10	103.17
Orissa	93.94	88.44	105.41	114.70
Punjab (including Haryana).	91.17	80.30	102.31	118.15
Rajasthan	99.45	99.64	92.88	108.53
Tamil Nadu	66.67	87.16	98.18	106.11
Uttar Pradesh	94.23	91.06	104.10	108.38
West Bengal	91.21	95.90	110.08	114.18

APPENDIX 3.12 (Contd.)

	1	2	3	4	5
Non-Foodgrains					
Andhra Pradesh		69.99	82.27	99.66	113.59
Assam		96.02	97.76	94.78	107.84
Bihar		105.90	91.89	112.56	119.56
Gujarat		82.86	96.46	108.97	130.55
Himachal Pradesh		111.35	121.62	100.89	93.47
Karnataka		71.18	85.78	98.75	120.37
Kerala		103.06	103.69	99.22	101.50
Madhya Pradesh		77.93	86.58	116.50	119.79
Maharashtra		71.23	71.33	124.06	108.70
Orissa		88.37	94.74	94.40	100.78
Punjab (including Haryana)		81.73	69.94	104.20	113.85
Rajasthan		90.51	78.61	118.63	80.22
Tamil Nadu		75.28	87.55	103.26	99.38
Uttar Pradesh		86.58	81.95	102.18	113.05
West Bengal		115.03	91.94	103.97	106.87

State index numbers of agricultural productivity are based on "Growth Rates in Agriculture, 1949-50 to 1964-65" by the DES. For the purposes of comparison with the all-India series the comparison base period has been shifted to the triennium ending 1961-62

APPENDIX 3.13
Area, Production and Yield of Important Crops—Statewise*

(Paragraph 3.4.66)

State	Area				Production				Yield			
	1962-65 (average)	1971-74 (average)	% increase or decrease in col. 3 over col. 2		1962-65 (average)	1971-74 (average)	% increase or decrease in col. 6 over col. 5		1962-65 (average)	1971-74 (average)	% increase or decrease in col. 9 over col. 8	
	2	3	4		5	6	7		8	9	10	
1												
Rice												
Andhra Pradesh	3,431	3,076	(-)10.4		4,531	4,775	5.4		1,321	1,552	17.5	
Assam	1,907	2,038	6.9		1,801	2,051	13.9		944	1,006	6.6	
Bihar	5,276	5,082	(-)3.7		4,568	4,626	1.3		866	910	5.0	
Gujarat	544	442	18.8		457	378	(-)17.3		840	855	1.8	
Haryana	167	291	74.3		212	513	142.0		1,269	1,763	38.9	
Himachal Pradesh	102	97	(-)4.9		92	102	10.9		902	1,052	16.6	
Jammu & Kashmir	227	227	—		385**	391	1.6		1,696	1,722	1.5	
Karnataka	1,112	1,091	(-)2.8		1,592	1,972	23.9		1,419	1,808	27.4	
Kerala	803	875	9.0		1,114	1,361	22.2		1,387	1,555	12.1	
Madhya Pradesh	4,258	4,524	6.2		3,052	3,441	12.7		717	761	6.1	
Maharashtra	1,354	1,325	(-)2.1		1,412	1,252	(-)11.3		1,043	945	(-)9.4	
Orissa	4,359	4,625	6.1		4,140	4,014	(-)3.0		950	868	(-)8.6	
Punjab	263	478	81.7		297	1,013	241.1		1,129	2,119	87.7	
Rajasthan	112	134	19.6		109	119	9.2		973	888	(-)8.7	
Tamil Nadu	2,637	2,764	4.8		3,977	5,489	38.0		1,508	1,986	31.7	

area—thousand hectares
production—thousand tonnes
yield—kg/hectare

Uttar Pradesh	4,359	4,522	3 7	3,245	3,630	11 9	744	803	7 9
West Bengal	4,549	5,071	11 5	5,169	6,008	16-2	1,136	1,185	4-3
All-India	35,988	37,489	4-2	36,507	42,018	15 1	1,014	1,121	10-6
				Wheat					
Bihar	678	1,828	169 6	455	2,427	433 4	671	1,328	97-9
Gujarat	412	489	18 7	353	784	122-1	857	1,603	87-0
Haryana	699	1,208	72-8	881	2,148	143 8	1,260	1,778	41-1
Himachal Pradesh	301	315	4-7	234	337	44 0	777	1,070	37-7
Jammu & Kashmir	180	186	3-3	102	172	68-6	567	925	63-1
Karnataka	308	331	7 5	97	162	67-0	315	489	55-2
Madhya Pradesh	3,240	3,439	6-1	2,016	2,612	33-5	662	783	25 9
Maharashtra	885	888	0-3	401	429	7 0	453	483	6-6
Orissa	13	40	207 7	7	69	885-7	538	1,725	220-6
Punjab	1,540	2,375	54-2	2,040	5,414	165-4	1,325	2,280	72 1
Rajasthan	1,187	1,528	28 7	1,020	1,811	77 5	859	1,185	38 0
Uttar Pradesh	3,974	6,079	53-0	3,348	7,026	109 9	842	1,156	37 3
West Bengal	48	373	677 1	30	746	2,386-7	625	2,000	220-0
All-India	13,504	19,220	42 3	10,962	24,406	122 6	812	1,270	56 4
				Jowar					
Andhra Pradesh	2,591	2,716	4 8	1,315	1,231	(-)6 4	508	453	(-)10-8
Gujarat	1,414	1,071	(-)24 3	435	376	(-)13-6	308	351	14-0
Karnataka	3,016	2,143	(-)29-0	1,445	1,547	7-1	479	722	50-7
Madhya Pradesh	2,052	2,102	2 4	1,525	1,382	(-)9-4	743	658	(-)11-4
Maharashtra	6,117	5,770	(-)5 7	3,270	2,016	(-)38-4	616	349	(-)43-3
Rajasthan	1,135	1,006	(-)11 4	367	316	(-)13-9	323	314	(-)2-8
Tamil Nadu	746	689	(-)7-6	567	538	(-)5-1	760	781	2-8
Uttar Pradesh	886	685	(-)22-7	562	412	(-)26-7	634	601	(-)5-2
All-India	18,282	16,418	(-)10-2	9,543	7,894	(-)17 3	522	481	(-)7-9

APPENDIX 3.13 (Contd.)

State	Area			Production			Yield		
	1962-65 (average)	1971-74 (average)	% increase or decrease in col. 3 over col. 2	1962-65 (average)	1971-74 (average)	% increase or decrease in col. 6 over col. 5	1962-65 (average)	1971-74 (average)	% increase or decrease in col. 9 over col. 8
1	2	3	4	5	6	7	8	9	10
Bajra									
Andhra Pradesh	605	530	(-)12.4	324	252	(-)22.2	536	475	(-)11.4
Gujarat	1,438	1,773	23.3	733	1,234	68.3	510	696	36.5
Haryana	730	912	24.9	291	593	103.8	399	650	62.9
Karnataka	501	410	(-)18.2	134	156	16.4	267	380	42.3
Madhya Pradesh	194	216	11.3	139	160	15.1	716	741	3.5
Maharashtra	1,708	1,549	(-)9.3	501	433	(-)13.6	293	280	(-)4.4
Punjab	124	136	9.7	157	136	13.6	460	1,000	117.4
Rajasthan	4,446	5,349	20.3	1,016	1,470	44.7	229	275	20.1
Tamil Nadu	453	450	(-)0.7	297	295	(-)0.7	656	656	(-)0.2
Uttar Pradesh	1,034	1,033	(-)0.1	615	686	11.5	595	664	11.6
All-India	11,297	12,412	9.9	4,119	5,445	32.2	365	439	20.3
Maize									
Andhra Pradesh	205	277	35.1	195	319	63.5	9.51	1,152	21.1
Bihar	801	885	10.5	787	625	(-)20.6	983	706	(-)28.2
Gujarat	234	259	10.7	280	294	5.0	1,197	1,135	(-)5.2
Himachal Pradesh	230	248	7.8	343	386	12.5	1,491	1,556	4.4
Jammu & Kashmir	247	275	11.3	382**	353	(-)7.6	1,547	1,284	(-)17.0
Madhya Pradesh	488	614	25.8	506	506	—	1,037	824	(-)20.5
Punjab	370	553	49.5	477	834	74.8	1,289	1,508	17.0
Rajasthan	694	801	15.4	720	585	(-)18.8	1,037	730	(-)29.6

Uttar Pradesh	1,094	1,482	35.5	888	1,100	23.9	812	472	(-)8.6
West Bengal	55	46	(-)17.9	37	38	2.7	673	826	22.7
All-India	4,614	5,842	26.6	4,611	5,711	23.9	999	978	(-)2.1
Groundnut									
Andhra Pradesh	991	1,428	44.1	777	1,161	49.4	784	813	3.7
Gujarat	2,112	1,700(-)	(-)19.5	1,360	1,044	(-)23.2	644	614	(-)4.7
Karnataka	893	870	(-)2.6	567	606	6.9	635	697	9.8
Madhya Pradesh	462	454	(-)1.7	301	267	(-)11.3	652	588	(-)9.8
Maharashtra	1,134	723	(-)36.2	809	383	(-)52.7	713	530	(-)25.7
Punjab	107	162	51.4	110	161	46.4	1,028	994	(-)3.3
Rajasthan	191	246	28.8	103	142	37.9	539	577	7.1
Tamil Nadu	920	1,095	19.0	1,058	1,180	11.5	1,150	1,078	(-)6.3
Uttar Pradesh	299	332	11.0	292	252	(-)13.7	977	759	(-)22.3
All-India	7,175	7,133	(-)0.6	5,455	5,357	(-)1.8	760	751	
Five Major Oilseeds									
Andhra Pradesh	1,560	2,024	29.7	878	1,279	45.7	563	632	12.3
Gujarat	2,325	1,907	(-)18.0	1,419	1,143	(-)19.5	611	599	(-)2.0
Karnataka	1,049	1,023	(-)2.5	612	656	7.2	583	641	9.9
Madhya Pradesh	1,622	1,668	2.8	543	588	8.3	335	353	5.4
Maharashtra	1,481	1,083	(-)26.9	883	457	(-)48.3	596	422	(-)29.2
Punjab	216	306	41.7	170	275	61.8	787	899	14.2
Rajasthan	1,140	1,198	5.1	272	372	36.8	238	311	30.7
Tamil Nadu	1,043	1,237	18.6	1,098	1,226	11.7	1,053	991	(-)5.9
Uttar Pradesh	3,588	3,680	2.6	1,365	1,481	8.5	380	402	5.8
All-India	15,138	15,291	1.0	7,694	8,096	5.2	508	529	4.1

APPENDIX 3 13 (Concl.)

State	Area				Production				Yield			
	1962-65 (average)	1971-74 (average)	% increase or decrease in col. 3 over col. 2		1962-65 (average)	1971-74 (average)	% increase or decrease in col. 6 over col. 5		1962-65 (average)	1971-74 (average)	% increase or decrease in col. 9 over col. 8	
	2	3	4	5	6	7	8	9	10	11	12	13
Cotton @												
Andhra Pradesh	389	348	(-)-10.5	130	213	63.8	60	110	83.3			
Gujarat	1,778	1,833	3.1	1,501	1,759	17.2	152	173	13.8			
Haryana	156	253	62.2	255	437	71.4	294	311	5.8			
Karnataka	1,013	988	(-)-2.5	430	538	25.1	76	98	28.9			
Madhya Pradesh	782	689	(-)-11.9	399	296	(-)-25.8	92	77	(-)-16.3			
Maharashtra	2,762	2,376	(-)-14.0	1,318	970	(-)-26.4	86	73	(-)-15.1			
Punjab	490	493	0.6	802	983	22.6	295	359	21.7			
Rajasthan	230	326	41.8	175	321	83.4	137	177	29.2			
Tamil Nadu	384	306	(-)-20.3	354	352	(-)-0.6	166	207	24.7			
All-India	8,105	7,693	(-)-5.1	5,444	5,933	9.0	121	139	14.9			
Jute @												
Assam	134	142	6.0	872	1,095	25.6	1,171	1,388	18.5			
Bihar	190	135	(-)-29.0	1,045	653	(-)-37.5	990	871	(-)-12.0			
Orissa	51	50	(-)-2.0	340	388	14.1	1,200	1,397	16.4			
Uttar Pradesh	20	10	(-)-50.0	153	89	(-)-41.8	1,377	1,602	16.3			
West Bengal	446	416	(-)-6.7	3,360	3,285	(-)-2.2	1,356	1,421	4.8			
All-India	854	769	(-)-10.0	5,862	5,613	(-)-4.3	1,236	1,314	6.3			

					Sugarcane (Gmt)					
Andhra Pradesh	120	136	13 3	1,039	1,210	16.5	8,658	8,897	2.8	
Bihar	156	141	(-)-9 6	563	479	(-)-14.9	3,609	3,397	(-)-5.9	
Haryana	129	133	3 1	538	570	5.9	4,171	4,286	2.8	
Karnataka	81	107	32 1	651	880	35.2	8,037	8,224	2.3	
Madhya Pradesh	60	50	(-)-16 7	151	135	(-)-10.6	2,517	2,700	7.3	
Maharashtra	144	163	13 2	1,109	1,332	20.1	7,701	8,172	6.1	
Punjab	117	106	(-)-9 4	381	490	28.6	3,256	4,623	42.0	
Tamil Nadu	78	137	75 6	656	1,199	82.8	8,410	8,752	4.1	
Uttar Pradesh	1,293	1,352	4.6	4,900	5,574	13.8	3,790	4,123	8.0	
All India	2,364	2,521	6.6	10,766	12,812	19.0	4,554	5,082	11.6	

Estimates of Area and Production of Principal Crops in India, DES

Adjusted estimates.

+ Includes groundnut, sesamum, rapeseed, mustard, linseed and castorseed.

@ Production in terms of thousand bales of 180 kg each

APPENDIX 3 14

(Paragraph 3.4.76)

Statewise Estimates of Production of Foodgrains, Oilseeds, Cotton, Jute and Sugarcane

(1967-68 to 1973-74)*

(Thousand tonnes)									
State	(1967-68 to 1973-74)*								
	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	Fourth Plan target (1973-74)	
1	2	3	4	5	6	7	8	9	
									Foodgrains
Andhra Pradesh	7,186	6,847	7,400	7,406	7,290	6,708	8,331	10,800	
Assam	2,037(a)	2,304(a)	2,119(a)	2,034	1,996	2,396	2,171	2,600	
Bihar	8,627	8,870	7,546	7,881	9,067	9,320	7,679	11,400	
Gujarat	2,330	2,346	3,221	4,406	4,222	2,214	3,628	4,400	
Haryana	3,992	3,006	4,567	4,751	4,515	4,078	3,839	4,400	
Himachal Pradesh	898	961	982	950	945	914	937	1,350	
Jammu & Kashmir	682	1,099	1,151	945	959	954	1,010	1,100	
Kerala	1,151	1,427	243	1,321	1,373	1,397	1,376	1,750	
Madhya Pradesh	10,232	9,470	9,169	10,922	11,634	10,631	10,412	12,900	
Maharashtra	6,825	7,157	6,914	5,590	4,953	3,051	7,236	10,400	
Manipur	251	319	245	167	180	174	266	—	
Meghalaya	@	@	@	122	118	120	109	200	
Karnataka	4,665	5,050	5,891	5,962	6,065	4,600	6,151	6,200	
Nagaland	51	53	50	54	33	54	56	77	
Orissa	4,334	5,430	5,033	5,104	4,354	4,860	5,310	7,900	
Punjab	5,407	6,252	6,937	7,306	7,928	7,694	7,720	7,500	
Rajasthan	6,602	4,007	4,749	8,838	6,335	5,158	6,716	8,100	

Tamil Nadu	5,761	5,415	6,239	6,974	6,943	7,167	7,258	7,900
Tripura	209	206	236	257	273	186	364	—
Uttar Pradesh	16,779	16,296	17,547	19,585	17,698	18,154	15,730	21,400
West Bengal	5,741	7,162	7,364	7,491	7,856	6,772	6,865	9,000
Union Territories	292	345	299	336	401	424	447	1,152
All-India	95,052	94,013	99,501	108,422	105,168	97,026	103,611	129,000

Five Major Oilseeds@@

Andhra Pradesh	1,146	984	1,186	1,253	1,264	1,083	1,490	1,400
Assam	66 (a)	54 (a)	55 (b)	62	70	72	97	67
Bihar	106	74	108	92	81	90	89	170
Gujarat	1,526	862	1,163	1,945	1,647	422	1,360	1,778
Haryana	120	43	89	97	99	107	61	130
Himachal Pradesh	7	6	6	7	7	5	6	—
Jammu & Kashmir	31	29	28	25	25	26	26	50
Karnataka	466	601	560	665	804	473	692	850
Kerala	27	28	23	20	20	20	22	30
Madhya Pradesh	561	460	544	582	604	615	545	650
Maharashtra	817	719	6,690	693	550	249	572	1,050
Meghalaya	@	@	2	2	3	3	3	@
Orissa	171	170	191	179	232	233	247	270
Punjab	312	265	220	232	272	268	287	400
Rajasthan	328	152	217	534	393	383	339	450
Tamil Nadu	923	875	952	959	1,321	1,151	1,207	11,300
Tripura	3	2	3	3	2	2	2	—
Uttar Pradesh	1,640	1,469	1,645	1,852	1,289	1,591	1,563	1,900
West Bengal	48	49	49	55	57	59	66	125
Union Territories	5	3	3	4	6	6	9	18
All-India	8,303	6,845	7,734	9,259	8,746	6,858	8,683	10,500**

APPENDIX 3.14—(Contd.)

State	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	Fourth Plan Target (1973-74)
1	2	3	4	5	6	7	8	9
	Cotton (Lint)							
					(thousand bales of 180 Kg. each)			
Andhra Pradesh	155	96	98	79	166	113	361	245
Gujarat	1,518	1,425	1,552	1,571	2,280	1,383	1,613	1,900
Haryana	374	337	340	353	439	423	450	425
Madhya Pradesh	319	340	327	210	369	331	188	590
Maharashtra	1,353	1,357	1,214	482	917	1,053	940	1,900
Karnataka	310	356	339	343	569	419	626	700
Punjab	779	741	802	819	972	1,015	961	1,000
Rajasthan	227	172	118	229	393	287	283	550
Tamil Nadu	369	256	397	345	388	327	341	525
Other States and Union Territories	650	64	68	68	71	66	56	118
All-India	5,454	5,144	5,255	4,499	6,564	5,417	5,819	8,000
	Jute							
					(thousand bales of 180 Kg. each)			
Assam	1,049(a)	779(a)	1,082(b)	937	1,138	1,010	1,136	1,082
Bihar	833	400	668	773	470	687	801	1,100
Meghalaya	@	@	49	49	57	41	40	55
Orissa	361	290	315	328	380	381	401	560
Tripura	91	45	57	65	68	59	49	90
Uttar Pradesh	132	88	86	103	102	88	76	220
West Bengal	3,854	1,329	3,398	2,683	3,469	2,712	3,673	4,300
All-India	6,320	2,931	5,655	4,938	5,684	4,978	61,176	7,400

	Sugarcane (Gur)										
	1,010	1,274	1,121	947	1,181	1,108	1,343	1,175			
Andhra Pradesh	117(a)	121(a)	162(b)								
Assam	403	591	656	621	447	475	516	750			
Bihar	149	166	187	194	185	180	223	425			
Gujarat	471	669	792	698	514	600	596	800			
Haryana	3	5	5	5	4	5	5	—			
Himachal Pradesh	1	2	2	2	2	1	1	—			
Jammu & Kashmir	735	909	771	848	878	846	916	880			
Karnataka	50	50	50	38	39	40	51	80			
Kerala	95	142	169	161	144	137	125	200			
Madhya Pradesh	1,189	1,428	1,625	1,679	1,297	1,311	1,386	2,000			
Maharashtra	181	211	202	163	192	200	259	300			
Orissa	455	515	618	527	403	469	597	658			
Punjab	31	52	68	121	120	135	194	110			
Rajasthan	965	1,484	1,108	1,144	975	1,250	1,372	1,100			
Tamil Nadu	3,791	5,054	6,068	5,467	4,935	5,673	6,114	6,575			
Uttar Pradesh	118	118	150	207	166	164	164	170			
West Bengal	22	35	29	31	31	34	34	80			
Other States & Union Territories											
All India	9,786	12,826	13,783	12,979	11,626	12,763	14,046	15,449			

(i) Estimates of Area and Production of Principal Crops in India, 1971-72, 1972-73 & 1973-74, DES

(ii) The Fourth Plan Mid-Term Appraisal-Volume, II.

@@Include groundnut, sesamum, linseed, rapeseed and mustard and castor-seed.

* The State targets aggregated to 10.6 million tonnes but the all-India target was kept at 10.5 million tonnes.

+ The State targets aggregated to 129.6 million tonnes but the all-India target was kept at 129.0 million tonnes

@ Data included under Assam

(a) Data relate to Assam (as at present) and Meghalaya & Mizoram.

(b) Data relate to Assam (as at present) and Mizoram.

APPENDIX 3.15

(Paragraph 3.4.77)

Statewise Growth in Area, Production and Yield 1962-65 to 1971-74*

Crop	Area				Production				Growth Rate (percent per annum)				area : thousand hectares production : thousand tonnes
	1962-65		1971-74		1962-65		1971-74		1962-65		1971-74		
	% increase or decrease in col. 3 over col. 2		% increase or decrease in col. 3 over col. 2		% increase or decrease in col. 3 over col. 2		% increase or decrease in col. 3 over col. 2		% increase or decrease in col. 3 over col. 2		% increase or decrease in col. 3 over col. 2		
1	2	3	4	5	6	7	8	9	10				
Andhra Pradesh													
Rice	.	.	.	.	3,431	3,076	(-)	10.4	4,531	4,775	5.4		
Jowar	.	.	.	.	2,591	2,716	.	4.8	1,315	1,231	(-)	6.4	
Bajra	.	.	.	.	605	530	(-)	12.4	324	252	(-)	22.2	
Ragi	.	.	.	.	339	251	(-)	26.0	290	240	(-)	17.2	
Small millets	.	.	.	.	974	694	(-)	28.8	399	262	(-)	34.3	
Pulses	.	.	.	.	1,409	1,349	(-)	4.3	316	353	11.7		
Groundnut	.	.	.	.	991	1,428	.	44.1	777	1,161	49.4		
Cotton	.	.	.	.	389	348	(-)	10.5	130@@	213@@	63.8		
Chilies	.	.	.	.	151	175	.	15.9	116	111	(-)	4.3	
Tabacco	.	.	.	.	181	227	.	25.4	154	194	26.0		
All crops	.	.	.	.					(-)	0.27	1.17	1.39	

Assam									
Rice	.	.	.	.	1,907	2,038	1,801	2,051	13.9
Jute	.	.	.	.	134	142	872@@	1,095@@	25.6
Tea	.	.	.	.	164	184	180	239	32.8
Rapeseed & Mustard	.	.	.	.	130	153	52	73	40.4
All crops	.	.	.	.			0.87	2.63	1.67
Bihar									
Rice	.	.	.	.	5,276	5,082	4,568	4,626	1.3
Maize	.	.	.	.	801	885	787	625	(-)-20.6
Wheat	.	.	.	.	678	1,828	455	2,427	433.4
Barley	.	.	.	.	371	218	207	128	(-)-38.2
Gram	.	.	.	.	493	256	271	139	(-)-48.7
Jute	.	.	.	.	190	135	1,045@@	653@@	(-)-37.5
Sugarcane (gur)	.	.	.	.	156	141	563	479	(-)-14.9
All crops	.	.	.	.			0.81	1.67	0.84
Gujarat									
Rice	.	.	.	.	544	442	457	378	(-)-17.3
Jowar	.	.	.	.	1,414	1,071	435	376	(-)-13.6
Bajra	.	.	.	.	1,438	1,773	733	1,234	68.3
Maize	.	.	.	.	234	259	280	294	5.0
Wheat	.	.	.	.	412	489	353	784	122.1
Groundnut	.	.	.	.	2,112	1,700	1,360	1,044	(-)-23.2
Cotton	.	.	.	.	1,778	1,833	1,501@@	1,759@@	17.2
All crops	.	.	.	.			(-)-0.51	1.75	1.84

		Jammu & Kashmir			
Rice	227	227	385**	391	1.6
Maize	247	275	382**	353	(-)/7.6
Wheat	180	186	102	172	68.6
All crops			0.58	0.69	0.07
Karnataka					
Rice	1,122	1,091	1,592	1,972	23.9
Jowar	3,016	2,143	1,445	1,547	7.1
Bajra	501	410	134	156	16.4
Ragi	1,083	969	867	851	(-)/1.9
Wheat	308	331	97	162	67.0
Groundnut	893	870	567	606	6.9
Cotton	1,013	988	430@@	538@@	25.1
Sugarcane (gur)	81	107	651	880	35.2
All crops			(-)/1.54	1.88	3.95
Kerala					
Rice	803	875	1,114	1,361	22.2
Black pepper	99	117	23	25	8.7
Coconuts	559+	740	3,278+@	3,892.8@	18.8
Tapioca	214	305	2,276	5,584	145.3
Rubber	143	195	35	107	205.7
All crops			2.53	4.96	1.87

APPENDIX 3.15 (Contd.)

Crop	Area		Production				Growth Rate (percent per annum)	
	1962-65	1971-74	% increase or decrease in col. 3 over col. 2	1962-65	1971-74	% increase or decrease in col. 6 over col. 5	area	produc- tion yield
1	2	3	4	5	6	7	8	9 10
Madhya Pradesh								
Rice	4,258	4,524	6.2	3,052	3,441	12.7		
Jowar	2,052	2,102	2.4	1,525	1,382	(-)-9.4		
Maize	488	614	25.8	506	506	—		
Wheat	3,240	3,439	6.1	2,016	2,692	33.5		
Gram	1,505	1,692	12.4	840	1,078	28.3		
Tur	405	515	27.2	259	398	53.7		
Groundnut	462	454	(-)-1.7	301	267	(-)-11.3		
Linseed	658	695	5.6	136	170	25.0		
Cotton	782	689	(-)-11.9	399@@	296@@	(-)-25.8		
All crops					0.70	1.29		0.56
Maharashtra								
Rice	1,354	1,325	(-)-2.1	1,412	1,252	(-)-11.3		
Jowar	6,117	5,770	(-)-5.7	3,270	2,016	(-)-38.4		
Bajra	1,708	1,549	(-)-9.3	501	433	(-)-13.6		
Wheat	885	888	0.3	401	429	7.0		
Tur	565	540	(-)-4.4	340	271	(-)-20.3		
Groundnut	1,134	723	(-)-36.2	809	383	(-)-52.7		

[illegible]

APPENDIX 3.15 (Contd.)

Crop	Area			Production			Growth Rate (percent per annum)		
	1962-65	1971-74	% increase or decrease in col. 3 over col. 2	1962-65	1971-74	% increase or decrease in col. 6 over col. 5	area	produc- tion	yield
1	2	3	4	5	6	7	8	9	10
Rajasthan									
Jowar	1,135	1,006	(-)-11.4	367	316	(-)-13.9			
Bajra	4,446	5,349	20.3	1,016	1,470	44.7			
Maize	694	801	15.4	720	585	(-)-18.8			
Wheat	1,187	1,528	28.7	1,020	1,811	77.5			
Barley	444	489	10.1	480	552	15.0			
Gram	1,474	1,453	(-)-1.4	679	802	18.1			
Rapeseed & mustard	278	351	26.3	85	150	76.5			
Sesamum	563	520	(-)-7.6	57	56	(-)-1.8			
Cotton	230	326	41.8	175@	321@	83.4			
All crops					1.46	3.80			2.03
Tamil Nadu									
Rice	2,637	2,764	4.8	3,977	5,489	38.0			
Jowar	746	689	(-)-7.6	567	538	(-)-5.1			
Bajra	453	450	(-)-0.7	297	295	(-)-0.7			
Ragi	334	284	(-)-15.0	336	299	(-)-11.0			
Groundnut	920	1,095	19.0	1,058	1,180	11.5			
Cotton	384	306	(-)-20.3	354@	352@	(-)-0.6			
Sugarcane (gur)	78	137	75.6	656	1,199	82.8			
All crops					0.35	3.12			2.68

Tripura

Rice	.	.	.	.	.	243+	286	17.7	202+	272	34.7	2.21	4.34	1.81
Uttar Pradesh														
Rice	.	.	.	.	.	4,359	4,522	3.7	3,245	3,630	11.9			
Jowar	.	.	.	.	.	886	685	(-)/22.7	562	412	(-)/26.7			
Bajra	.	.	.	.	.	1,034	1,033	(-)/0.1	615	686	11.5			
Maize	.	.	.	.	.	1,094	1,482	35.5	888	1,100	23.9			
Wheat	.	.	.	.	.	3,974	6,079	53.0	3,348	7,026	109.9			
Barley	.	.	.	.	.	1,589	1,287	(-)/19.0	1,303	1,266	(-)/2.8			
Gram	.	.	.	.	.	2,565	1,955	(-)/23.8	1,633	1,359	(-)/16.8			
Tur	.	.	.	.	.	638	520	(-)/18.5	582	588	1.0			
Groundnut	.	.	.	.	.	299	332	11.0	292	252	(-)/13.7			
Rapeseed & mustard	.	.	.	.	.	1,824	2,037	11.7	779	971	24.6			
Sugarcane	.	.	.	.	.	1,293	1,352	4.6	4,900	5,574	13.8			
(gur)	.	.	.	.	.									
All crops	.	.	.	.	.							0.98	3.28	2.10

West Bengal

Rice	.	.	.	.	.	4,549	5,071	11.5	5,169	6,008	16.2			
Wheat	.	.	.	.	.	48	373	677.1	30	746	2,386.7			
Gram	.	.	.	.	.	157	115	(-)/26.8	86	70	(-)/18.6			
Rapeseed & Mustard	.	.	.	.	.	95	109	14.7	34	41	20.6			
Jute	.	.	.	.	.	446	416	(-)/6.7	3,360@@	3,285@@	(-)/2.2			
All crops	.	.	.	.	.							1.66	3.14	1.33

* Estimates of Area and Production of Principal Crops in India, DES.

** Adjusted estimates

+ relates to 1964-65

@ million nuts

@@ thousand bales of 180 kg each

APPENDIX 3.16
Area under High-Yielding Varieties of Five Major Cereals¹ +

(Paragraph 3.5.13)

State/Union Territories	(thousand hectares)							
	1	2	3	4	5	6	7	8
Andhra Pradesh	.	267	604	650	863	1,580	2,203	2,125
Assam	.	68	111	150	234	354	416	364
Bihar	.	604	825	1,332	1,754	2,302	2,500	3,280
Gujarat	.	239	332	802	992	1,253	1,533	1,675
Haryana	.	245	602	914	1,094	1,324	1,396	1,416
Himachal Pradesh.	.	(a)	100	151	201	230	315	180
Jammu & Kashmir	.	158	166	179	186	256	290	306
Kerala	.	165	239	264	365	190	275	550
Karnataka	.	298	407	549	552	691	897	889
Madhya Pradesh	.	263	421	563	803	1,101	1,674	1,440
Maharashtra	.	1,007	970	1,415	969	1,159	2,142	3,561
Manipur	.	—	4	9	3	12	19	19
Meghalaya	.	(b)	2	3	6	7	8	22
Nagaland	.	—	—	—	—	1	1	4
Orissa	.	154	185	197	278	449	421	743
Punjab	.	1,370	1,632	1,803	2,130	2,289	2,411	1,963
Rajasthan	.	289	528	700	677	900	1,054	1,570

Tamil Nadu	.	.	.	693	1,233	1,988	2,599	2,857	2,620	1,752
Tripura	.	.	.	—	8	14	22	42	64	20
Uttar Pradesh	.	.	.	2,949	2,311	2,709	3,251	4,177	4,395	3,472
West Bengal	.	.	.	356	634	902	1,089	1,035	1,084	2,055
Union Territories	.	.	.	75	80	90	104	112	131	56
All India	.	.	.	9,200	11,394	15,384	18,173	22,321	25,849	25,000@

* (i) Data obtained from the Planning Commission.

(ii) Fourth Plan Mid-Term Appraisal, Vol. II

(iii) Annual Plans, 1974-75 and 1975-76.

+ The five major cereals include rice, jowar, bajra, maize and wheat.

(a) Included under Union Territories.

(b) Included under Assam.

@ Targets proposed by the State Governments aggregate on 27.46 Mha but the all-India target was fixed at 25.0 Mha.

APPENDIX 3.17

(Paragraph 3.7.6)

Production of Marine and Inland Fish—Statewise*

(thousand tonnes)

State/Union Territory	1967		1968		1969	
	marine	inland	marine	inland	marine	inland
1	2	3	4	5	6	7
Andhra Pradesh	76.0	76.8	77.4	77.7	77.5	95.7
Assam	—	23.9+	—	24.6+	—	27.0+
Bihar	—	46.0	—	48.0	—	52.0
Gujarat	75.6	10.2	86.6	11.3	82.2	11.3
Haryana	—	0.6	—	0.7	—	0.8
Himachal Pradesh	—	0.6	—	0.5	—	0.6
Jammu & Kashmir	—	3.2	—	5.2	—	5.9
Karnataka	49.2	43.0	87.7	43.2	75.8	48.0
Kerala	364.1	4.4	345.1	9.4	294.8	9.4
Madhya Pradesh	—	7.5	—	7.6	—	8.0
Maharashtra	133.3	13.2	124.0	13.2	168.7	13.3
Manipur	—	0.9	—	0.1	—	1.0
Meghalaya	—	—	—	—	—	—
Nagaland	—	0.1	—	0.1	—	—
Orissa	×	25.0	×	25.0	×	25.5
Punjab	—	1.6	—	1.8	—	1.6
Rajasthan	—	5.0	—	5.0	—	5.0
Tamil Nadu	124.5	108.2	124.9	119.0	151.9	131.0
Tripura	—	3.7	—	3.6	—	3.6
Uttar Pradesh	—	12.3	—	13.3	—	20.0
West Bengal	19.0	150.0	29.9	212.0	22.9	233.0
Andaman and Nicobar Islands	0.4	—	0.4	—	0.4	—
Arunachal Pradesh	—	0.1	—	0.1	—	0.1
Delhi	—	0.2	—	0.2	—	0.2
Goa	12.5	—	18.9	—	27.6	—
Lakshadweep	0.8	—	1.1	—	1.2	—
Mizoram	—	—	—	—	—	—
Pondicherry	8.0	0.3	8.2	0.2	10.6	0.2
Total	863.4	536.8	904.2	621.8	913.6	675.2

APPENDIX 3.17 (Contd.)

State/Union Territory	1970		1971		1972		1973	
	marine	inland	marine	inland	marine	inland	marine	inland
1	8	9	10	11	12	13	14	15
Andhra Pradesh	74.5	95.7	84.0	86.7	83.9	80.3	116.7	89.6
Assam	—	26.5+	—	26.4	—	28.1	—	29.8
Bihar	—	56.0	—	58.0	—	60.0	—	67.1
Gujarat	89.0	12.2	82.2	15.1	75.8	14.2	151.2	14.6
Haryana	—	0.8	—	0.9	—	0.9	—	1.0
Himachal Pradesh	—	0.7	—	0.7	—	0.7	—	0.7
Jammu & Kashmir	—	6.2	—	6.3	—	7.6	—	7.6
Karnataka	116.9	61.7	103.7	63.5	83.4	40.4	55.1	60.0
Kerala	392.9	8.6	445.4	17.8	291.9	16.2	350.8@	17.8@
Madhya Pradesh	—	8.1	—	8.5	—	8.7	—	9.0
Maharashtra	192.4	13.4	215.3	13.5	219.2	13.8	292.3	15.5
Manipur	—	1.0	—	1.2	—	1.0	—	1.2
Meghalaya	—	—	—	—	—	0.7	—	0.8
Nagaland	—	0.1	—	0.1	—	0.1	—	0.1
Orissa	×	25.5	×	15.0	×	20.0	17.0	23.0
Punjab	—	1.8	—	2.0	—	1.8	—	1.7
Rajasthan	—	6.7	—	1.0	—	0.7	—	8.0
Tamil Nadu	155.5	92.4	160.6	120.0	155.3	109.5	182.5	135.0
Tripura	—	3.7	—	3.7	—	4.1	—	4.2
Uttar Pradesh	—	20.7	—	21.7	—	22.5	—	23.4
West Bengal	31.4	228.0	18.0	227.1	14.2	232.0	8.9	235.2
Andaman & Nicobar Islands	0.5	—	0.6	—	0.6	—	0.9	—
Arunachal Pradesh	—	0.1	—	0.2	—	0.2	—	0.2
Delhi	—	0.2	—	0.2	—	0.2	—	0.2
Goa	20.7	—	40.0	—	40.0	1.5	15.7@	1.2@
Lakshadweep	1.2	—	1.2	—	1.2	—	1.9	—
Mizoram	—	—	—	0.2	—	0.2	—	0.2
Pondicherry	10.6	0.4	10.4	0.4	9.0	0.4	17.5	0.5
Total	1,085.6	670.5	1,161.4	690.2	974.5	665.8	1,210.5	747.6

* Statistical Supplement 9th Meeting of the Central Board of Fisheries, Lucknow, Ministry of Agriculture and Irrigation (Department of Agriculture).

@ Provisional.

× Included under West Bengal.

+ Includes estimates for Mizoram & Meghalaya.

APPENDIX 3.18

(Paragraph 3.8.11)

Classification of Forest Area—1950-51 and 1970-71*

Classification	(thousand sq. km)	
	1950-51	1970-71(P)
I. Total forest area	718	748(a)
Percentage of forest area to total geographical area	22	23
II. Classification by ownership		
(i) State	596	707
(ii) Corporate bodies	2	28
(iii) Private individuals	120	13
II. Classification by Legal status		
(i) Reserved	344	360(b)
(ii) Protected	118	243(b)
(iii) Unclassed	256	115(b)
V Classification by Composition		
(i) Coniferous	36	39
(ii) Non-coniferous or broad-leaved		
(a) Sal	106	118
(b) Teak	43	82
(c) Miscellaneous	533	500
Total	682	700
V. Classification by exploitability		
(i) Merchantable	585	578
(ii) Unprofitable or inaccessible	133	161

Directorate of Economics & Statistics, Ministry of Agriculture & Irrigation.

(P) Provisional

- (a) Includes an area of 9 thousand sq km for which details regarding classification by legal status, composition and exploitability are not available.
- (b) Excluding Jammu & Kashmir for which break-up is not available. The legal classification of forest in vogue in Jammu & Kashmir State is "demarcated", "partially demarcated" and "undemarcated".

APPENDIX 3.19

(Paragraph 3.8.12)

Classification of Forest Area, 1970-71*

State	Total forest area	Type of forest		Legal status		Composition				Ownership			(sq km.)		
						reser-ved	protected un-classed	conife-rous (soft wood)	non-coniferous (hard wood)		Forest Deptt.	civil authori-ties		cor-porate bodies	private indivi-duals
									sal	teak					
Andhra Pradesh	64,957 (23.5)	50,667	14,290	44,757	19,050	1,150	—	97	9,063	55,797	64,957	—	—	—	
Assam (incl. Mizoram)	36,834 (37.0)	34,834	2,000	14,544	—	22,290	—	2,100	51	34,683	14,544	4,005	18,285	—	
Bihar	29,212 (16.8)	29,212	—	5,008	24,062	142	—	28,910	74	228	29,168	44	—	—	
Gujarat	17,391 (8.9)	17,391	—	7,625	1,872	7,894	—	—	11,821	5,570	15,731	6	—	1,654	
Haryana	1,478 (3.3)	1,084	394	160	529	789	15	47	—	1,416	751	—	—	727	
Himachal Pradesh	21,436 (38.5)	13,451	7,985	1,864	17,306	2,266	13,298	109	—	8,029	19,957	—	25	1,454	
Jammu & Kashmir	21,037(b) (9.5)	8,567	11,752	N.A.	N.A.	N.A.	19,300	—	—	1,019	21,037	—	—	—	
Karnataka	(c)35,100 (a)(18.3)	24,320	10,780	31,150	3,950	—	—	—	10,000	26,100	31,150	3,950	—	—	
Kerala	11,108 (28.6)	5,653	5,455	8,943	748	1,417	—	—	1,086	10,022	8,943	758	—	1,407	
Madhya Pradesh	168,849 (38.1)	125,740	43,109	80,106	88,046	697	—	37,897	32,286	98,666	168,849	—	—	—	

APPENDIX 3.19 (Contd.)

State	Total forest area	Type of forest		Legal status			Composition							Ownership		
		mer- chantable	unpro- fitable or inacces- sible	reser- ved	protected un- classified	conife- rous (soft wood)	non-coniferous (hardwood)			Forest Deptt.	civil authori- ties	cor- porate bodies	private indi- viduals			
							sal	teak	misc							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
Maharashtra	66,186 (21.5)	50,460	15,726	39,693	16,803	9,690	—	—	11,762	54,424	56,102	6,120	11	3,953		
Manipur	(a) 6,020 (26.9)	3,652	2,368	4,740	770	510	900	—	—	5,120	6,020	—	—	—		
Meghalaya	(e) 8,229 (36.6)	8,229	(f)	706	12	7,511	—	360	3	7,866	718	(h)	7,511	(h)		
Nagaland	2,876 (17.4)	2,358	518	280	518	2,072	259	—	—	2,617	804	—	—	2,072		
Orissa	(c) 67,461 (43.3)	47,130	20,331	30,317	37,132	12	—	38,300	570	28,591	66,181	1,261	—	19		
Punjab	2,111 (4.2)	892	1,219	39	714	1,358	128	—	—	1,983	892	—	—	1,219		
Rajasthan	36,903 (0.8)	36,903	—	13,201	15,680	8,022	—	—	4,203	32,700	36,903	—	—	—		
Tamil Nadu	22,480(a) (17.3)	18,375	4,105	17,250	3,808	1,413	—	—	460	22,020	21,067	1,413	—	—		
Tripura	6,298 (60.1)	5,048	1,250	4,088	2,210	—	—	244	19	6,035	6,298	—	—	—		
Uttar Pradesh	49,532(g) (16.8)	29,589	11,387	32,847	113	8,016	5,182	5,052	192	30,550	40,976	6,357	2,033	166		

West Bengal	11,863 (13.5)	11,228	635	6,994	4,371	498	91	4,661	35	7,076	11,674	90	57	42
Andaman Nicobar Islands	7,467 (90.0)	7,467	—	2,436	5,031	—	—	—	55	7,412	7,467	—	—	—
Arunachal Pradesh	51,540 (61.7)	44,200	7,340	12,170	—	39,370	—	Neg.	2	51,538	51,540	—	—	—
Delhi	41 (2.8)	27	14	5	14	22	—	—	—	41	—	6	35	—
Goa, Daman, Diu	1,309 (34.3)	930	379	1,309	—	—	—	—	—	1,309	1,053	(i)	(i)	256
All India	747,718 (22.8)	577,407 (i)	161,037 (k)	360,247 (k)	242,739 (k)	115,139 (k)	39,173 (k)	117,777 (k)	81,682 (k)	499,812 (k)	682,782 (k)	24,010 (k)	27,957 (k)	12,969 (k)

Forestry in India 1969-70 & 1970-71, DES

NOTE : Figures in brackets indicates percentage of total geographical area.

N.A. : Not available.

- (a) Data supplied by Forestry Statistics Cell, Ministry of Agriculture & Irrigation.
- (b) Includes 718 sq km of *raikis* & *games* reserved land, for which details are not available.
- (c) Relates to the year 1968-69
- (d) Relates to the year 1969-70.
- (e) Relates to the year 1971-72.
- (f) Included under the head merchantable.
- (g) Includes an area of 8556 sq km for which details are not available.
- (h) Includes under the head 'corporate bodies'.
- (i) Included under the head 'private individuals'.
- (j) Includes an area of 9,274 sq km for which details are not available.
- (k) Excludes figures for Jammu & Kashmir for which legal classification of forest area is not available.

APPENDIX 3.20

(Paragraph 3.8.15)

Statewise Revenue and Expenditure of Forest Departments, 1972-73*

(Rs. in lakhs)

State/Union Territory	Revenue	Expenditure	Surplus (+) or deficit (—)
Andhra Pradesh	9,65.0	5,69.3	3,95.7
Assam	4,37.9	1,80.5	2,57.4
Bihar	5,40.1	3,26.4	2,13.7
Gujarat	4,97.5	4,78.6	18.9
Haryana	72.3	1,33.5	(—)61.2
Himachal Pradesh	7,27.2	7,12.6	14.6
Jammu & Kashmir	7,05.8	2,21.9	4,83.9
Karnataka@	14,50.2	7,54.0	6,96.2
Kerala	10,32.9	3,58.8	6,74.1
Madhya Pradesh	36,44.4	9,99.4	26,45.0
Maharashtra	18,40.3	13,45.6	4,94.7
Manipur	9.2	18.4	(—)9.2
Meghalaya	41.7	24.1	17.6
Nagaland@	8.9	37.5	(—)28.6
Orissa	7,96.6	3,13.1	4,83.5
Punjab	73.0	1,48.4	(—)75.4
Rajasthan	1,96.3	4,70.8	(—)2,74.5
Tamil Nadu	4,90.0	4,21.3	68.7
Tripura	31.8	85.9	(—)54.1
Uttar Pradesh	24,65.9	9,51.7	15,14.2
West Bengal	4,12.5	3,22.2	90.3
Total States	1,64,39.5	88,74.0	7,565.5
Andaman & Nicobar Islands	2,22.3	2,09.2	13.1
Arunachal Pradesh	1,44.5	1,29.5	15.0
D & N Haveli@	18.6	3.9	4.7
Delhi+	0.2	0.2	—
Goa, Daman & Diu	23.6	37.6	(—)14.0
Mizoram	2.4	2.4	—
Total Union Territories	4,01.6	3,82.8	18.8
ALL INDIA	1,68,41.1	92,56.8	75,84.3

Data from Forest Statistical Cell, Department of Agriculture, Ministry of Agriculture and Irrigation. Figures are subject to revision

@ Data relate to 1970-71.

+ Data relate to 1969-70.

APPENDIX 3.21

(Paragraph 3.9.1)

Value of Imports and Exports of Agricultural Commodities 1950-51 to 1973-74*

(Rs in lakhs)

Year	Cereals & cereals preparations & direct leguminous vegetables and flour thereof (grain pulses & flour preparations thereof)		Coffee, tea, cocoa, spices & manufactures thereof		oilseeds, oilnuts & oil kernels		Crude, vegetable materials n.e.s.		Silk, cotton, jute, vegetable fibres except cotton and jute waste material from textile fabrics	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
1	2	3	4	5	6	7	8	9	10	11
1950-51	9,921	6	561	10,728	229	1,734	1,611	1,362	10,322	652
1955-56	1,747	923	654	12,072	792	392	—	—	5,806	4,142
1960-61	18,138	8	198	14,746	1,163	511	289	1,595	9,070	1,375
1965-66	32,200	187	74	15,100	881	23	227	1,678	5,843	1,761
1966-67**	65,098	497	55	20,367	473	36	261	2,287	11,570	2,902
1967-68	51,820	189	236	22,601	522	180	238	1,914	9,182	2,389
1968-69	33,662	591	111	20,004	351	731	252	2,166	10,943	1,985
1969-70	26,098	1,013	111	17,907	345	824	207	2,576	9,235	2,360
1970-71	21,301	1,097	94	21,266	636	596	221	3,402	10,344	2,218
1971-72	13,121	2,932	137	21,503	1,053	672	224	3,762	11,938	3,246
1972-73	8,079	8,536	137	20,993	1,232	682	209	3,956	9,812	3,092
1973-74	47,315	1,152	183	24,810	737	3,725	354	5,844	6,936	4,408

APPENDIX 3.21 (Contd.)

Year	(Rs in lakhs)										
	Fixed vegetable oils and fats		Wood lumber & cork and manufacture thereof		Crude rubber (incl. synthetic & reclaimed) & rubber manufacture n.e.s.		Live animals		Feeding stuff for animals (not incl. unmilled cereals)		
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	
1	12	13	14	15	16	17	18	19	20	21	
1950-51	334	2,526	396	114	336	22	21	37	45	—	
1955-56	656	3,430	413	225	223	9	14	68	3	167@	
1960-61	—	854	684	258	1,403	33	3	12	1	1,505	
1965-66	711	409	235	201	602	221	10	13	35	3,597	
1966-67**	1,127	283	191	352	1,292	347	10	17	21	5,235	
1967-68	1,655	396	195	461	619	304	18	17	42	4,690	
1968-69	968	1,171	167	495	787	465	19	9	32	5,137	
1969-70	1,723	495	96	784	1,335	472	18	1	32	4,322	
1970-71	2,308	703	101	762	641	690	11	3	24	5,897	
1971-72	2,817	757	99	815	664	775	14	3	27	4,397	
1972-73	1,550	2,548	122	1,078	750	649	8	9	53	7,907	
1973-74	5,694	3,165	183	2,223	987	1,047	51	10	53	18,743	

APPENDIX 3.21 (Contd)

Year	(Rs in lakhs)									
	Meat and meat pre- parations		Dairy products and eggs		Hides, skins and fur skins undressed		Crude animal ma- terials		Wool and other animal hair (except human hair)	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
1	22	23	24	25	26	27	28	29	30	31
1950-51	.	.	—	508	Neg.	47	957	38	165	787
1955-56	.	.	4	692	—	90	659	51	19	1,061
1960-61	.	.	18	624	42	249	1,002	47	469	722
1965-66	.	.	1	756	2	237	985	26	693	731
1966-67**	.	.	1	2,265	4	180	1,647	22	1,317	796
1967-68	.	.	Neg.	1,423	10	131	757	14	1,223	647
1968-69	.	.	4	1,494	5	174	532	30	1,563	579
1969-70	.	.	1	1,210	6	171	845	27	1,244	496
1970-71	.	.	3	1,063	9	158	379	22	912	309
1971-72	.	.	Neg.	2,081	21	135	66	24	950	427
1972-73	.	.	Neg.	2,133	45	102	87	23	998	699
1973-74	.	.	2	1,873	20	77	153	17	1,627	853

APPENDIX 3.21 (Contd.)

(Rs in lakhs)

Year	Fish and fish preparations		Animal oils & fats		Fertilisers manufactured		Crude fertilisers		Agricultural machinery and implements	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
1	32	33	34	35	36	37	38	39	40	41
1950-51	.	24	246	2	Neg	—	—	—	725	—
1955-56	.	309	376	4	Neg	—	—	—	50	—
1960-61	.	354	462	81	1	961	252	22	100	1
1965-66	.	18	659	584	1	3,897	592	4	1,002	6
1966-67**	.	Neg.	1,725	313	1	8,970	1,326	Neg.	1,293	14
1967-68	.	1	1,795	1,758	1	13,902	981	0	1,369	26
1968-69	.	2	2,217	942	3	13,922	1	—	1,356	45
1969-70	.	2	3,083	1,201	2	7,707	874	—	2,167	50
1970-71	.	1	3,054	1,512	2	6,120	1,228	—	2,785	51
1971-72	.	6	4,139	1,792	22	8,120	189	—	2,560	37
1972-73	.	74	5,379	903	* 57	9,636	67	—	1,714	60
1973-74	.	209	8,810	719	4	16,284	1	Neg.	1,703	128

APPENDIX 3.21 (Contd.)

(Rs in lakhs)

Year	Tobacco and tobacco manufacturers		Textile yarn fabrics made up articles and related products		Leather, leather manu- factured n.e.s. & dressed fur skins		Animal & vegeta- ble oils & fats pro- cesses & waxes of animal or vege- table origin		Pulp & waste paper			
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports		
1	42	43	44	45	46	47	48	49	50	51		
1950-51	.	.	1,521	1,993	25,966	57	2,577	3	7	41	—	
1955-56	.	.	1,183	2,522	19,027	25	2,299	10	11	234	—	
1960-61	.	.	1,575	1,769	22,242	33	2,497	—	977	673	Neg.	
1965-66	.	.	2,114	993	27,648	7	2,846	68	45	388	3	
1966-67**	.	.	2,252	986	36,588	7	6,213	35	21	974	Neg.	
1967-68	.	.	3,559	754	35,044	11	5,345	30	18	1,031	Neg.	
1968-69	.	.	3,376	779	35,571	6	7,267	20	21	1,043	1	
1969-70	.	.	3,336	678	36,150	5	8,154	33	10	1,247	52	
1970-71	.	.	3,256	786	35,041	7	7,218	30	6	1,227	101	
1971-72	.	.	4,508	1,001	42,881	12	9,077	40	11	959	21	
1972-73	.	.	6,387	625	45,705	11	17,451	39	26	1,015	2	
1973-74	.	.	3	7,092	596	56,772	12	17,219	75	43	926	2

APPENDIX 3.21 (Concd.)

Year	(Rs in lakhs)									
	Paper, paper board and manufacturers thereof				Dyeing and tanning extracts & synthetics tanning material		Sugar & sugar propa- rations and honey		Fruits & vegetables	
	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
1	52	53	54	55	56	57	58	59		
1950-51	.	1,014	25	—	434	17	951	1,276		
1955-56	.	1,531	71	—	386	96	1,130	1,528		
1960-61	.	1,210	163	124	14	335	2,038	2,540		
1965-66	.	1,348	120	170	12	1,127	2,271	3,333		
1966-67**	.	2,167	193	320	21	1,824	3,019	5,502		
1967-68	.	1,765	284	224	10	1,651	3,925	5,160		
1968-69	.	1,831	514	342	14	1,062	4,640	7,250		
1969-70	.	2,374	488	317	13	894	4,365	7,032		
1970-71	.	2,507	541	366	35	2,945	4,320	6,502		
1971-72	.	3,492	294	314	13	3,113	3,784	7,035		
1972-73	.	3,136	416	466	19	1,390	5,330	8,116		
1973-74	.	2,924	691	407	15	4,346	4,848	9,064		

* Monthly Statistics of Foreign Trade in India, Vols. I & II—Department of Commercial Intelligence and Statistics, Calcutta.

** Includes figures for April and May 1966 converted in terms of the devalued rupee.

Neg. Below Rs. 50,000.

@ Relates to total of fodder bran and pollards.

SOME ECONOMIC ASPECTS

INTRODUCTION

4.1.1 In Chapter 3 on Progress of Agricultural Development an assessment has been made of crop production and development of animal husbandry and fisheries at the national and regional levels. Agricultural production in a vast country like India is carried on in operational units which differ in endowment and efficiency from size group to size group and from area to area. It is, therefore, important to study analytically the structure and organisation of the farms sector and the functional relations binding the factors of production at the micro or farm level. In this Chapter on the basis of available data and studies undertaken by institutions and individual authors, an attempt has been made to focus on structural and functional aspects of the farm organisation which motivate the process of change or maintain status-quo. Besides crop production the analysis comprehends dairying, poultry, piggery and fish culture. While the main aspects studied are output, cost, income and to some extent employment, progressive commercialisation of some fields in agricultural production has also been dealt with. The other important aspects covered are economic of irrigation and mechanisation and the constraints on farm operations due to size disability and tenorial conditions.

4.1.2 The main source of data for farm level analysis of the traditional, transitional and modern phases of crop production has been the farm management studies organised by the Ministry of Agriculture and Irrigation in the fifties and sixties. Besides evaluation studies of High-Yielding Varieties Programme by the Programme Evaluation Organisation of the Planning Commission and agro-economic research centres and a number of studies by individual authors have also been drawn upon. These have been referred to at appropriate places in the Chapter. In view of the limited coverage of these studies, definitional and conceptual problems and gaps in information we have sought to build only a framework for identifying issues for further analysis and research and have not attempted to generalise

for policy formulation. Lack of upto-date studies has reduced the scope of analysis in animal husbandry and fisheries. The Chapter is prefaced by a section on production base of agriculture. Agricultural Census 1970-71 provides valuable information in this regard.

2 PRODUCTION BASE OF AGRICULTURE

Operational Holdings

4.2.1 According to the Agricultural Census, 1970-71 there were 70.49 million operational holdings or farming units in the country. These holdings covered 162.13 Mha that is, about one-half of the geographical area. Area under a holding comprised all land forming part of it whether cultivated or uncultivated including land occupied by farm buildings, if they were located within the cultivated area.

4.2.2 The distribution of these holdings, however, was far from even. One-half of them was less than one hectare in size. Operated area covered by these marginal and submarginal holdings accounted for only 9 per cent of the total. Within this group holdings less than 0.5 ha constituted nearly two-thirds of the number and one-third of the operated area. Small and semi-medium holdings (1 to 4 ha) formed a little over one-third of the number and operated 30 per cent of the area. Respective shares of medium holdings (4 to 10 ha) were 11 per cent and 30 per cent. Holdings of 10 ha and above constituted only 4 per cent of the total but commanded 50 Mha or 31 per cent of the operated area. Details of distribution of operational holdings are indicated in the following table :

TABLE 4.1
Size Distribution of Operational Holdings 1970-71*

Category of holdings	Size group	Number (in million)	Per- cent to total	Area (in million hectares)	Percent to total
marginal & sub-marginal	less than 1 ha	35.68	50.6	14.54	9.0
small	1 to 2 ha	13.43	19.0	19.29	12.0
semi-medium	2 to 4 ha	10.68	15.2	30.00	18.4
medium	4 to 10 ha	7.93	11.3	48.23	29.7
large	10 ha and above	2.77	3.9	50.07	30.9
all categories		70.49	100.0	162.13	100.0

1 [The figures given in Tables 4.1 to 4.3 do not tally with land use statistics given elsewhere as these relate only to operational holdings.]

* Agricultural Census of India, 1970-71

4.2.3 The average size of holding in the country was of 2.3 ha. About three-fourths of the operational units were less than the national average. Average size of holdings obtaining in the States of Andhra Pradesh, Karnataka, Punjab and Haryana was in the range of 2.5 to 3.8 ha and in Maharashtra, Madhya Pradesh, Gujarat and Rajasthan, more than 4 ha. In the States of Assam, Bihar, Himachal Pradesh and Tamil Nadu, average size of holdings was about 1.5 ha. It was slightly more in Orissa 1.9 ha. In Uttar Pradesh which accounted for the largest number of holdings in the country and in West Bengal, the average holding was about 1.2 ha. It was the smallest in Kerala being 0.7 ha. In the latter group of States, with the exception of Orissa, marginal and sub-marginal holdings (less than 1 ha) outnumbered holdings of 1 ha and more. In Kerala as many as 81.6 per cent of the holdings belonged to the former group. Large farms of 10 ha and above were very few, 1 per cent or less in these States. The situation was a reflection of increased pressure of population on cultivated land in these States. It was observed that paddy was the main crop grown in these States. Large farms of 10 ha and above were mainly concentrated in the States of Rajasthan, Maharashtra, Gujarat, Madhya Pradesh and Haryana.

Land use

4.2.4 Data collected in Agricultural Census revealed land use pattern, irrigation status, cropping intensity, cropping pattern, etc. according to size of holdings. About 135.8 Mha or 84 per cent of the operated area was under active farming operations in the reference year. The proportion was higher in the range of 87 to 89 per cent in holdings up to 4 ha but somewhat less—77 per cent—in the large holdings of 10 ha and above. The comparatively lower land use ratio obtaining in large farms was presumably due to the concentration of old fallow and cultivable waste lands in them. More than 50 per cent of such lands was concentrated in large holdings. Past trends in net sown area showed that during 1950-51 to 1970-71, it increased hardly by 1 per cent per annum. The scope for reclamation of land is rather limited; and whatever possibility exists, is mainly confined to large holdings.

4.2.5 There has been significant increase in the area cultivated more than once during the period 195-51 to 1970-71. Even so, only 18 per cent of the net sown area was double cropped in the latter year. Bulk of the increase in double cropping took place in a few States mainly in Uttar Pradesh, Punjab and Haryana followed by Andhra Pradesh, Bihar, Rajasthan and Madhya Pradesh.

Cropping Pattern

4.2.6 The major changes in cropping pattern during the period were that though the share of food grains in total cropped area remained unchanged at about 75 per cent, that of wheat increased from 7.6 per cent in 1950-51 to 11.0 per cent in 1970-71 and the share of pulses declined from 15.6 per cent to less than 14 per cent. Among cash crops there was significant increase in the area under cotton and groundnut. The share of cotton in the all-India acreage moved up from 4.3 per cent in 1950-51 to 5 per cent by 1970-71 and that of groundnut from 3.3 per cent to 4.5 per cent. At the State level, significant changes in the cropping pattern were increase in wheat area in principal wheat growing States and in rice area in the southern States of Andhra Pradesh, Karnataka and Tamil Nadu. While the shift in favour of wheat occurred at the expense of rabi foodgrains, mainly gram, crops adversely affected in the Southern States were mainly coarse grains. Among cash crops there was an increase in the proportion of area sown to groundnut in all important producing States. Area under sugarcane registered appreciable gains in the southern States of Andhra Pradesh, Karnataka and Tamil Nadu, as also in Gujarat and Maharashtra.

Irrigation

4.2.7 There was a sizable expansion in irrigated area during the last two decades from 1950-51 to 1970-71. More than half of the net addition was under wells and about 42 per cent under Government canals. Area under wells in the country which remained almost static during the first half of the century expanded at an unprecedented rate after 1950-51 under the stimulus of promotional measures. Uttar Pradesh, Punjab, Haryana, Andhra Pradesh, Rajasthan and Gujarat accounted for about seven-tenths of the increase in net irrigated area. Cropwise, paddy and wheat accounted for 70 per cent of the increase. The balance was shared by a number of crops, particularly sugarcane, cotton and groundnut.

4.2.8 Out of the 70 million operational holdings in 1970-71, 29.4 million had irrigation. However, only 12.4 million holdings had their entire cultivated area of 12.1 Mha under irrigation. The remaining 17.0 million holdings were only partly served. Total net area receiving irrigation aggregated to 29 Mha or 21.3 per cent of the net sown area. The number of farms wholly unirrigated and dependent solely on rainfall was 40.7 million. Together with the unirrigated part of partly irrigated farms these holdings accounted for about 106.8

Mha of cultivated area. Needless to add that cultivation was generally precarious on these farms because of their total dependence on the monsoon. Data on net-sown area, irrigated area, and cropping intensity are indicated in the following table according to size groups :

TABLE 4.2
Irrigation and Cropping Intensity by Size Groups*

Size groups	Net sown area	Net irrigated area	Gross irrigated area	Gross cropped area	Percent of irrigated area to sown area	Cropping intensity index in %	
						Irrigated areas	Unirrigated areas
(Million hectares)							
less than 1 ha	13.00	4.39	5.39	16.93	33.7	123	134
1 to 2 ha	17.01	4.74	5.83	20.81	27.8	123	122
2 to 4 ha	26.25	6.61	8.15	31.33	25.1	123	118
4 to 10 ha	40.93	8.33	10.23	46.72	20.3	123	112
10 ha & above	38.64	5.04	6.12	42.26	12.9	121	108
all groups	135.83	29.11	35.72	158.05	21.3	123	115

* Agricultural Census of India, 1970-71.

4.2.9 Proportion of irrigated area was higher in the marginal and sub-marginal holdings of less than 1 ha being 33.7 per cent and the least—about 13 per cent—in large holdings. In the small and medium holdings it varied between 28 per cent and 20 per cent. A significant feature of the sizewise distribution was that two thirds of the total net irrigated area in the country was concentrated in the sizegroups 1 ha to less than 1 ha. Intensity of cropping on irrigated holdings showed remarkable stability in all size groups, the index being close to 123. In respect of unirrigated holdings, however, this index showed a steady decline with increase in the size of holdings from 134 in farms less than 1 ha to 118 in 2 to 4 ha farms and further to 108 in large farms. These data clearly bring out that smaller holdings were comparatively better endowed and more intensively cultivated which was true even of the unirrigated holdings. However intensity of cropping in irrigated areas in general was 123 per cent which was only marginally higher than the general cropping intensity.

4.2.10 Distribution of irrigated area under the major crops of rice and wheat in 1970-71 was as follows :

TABLE 4.3
Cultivation of Rice and Wheat by Size Groups of Holdings*
(Area, million hectares)

Size groups	Area under rice					Area under wheat				
	Irrigated	col. (2) as % of col. (6)	Un-irrigated col. (4) as % of col. (6)	col. (5)	Total	Irrigated	% of col. (11)	Un-irrigated	% of col. (11)	Total
less than 1 ha	2.48	37.8	4.08	62.2	6.56	1.43	64.1	0.80	35.9	2.23
1 to 4 ha	5.62	35.4	10.24	64.6	15.86	3.91	61.9	2.41	38.1	6.32
4 to 10 ha	3.17	35.7	5.71	64.3	8.88	3.10	56.8	2.36	43.2	5.46
10 ha & above	1.61	33.5	3.20	66.5	4.81	1.78	41.8	2.48	58.2	4.26
all categories	12.88	35.7	23.23	64.3	36.11	10.22	55.9	8.05	44.1	18.27

* Agricultural Census of India, 1970-71.

Nearly one half of the irrigated area and one-third of the un-irrigated area under cereal crops were devoted to rice cultivation. Even so, almost two-thirds of the rice area remained un-irrigated. This provided a rough index of the vulnerability of the crop to weather hazards like droughts and floods. Small and semi-medium holdings, (1 to 4 ha) had the highest proportion of rice area, both irrigated and un-irrigated (43.6 per cent and 44.1 per cent respectively). Marginal and sub-marginal holdings (less than 1 ha) and medium holdings (4 to 10 ha) accounted for about one fifth and one fourth respectively of the rice acreage. Large holdings (10 ha and above comprising about one-eighth of total rice area could be considered as playing only a marginal role. It is of interest to note that the proportion of irrigated area under rice was close to 35 per cent in all size groups. The substantial role that small and semi-medium holdings could play in augmenting rice production has been clearly brought out in Table 4.3

4.2.11 In marked contrast to rice crop, greater proportion of the wheat crop (55.9 per cent) was raised under irrigated conditions. But as in the case of rice, small and semi-medium holdings (1 to 4 ha) accounted for the largest part of area under wheat cultivation—38.2 per cent of the irrigated and 30.0 per cent of the unirrigated area. Share of the marginal and sub-marginal holdings (less than 1 ha) and medium holdings (4 to 10 ha) in the total crop area was 12 per cent and 30 per cent respectively. Larger holdings (10 ha and above) appeared to

be of greater importance in wheat cultivation than in rice cultivation as 23 per cent of the crop area belonged to this group. Although marginal and sub-marginal farms accounted for only 12 per cent of the area under wheat, irrigated component in these holdings was the highest—64.1 per cent. Proportion of area irrigated showed a progressive decline with increase in the size of holdings.

4.2.12 Other cereal crops, except barley were grown mainly under unirrigated conditions. In the case of barley, half of the crop area received irrigation. However as a food crop, it was hardly of importance. Only 3 to 4 per cent of the area under bajra and jowar was irrigated. The greater part of unirrigated area under cereals (about 40 per cent) was devoted to these two crops. Holdings of 4 ha and above accounted for 70 per cent or more of the area. Pulses, big and small, were grown under rainfed conditions. Bigger farms had a larger share of the crop area. Similar was the case with oil-seeds and cotton. In the case of jute, however, more than half the crop area was confined to small and semi-medium holdings (1 to 4 ha). This, in sum, was the land resource structure in relation to crop production, as revealed by the Agricultural Census 1970-71.

Tenancy

4.2.13 A sizeable proportion of operated land in the country is known to be under different forms of tenancy. However, according to Agricultural Census 1970-71 tenancy arrangements covered only one-tenth of the operated area. It is relevant to note in this context that the village records provided the source-material for the Census; and these records in practice reflected only open tenancies. Earlier, 1961 population Census data had indicated a much wider spread covering 23 per cent of the area. As according to the 16th Round of the National Sample Survey (NSS) (1960-61) about 12.5 per cent of the area was held under open tenancies, the remaining area was taken as comprising all types of concealed tenancies including share cropping. These magnitudes of 10 per cent under concealed tenancies and 23 per cent under all forms of tenancies were generally taken as indicating the upper limits. In view of the sharp increase in population during the interregnum and the mounting pressure on land, any significant change in the tenancy situation would be unlikely.

Workforce in Agriculture

4.2.14 The 1971 Census reported 180.4 million persons as economically active, out of which 130 million or 72 per cent were engaged in agriculture; 78.2 million of them as cultivators, 47.5 million as

agricultural labourers and some 4.3 million people working in livestock, forestry, fisheries, plantations, orchards etc. Cultivated area per worker at the all-India level during the last two decades showed a fall from 1.33 ha in 1951 to 1.21 ha in 1971. This diminution in land availability was experienced in several States except a few like Punjab, Haryana, Madhya Pradesh, Rajasthan and Uttar Pradesh.

4.2.15 Some information about farm employment is available in the farm management studies undertaken in various regions since 1954. This shows that the number of man-days for which a family worker was employed on the farm declined over the years practically in all regions. During the fifties, on an average, a family worker found employment on the farm on as many as 268 days in Punjab (Amritsar and Ferozepur districts) 263 days in western Uttar Pradesh (Meerut and Muzaffarnagar districts), 202 days in the low rainfall areas of Tamil Nadu (Salem and Coimbatore districts) and 108 days in Orissa (Sambalpur district). In contrast, during the subsequent period of 1966-70 on an average he worked only for 148 days in Punjab (Ferozepur district), 112 days in Uttar Pradesh (Muzaffarnagar district), 70 days in Andhra Pradesh (Cuddapah district comparable to Salem and Coimbatore in Tamil Nadu) and 106 days in Orissa (Cuttack district). The comparatively low figure of employment in respect of Andhra Pradesh (Cuddapah district) was due to drought conditions in the area during one of the years investigated. Generally on-farm employment of family labour showed an increase and off-farm employment a decrease with increase in the size of holdings. Employment was relatively higher in regions like Punjab, western Uttar Pradesh and the delta areas of the South because of higher cropping intensity and also favourable land/man ratio obtaining in some of the areas. In regions like Orissa and Rayalaseema, farm employment was relatively low due to lower cropping intensity.

Work Animals on the farm

4.2.16 According to the Livestock Census of 1972 (Provisional) number of bovines kept on the farm for draught purposes was 82.48 million in all, consisting of 74.86 million cattle and 7.62 million buffaloes. Cattle thus provided about nine-tenths of the animal draught power. Most of the draught animals of both species were drawn from the male population of 3 years and above. A measure of stability in the number of work-animals was discernible in recent years. Consequently, there had been no significant change in cultivated area per bullock pair over the two decades at the all-India level. Some variations, however, were observed in the States.

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4.2.17 Farm employment of drought animals showed some interesting trends. For instance in Punjab, whereas a pair of bullocks was employed on the farm for only 134 days during 1954-57, it found employment for 150 days during 1967-70. There was a significant reduction in their number and farmers were making intensive use of them. In western Uttar Pradesh on the other hand, employment per bullock shrunk from 150 days to 101 days during the same period. The general trend in the use of bullocks conformed to this pattern. Main reason for the reduced use of animal power on farms was the introduction of tractors, threshers, pumpsets, tubewells etc. which had been increasing in recent years. By and large, employment of bullock labour was found to be comparatively higher in regions where employment per farm worker was also high.

Farm Machinery

4.2.18 There had been significant increase in the number of tractors, threshers, diesel and electric pumps etc. used for agricultural purposes since 1950. Between 1951 and 1972 the number of tractors increased from a mere 9 thousand to 170 thousand and that of oil engines and electric pumps from 108 thousand to 2578 thousand. The order of increase witnessed during the last five years of this period was spectacular compared to the increase recorded during the earlier years.

4.2.19 Minimum farm power requirement for obtaining a reasonable output from a hectare of cultivated area had been estimated in the range of 0.5 to 0.8 hp by the Presidents' Science Advisory Committee, USA¹ and at 0.80 hp by the Fifth Plan Task Force². Based on the data available relating to different sources of power, total power availability in the country in 1971 was estimated at 49.8 million hp. Keeping in view that net sown area at the same time point was 140 Mha the per hectare power availability was only 0.36 hp. Even on the basis of the lower estimate of 0.50 hp. per hectare, the overall availability was found to fall short of requirements significantly. This issue is dealt within detail in Chapter 50, Farm Power.

Farm Assets and Investments

4.2.20 According to an estimate by the Reserve Bank of India, the

- 1 1967. *The World Food Problem—A Report of the President's Science Advisory Committee*, Vol. II : 397-98, Washington, U.S. Government Printing Office
- 2 1973 July. Report of the Task Force (1) on Vehicles, Earth Moving and Construction Equipment, Agricultural Machinery, Diesel Engines and automotive ancillaries, para 2.1.2, New Delhi, Planning Commission.

country's total tangible wealth was Rs 1,04,500 crores in 1965-66. Of this the reproducible tangible wealth which was exclusive of the value of land, was estimated at Rs 73,120 crores. The share of agriculture and allied activities was only Rs 12,040 crores or 16.5 per cent of the reproducible tangible wealth. This was in sharp contrast to the concentration of land, labour and draught animals in agriculture observed earlier.

4.2.21 Farm management studies provided some micro level data in certain cases for two points of time for comparable regions. The concept of farm assets used in these studies covered land, buildings, livestock, implements and machinery farmstock and financial assets, all evaluated at current market prices. The level of investment showed marked variations as between different regions, which were mainly due to differences in farm size, quality of land and other factors like irrigation facilities. Inter-regional differences in complementary investments on items like farm buildings, livestock and implements also contributed to the variations observed. Investment per unit area was generally higher in small holdings. A substantial portion of farm assets and investments—about 65 to 85 per cent—was in the form of land, followed by livestock and implements in the order of importance. In general, investment in livestock was found to be more in smaller holdings as compared to larger size groups.

4.2.22 Farm management studies made during the sixties showed significant increase in the value of farm assets and investments compared to the fifties; however a good part of the increase could be attributed to change in prices. A significant difference observed was that the share of land and livestock in total assets showed some decline, though only marginal in most cases; the items which gained in importance were farm machinery, implements, etc. An independent investigation¹ conducted by the Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad in typical dry land farming areas of Gujarat (Panchmahals) and Karnataka (Bellary) showed that between 1961 and 1971, capital stock on the sample farms (in the form of irrigation sources, land improvements effected, bullocks, farm implements and livestock) increased nearly 7 times in Panchmahals and 16 times in Bellary. The study admitted that the estimates of increase in capital stock over time suffered from certain limitations; even so, the relative increase in investment had been of such an order that substantial augmentation in capital stock could be expected.

¹ 1973. Status of Dry Land Agriculture, Vol. I & II Ahmedabad, Indian Institute of Management and Bombay, National Institute of Bank Management.

3 CROP FARMING

Farming in the Fifties

4.3.1. We might now turn to review the available data on the economics of crop production or farm business for which the main source would be the farm management studies referred to earlier. The first series of studies were undertaken from 1954-55 in typical agro-climatic regions in the country. Generally the investigations were repeated for three crop years in the selected regions with a view to obtaining a near-normal picture of the farm situation. Statistical data were collected in considerable detail about all relevant aspects of farm economy, in particular crop production. The first districts taken up for investigation were Amritsar and Ferozepur in Punjab, Meerut and Muzaffarnagar in Uttar Pradesh, Coimbatore and Salem in Tamil Nadu, Hooghly and 24-Parganas in West Bengal, Akola and Amraoti in Vidarbha and Nasik and Ahmednagar in the rainshadow belt of Maharashtra. In 1957-58, West Godavari in Andhra Pradesh, Monghyr in Bihar and Sambalpur in Orissa were also taken up for similar investigations. While the districts selected from Uttar Pradesh, Punjab and Andhra Pradesh enjoyed comparatively better irrigation, other districts had very little of it. Food crops accounted for over four-fifths of the cropped area in most of the selected districts except in Meerut-Muzaffarnagar area and the Akola-Amraoti tract. The first two districts had sizeable area under sugarcane and fodder and the latter under cotton and groundnut. Wheat was the main food crop in the selected districts of Punjab and Uttar Pradesh, rice in those of West Bengal, Orissa, Bihar and Andhra Pradesh and coarse grains in the other districts.

4.3.2 Reports brought out by the farm management investigations provide data on gross income and aggregate cost in respect of individual crops as also farm business as a whole. Gross farm income used here, however, covers only crop production. As such, to the extent the ancillary sources like dairying, poultry-keeping etc. and other avenues like wages and rent are ignored, the data on income are incomplete. According to the national income statistics, however, crop production alone accounted for about 90 per cent of the total income from agriculture. As such sufficient indications would be forthcoming about the incomes accruing to farmers from an analysis of the returns from crop production. Data on farm costs gathered in detail, provide a break-up of components into paid-out cost and imputed cost. The former known as cost A2 in farm management studies covers cash and kind expenditure on items like hired human labour;

bullock labour; seed; manures; fertiliser; land revenue; cess; irrigation charges; depreciation charges on implements; machinery and buildings; interest on crop loan and rent paid on land leased in. The difference between gross income and paid out cost indicates the order of farm business income accruing to the cultivators. As all the studies referred to above were carried out during the fifties, when no far-reaching technological improvements had taken place in Indian agriculture, they could throw light on the economic aspects of the so called 'traditional agriculture'.

4.3.3 Appendix 4.1 gives average per hectare annual gross output, paid out cost, total cost, farm business income and net income, farm business income per capita and the output/input ratio, all according to farm size for different agricultural regions. It appears from the table that a reasonable margin of gross income over total cost was not the normal feature in most of the areas and size ranges. Only in four out of nine regions namely, Uttar Pradesh, West Bengal, Orissa and Vidarbha area, there was any consistent trend for gross returns to exceed costs, thus yielding some profits. The margins obtained were, however, often narrow, hardly 15 to 25 per cent of the cost, which could not be considered attractive enough to cultivators for a whole year's labour. There were a few instances of bigger holdings in some parts obtaining wider margins of about 30 to 35 per cent, for instance, farms of 6 ha and above in Uttar Pradesh and those of 8 ha and above in Vidarbha. It was observed that some specific factors favoured such developments, for instance cultivation of crops like sugarcane which fetched higher prices, in Uttar Pradesh and of cotton and groundnut in Vidarbha. The diseconomy observed on small farms in these areas in the maintenance of bullocks was generally absent in bigger farms. In the middle size ranges in Vidarbha there was considerable leasing in of land which facilitated a more efficient use of the bullock-stock. On the other hand in Punjab, Tamil Nadu, Andhra Pradesh and Maharashtra (Ahmednagar/Nasik area) aggregate costs and gross income were found to move rather close, very often costs exceeding the returns. The trends in farms returns and costs are more clearly brought out by the output/input ratios for various size classes given in Appendix 4.1. The picture that emerged was that farming, by and large, was an unremunerative enterprise in large parts of the country and farmers did not get enough margins in crop production so as to enthruse them to invest more in agriculture when judged on the basis of net income. Some economists are, however, critical of the practice of evaluating the family labour component in aggregate cost at the market wage rates adopted by some Centres and some others of attaching a price on the use of owned-land in crop

production.¹

4.3.4 Farm business income, defined as the difference between gross returns and all out-of-pocket expenses on items like seed, manures, fertilisers, irrigation charges, rent paid, etc. would be a more realistic measure to judge the economic rationale of traditional agriculture. As defined above, it quantifies the sum-total of earnings from farm business, real or notional, accruing to the farm-household in the form of wages for work done by family members, rental on the use of family land, interest on capital employed, and profits if any which rightly is a reward for the managerial role played by the farmer.

4.3.5 Trend in farm business income in different regions as could be seen from Appendix 4.1 was a mixed one. Income obtained in the first few size-groups were generally higher compared to the middle ranges, presumably due to the higher content of family labour, which was abundant on these farms. There was, however, a tendency for these incomes to decline in the middle ranges of say 2-6 ha and then to rise again. On the larger farms, paid-out cost was found showing a decline resulting in a wider margin of business income which was as much as 50 to 60 per cent of gross returns. The trend is consistent with our knowledge of the farm business; the larger farms in general were found to employ human labour which consisted mainly of hired hands and draught animals much more economically. Besides, while leasing in was not very common in these size-groups, rental was reckoned on owned land which was sizeable. In areas where paid out costs were comparatively higher than imputed costs as in Uttar Pradesh, Tamil Nadu, Andhra Pradesh and Ahmednagar-Nasik area, the farm business income accruing was lower. Some of the factors responsible for depressing the farm business income were the comparatively higher expenditure incurred on bullocks as in Tamil Nadu, Maharashtra and Uttar Pradesh. In Andhra Pradesh it was observed that family labour contributed only about one-fourth of farm labour requirements and as much as 75 per cent had to be hired which made a large difference to paid out cost at all size levels. It was also observed that farmers in some areas, particularly small farmers, had to spend more on seed, instance in Andhra Pradesh and Maharashtra. As a result, there was considerable reduction in the margin of profits which otherwise would have accrued. Only in Vidarbha and

1 Amartya Sen, 1962, February. An Aspect of Indian Agriculture. The Economic Weekly, Annual Number, XIV (4, 5 & 6) : 243-246; and G. R. Saini, 1971, June, Holding size, Productivity and Some Related Aspects of Indian Agriculture, Review of Agriculture, Economic and Political Weekly : A-79-85. The practice generally adopted in farm management studies is to evaluate family labour at rates paid to permanent farm labour and not at current market wage rates.

West Bengal, paid-out costs were found to be comparatively lower, thus raising the margin of farm business income to more than 50 per cent of gross income. In Punjab, total costs were more or less equally divided between paid-out costs and other imputed items of cost. However, a higher proportion of farm business income to gross returns did not always mean more incomes at the disposal of the farmer. The latter was found to depend mainly on the level of overall returns from crop production, comparative prices of crops grown and size of the farm family with whom the cake had to be shared.

4.3.6 A Study Group of the Planning Commission appointed in July, 1962 had indicated the dividing line between poverty and subsistence in the country in terms of a minimum consumer expenditure level as Rs. 240 per capita.* This much money in 1960-61 could fetch essential components of a food basket considered adequate under Indian conditions and ensure a minimum desirable standard of living. Dandekar and Rath¹ had estimated the minimum annual per capita consumer expenditure for rural areas at Rs. 180 at 1960-61 prices. According to them the same basket of food and service would have cost about Rs. 150 in 1956-57. Keeping in view the above minimum norm of consumption one might review the distribution of farm business income accruing to farm households with a view to finding out how many of them managed to secure a minimum level of living. However, strictly speaking it would not be quite appropriate to compare farm business income with the amount of income needed for minimum consumption requirements. The latter is based on the estimated cost of a basket of food items required for giving about 2250 calories with some allowance for other expenditure. In the case of producers, particularly those with marginal holdings under the traditional agriculture their minimum food requirements are the first charge on their output; besides they also consume food stuffs grown in the backyard which are not included in the farm output. The prices at which the grain output and the grains for consumption are valued generally vary, the latter being much higher than the former. Moreover, farm business income does not include income from other sources like wage-earnings, rent on leased out land, and income from subsidiary occupations; it also does not represent actual cash income inasmuch as the grains retained for consumption are also valued at the prevailing harvest prices. In view of the considerations stated above, an

* There is a divergence of views on the estimates of value of items in minimum consumer expenditure—See article by Sen, Bardhan & Rudra; 1974, *Poverty and Income Distribution in India*, Calcutta, Statistical Publishing Society: 67, 113, 281.

1 V. M. Dandekar and Nilkantha Rath, 1971, *Poverty in India*, Economic and Political Weekly, VI (1 & 2): 25-48 & 106-146.

income of Rs. 150 per capita per annum in 1956-57 prices based on farm management studies would provide for a viability norm. A viability norm may be defined as an income and needs norm somewhat higher than what is implied in the minimum needs norm. One might now attempt a review of the distribution of farm business income accruing to farm households in various size groups with a view to indicating the viability size of holdings under different agro-climatic and technological situations. However, the limitation of the approach indicated above needs to be kept in view while drawing conclusions.

4.3.7 Except for a few holdings belonging to large size groups, vast majority of them irrespective of the region to which they belonged and the type of crops they raised, were not found to be viable when the viability norm was applied without any adjustment for regional variations. In some parts like the rain-shadow tract of Maharashtra and the high-rainfall monsoon agriculture areas of West Bengal none of the size groups received even Rs. 150 per capita as farm business income viability level in terms of a minimum farm size was found to vary from region to region depending on a number of factors like irrigation, intensity of cropping, cropping pattern adopted etc. In the delta areas of Andhra Pradesh and western Uttar Pradesh only farms of 4 ha size and above satisfied the viability norm. Both these tracts had fairly good irrigation facilities and a diversified cropping pattern which included high value crops like paddy and tobacco in Andhra Pradesh, and paddy, wheat and sugarcane in western Uttar Pradesh. About two-fifths of the cultivated area was double cropped in both the tracts. Only farms of 8 ha and above in Punjab and Vidarbha where double cropping practised was rather moderate, and holdings more than 10 ha in the dry lands of northern Tamil Nadu satisfied the viability norm. Though cash crops formed a sizable proportion of cropped area both in Punjab and Vidarbha areas, some interesting differences between the two were discernible. While the Punjab farms enjoyed good irrigation facilities, Vidarbha farms were, by and large, dependent on rainfall. The former had to resort to intensive use of inputs to extract 45 to 50 per cent of the gross output as farm business income whereas Vidarbha farms managed the same by means of diversification of cropping and extensive cultivation methods, using farm based inputs to the maximum extent possible. At the other extreme, in the predominantly dry land farming areas of Nasik, farms as large as 20 hectares and above were struggling to reach the threshold level; the position was worse in the neighbouring Ahmednagar area. In eastern India, none of the sample farms from Hooghly and 242 Parganas, irrespective of the size of holdings (farm size was generally small in these areas) were found to be viable. This inability was

partly due to lower yields obtained and, partly due to unfavourable land-man ratio consequent on the very high and increasing demographic pressures.

4.3.8 If farming were to be judged by farm business income accruing on a per capita basis it was found that in irrigated areas practising double cropping on a large scale, only medium size farms of 4 ha and above were viable. In areas enjoying either irrigation or assured rainfall and growing cash crops on a sizable scale but practising cultivation on extensive lines, a much larger area of about 8 ha and above was required to satisfy the assumed norm. Extent of this requirement was even more in similar areas growing mainly food crops, particularly millets and pulses. In the rainshadow belt as also in the paddy growing areas in eastern parts practising less intensive monsoon agriculture, none of the size groups was found to be viable. It might, however, be pointed out that operators of small size groups were found supplementing their meagre income crop production with wage earnings in all regions except Punjab. Ancillary fields like dairying too provided limited opportunities. Similarly the finding that even large farms failed to make the grade in some parts like West Bengal required some qualification. Tenancy, particularly share cropping, is known to be prevalent in these areas; and large farmers generally parcelled out plots to small operators on extortive terms to collect large rental income. While the former made handsome fortune on the sly, it was likely that crop production on holdings operated by them did not received adequate attention.

4.3.9 In sum, the following main factors contributed to the success of farm business in 1950's :

- (i) irrigation coupled with double or multiple cropping and greater use of inputs particularly manures and fertilisers;
- (ii) greater diversification of cropping with cash crops;
- (iii) better economy in expenditure as evidenced by the declining trend in paid-out cost with increase in farm size; and
- (iv) fuller and more efficient use of farm based factors of production on larger farms.

Farmers in middle size groups in some areas were found to lease in land to effect greater economy in operation. It is evident from the foregoing that the approach adopted by farmers in different regions to get over the various operational constraints, whether environmental or resource based, to maximise income, differed from region to region and within a region from size group to size group. In the ultimate analysis success depended upon how efficiently they combined and employed various factors of production at their command so as to get

the best-out of farm business. Only studies bearing on production relationship in agriculture in different regions between farm out-put on the one hand and input items on the other, can throw light on the efficiency aspects of farm business. Production function studies have precisely the above objective in view.

4.3.10 Though some of the farm management studies had attempted production function analysis, there was no uniformity about the form of the functions tried and the explanatory variables included in the analysis. The centres were free to adopt their own approach in the beginning as these investigations were mainly methodological in nature. There are, however, quite a few independent studies most of them based on the same farm management data relating to the 1950's. Important among them are those by Hopper¹, Raj Krishna², Hanumantha Rao³, Reddy⁴, Sahota⁵, Khusro⁶, and Saini⁷. While studies by Hopper, Raj Krishna and Saini related to Punjab and Uttar Pradesh, those by Reddy and Rao related to South India and the erstwhile Hyderabad State respectively. Khusro's study and that of Sahota had a wider coverage. The general approach adopted in these studies was to identify the functional relationship between farm returns and input factors like cultivated land, human labour, bullock labour, seeds, fertilisers and manures, irrigation etc. and to deduce therefrom production elasticities of inputs, returns to scale in farm business, and marginal productivities of the different factors. The form of the function chosen for the studies was that of the Cobb Douglas type which had been empirically tested and found to be efficient in explaining production relations in agriculture.

4.3.11 Major findings of these investigations were that crop production in Indian economy in the 1950's, by and large, was subject to constant returns to scale; that the notion of zero productivity of labour was inconsistent with real farm situation and that, in general, there was a great measure of efficiency in the allocation and use of farm

- 1 Hopper W. David, 1965, August. Allocation Efficiency in a Traditional Indian Agriculture, *Journal of Farm Economics*, 47(3) : 611-624.
- 2 Raj Krishna, 1964, July-Dec. Some Production Functions for the Punjab, *Indian Journal of Agricultural Economics*, XIX (3&4) : 87-97
- 3 C. H. H. Rao, 1965. *Agricultural Production Functions, Costs and Returns in India*: New Delhi, Asia Publishing House.
- 4 Chennarddy Venkareddy, 1967, Nov. Production Efficiency in South Indian Agriculture, *Journal of Farm Economics*, 49(4) : 816-820.
- 5 Sahota, Gian, 1968, August. Efficiency of Resource Allocation in Indian Agriculture, *American Journal of Agricultural Economics*, 50(3) : 584-605
- 6 A. M. Khusro, 1964, July-December. Returns to Scale in Indian Agriculture, *Indian Journal of Agricultural Economics*, XIX (3&4) : 51-80
- 7 G. R. Saini, 1973, January. *Economics of Farm Management*, Thesis submitted to the University of Delhi.

resources. There was, however, strong evidence for the uneconomic nature of bullocks on the farm; the situation, no doubt, was aggravated by excess number of bullocks in small holdings. Farm management studies also revealed that part of the unprofitability observed in Indian agriculture was due to diseconomies in bullock use. Use of modern inputs like chemical fertilisers had not picked up in the 1950's. Analysis, where manures and fertilisers were included as explanatory variables, showed that production response to this input, if at all, was very marginal. Irrigation, however, was found making a substantial contribution to farm output. The consensus of these studies was that there was a great measure of efficiency in the development of factors in crop production, whether the area studied was predominantly irrigated or rainfed.

4.3.12 The Cobb Douglas production function approach has certain limitations and hence the results need to be interpreted with caution. These studies covered different areas, typical of important farming systems in the country and also related to different years. Several of them used disaggregated farm management data for analysis rather than the aggregated, size-wise averages given in the farm management studies. The rigour of statistical analysis and level of sophistication brought to bear on them also varied from study to study. Nevertheless the unmistakable indication provided by these studies was that much progress could not be made towards improvement of crop production in the country within the confines of the existing production functions and traditional resources as there was little evidence of economic inefficiency in resource use. Significant improvements in Indian agriculture, would, therefore, need induction of new resources, skills and techniques.

Transitional Phase

4.3.13 In 1960-61, the Intensive Agricultural District Programme (IADP) was introduced in a few, well-endowed districts, with the immediate objective of demonstrating quicker ways of raising food production in the country. In the process the selected districts themselves were to achieve significant increases in yields and in farm income.

4.3.14 By 1963-64, there were 17 districts in the country implementing the programme. The IADP districts covered about 8.9 Mha of crop area or about 6 per cent of such lands in the country. Actual coverage of the programme was, however, confined to one-third of this area in 1965-66. As it was mainly concerned with raising food production, the actual increases in yields and production of foodgrains

realised in these districts should provide a true measure of its success as a 'path finder' and 'pace setter' programme. The Expert Committee on Assessment and Evaluation of the IADP in their Fourth Evaluation Report had indicated that production increases achieved in certain districts, in respect of rice, maize and wheat from 1958-61 (base period) to 1967-68 were of the order of 38 per cent, 100 per cent and 260 per cent respectively. These figures, however, were of limited significance as they related only to a selected band of districts within a selected group and also included the contribution of area-increase to production. The increases in yields recorded during this period, however, appeared to be much less spectacular. Rice yields (in terms of hulled rice) in the 12 rice districts and wheat yields in the 4 wheat growing districts averaged only 13.3 quintals and 13.5 quintals per hectare respectively compared to the pre-package average of 12.4 and 10.2 quintals. The average yield of rice and wheat obtained at the national level during 1967-68 were 10.3 quintals and 11.0 quintals per hectare. Again the IADP yields of maize at 11.8 quintals, jowar at 4.6 quintals and bajra at 4.4 quintals were only nominally above the national average yield, except in the case of jowar. These margins were quite thin to impress the farmers and attract more of them to join the programme.

4.3.15 Desai¹ and Brown², who critically examined the progress data for the period 1960-61 to 1966-67, were of the view that there was very little in the performance of the selected districts to distinguish them from others. The data relating to crop demonstrations throw some light on the inadequate progress in regard to programme-coverage and yields. Results of these demonstrations for major cereal crops in IADP districts showed only an average increase of 7.2 quintals per hectare for paddy, wheat and maize on irrigated fields, 3.0 quintals for jowar and 4.0 quintals for bajra. The total added cost for the recommended practices including family labour was approximately Rs. 370 for irrigated paddy, Rs. 400 for irrigated wheat, Rs. 440 for irrigated maize and Rs. 247 for jowar and bajra. According to Browns assessment, until the increase in prices of foodgrains in 1965-66, it took 7.4 quintals of paddy in Alleppey, Mandya and Palghat and 10 to 12.4 quintals in the other districts to equate the added cost of the 'package'. On the average, 10 quintals of wheat, 12.4 quintals of maize and 7.4 quintals of jowar and bajra were required. It was obvious that the package of practices recommended were not econo-

- 1 D. K. Desai, 1969, June 28. Intensive Agricultural District Programme; Analysis of Results, Economic and Political Weekly, Review of Agriculture : A-83-90.
- 2 Dorris D. Brown, 1971. Agricultural Development in India's Districts; Cambridge, Massachusetts, Harvard University Press ; 33.

mical and the yields obtained were not high enough. A detailed analysis of the demonstration data collected prior to 1965-66 showed that only in about 25 per cent of the cases the increased output exceeded the amount needed to show profit, in 20 per cent cases output just matched costs leaving no margin whatsoever, and in 55 per cent cases returns were not enough to recover cost. No wonder then that the programme did not move fast enough as originally envisaged. The main factors which inhibited progress of IADP, particularly during the first five years or so, were the absence of fertiliser-responsive, high-yielding crop varieties of proven genetic potential and the unremunerative level of foodgrain prices.

4.3.16 There is very little evidence that any significant change in agriculture took place in the IADP districts before the advent of high yielding varieties of cereal crops. The National Institute of Community Development attempted a comparative study of the IADP¹ and non-IADP districts in 1966-67 which, however, was limited to three States, viz; Punjab, Andhra Pradesh and Orissa. Besides attempting crude estimates of productivity of factors, the authors of the study subjected the farm level data to a multivariate functional analysis of the Cobb Douglas type. Size of holdings, human and bullock labour and amounts of fixed and working capital were the variables selected by them to explain the behaviour of gross revenues. The analysis showed that, on the whole, land and working capital tended to exert a relatively greater determinative influence on output than the other factors. Production elasticities of bullock labour were found to be negative in several situations and often non-significant statistically. Among the input categories which showed clear trends, working capital occupied top position; regression co-efficients of this variable were always positive and usually highly significant and its marginal value product always higher than marginal cost. Furthermore, the marginal product invariably improved while shifting from non-intensive to intensive agriculture. The overall trend was indicative of the importance of new inputs like improved seeds, chemical fertilisers, pesticides etc. represented by working capital, all required by farmers under the new farm situation. The scale co-efficients in all the three cases studied indicated constant returns to scale. Indian agriculture, thus, continue to be very much the same as before, except that there was a moderate measure of input intensification which was showing up in the growing importance of working capital in the functional relationship.

1 1969. Resource Use and Productivity of Farms : A comparative Study of Intensive and Non-Intensive Areas, Hyderabad, National Institute of Community Development.

4.3.17 There is, however, no denying that the IADP was a significant step forward in Indian agriculture. The emphasis in agricultural development programmes, for the first time, shifted to crop production and the farmer became the focus of all efforts. By its emphasis on scientific approach to farming, the IADP succeeded in a large measure in preparing farmers to adopt technological improvements. Some districts witnessed remarkable changes in the attitude of farmers and their priorities. For instance, it was observed that farmers of Shahabad, who used to invest most of their savings in gold and silver 10 years ago were using most of it now for developing land and educating children. In Ludhiana, even medium farmers were found to be keen on acquiring tractors for agricultural purposes. The most significant contribution of IADP was that it set the stage for far reaching changes in crop production. It played a crucial role in the launching of the high-yielding varieties programme which formed the major plank of the new strategy in the Fourth Plan.

High Yielding Varieties

4.3.18 The inability of the IADP to move crop production at a fast enough pace in the early phase was mainly due to the inherent limitations of existing crop varieties. The high-yielding strains, exotic as well as locally identified, which appeared on the scene during this period brought about a material change in the situation. Potential yields expected from them—2 to 4 tonnes per hectare from hybrid millets and 4 to 6 tonnes per hectare from paddy and wheat varieties held out the promise that agriculture would soon become an attractive business proposition for a large number of farmers. The High-Yielding Varieties Programme (HYVP) which centred on the new strains of paddy, wheat and hybrids of jowar, bajra and maize was launched on a countrywide scale in the kharif season of 1966.

4.3.19 Important crop varieties propagated at the initial stage were *Taichung Native 1*, *Tainan 3*, *ADT 27* etc. in respect of paddy, *Lerma Rojo*, *Sonora 64*, etc in respect of wheat and a few hybrids of jowar bajra and maize. Soon a number of new varieties were introduced which replaced old ones for instance *IR 8*, *Jaya*, *Padma*, *Hamsa*, *Pankaj* in the case of paddy, *Kalyan Sona*, *Sonalika* etc. in the case of wheat.

4.3.20 Progress of HYV Programme has been discussed in detail in Chapter 3 on Progress of Agricultural Development; it may suffice to note that it was neither smooth nor uniform. In the case of wheat, the new varieties spread so fast that area targets fixed in the Fourth Plan were exceeded in the third year itself i.e. by 1971-72. Wheat crop not only gained sizeable area in non-traditional States of West

Bengal and Bihar but also fared exceedingly well. In the case of paddy and bajra, 95 per cent of the target was achieved in the final year of the Fourth Plan. However, area under hybrid maize and jowar lagged considerably behind their respective targets. A significant trend observed in regard to paddy was that cultivation of new varieties became more popular during the rabi/summer season in the eastern and southern States and as a *kharif* crop in Punjab and Haryana. In general the difference in performance of the main crops viz. *kharif* paddy and wheat was very marked and could be explained, by and large, in terms of simple economic concepts like cost, returns and profitability.

4.3.21 Paddy versus wheat : Progress of the HYVP was assessed and evaluated from its very beginning. Two agencies which undertook the work on a systematic basis were the Programme Evaluation Organisation (PEO) of the Planning Commission and the agro-economic research (AER) centres of the Ministry of Agriculture and Irrigation. While PEO initiated sample studies beginning from the *kharif* season of 1967 for a period of three years, the AER Centres attempted evaluation studies in selected districts from 1966. Information on costs and returns in respect of high yielding varieties and other crops grown were collected by both these agencies by the survey method. The concept of cost adopted by PEO was nearly the same as 'paid out cost' or 'A₂ cost' employed in farm management studies with the difference that value of farm based inputs, depreciation and interest charges were not included. Other major limitations of these data were that only average yield of high yielding varieties were collected and no estimates of gross returns from farm business were attempted. Average yields were therefore evaluated, using procurement prices. Data relating to 1967-68 and 1968-69 collected by PEO and those for the latter year collected by AER centres have been used in the present analysis. These data suffered from a number of limitations and hence might be taken only as suggestive of the basic arithmetic of farm business that influenced decision making by farmers.

4.3.22 Relevant data on farm cost, gross returns and farm business income relating to different States and crops collected by the PEO and the AER Centres are given in Appendices 4.2 and 4.3. A summary

of Appendix 4.2 based on *PEO* studies, is given below.

TABLE 4.4
Costs and Returns from High Yielding Varieties
(Rupees—per hectare)

	Average Yield (quintals per hectare)	Gross returns	Paidout cost	Farm business income
Paddy (<i>Kharif</i>)				
1967-68	23.21	1190	1003	187
1968-69	42.05	2157	1171	986
Paddy (<i>Rabi</i>)				
1967-68	43.52	2232	798	1434
1968-69	46.88	2404	1201	1203
Wheat				
1967-68	25.95	2079	620	1459
1968-69	25.61	1946	586	1360
Bajra				
1976-68	11.06	586	261	325
1968-69	7.82	411	424	—13
Maize				
1967-68	21.37	1175	973	202
1968-69	25.89	1424	730	694

4.3.23 Detailed data in Appendix 4.2 show wide variations between States and seasons which could be ascribed to difference in soil conditions, farming practices, sources of irrigation and irrigation practices, susceptibility to pests and, duration of the crops etc. However, certain facts stand out very cognizably in the summary table itself. In general, compared to *Hharif* paddy, yields of *rabi* paddy were higher and less unsteady. In comparison to both the paddies, yields of wheat varieties were more steady. Paid-out costs per hectare of high yielding paddy varieties, whether grown in *kharif* or *rabi* were generally higher compared to those of wheat. Paddy growers incurred more expenditure on a number of important items of cost. For instance, while wheat growers spent per hectare only about Rs 225 to Rs 235 on fertilisers and Rs 135 to Rs 195 on hired labour, similar expenditure by paddy farmers were in the range of Rs 350 to Rs 450 and Rs 350 to Rs 500 respectively. Plant protection for paddy cost as much as Rs 15 to Rs 65 depending upon the season and the extent of incidence of pests and diseases : whereas in respect of wheat, similar expenditure was

nominal, hardly Rs 1 to Rs 3 per hectare. The only item on which wheat growers had to spend more was irrigation; Rs 65 to Rs 70 per hectare compared to Rs 15 to Rs 55 in the case of paddy. In striking contrast, wheat proved to be more efficient net earner with an attractive benefit-cost ratio.

4.3.24 *Kharif* paddy versus *rabi* paddy : Between paddy varieties grown during *kharif* season and those raised during *rabi*, while costs were broadly comparable, the latter proved more remunerative in most areas owing mainly to higher yields obtained and greater stability of yields. Besides, the dry season was found to be more favourable as incidence of pests and diseases was more controllable. These were the main reasons for the popularity gained by *rabi* summer crop of high yielding varieties paddy in recent years in the eastern and southern States. Area under the crop increased manifold in Bihar, West Bengal, Assam and Orissa and significantly in the southern States. *Rabi* paddy, however, occupied only 2 to 5 per cent of the total paddy area in the eastern States. Only in the south, notably in Andhra Pradesh, did the crop enjoy any sizeable area. A significant exception to the trend was the Punjab and Haryana region where new paddy strains had become popular during the *kharif* because of their relative profitability in relation to other crops that could be raised during the season. Many farmers took to the high yielding paddy varieties in their irrigated fields as a result of which paddy area recorded impressive gains. Paddy was, however, not grown in this region during the *rabi* season. Like *kharif* paddy in most States, gross returns from hybrid millets like jowar and maize were also meagre and subject to instability. These wide differences in returns provided a convincing explanation for the immediate popularity gained by high-yielding varieties of wheat and for the comparatively better progress made by paddy varieties grown during the *rabi* season.

4.3.25 New varieties versus traditional varieties : However, as wheat and paddy are not competing crops, the differences in their respective costs and returns provide only a partial explanation, though on less important. Given the season, the decision to grow a particular crop or a specific variety would normally be based on considerations of the relative returns expected from alternative crops, which in the case of high yielding varieties of wheat and paddy were, more often than not, their local varieties. It is, therefore, important to examine how

these varieties fared in comparison with competing traditional varieties. Unfortunately, data collected by the PEO are not very helpful in this context. For one thing average yields of traditional varieties were not collected; for another, data on paid out costs of local *desi* strains as also other competing crops had been lumped together, with the result that it was impossible to sort out the cost components of the former which alone were relevant to the issue under consideration. It was in this context that the data collected by the AER centres (Appendix 4.3) assumed greater relevance. These data fully supported the finding that compared to wheat, paid-out costs were higher in the case of both *kharif* and *rabi* paddy crops and that net returns were lower in the case of *kharif* paddy. But what was more revealing was the difference in the comparative performance of high yielding varieties of wheat, *kharif* paddy and *rabi* paddy vis-a-vis local varieties of the respective crops. For instance, it was found that additional gross returns per hectare in respect of *kalyan* variety of wheat in the districts of Amritsar and Karnal, compared to *desi* wheat were Rs 1355 and Rs 603 respectively whereas the additional cash expenditure that had to be incurred were only Rs 390 and Rs 185 per hectare respectively. The extra benefit reaped was more than three times the additional cost. The position was not significantly different in respect of other varieties of wheat and other districts in the wheat zone. A similar situation was also observed in respect of *rabi* paddy. In contrast high-yielding paddy strains grown in *kharif* season brought only marginal benefits, if at all, compared to local strains. It was, therefore, obvious that the immediate popularity gained by high yielding varieties of wheat and the comparative progress made by similar paddy varieties grown in *rabi* season were largely owing to their greater profitability compared to the competing local varieties. A comparative study of the economics¹ of the new varieties of paddy and local strains in important rice districts of Andhra Pradesh—and the State had the largest area under *rabi* paddy in the country—showed that while in the case of the high yielding varieties, average yield and cash expenditure per hectare during *kharif* and *rabi* were comparable,

1 Parthasarathy C. and D. S. Prasad; 1971, September, 25 Season-wise progress of High Yielding varieties in Andhra Pradesh. Role of Economic Variables, Economic and Political Weekly, Review of Agriculture : A-117-122.

local strains yielded comparatively less, at higher cost during the *rabi* season which gave an edge to the high yielding varieties. Besides, paddy prices tended to move up in these areas during the *rabi* season. Under such circumstances the preference would go to high yielding varieties if the farmer had the necessary resources or could mobilise the same.

4.3.26 Additional returns from new strains alone were not indicative of the full economic benefits that accrued to farmers. A majority of the newly evolved strains were of short duration; hence their adoption in place of local varieties facilitated the growing of another crop to add to the income stream. The wheat growing areas of the Indo-Gangetic plains, endowed with irrigation facilities and good, well drained soils offered greater scope for double or multiple cropping and farmers were quick in cashing on this opportunity. It is, therefore, not surprising that wheat growers of Punjab, Haryana and western Uttar Pradesh diverted most of the area traditionally sown to *desi* wheat varieties to the new high yielding strains and also resorted to more intensive use of land. As much as 43 per cent of the wheat area in these parts was under high yielding wheat varieties in the year 1970-71. Cropping intensity in irrigated lands in the region also showed an increase from 1.24 in 1964-65 to 1.32 in 1969-70.

4.3.27 Yet another reason that could be advanced to explain the quick spread of high yielding varieties of wheat was the relative increase in prices in recent years. "The price of wheat has been rising faster than that of rice owing to favourable demand, existence of domestic supply gap reflected in sizeable imports and greater influence of producer interests on the fixation of procurement prices". Between 1964-65 and 1971-72, whereas procurement prices of paddy in the important growing areas of the south and the east were raised only by 30 to 45 per cent, wheat was given an increase of over 60 per cent in the wheat growing belt of North India. The cost of production of paddy being comparatively higher than wheat, the improvement allowed in wheat prices could also have brought about a shift in the tenuous cost-price-yield relationship in favour of wheat. As for paddy, the advantage due to higher yields could, to some extent, have been offset by the unfavourable costs and prices resulting in reduced profitability.

4.3.28 It is clear from the foregoing rational economic considerations were behind the resource allocation decisions by farmers. Substitution of the new strains in place of traditional varieties resulted in higher yields as also greater income to farmers, more so in the case of wheat and *rabi* paddy. Hybrid bajra too fared well in some parts.

1 1974. Hanumantha Rao C. H. Technological Changes and the Distribution of Gains in Indian Agriculture, New Delhi Institute of Economic Growth.

There were, however, indications that participation in the programme was not universal; and that lion's share of the benefits of the new technology accrued to the more affluent among the farmers.

4.3.29 HYVP participation and farm size: The PEO study revealed a strong positive linear association between the proportion of farmers adopting high-yielding varieties and the size of the farm. This relationship was in evidence in respect of all the five crops studies irrespective of the differences in their performance. The following table gives a broad picture of farmer participation in HYVP in 1968-69 :

TABLE 4.5

Proportion of Cultivators Adopting High-Yielding Varieties by Size Groups-All-India, 1968-69¹

(per cent)

Crops	Size group in hectares						All groups
	Below 1.01	1.01 to 2.02	2.02 to 4.05	4.05 to 8.09	8.09 to 20.23	Above 20.23	
wheat	57	66	76	78	82	98	73
paddy (kharif)	16	27	29	30	26	56	22
paddy (rabi)	49	57	60	60	66	92	54
maize	1	3	5	9	26	44	6
bajra	1	7	11	13	25	29	14

1 1969, Reports on Evaluation of the High Yielding Varieties Programme : Kharif-1968 and Rabi 1968-69 Programme Evaluation Organisation, Planning Commission, New Delhi

Popular participation by farmers belonging to smaller size groups in the case of wheat and rabi paddy which were relatively profitable had a significance of its own. This was a definite indication of farmers' willingness to face risks in trying the new varieties if there were reasonable prospects of remunerative returns. One of the main factors inhibiting small farmers to come forward to participate in the programme was finance. An indication of the order of additional finance required for raising high yielding varieties could be had from Appendix 4.3. Cash needs in the case of paddy were known to be comparatively greater. The PEO data further revealed that while wheat growers were in a position to meet bulk of their cash needs from their own sources and were required to borrow only one-fourth of their requirements from institutional sources, the paddy growers (khariff season) had to borrow one-third to onehalf of their cash requirements. Lack of liquid funds could be still another factor which restricted farmer participation in the case of paddy.

Impact of Technological Changes at Farm Level

4.3.30 It would be equally important to know how the introduction of these high yielding varieties had influenced farming efficiency in general and at what level of operation, and how the economic gains resulting therefrom were distributed among various size groups of farm operators. Analysis of these issues are based on the data available from farm management studies.

4.3.31 Seven farm management studies relating to the latter half of sixties are available, three of them undertaken during 1966—69 and the others during 1967—70. As in the earlier series, they relate to districts which are representative of typical agro-climatic regions in the country. Two of the districts, viz Ferozepur (Punjab) and Muzaffarnagar (western Uttar Pradesh) belonged to the wheat zone. They had been studied earlier during the mid-fifties. Two other districts viz. Thanjavur (Hamil Nadu) and Cuttack (Orissa) are from the typical paddy growing tract of monsoon-India. The other districts studied are Deoria (eastern Uttar Pradesh); Surat-Bulsar (Gujarat) and Cuddapah (Andhra Pradesh). A variety of crops are grown in these districts. Paddy is an important crop in Deoria as also in Surat-Bulsar. Besides, Deoria has sizeable acreage under wheat and sugarcane and Surat-Bulsar under millet crops, pulses, cotton and crop mixtures. Main crops grown in Cuddapah are groundnut followed by jowar, paddy, bajra and cotton in that order. The HYVP had made significant progress in Ferozepur and Muzaffarnagar in respect of wheat and in Thanjavur in respect of rice; as such the farm management studies relating to these districts in particular could be expected to throw light on the impact of the new varieties on the farm economy. It might, however, be cautioned that the findings of these studies might be taken only as suggestive of the dominant trends.

4.3.32 Appendix 4.4 gives relevant information pertaining to the seven districts referred to above comparable to those furnished in Appendix 4.1. It could be seen therefrom that farm business income obtained in almost all areas in the 1960's when viewed as a proportion of gross returns, either showed marked stability or moderate increase with increase in farm size, in contrast to the unsteady trend observed during the 1950's. The new emerging trend implied that the big farmers, encouraged by the remunerative prospects of the new farm technology were endeavouring to offset the widely experienced paucity of labour on their farms with more technical inputs in the form of good seeds, fertilisers etc. and efficient management. Comparing the two sets of figures at the aggregate level (comparison being confined to sets or pairs of similar areas), we find that significant changes had taken place over

the period in most of the areas. In Ferozepur and Muzaffarnagar which were covered by investigations at both points of time, the proportion of gross returns accruing as farm business income to farm households increased from 48 and 43 per cent respectively in 1954-57 to 53 and 77 per cent in 1969-70. Taking the other comparable areas, for instance, Sambalpur, Hooghly and 24-Parganas growing mainly paddy under monsoon conditions studied in the 1950's and similarly placed Cuttack studied in the 1960's as one set, West Godavari enjoying good irrigation and growing mainly paddy and the equally endowed paddy growing Thanjavur as another; and the low rainfall areas of Salem and Coimbatore in Tamil Nadu and Cuddapah in Andhra Pradesh as the third set, we find that the general improvement observed in farm business income was shared by all districts. As farm business income was reckoned in terms of prevalent market prices, a part of the increase in sixties was due to the general rise in the level of commodity prices; nevertheless, the increase in the proportion of gross returns accruing as farm business income indicated a definite improvement. However, a higher percentage of farm business income to gross returns did not always mean higher and adequate disposable income for the farm family as it depended mainly on productivity of the crop raised. Hence the per capita variant of farm business income becomes a more appropriate yard-stick.

4.3.33 Assuming that the per capita minimum consumption requirements for rural areas in general was about Rs 324 in 1968-69 as indicated by Dandekar and Rath, it was observed that areas which had made better progress with high yielding varieties also reported comparatively higher levels of per capita farm business incomes. In 1968-69, high yielding varieties of wheat commanded about 33 to 40 per cent of the total area under the crop in Muzaffarnagar and Ferozepur and those of paddy occupied 30 to 45 per cent of the total paddy area in Thanjavur during the *kuruva* and *samba* seasons. Deoria in eastern Uttar Pradesh had also reported sizeable area under the new varieties of both paddy and wheat. Elsewhere the programme had not made much headway. All farms in Ferozepur and Muzaffarnagar were found to enjoy per capita farm business incomes much above Rs 324, assumed as the viability level. The average income per capita obtained was Rs 1,413 in Ferozepur and Rs 1,603 in Muzaffarnagar, i.e. 3 to 4 times the norm. It might be noted that the average farms obtaining in the two districts were of size 12.4 ha and 6.5 ha respectively. On the basis of average level of farm business income obtaining, a 3 ha farm in Ferozepur and 2 ha farm in Muzaffarnagar could be considered viable. In Thanjavur and Deoria, where progress under HYVP was as good as in the former, farms of 2.0 ha and above were efficient from the point of view of viability. The average level of farm

business income per capita obtained was, however, lower—Rs 437 in Thanjavur and Rs 374 in Deoria. In Cuddapah and Surat-Bulsar, situated in the low rain-fall tract, only larger farms of 6 ha and above were viable. At the other extreme was Cuttack in Orissa, where none of the farms irrespective of the size group to which they belonged, could satisfy the viability test. Per capita farm business income was a mere Rs 87 in a lowest size group, Rs 254 in the largest and Rs 178 on the average farm. We may again sound a word of caution that in all cases, farm business income did not include wage earnings and rent receipts which generally constituted major source of additional income in the lower and higher size groups respectively and to this extent, per capita income was underestimated.

4.3.34 Before we set out to identify the factors responsible for such widely differing performance by districts, a comparison of the size-wise distribution of per capita farm business income in the 1960's with that of 1950's would be relevant. It would have as its focus, the overall change and improvement in agriculture resulting from technological improvements introduced from time to time and their impact on life around the farm. The picture that emerged was one of satisfactory progress in most areas. Proportion of farms satisfying the viability norm had increased during the last decade. There were also signs of increase in overall productivity of land. In Ferozepur, while only farms of 8 ha and above were found viable in the 1950's is the same area in the late sixties, an average farm of about 3 ha was found to be economical. A similar improvement was also observed in irrigated paddy areas and low rainfall areas. In the typical traditional monsoon paddy area of eastern parts, however, no worthwhile changes were observed. These areas were unable to adopt the new technological prescriptions for higher production to any significant extent because of certain inherent difficulties or constraints.

Identification of Factors

4.3.35 It is perhaps inappropriate to explain the varying levels of progress achieved in some districts and the total lack of it in others in terms of high-yielding varieties alone. True, among the districts considered, progress was more conspicuous in districts where the new varieties had made impressive gains. It is, however, equally true that these varieties occupied only a part of total cropped area and most of them had sizeable area under cash crops. Hence an explanation has to be sought in terms of the totality of resources and other relevant factors. Taking the extreme cases, viz. Ferozepur and Muzaffarnagar on the one hand, and Cuttack on the other for a deeper probe, we find wide differences in the resource base of these districts both quanti-

tative and equalitative. Compared to the average 6 ha farm of Muzaffarnagar and 12 ha farm of Ferozepur, the average Cuttack farm was less than 2 ha; and worse still, it was badly fragmented into as many as 8 tiny plots. Tenancy was common in Cuttack. There is obvious diseconomy in management and use of inputs, particularly of labour, under such conditions. The Ferozepur and Muzaffarnagar farms were, to a large extent, free from the debilitating influence of fragmentation due to the efficiently implemented programme for consolidation of holdings. Besides, irrigation facilities were more widespread in these areas and cropping pattern considerably diversified with 40 to 50 per cent area under cash crops like cotton, sugarcane etc. Cropping intensity index for these farms was in the range of 130 to 133. In contrast the average Cuttack farm had 84 per cent of the cropped area under paddy, most of it raised during *kharif* season under rainfed conditions and as much as 98 per cent of cropped area under foodgrains. Thus, resource-wise, the wheat districts of Punjab and western Uttar Pradesh were far better endowed compared to the rice districts of Orissa, and their larger farm size afforded better management, greater efficiency as also economy in operation. In addition, these farms also enjoyed the natural advantage of good alluvial soils and a temperate climate more suited to stable agricultural production. Placed under such favourable circumstances, farmers of the northern districts could take to the cultivation of new wheat varieties readily and in a big way as they were in a position to provide the essential pre-requisites viz. assured and controlled irrigation and working capital without facing much of an adjustment problem.

4.3.36 The main attractions of the new varieties, particularly those of wheat, were their responsiveness to fertilizers and their high yield potential. It would be useful to attempt a comparison of average yields obtained in respect of staple grains, for instance *desi* wheat in Muzaffarnagar and Ferozepur and paddy in Cuttack during the two reference periods 1954-57 and 1966-70. Compared to the bench-mark levels, the average yields of traditional variety of irrigated *desi* wheat in the two districts registered an increase of 30 to 40 per cent in 1967-68. The comparable increase in Cuttack in the yield of its main crop, viz. *kharif* paddy, was also well over 30 per cent, despite the many disadvantages the district suffered from. Thus, there was not much to mark out the wheat districts if the comparison was limited to the performance of traditional varieties of staple grains. However, more appreciable increases in productivity were recorded in respect of cash crops like cotton and sugarcane which occupied sizeable area in the wheat districts. Average yield of American cotton nearly doubled in Ferozepur while that of *desi* cotton increased by over 45 per cent. The increase in productivity of sugarcane (planted) in Muzaffarnagar

was about 40 per cent in 1966-69 over 1954-57. On top of this increase in productivity, prices of cash crops particularly those of cotton, groundnut, and sugarcane had been gaining appreciably compared to foodgrains as a group from the late fifties. In point of fact, the economic situation in the wheat districts had been improving from the early sixties under the stimulus of higher prices for cash crops and also wheat and greater support to agriculture from research and extension. All these facilitated the development of better physical and financial base at the farm level. When the new dwarf varieties of wheat arrived on the scene, they gained immediate popularity because of their higher-rated potential for raising yields and augmenting incomes. As the new technology had the advantage of being divisible and neutral to scale, it gained almost immediate acceptance on the comparatively larger farms in the wheat districts, possessing the necessary wherewithal, including irrigation facilities and working capital. But as for Cuttack, where farming practices followed were largely traditional and where even fertilizer use had not become popular, the new crop varieties could not have been much of an attraction. Besides, farmers had neither the essential irrigation facilities on their farms, nor working capital in adequate measure to adopt them. Thus, there was hardly any change in the farm situation in Cuttack; small holdings made up of number of fragments obtained poor yields and low incomes; there were too many to share the meagre output which resulted in little or no saving at all. Farmers were thus left with no other alternative than to continue with their traditional cultivation, leading again to low yields and low incomes. Tenancy also aggravated the situation.

Progressive Wheat and Paddy Districts

4.3.37 A comparison of the wheat districts with the progressive paddy growing area of Thanjavur (Tamil Nadu) where some new strains of paddy had become popular, would also be relevant. Over 90 per cent of the cultivated area in the selected farms of Thanjavur was irrigated and double cropping was practised on more than half of the net area sown, a record not even the wheat districts could excel. But Thanjavur was predominantly a foodgrain growing area where paddy alone accounted for about 80 per cent of area and other food crops like jowar, ragi and pulses for another 10 per cent. Most of the paddy was grown under irrigation, particularly high yielding varieties which formed a sizeable proportion. Cash crops like sugarcane and groundnut were raised only on a small area. However compared to Ferozepur and Muzaffarnagar, the average per capita farm business income obtained on Thanjavur farms was much lower, only about 30 per cent of

that obtained in the former. Small farms belonging to the size group of less than 2 ha could not earn even a minimum living. The explanation for the low-key performance of Thanjavur has to be attempted, as in the case of Cuttack, in terms of farm size and other disabilities in operation. Average farm in Thanjavur was only a little more than 3 ha which was about half the size of the Muzaffarnagar farm and one-fourth the size of the Ferozepur farm. Tenancy was, however, widespread; as many as one-third of operators were either tenants or owner-cum-tenants and fragmentation as serious an impediment as in Cuttack. As a result, farm business income obtained in Thanjavur was only 44 per cent of gross returns on the average. It was even less, about 35 per cent on smaller farms of less than 2 ha as these farms had to incur more expenditure on rent and maintenance of farm animals. As for yields, productivity curve in respect of traditional varieties of paddy had already touched a plateau from where further increases did not appear to be quite likely. Besides, the new varieties which had become popular in the district, viz. Co. 25 as *samba* crop and ADT 27 as *kuruvai* crop were not that high-yielding, yield differentials compared to local varieties being only about 5 per cent and 30 per cent respectively. Thanjavur was thus found to be badly encumbered. The comparatively higher cost of paddy cultivation considerably reduced the margin of income. Prevalence of tenancy and large scale fragmentation of holdings adversely affected farming efficiency. Exclusive dependence on paddy rendered farming vulnerable to pests and diseases, crop failures and price fluctuations. New high yielding varieties which suited the seasonal pattern and consumer preferences were only in the process of being evolved. The net result was that progress was rather slow.

4.3.38 Situation in Deoria in eastern Uttar Pradesh was broadly similar. Farms were even smaller and fragmentation of holdings more acute compared to Thanjavur though tenancy was negligible. Paddy, wheat and sugarcane figured prominently in the cropping pattern, but on the whole food crops dominated commanding about 85 per cent of the area. Average yields of wheat and sugarcane obtained in Deoria were quite comparable to those obtained in Muzaffarnagar; however, paddy yields were considerably lower. On an average, more than 60 per cent of the gross returns from crop production accrued to operators as farm business income. Even so, as farm size was generally small and family size large, per capita income obtained got badly reduced. It was only Rs 374 for all the farms together. As in Thanjavur, only farms more than 2 ha could make a living from crop husbandry and the smaller farms had to content with a sub-marginal existence. True, high-yielding varieties of wheat and paddy

had made some head-way in the district, but their impact appeared to have been overmatched by the countervailing demographic pressures manifest in the number of small and fragmented holdings.

4.3.39 In Cuddapah and Surat-Bulsar, incomes above minimum levels accrued only to larger holdings of 6 ha and above. Farms in these parts generally suffered from fragmentation and paucity of irrigation. Intensity of land use observed was also low. Tenancy, however, was generally absent. The cropping pattern in vogue was heavily weighted in favour of food crops which included low yielding millets in Cuddapah and crop mixtures of all kinds in Surat-Bulsar. It was the sheer command on more hectares of operated area that enabled bigger farmers to obtain adequate farm business income.

4.3.40 It is obvious from the foregoing analysis that agriculture had been undergoing a process of transition in most areas in the country. While as a rule, the change process was gradual and slow, it gained momentum and speed in some areas so as to gain for agriculture the stamp of modernity within a short period, in some other areas like monsoon paddy tract it remained checkmated. It was, however, the general resource position more than any other factor that set the pace of transition/progress and decided the level of living, whether in wheat districts or in rice districts or in the low rainfall areas.

Farming in Low Rainfall Areas

4.3.41 Low rainfall areas or dry land farming tracts occupy a place of special importance in Indian agriculture. Very often the performance of these areas makes all the difference between scarcity, adequacy and plenty in respect of foodgrains and basic raw materials requirements. About 36 per cent of cultivated area in the country are confined to these tracts which grow a variety of crops particularly jowar, bajra, cotton and groundnut. Some distinguishing characteristics of the region are long spell of dry weather prevailing for most part of the year, a short interval of monsoon rainfall, which itself is scanty and variable and inadequate irrigation. All these lead to low crop productivity and instability. Increasing attention has been given to the problems of these areas in recent years with a view to bringing about improvements in farming practices. As a result, a new technology has been evolved to meet the specific requirements of crops grown in these areas. This technology, conceived as a well-knit package, includes the following components :

- (i) soil and moisture conservation measures;
- (ii) use of improved implements;
- (iii) use of improved crop varieties, particularly hybrids and high-yielding and drought resistant varieties of cereals;

- (iv) use of chemical fertilisers and plant protection measures; and
- (v) adoption of appropriate agricultural and agronomic practices.

4.3.42 Very little reliable farm level data are available about the economics of the new dry farming technology. A study jointly undertaken in 1970-71 by the Indian Institute of Management, Ahmedabad, and the National Institute of Bank Management, Bombay in parts of Bellary (Karnataka) and Panchmahals (Gujarat), however provides some valuable information of general applicability.

4.3.43 The study revealed that improved and hybrid varieties fared generally better compared to local varieties. In Bellary, for instance, hybrid bajra yielded 790 kg per hectare which was about four times the yield of local bajra; hybrid jowar yielded 667 kg per hectare or about two and a half times the local variety and improved groundnut about 385 kg per hectare or about twice as much as the local variety. Improved cotton also fared better. Average yields of improved varieties obtained in Panchmahals though were higher, yield differences compared to local varieties were not that conspicuous. By and large, production of a large number of crops in these districts was found to be conditioned by the level of adoption of the recommended parties.

4.3.44 The general trend in crop yields observed in Bellary was that smaller farms obtained higher yields in respect of food crops like jowar, bajra, etc. compared to larger farms. In fact, yield of foodgrains was found to be inversely related to size of holdings. On the other hand, yield of cash crops like groundnut and cotton improved as size of holdings increased. No such trends, however, were observed in Panchmahals. Gross income received per hectare of cultivated area ranged between Rs 370 in the smallest size group of less than 2 ha to Rs 430 in the largest size group over 14 ha in Bellary and between Rs 465 to Rs 710 in Panchmahals. Higher income on large size farms was presumably due to greater allocation of area to cash crops. The average gross income per hectare obtained in Bellary and Panchmahals was Rs 375 and Rs 565 respectively.

4.3.45 Data relating to cost of production* revealed that in both districts aggregate costs per hectare showed a general tendency to fall with increase in farm size, from Rs 360 in the smallest size group to Rs 230 in the largest in Bellary and from Rs 325 to about Rs 220 in Panchmahals. This trend was partly due to reduction in fixed costs of

1 *Ibid.* 1(p. 402).

* Aggregate cost inclusive of imputed value of family labour and rent on owned land.

cultivation and optimal utilisation of indivisible inputs like bullock labour in the larger size groups. It was also observed that cultivation tended to become less intensive as farm size increased which was another important reason for the decline in unit costs. The imputed components i.e. family labour, rent on owned land and interest on owned fixed capital, accounted for 15 to 30 per cent of aggregate costs in Bellary and 17 to 36 per cent of it in Panchmahals.

4.3.46 However, an analysis of data relating to farm income showed that the overall position in the two districts was quite unsatisfactory. If it was assumed that a rupee a day per capita was the minimum required for the farm family in 1970-71, it appeared that over 90 per cent of sample households of Bellary and 84 per cent of them in Panchmahals obtained less than this much from crop production. This, at once is, a measure of the extent and acuteness of economic distress in the low rainfall areas as also the possibilities of increasing farm incomes. A number of inadequacies had been observed in crop production which were inhibiting progress. For instance, the study revealed that though improved varieties had made some headway, the new hybrid millets occupied hardly 7.0 per cent of the total area under millets in Bellary and 3.0 per cent of it in Panchmahals. Fertiliser use was reported from only 31.5 per cent of the cropped area in the former and 20.4 per cent of the area in the latter, the average application in terms of nutrients was 14 kg and 24 kg per hectare respectively which were far below the recommended levels. It was also observed that even a widely known soil and moisture conservation measure like contour bunding, important for low rainfall areas, was not universally adopted, even though majority of farmers were aware of its usefulness. More capital intensive measures like land levelling and water harvesting had gained very little acceptance with them. Greater adoption of the new varieties along with complementary inputs and soil conservation measures could lead to higher farm productivity and incomes in these areas.

4.3.47 An important constraint coming in the way of the adoption of the recommended package and land improvement measures was finance. The average investment per farm in both the districts was Rs 62 per hectare of which as much as 75 per cent came from own sources, 7 to 10 per cent from private sources like friends, relatives and moneylenders and 15 to 18 per cent from institutional sources like the Government, cooperatives and commercial banks. Position in regard to short term finance was no better. Only one-fifth of the sample households in Bellary and two-fifths of households in Panchmahals received any advances from village cooperatives and the rest depended on own sources or private borrowings. The borrowing farmers of Bellary get about Rs 30 per hectare from cooperatives whereas those of Panch-

mahals received about Rs 110 per hectare. Keeping in view that the per-hectare cost of recommended package, even when restricted to seeds, fertilisers and pesticides, was in the range of Rs 245 to Rs 285 in respect of hybrid bajra and improved cotton and about Rs 445 in respect of hybrid jowar and improved groundnut in the two districts, the financial assistance made available from institutional sources was far from adequate. A good deal of what could be achieved in these areas would depend on the extent of financial support that could be provided to farmers.

4.3.48 A significant finding of the study was that the new technology showed greater potential for creating on-farm employment opportunities compared to traditional farming. In Bellary for instance, compared to local varieties, cultivation of improved cotton required 40 per cent more labour, that of hybrid bajra 29 per cent more and hybrid jowar, 27 per cent. Similarly in Panchmahals, hybrid bajra was 48 per cent more labour demanding and hybrid maize about 13 per cent more. Labour requirements of the new varieties were generally higher at the higher level of adoption of the recommended technology. When farmers were grouped according to level of adoption of the recommended practices, particularly the use of new varieties and fertilisers it was found that gross income from crop production obtained by high-level adopters was about 125 per cent more in Bellary and 150 per cent more in Panchmahals, as compared to what the low level adopters received. These are broadly indicative of the employment augmenting and income-raising possibilities that are available through the new technology in the dry-farming areas.

Trends in Seventies and Future Studies

4.3.49 It is indeed true that farm management data relating to the sixties used for analysis in this Chapter do not adequately reflect the impact of the new high yielding crop varieties on income and standard of living of the farming population. For one thing the HYVP was still in the early stages when these studies were undertaken and a large number of farmers were in the process of considering whether or not to adopt the new varieties. While this phase understandably would be marked by a measure of hesitancy and reservation, the seventies coincided with the stage of popular adoption, as manifested in the case of new wheat varieties. In the case of paddy, while the programme was launched only with a limited number of varieties, all of them not popular or superior compared to indigenous strains, a number of new varieties suited to different agro-climatic conditions have been introduced in subsequent years. The impact of these paddy varieties has not been reflected in most of the studies referred to above. To take the case of Thanjavur

district, in place of a few varieties tried in the sixties like *ADT-27*, *CO-25* and *IR8*, many more new varieties have been introduced in the subsequent years viz., *Annapurna*, *Kannaki*, *Karuna*, *Karikalan*, *Ponni*, *Triveni* and *IR-20* which are markedly superior in respect of yield and grain quality. These varieties are expected to make a significant impression on farm output and incomes. Besides, the new agricultural technology based on new varieties and modern farm inputs which envisages intensive land use including multiple and relay cropping, is labour intensive as also income augmenting. These aspects have not received adequate coverage in the farm management studies. Even the Ferozepur and Muzaffarnagar studies provide only glimpses of modern trends. We, therefore, need more studies reflecting the changes and improvements that have been brought about by the new technology particularly the emerging commercialisation of crop husbandry.

4.3.50 It may also be recalled that we have taken into account only income from crop production in the above analysis, leaving out supplementary sources like wage earnings of small farm operators, rental income from leasing out land and income from subsidiary occupations like dairying, poultry, piggery, fishing, etc. which could be combined with crop production. Most of the households could be expected to supplement their income from crop production by pursuing one or more of the lines indicated above. It is now well established that dairying, if properly organised could be a source of additional income for many farm households. Poultry is also becoming increasingly popular as a subsidiary occupation. There is no doubt that if such secondary flows of income streams could be traced and included in the aggregate household income, there could be significant departures from the situation indicated in para 4.3.33 for the better. While for want of adequate data this could not be attempted, there is no doubt that the income concept used in farm management studies has to be made comprehensive so as to include all sources of income. It is equally important that minimum consumption norms are evolved for different regions, taking into account the regional peculiarities in consumption needs. It should be dynamic concept allowing for changes and improvement over the years in minimum requirements which can provide adequate analytical support for policies for growth and income distribution in rural sector in years ahead. We feel that a new set of studies may be undertaken particularly on the following aspects :

- (i) An enquiry into minimum rural income conforming to the regional norms of consumption and price differentials. As indicated earlier, on this basic normative standard for income and employment policies, there is need for an authoritative study. This study should be repeated every five

years before the formulation of a new five year plan in order to orient the study to the growth potential of the economy, rural and urban, and the needs of the different sections of the community.

- (ii) Income and employment potential of farm business including those from sources other than crop production, under different agro-climatic situations and according to size of holdings; and
- (iii) Extent of growth of commercialisation in farm business in different agro-climatic regions according to size of holdings and the constraints thereon.

4 FARM SIZE—SOME ISSUES

Economics of Scale

4.4.1 An important finding of farm management studies and similar investigations has been that small farms as a class are more efficient production units compared to large farms when considered from the point of view of productivity and employment potential. These farms are generally better endowed with irrigation, which in turn facilitate intensive use of land. Family labour being more abundant on these farms, they generally apply more labour to produce higher yields per unit area cultivated. In contrast man/land ratio is much lower on larger farms and per hectare output too is comparatively lower. This inverse relation between the size of holdings and gross output per hectare, the latter decreasing with increase in the former has been widely recognised by observers of the Indian agricultural scene. This is also well-reflected in Appendices 4.1 and 4.4 Krishna Bhardwaj¹ attributed this inverse relation to differences in the intensity of cultivation and cropping pattern among the different size groups—the smaller farms generally cultivating land more intensively or producing crop of greater value per hectare. However, as a result of recent advances in crop production, particularly following the introduction of new crop varieties in the mid-sixties some material change in the trend could be expected. Recent studies on farm management show that in areas where the new technology has made significant progress, even though resource position continues to be better with smaller farms as before, there is neither a steady decline nor a steady increase in output per unit area with increase in the size of

1 Krishna Bhardwaj, 1974. *Production Conditions in Indian Agriculture* : 84 London, Cambridge University Press.

holdings. Instead the trend has been one of stability (see data in respect of Ferozepur in Appendix 4.4). It appeared plausible that large farms with more investible funds at their disposal have been, of late, trying to make good the deficiency in labour by resorting to labour saving machinery and greater application of modern inputs like better seeds, fertilisers, pesticides, etc. with a view to extracting higher yields than before and to some extent they have been successful. Even so the inverse relationship between size of holdings and output per hectare holds in most areas.

4.4.2 Statistical studies of production functions based on farm management data also indicate constant returns to scale* in Indian Agriculture. This means that returns per unit of land would remain the same wheather area cultivated is 1 ha or 10 ha provided the yield raising inputs recommended for the region like better seeds, irrigation facilities pesticides etc. are applied at the right time and in right quantity. The position is no different even after the advent of the new technology according to recent farm management investigations and other studies. Farm size, therefore, is not a constraint on production, if recommended practices are followed.

4.4.3 The inverse relation between farm size and yield indicates that under the typical farm situation obtaining in the country, marked by scarcity of capital and abundance of labour, smaller farms are more efficient producers of grain and employers of farm labour. As farming in general is neutral to scale there is no rational basis to expect any better performance from larger farms of say 10 or 20 ha compared to smaller farms of 1 or 2 ha from the point of view of productivity. It is, however, necessary to keep in mind a minimum size below which farms would be uneconomical from the point of view of employment of family labour and draught animals and of securing a minimum level of income. This size no doubt would vary from area to area and from region to region, depending upon factors like soils, climate, cropping pattern, availability of irrigation etc.

Economic Holding and Mixed Farming

4.4.4 Based on the farm management data relating to the fifties,

* There is no inconsistency between the widely observed inverse relation between size of holdings and crop output and the phenomenon of constant returns to scale. While the former indicates the general trend in production as a result of changes in one of the input factors, viz. land, returns to scale indicate the net change in output consequent on a proportionate increase in all the relevant input factors when effected simultaneously. As such trend output per hectare, whether decreasing, constant or increasing, following a steady increase in farm size is considered quite compatible with the general situation of constant returns to scale.

Khusro¹ estimated the minimum size of a work unit and a plough unit for the country as a whole at about 3 ha and that of an income unit at 6 ha which would in fact be only 4 ha if some allowances were made for underestimating various receipts which constituted farm business income. In view of the major trends in agriculture towards more irrigation, double or multiple cropping and in particular the new technology based on high yielding varieties and fertiliser use, he felt that the essential requirements of a work unit, a plough unit and income unit would all gradually converge towards a general minimum of 2 ha. Farms falling below this size would create inefficiency.

4.4.5 Investigations based on the latest series of farm management studies indicated that adoption of high yielding varieties and greater use of modern inputs even on smaller holdings would meet the minimum income requirements of farm households. We had stated in the Interim Report on Reorientation of Programmes of Small Farmers and Marginal Farmers and Agricultural Labourers Development Agencies that "in irrigated areas of Punjab and Haryana a one hectare farm with a current investment of Rs. 1,254 can with improved technology give a net monetary return of Rs. 2,750 by raising two crops—*kharif* paddy followed by *rabi* wheat. Similarly, the alternative rotation of *kharif* maize followed by *rabi* wheat can give a net income of Rs 2,600 with an investment of Rs 1,075. Incomes of this order would take the farmers with irrigated holdings of one hectare, above the national desirable minimum level of consumption which can be put at about Rs 2,500 per family, assuming the per capita consumption at Rs 37 per month at 1971-72 prices. It appears possible to attain this level of income from a holding of 2 ha in rainfed areas with land development, application of improved technology and necessary physical inputs. Even in holdings below this size in rainfed areas gains are possible with such an approach although these may not be sufficient to take the family above the minimum consumption level."² However a major limitation of the above studies has been that they take into account income from crop production alone, leaving supplementary streams out of focus.

4.4.6 A major objective of the various programmes launched in recent years for the benefit of weaker sections has been to promote and develop mixed farming with a view to making smaller farm units viable. This is obvious from the emphasis in Small Farmers' Development Agencies (SFDA) and Marginal Farmers and Agricultural Labourers

1 Khusro, A.M.: 1973, *Economics of Land Reforms and Farm Size in India*. 71-73. Madras, Macmillan Company of India

2 1973 Interim Report, National Commission on Agriculture on Re-orientation of Programmes of Small Farmers and Marginal Farmers and Agricultural Labourers Development Agencies 16, New Delhi, Ministry of Agriculture & Irrigation, Govt. of India.

(MFAL) Programmes on subsidiary lines of economic activity like dairying, poultry, piggery, apiculture, sericulture, aquaculture, etc. Economic gains that can be expected from mixed farming are discussed in detail in Chapter 33 on Mixed Farming. Mixed farming, combined with modern trends in crop production and animal husbandry favouring intensive land use and use of cross-bred animals respectively, and supported by necessary arrangements for extension research and supply of inputs and credit should be able to provide a desirable minimum income to small operators well above the minimum levels, even from holdings smaller than the size indicated above. There is need for studies on the economics of mixed farming operations.

Constraints Due to Size

4.4.7 Operational holdings less than 1 ha and less than 2 ha constituted 50 per cent and 70 per cent respectively of the total number of holdings in 1970-71. A large number of these farms would be uneconomical from the point of view of cost of production. But they provide greater scope for employment to family based labour and indeed carry farm production much beyond the level dictated by profit considerations. With some co-operative organisation, economics of these farms could improve a great deal.

4.4.8 Despite the finding that new technology is, by and large neutral to scale, that is, that size of gross output per unit area is not significantly affected by scale of operation, the general experience has been that small farms under actual farm conditions are subject to several constraints with respect to adoption of new technology. Though production programmes are open to all, the social and power structure in villages generally enable larger farmers to pre-empt certain facilities and inputs like extension service, credit, irrigation from public sources etc. leaving little for others. Besides, environmental factors manifested in such problems as drainage and plant protection also operate in a majority of cases to the disadvantage of small farmers.* Therefore, the expectation that these farms would secure the rated returns independent of scale of operation would not be realised unless the constraints are removed *i.e.*, unless basic facilities like production credit according to the actual needs, adequate irrigation based on a warabandi system and field drainage connecting all farms, big or small, to outlet channels are provided and pest and disease control routine according to requirements of the season, size of the broods of pests and nature of diseases is

* A fuller exposition of these operational constraints is available in the address of B. Sivaraman to the 26th Conference of Indian Society of Agricultural Statistics, Kalyani, December, 1972 on the theme: "Scientific Agriculture is Natural to Scale—the Fallacy and the Remedy".

enforced. Most of these problems have been dealt with in detail and appropriate remedial measures recommended in relevant chapters.

4.4.9 A similar doubt has also been expressed in a study jointly undertaken by the World Bank and the University of Sussex.¹ It is observed that "It does not seem prudent to assume that future improvements in agricultural technology will be scale neutral". In the view of the authors, "The extent to which improvements in agricultural technology in the past were scale neutral is an unresolved empirical question". They further observed that "This raises the issue of institutional forms of land holding alternative to small family farms, and particularly of communes, cooperatives and collectives".

Tenancy Including Share Cropping

4.4.10 Another problem requiring special attention is that of tenant farmers, particularly share croppers. Some keen observers of Indian agriculture are of the view that a typical farm would not be in a position to provide for both the rentier and the tiller economically. Even so tenancy has been widely prevalent due to acute land hunger in villages. It covered nearly one-fourth of the operated area in rural India according to the Population Census of 1961. "Prevalence of tenancy is significantly higher in wet areas (including irrigated land) than in the dry areas. For areas with assured rainfall, the area covered by tenancy infested holdings totals 27.6 per cent and for areas with extensive irrigation it amounts to 35.3 per cent. This contrasts with 23.2 per cent of tenancy infested land for rural India as a whole."² While on tenant operated farms the disincentives traditionally associated with tenancy could be overcome by proper enforcement of legislative measures allowing for fixity of tenure and regulation of rent and also by promotion measures like provisions of credit and scarce inputs like fertilisers share cropping arrangements pose greater problem to agriculture as they could even prevent adoption of new agricultural technology if adequate safeguards are not built into the arrangement.

4.4.11 The *modus operandi* of share-cropping is that the tenant cultivates land at his own expense and renders to the landlord a fixed proportion of the produce as rent which could be as much as half of the produce. The former supplies not only the required labour but also

1 1974, Redistribution with Growth—A joint Study by the World Bank Research Centre and Institute of Development Studies: 102, University of Sussex, Oxford University Press.

2 Amartya Kumar Sen and T. C. Verghese: Tenancy and Resource Allocation in Indian Agriculture; Paper submitted to the seminar on Agriculture—Problems and Prospects; April, 1966 Agricultural Economics Research University of Delhi.

capital for farm operations. His obligations to part with a fixed proportion of the produce irrespective of the cost he incurs and the returns he receives not only comes in the way of adoption of modern, yield-raising inputs, but also inhibits production. For instance, for a crop-sharer who cultivates land on the basis of a 50 per cent share of the gross produce, the use of an input *e.g.* fertiliser costing Rs 25 would be worthwhile only if the resulting increase in output is at least Rs 50. In fact, taking into consideration the interest charges he has to bear on the amount, the increase in output has to exceed Rs 50 by an amount depending on the level of the interest rate. It is often found from practical farm situations that such margins in production are difficult to obtain. The net result, therefore, is that, when a new 'package', which is both costly and yield-raising is sought to be popularised, even enterprising crop-sharers may find that the additional cost they have to incur either does not bring in adequate returns or even reduces the net-returns after paying the land-lord's share. No rational farmer would accept the new package under such conditions; hence the inevitable result would be non-acceptance of the 'package' and lower returns for the land-lord. Even the country would have to forego a possible increase in production. The situation can, however, be significantly altered if the land-lord is made to share with the tenant, the cost of at least purchased inputs included in the package, preferably in the same ratio as the produce.

5 IRRIGATION AND MECHANISATION

Irrigation

4.5.1 The main effort to improve agriculture in the past from the British days was in the direction of extending irrigation. More emphasis was placed on this aspect of development from the very beginning of economic planning. Gross irrigated area increased from 22.6 Mha in 1950-51 to about 42.9 Mha (anticipated) in 1973-74 which constituted nearly one-fourth of gross sown area. However, as about three-fourths of the cropped area at present is dependent entirely on rainfall it is important that to the extent possible irrigation facilities are augmented to reduce the instability which marks crop production in these areas. The ultimate irrigation potential in the country is estimated at 110 Mha, 70 Mha from surface water sources and 40 Mha from ground water sources. According to present reckoning this potential would be realised in 50 years time *i.e.*, by 2025 AD. As gross cropped area is expected to increase to 210 Mha by that time the proportion that would be ultimately irrigated would be about 52 per cent. A major part of irrigation

that remains to be developed would come from surface water sources like rivers, streams, tanks, etc.

4.5.2 Irrigation holds considerable promise of employment rural labour force. The first series of farm management studies showed that in the canal irrigated areas of western Uttar Pradesh (Meerut and Muzaffarnagar districts) and Punjab (Amritsar and Ferozepur districts) average farm employment per family worker was in the range of 263 to 268 days a year, whereas in the rainfed areas of Vidarbha (Akola and Amraoti districts) a family worker could hardly find work for 153 days. In general canal irrigation in most areas was not designed to support intensive cultivation; it was intended to protect the crop from vagaries of the monsoon. Even so canal irrigation augmented employment opportunities on the farm by a sizeable margin.

4.5.3 Installation of tubewells and pumpsets facilitated adoption of intensive farming techniques which were not generally possible with canal irrigation. This had been the experience of the canal tracts of Punjab, Haryana and Uttar Pradesh. According to the recent study¹ conducted in Muzaffarnagar district by the National Council of Applied Economic Research (NCAER), installation of tubewells or pumpsets raised labour input in crop production by 25 to 50 per cent in different size groups of farms compared to non-mechanised (*i.e.* canal irrigated) farms of comparable size. In regard to bullock labour while employment increased in small farms, medium farms reported a moderate drop. On the whole there was no significant displacement of bullock labour. The farm management repeat study of Ferozepur district conducted in the late sixties too indicated that installation of tubewells in canal tracts raised labour requirements per hectare of cultivated land by about 40 per cent. Employment potential of tubewells and pumpsets in unirrigated areas could be expected to be more.

4.5.4 As for the impact of irrigation, a comparison of data based on crop cutting experiments by NSSO for the years 1970-71 and 1971-72 showed that compared to the unirrigated crops, yields of irrigated crops were high by about 80 to 95 per cent in the case of paddy and by 105 to 115 per cent in the case of wheat. Irrigated cotton showed a higher order of increase in yield, about 3 times compared to unirrigated cotton. According to a statistical analysis² based on aggregate crop production and irrigated and unirrigated crop area relating to the fifties, there was substantial difference between the irrigated and non-irrigated yields of foodgrains. The yield of irrigated wheat was as much as 1.28 tonnes per hectare compared to 0.46 tonne per hectare of unirrigated wheat.

1 1973, Impact of Mechanisation in Agriculture on Employment. New Delhi, National Council of Applied Economic Research.

2 David Hopper, 1965, September. Planning "Yardsticks" for Fertiliser and Irrigation. Agricultural Situation in India : 463-477.

In the case of rice, irrigated yield was 1.47 tonnes per hectare and un-irrigated yield 0.47 tonne per hectare. The difference between the two sets of figures is far too large. Though irrigation is so crucial in agricultural development in the Indian context, no reliable data are available about yield differentials due to irrigation in respect of various crops.

4.5.5 An estimate of net marginal productivity of irrigation was attempted by Hopper¹ for the village Senapur in the Ganges valley. Using production function techniques he estimated the marginal productivity of a cubic metre of water at 0.25 kg of wheat or 0.36 kg of barley. Some studies to assess the benefits from irrigation were also undertaken by the Indian Statistical Institute, by Sovani and Rath for Orissa and by Gadgil for 5 different areas. But none of them gave information about the average quantity of water used or supplied. However, assuming the average quantity of water applied on the farm as 0.5 metre or 5,000 cubic metres per hectare and taking into consideration Hopper's estimate of 0.25 kg of water per cubic metre, Colin Clark² estimated the net marginal production from irrigation at 1.25 tonnes wheat equivalent per hectare*. This estimate was well above the estimates made by Indian Statistical Institute for various States, but broadly corresponded with the estimate made by Sovani and Rath for Orissa.

4.5.6 The cost of irrigation per hectare varied widely from State to State. Due to differences in terrain and nature of schemes irrigation projects in peninsular India generally cost more than in the Indo-Gangetic plains. Again due to rise in price of construction material, cost of continuing schemes is higher than that of completed schemes. Cost of new projects is likely to be still higher. According to the Irrigation Commission, "In the States of peninsular India where irrigation costs are higher, on the assumption that the cost per hectare would be Rs 2,500, the interest liability at the current rate of 6½ per cent would annually come to Rs 163 per hectare. To this should be added the cost of maintenance and operation, which is estimated at Rs 15 per hectare. For covering these costs the average water rate works out to Rs 178 per hectare, which is roughly the price of a quintal of foodgrains".³

4.5.7 As against the above estimates of benefits and cost of irrigation per hectare, the actual water rates being charged at present in canal areas of peninsular States are considerably lower. In the case of rice which

1 David Hopper, 1965, August. *Journal of Farm Economics* : 47(3) : 611-624.

2 Colin Clark, 1970, *The Economics of Irrigation* : 2nd Edition : 48. Oxford Pergamon Press.

3 1972, Report of the Irrigation Commission, Vol. I : 269, New Delhi, Ministry of Irrigation and Power, Government of India.

* The yardstick for irrigation assumed for official purposes is 0.5 tonne per hectare of area brought under irrigation.

is the most extensively irrigated crop, canal water rates per hectare are in the range of Rs 37 to Rs 60 in the States of Andhra Pradesh, Karnataka, Tamil Nadu, Maharashtra and Madhya Pradesh. Canal rates were within this range also in Punjab, Assam and Bihar. The rates per hectare varied within a range of Rs 12 to Rs 52 in Uttar Pradesh, Rs 34 to Rs 62 in Rajasthan, Rs 59 to Rs 82 in Gujarat and Rs 37 to Rs 99 in Kerala. Water rates for rice are the lowest in Orissa and West Bengal being Rs 2.50 to Rs 10 per hectare in the former and Rs 10 to Rs 30 in the latter. The rates are also comparatively low in Jammu and Kashmir (Rs 13 per hectare), and Haryana and Himachal Pradesh (Rs 24 per hectare in both cases). In the case of wheat water rates per hectare are in the range of Rs 13 to Rs 15 in Punjab, Haryana and Himachal Pradesh, Rs 37 to Rs 50 in Uttar Pradesh and Madhya Pradesh, Rs. 29 to Rs 37 in Rajasthan, Rs 22.25 in Bihar and Rs 57.50 in Maharashtra. Thus, water rates charged at present in the canal areas for the two extensively irrigated crops of paddy and wheat which commanded nearly 65 per cent of total gross irrigated area are nowhere near the estimated benefit of 1.25 tonnes wheat equivalent per hectare or the estimated working charge of Rs 178 per hectare indicated above.

4.5.8 Water rates fixed in various States under the existing system of assessment had been examined by various commissions/committees set up from time to time. In 1959 the National Council of Applied Economic Research (NCAER) studied the problem and suggested that water rates should be fixed on the additional net benefit derived due to the irrigation which should be measured by the excess of net benefit after irrigation over net benefit before irrigation. It suggested that water rates should in no case exceed say 50 per cent of the additional net benefit to the cultivator and might vary from 20 to 50 per cent. The Maharashtra Irrigation Commission (1960—62), considering the difficulties that might be encountered in estimating net benefits accruing to the farmer from irrigation, suggested that water rates on crop basis should be fixed between 6 to 12 per cent of the gross income, the gross income being easier to calculate. The higher limit of 12 per cent was suggested for cash crops and the lower limit for food and fodder crops which had a lower profit margin. Later in 1964, the Committee to Suggest Ways and Means of Improving the Financial Results of Irrigation Projects, set up by the Ministry of Irrigation and Power made similar recommendations but suggested a range between 5 and 12 per cent of the gross income. The Irrigation Commission, 1972, accepted the recommendations of the Committee regarding the fixation of gross income but expressed the view that due to various considerations involved there could be no precise formula for the fixation of these rates which must, therefore, remain a matter of administrative decision. As a guideline, how-

ever, the Commission recommended that the rates fixed should be within the paying capacity of irrigators. The rates so fixed should facilitate full utilisation of available supplies and reduce disparities (in rates) between regions to the minimum.

Farm Mechanisation

4.5.9 There has been appreciable increase in farm mechanisation in recent years as indicated in paragraph 4.2.18. The number of tractors in the wheat growing States of Punjab, Haryana, Uttar Pradesh and Rajasthan increased 3 to 4 fold between 1966 and 1972. In the case of pump-sets, besides the wheat growing States, significant increases were reported also from Gujarat, Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu. Tractor availability per thousand hectares of cultivated area provides a rough index of the progress in regard to tractorisation. For the year 1972 this was estimated at 11 in Punjab, 5.5 in Haryana, 2 in Uttar Pradesh and 1.2 for the country as a whole. Comparable figures for some other countries were many times higher than that of Punjab. These figures reveal, if anything, that in spite of the recent spurt in numbers, there was little impression at the national level, but tractors did make their impression felt in the wheat growing areas of the North.

4.5.10 It is common knowledge that energisation of wells with pump sets facilities intensive cultivation including multiple cropping, leading to greater employment and production. Such a process was observed in a group of districts in Tamil Nadu, viz., Ramanathapuram, Coimbatore, Chingleput and North Arcot, during the period 1949-50 to 1962-63¹. Highest rate of growth in crop production in the State during the period was observed in these districts which also reported the highest order of increase in irrigated area. Studies relating to Punjab also revealed a similar trend². The findings of two other studies in this regard, one relating to Muzaffarnagar and another to Ferozepur, have already been noted in paragraph 4.5.3. Most of the increase in labour requirement was due to intensive land use particularly multiple cropping. As mechanisation of irrigation by means of tubewells and pump sets is mainly land-augmenting in effect, it is non-controversial and becomes readily acceptable.

4.5.11 This is not, however, the case with tractors. Tractorisation has been generally viewed with concern because of the possibility of displacing labour and depressing wages and labour earnings. The

¹ Thamrajakshi R. 1967, Dec. Growth of Agriculture in Madras State 1949-50 to 1962-63, Agricultural Situation in India : 1003-1006.

² Regional Differences in Crop Output and Growth in Punjab 1952-53 to 1964-65 : page 26, New Delhi, Directorate of Economics and Statistics, Government of India.

economic effects of tractorisation on farm employment, both of human and bullock labour, and on farm productivity would, therefore, need a closer examination. It is sought to be assessed with the help of the Muzaffarnagar study by the NCAER and the farm management study of Ferozepur, both referred to earlier, and a few other studies conducted by individual researchers and institutions.

4.5.12 Muzaffarnagar study : The objective of the Muzaffarnagar study was to quantify the net change in farm level employment at three levels of mechanisation, viz., (a) when a tubewell was installed to secure better control on irrigation (T level); (b) when a tractor was also acquired (TT level); and (c) when threshers were introduced in addition to tubewell and tractor (TTT level); and at three levels of operation viz., small farms (less than 4 ha), medium farms (4 to 12 ha), and large farms (more than 12 ha). A significant feature of sample farms was that all of them including non-mechanised ones enjoyed irrigation, either from Government canals or from neighbour's tubewells. As such comparison between non-mechanised farms and fully mechanised farms at TTT level should give a broad measure of the impact of mechanisation on farm employment. As it is well-known that mechanisation of large farms has only beneficial effects in view of the dearth of manpower on these farms the comparison may be limited to small and medium farms. The overall impact of mechanisation on employment in 'small' farms at the TTT level compared to non-mechanised farms was a moderate increase in labour input of about 6 per cent in crop production proper and a more perceptible increase of 18 per cent in ancillary activities like animal husbandry, horticulture etc. 'Medium' farms, however, registered a drop of 7 per cent in labour input for crop production but a marginal increase of 3 per cent in ancillary activities. On large farms between T level and TT level the increase recorded was 5 per cent in crop production and 137 per cent in ancillary activities.

4.5.13 Increase in farm employment did not indicate a uniform trend in successive stages of mechanisation. It was observed that at the tubewell stage, there was a very sharp increase in labour requirements which was as much as 51 per cent on 'small' farms and 26 per cent on 'medium' farms compared to non-mechanised farms. However at the following stage of tractorisation there was a drop in employment of the order of 33 per cent in both 'small' and 'medium' farms. An interesting feature of the increase in farm employment at the tubewell stage and subsequent reduction following tractorisation was that family labour accounted for a major part of these variations; for instance on 'small' farms two-thirds of the increase in employment at T level and about half the drop at the TT level were accounted for by family labour

alone. In the case of 'medium' farms, while family labour accounted for only 27 per cent of the increase in labour input at the T level it absorbed as much as 67 per cent of the decline at the TT level of mechanisation. It appeared that at the tubewell stage of mechanisation, an all out effort was generally made by the farm family to involve as many members as were available in agricultural operations, whether the deployment was economically worthwhile or not. Data relating to average per hectare returns from crop production showed that there was no commensurate increase in the total value of crop output obtained at the tubewell stage of mechanisation compared to the non-mechanised stage as a result of this deployment. Significant increases in output were achieved both on 'small' and 'medium' farms only at higher levels of mechanisation.

4.5.14 The main reasons for introducing tractors in Muzaffarnagar were (a) shortage of labour experienced generally during October-December when *kharif* crops including sugarcane were required to be harvested and the same lands were to be prepared for *rabi* sowing; (b) shortage of time interval between *kharif* harvest and *rabi* sowing; and (c) special difficulties of ploughing the land vacated by sugarcane to make it ready for sowing wheat.

4.5.15 Major findings of the Muzaffarnagar study were the following. Employment in general, whether on farm or off-farm was found to increase on 'small' farms (less than 4 ha) and large farms (above 12 ha with mechanisation; in 'medium' farms, however, there was some reduction. More interestingly, with the increase in farm size and mechanisation, a clear tendency was in evidence for family labour to withdraw from farm chores and more hired labour, particularly permanent labour, to be employed. While some withdrawal of family labour due to preference for leisure could not be ruled out, a number of male members were found engaged in certain managerial functions, which were not reckoned as employment for purposes of the study. Mechanisation led to significant increase in farm output which was of the order of 56 per cent in small farms and 14 per cent in medium farms, compared to the non-mechanised farms. Increase in output obtained on fully mechanised large farms, compared to tubewell farms was as much as 132 per cent. Mechanisation also facilitated diversification of farm activity. Number of milch animals maintained on the farms particularly buffaloes increased with the level of mechanisation. There was also commensurate increase in the value of livestock products produced by these farms. The main victim of mechanisation was the bullock; bullock labour input per hectare distinctly declined with advance in the level of mechanisation.

4.5.16 Ferozepur study: Farm management study conducted in Ferozepur district during 1968-69 supported the main findings of the

Muzaffarnagar study. Like the latter district Ferozepur too is a canal irrigated area. According to the combined data for the years 1968-69 and 1969-70, labour input per hectare of cultivated area showed a steady increase with mechanisation. In 'small' farms (less than 6 ha), employment per hectare of cultivated area increased from 90 days in non-mechanised farms to 122 days in farms with tubewells. There were, however, no 'small' farms employing tractors. In the case of 'medium farms', (6 to 14 ha), labour input was found to increase steadily from about 66 days in non-mechanised farms to 95 days in tubewell operated farms and 113 days in tubewell-tractor farms. Relevant employment data in respect of large farms (more than 14 ha) were 59 days, 72 days and 79 days respectively for the three stages indicated above. There was, thus no evidence at all of any displacement of labour as a result of mechanisation. Detailed data available for the year 1968-69 showed that as in Muzaffarnagar there was considerable withdrawal of family labour from farm operations with increase in mechanisation which was more than made up by hired labour. However, when examined from the profitability point of view, it was found that while non-mechanised farms could secure a good margin of profit in all size groups which increased with increase in size of farms, in the case of tractorised farms only large farms of more than 14 ha could secure any profit.

4.5.17 Similar conclusions also emerged from studies conducted in the wheat areas of Punjab jointly by Ashok Rudra, Majid and Talib¹ Hanumantha Rao² and Kusum Chopra³. According to the study made by Rudra, tractors created demand for permanent servants and replaced casual labour. "The most frequently observed combination of permanent servant and casual labour is one permanent servant and between 100 and 200 man days of casual labour for non-mechanised farms, zero permanent servant and between 100 and 200 man days of casual labour for small farms with pumps and tubewells but no tractors and two permanent servants and between 100 and 200 man days of casual labour for tractorised farms". According to Rao's analysis of Ferozepur farms, "the technological displacement of labour consequent on the use of tractor is roughly compensated by the rise in employment, mainly

- 1 Ashok Rudra, Majid. A & Talib B. D 1969, September & December Big Farmers of Punjab, Economic and Political Weekly, Review of Agriculture : A-143 & A-213.
- 2 Hanumantha Rao, C H. Employment Implications of Green Revolution and Mechanisation in Agriculture in Developing Countries—A Case Study of India, Paper presented at the International Economic Association Conference on Place of Agriculture in the Development of Under-developed Countries, Bad Godesberg, W. Germany : August-September, 1972.
- 3 Kusum Chopra. 1974, December. Tractorisation and Changes in Factor Inputs—A Case Study of Punjab, Economic and Political Weekly, Review of Agriculture : A-119—127.

as a result of the increase in yield associated with tractor use." Kusum Chopra whose investigation covered three districts of Punjab, *viz.*, Hoshiarpur, Ludhiana and Ferozepur, reported all round improvement in the farm situation as a result of tractorisation *viz.*, increase in operated area by 11 per cent, higher intensity of cropping, changes in cropping pattern, and increase in employment for family workers, skilled labour and casual labour.

4.5.18 However, there were a few studies covering the same region reporting adverse effects as a result of tractorisation. According to B. Singh¹ whose enquiry covered the districts of Bhatinda, Ludhiana, Hissar and Sangrur, tractor farms producing wheat used much less labour per unit area compared to other farms. Another study by R. K. Sharma² showed that the rate of utilisation of labour (defined as labour used per cropped acre) was about 7 per cent higher for bullock farms than that of tractor farms. Rudra in his study of big farmers of Punjab noted that while pumps and tubewells appeared to add to the output value per acre, there was no increase in production when tractors were introduced. This finding, however, is in sharp contrast to the findings of the Muzaffarnagar study by the NCAER which showed that increase in output occurred only at the tractor stage of mechanisation.

4.5.19 Tractorisation was not confined merely to the irrigated tracts of North India. There was evidence that wherever farmers stood to gain from it, they were keen to employ tractors. To take an extreme case in the arid areas of Nagaur in Rajasthan where rainfall is scanty—annual average being 32 cm—and highly unsteady and irrigation practically non-existent, significant increase in the tractor population was observed in recent years. In the few villages covered by an investigation³, during the decade 1964-65 to 1973-74, number of tractors increased sixfold, proportion of households using tractors, partly or fully increased from 10 per cent to 78 per cent and percentage of holdings ploughed by tractors increased from 3—16 per cent in different villages studied to 70—77 per cent. Main factors favouring tractorisation were the extremely short duration of rainy season (2 to 4 weeks) in the area and the compelling need to prepare land for kharif sowing as quickly as possible, to take advantage of available soil moisture, which was extremely difficult with the help of bullock power. Tractorisation resulted in more intensive land use, greater stability and increase in crop output and greater demand for labour.

- 1 Singh, B. 1968. Economics of Tractor Cultivation, Case-Study, Indian Journal of Agricultural Economics, XXIII(I) : 83-88.
- 2 Sharma, R. K., 1972 Economics of Tractor versus Bullock Cultivation : 92, Agricultural Economics Research Centre, Delhi.
- 3 Jodha, N S., 1974, December, 28. A Case of Process of Tractorisation, Economic & Political Weekly, Review of Agriculture : A-111-118.

4.5.20 Between the type of situation indicated by Muzaffarnagar and Ferozepur on the one hand and Nagpur on the other, there obtained a variety of situations which prompt farmers to resort to tractorisation. The obvious advantages from tractor use are (a) availability of adequate power at the farm level, (b) possibility of expeditious completion of critical and time-bound farm operations, (c) intensive land use, and (d) diversification of cropping. The case of tractorising large farms where labour is a serious bottleneck is strong, but not so with medium and small type of farms. In regard to farm employment and farm output, though most of the studies show an increase, there is some evidence to the contrary as well. Amartya Sen in a recent study¹ observed that "the factual picture is unclear *e.g.*, the extent of the yield impact of tractorisation has not yet been isolated from variations in other factors, not complementary to tractor use for a sufficiently large number of cases." In view of the profitability of tractorisation on large farms and lack of it on small farms (less than 4 ha), Sen is inclined to take the view that "the case for and against tractors depends on the pattern of land ownership and the possibility of land reform". The studies available so far could not be considered adequate enough in coverage to provide guidance in policy formulation. In view of the importance of the subject, it is necessary to study the problem in greater thoroughness and depth. At present very few studies are available relating to paddy areas.

6 ANIMAL HUSBANDRY

4.6.1 As in the case of crop production, the object of this section is to examine the economics of animal husbandry organised on traditional lines as well as on commercial basis. The assessment is based on consideration of relevant components like investments, costs, gross returns and net profits, to the extent availability of data permits such analysis. A serious limitation observed in this area has been the extreme paucity of representative and reliable statistical data. The analysis has, therefore, been confined to dairying, poultry raising and piggyery; a reference has also been made about bullock.

Dairying

4.6.2 The economic aspects of dairying have been studied in this section on the basis of some specific studies relating to early sixties

¹ Sen, Amartya, 1975, *Employment Technology and Development*: 1964, Delhi, Oxford University Press.

and few farm management investigations undertaken in late sixties. However, only a few of them contained material which could be referred to for analysis. As indicated in Chapters 2 on Historical Review and 3 on Progress of Agricultural Development, major programmes for improvement of animal husbandry like the Intensive Cattle Development Project were launched only in mid-sixties. As such, these studies neither reflect modern trends nor indicate the new opportunities made possible by recent advances in this field and the potential for income and employment held out. However, some indications about these trends are available in experimental data from research stations and in a few of our Interim Reports.

4.6.3 Next to crop husbandry, dairying or milk production offers the largest scope for adding to household income. India has a large bovine population of 237 million comprising 179 million cattle and 58 million buffaloes. This is about one-sixth and one-half respectively of the world's cattle and buffalo population. Even so, the contribution of animal husbandry to overall income from agriculture is only about 7 per cent. There are, however, certain areas in the country where animal husbandry makes substantial contribution to farm income. For instance in Kaira district¹, covered by the Kaira District Cooperative Milk Producers' Union (KDCMPU) complex, income from dairying accounted for more than 56 per cent of the average total farm business income per farm. Similarly, in the case of largely grassland-based dairying within the desert areas of Rajasthan, as in Bikaner region¹ dairy income accounted for about 58 per cent of the gross farm income per household. These magnitudes provide some indications about the extent to which income from animal husbandry could be augmented.

4.6.4 Households dependent on dairying : According to the data² collected in Population Census, 1961 through the household schedule, there were about 331 thousand households associated with livestock enterprises* in rural areas and 41 thousand households in urban areas. Among the rural households 267.4 thousand were engaged mainly in rearing of livestock for milk production and animal power and the remaining associated with production of meat, egg, wool, silk, etc. Households pursuing the line of milk production and animal power

1 V. S. Vyas and N. S. Jodha, 1974, Contribution of Dairying to Rural Economy with particular reference to Small and Marginal Farmers in 'Dairying as an Instrument of Change' 78-79, International Dairy Congress, India, 1974

2 Sharma, P. S. 1965, Scale of Livestock Enterprise, Indian Journal of Agricultural Economics. XX(1) : 77-82.

* Livestock enterprises have been considered in terms of households associated only with livestock and also those engaged both in livestock and cultivation

constituted a clear majority among total livestock households in various States. Their proportion varied from 49.52 per cent in Mysore to 99.76 per cent in Jammu & Kashmir. West Bengal, however, was an exception, where most of the households were associated with sericulture. A further analysis restricted to main livestock districts** revealed that livestock enterprise was mostly undertaken by households on a small scale with 1 to 2 workers; the proportion of medium scale enterprise employing 3-5 workers and largescale enterprise employing 6-10 and more workers being relatively small. Most important livestock areas in the country particularly from the point of view of scale of operation were confined to the Saurashtra region of Gujarat and Telangana region of Andhra Pradesh. In these regions about 20 per cent or more of livestock enterprises were organised on a medium scale i.e. with 3-5 workers. In some districts like Guntur, Nellore, Kurnool, Mahbubnagar, Hyderabad and Nalgonda in Andhra Pradesh and Jamnagar, Rajkot, Surendranagar, Bhavanagar, Amreli, Junagadh, Kutch, Banaskantha, Ahmedabad etc. in Gujarat at least 15 per cent of the livestock units operated on a large-scale, combining the enterprise with crop production. On an average they operated more than 4 hectares. In some of these districts the proportion of large-scale livestock enterprise households was higher, about 40 to 60 per cent. There was not much evidence of commercialisation in livestock enterprises as the proportion of hired workers employed per 100 family workers in single occupation households was only 1 to 3. Households combining livestock with crop production showed a higher proportion of hired workers i.e. 3 to 10 per 100 family workers. According to the 1961 census household schedules, animal husbandry enterprise in India, by and large, related to milk production undertaken in majority of households on a small scale with very little evidence of commercialisation.

4.6.5 On the basis of certain recent studies, we had estimated¹ that 70 to 75 per cent of households possessing cattle, according to the size of holdings in different areas of the country, belonged to the category of small farmers, marginal farmers and agricultural labourers. Dairying by and large, was a small man's business.

4.6.6 Profitability of milk production : A study² of cost of milk production in Delhi villages in 1961-62 provided useful information. It covered 60 sample farms including 20 non-seller farms, divided on

** Only districts which accounted for about 2,000 or more household associated with livestock were considered for this analysis

1 1971, National Commission on Agriculture, Milk Production Through Small and Marginal Farmers and Agricultural Labourers : Interim Report, p 13, New Delhi, Ministry of Agriculture and Irrigation, Government of India

2 T. A. Ramasubban & S. K. Goel, 1965, An Inquiry into the Cost, Consumption and Supply Aspects of Milk Production by Cultivator families in Delhi Area, Indian Journal of Agricultural Economics, XX(I) : 92-96.

the basis of quantity of milk produced, i.e. upto 935 *l*, 935 to 1,870 *l* and 1,870 to 2,800 *l* annually. Three types of costs were studied, i.e. (i) feed cost (less the value of dung) defined as cost A, (ii) cost A plus interest and depreciation on imputed values of milch animals and cattle sheds termed as cost B, and (iii) total cost which included family labour cost besides cost B, denoted as 'C' cost. The study revealed that cost A comprised about 63 per cent of the total cost. However, cash expenses were estimated at only 27 per cent, which included costs incurred on about 10 per cent of fodder, the entire concentrates and about 2 per cent of human labour, which was hired. Thus, as much as 73 per cent of the cost of production of milk was accounted for by imputed items raised within the farm. The costs per litre of milk at different levels of production taking into account only animals in milk and all milch animals (including dry ones) are given in Appendix 4.5. The costs exhibited a declining trend with the increase in level of production. However, the expenditure incurred on dry animals invariably maintained by almost all farms pushed up the cost by nearly 50 per cent. Considering the returns to different costs at the rate of 55 paise per litre of milk which the farmer received during the period of enquiry, it was observed that in the case of lactating animals, farmers producing upto 935 *l* were not able to cover any of the costs. However, those producing above 935 *l* received profits depending on the level of production. The profits were maximum in the case of those producing above 2,800 *l* per annum and were estimated at 85 per cent, 28 per cent and 16 per cent on costs A, B and C respectively. When dry animals were also included none of the farm families were in a position to cover either cost B or C. Even cost A could be met only by families producing more than 1,870 *l*. Returns to cost A in the case of largest group (i.e. above 2,800 *l*) were also reduced from 85 per cent to only 39 per cent. Thus, taking into consideration the real farm situation requiring maintenance of dry animals on the farm, the cost of production of milk exceeded the price received by the farmer.

4 6.7 Another study¹ into the economics of livestock enterprise was conducted in 1962-63 in Azamgarh and Ghazipur districts in eastern Uttar Pradesh. The study revealed that in the case of buffaloes, taking into consideration the total expenditure incurred (i.e. cost C) and the total value of output from milk, dung and appreciation in calves, the farmers in the largest size group of holdings, i.e. 8 to 10 ha, incurred the maximum loss, while those in the size group of 6 to 8 ha received the maximum profit. In the case of farmers in

1 Dhondyal, S. P. & Parmatma Singh, 1965, Economics of Livestock Enterprise in Uttar Pradesh, India Journal of Agricultural Economics, XX(1) : 107-115.

other size groups of holdings, buffalo rearing was more or less a no-profit no-loss enterprise in relation to cost C. However, taking into account only the feed costs (i.e. cost A), farmers in all size group of holdings made profit, which showed a more or less decreasing trend with increase in the size of holdings. On the other hand in the case of cows, farmers in all size groups suffered a net loss in relation to cost C. However, in relation to cost A, farmers in the lower size groups, particularly those with less than 2 ha made some profit while those operating larger holdings suffered losses. The study revealed that since buffalo was primarily kept for milk production, this animal received more attention in the matter of feed and fodder. The cow and her progeny remained relatively neglected.

4.6.8 Farm management studies conducted in Ferozepur district in Punjab during 1967-70 also covered some aspects of livestock enterprise. The study revealed that dairying was more popular with small units but the activity was in a very disorganised form. Farming being a seasonal operation dairying provided off-season work and steady income, helping the farmer to keep himself busy all the year round. Buffalo was the main dairy animal and 95 per cent of holdings kept buffaloes while only about 58 per cent of the holdings maintained cows. On the average, number of buffaloes per farm was 2.7 while cows averaged 0.8. Contribution of milk production to total farm output was 17 per cent as against 83 per cent from crops. The percentage contribution of dairying to total farm output decreased with the increase in farm size and varied from 20.9 per cent on small size holdings to 6.4 per cent on the largest size group. Thus, dairying offered greater scope to small farmers for supplementing their income. However, on an average the farmer suffered a net loss of Rs. 46.80 and Rs. 45.30 per hectare on buffaloes and cows respectively on the basis of total cost. Details regarding gross income, farm business income, cost of inputs etc. per hectare according to different size groups of holdings for buffaloes and cows are given in Appendix 4.6. It will be seen therefrom that neither in the case of buffaloes nor cows did net income show any trend in relation to the size of holdings. However, in the case of buffaloes, farmers in the lowest size group of holdings suffered the minimum loss while in the case of cows they suffered the maximum loss per hectare. Also, for this size group, farm business income was the highest in the case of buffaloes and lowest in the case of cows. The inference that could be drawn from this was that for small farmers rearing of a buffalo was more profitable as compared to rearing of a cow. The data also revealed that in the case of buffaloes, with increase in the size of holding, difference between paid out costs (cost A) and gross income

narrowed down. In the case of holdings of 24 ha and above it was found that paid out costs even exceeded gross income. In the case of cows, cost A was invariably higher than gross income for all size groups. The Ferozepur study, thus confirmed that in the case of both buffaloes and cows, milk production was a losing proposition on cost C basis. Production of buffalo milk was profitable on cost A basis particularly for holdings below 6 ha. However, production of cow milk gave a negative return to farmers in all size groups.

4.6.9. A specific study into the economics of dairying was conducted by the Agro Economic Research Centre, Vallabh Vidyanagar¹ in Mehsana district of Gujarat during 1967-68. It covered two types of cluster of villages, one served by Dudh Sagar Dairy and having an assured market for milk, and the other not served by any marketing system. The economics of dairying was studied separately for the dairy cluster and non-dairy cluster of villages at two different levels i.e. (i) by including all the dairy animals whether young or adult in the definition of dairy farms and (ii) by including only adult milch animals. The size of the livestock enterprise was defined in terms of total units kept during the year as a whole. For arriving at the total units, FAO's latest standards for conversion* of various animals into standard units were followed. Concepts of cost A, B and C adopted were the same used in farm management studies. In addition to these three concepts, the paid out cost was also considered which included, cattle grazing charges, purchased feed, repair and maintenance charges, interest on dairy loans and miscellaneous expenditure. Gross income from the enterprise comprised (a) milk production, (b) dung production and (c) appreciation in the value of dairy animals.

4.6.10 Data regarding gross income, paid out cost, total cost, farm business income and net income taking into account dairy enterprise as a whole and milch animals only are given in Appendix 4.7. Main conclusions emerging from these data are as under :

- (i) Gross income per day per dairy unit showed an increase when only milch animals were considered as constituting the dairy enterprise; it declined when all the animals maintained on the dairy farm were included.
- (ii) Gross income per day per dairy unit was more in the dairy clusters of villages as compared to non-dairy clusters irrespective of the size of the dairy unit. The enter-

1 Studies in the Economics of Dairying in Gujarat, 1967-68 (Mehsana District). Vallabh Vidya Nagar, Agro-Economic Research Centre.

* A buffalo unit was assigned the weight of 1.0 and a cattle unit 0.8.

prise was thus, more profitable in the milk shed of a commercial milk scheme.

- (iii) The per unit total costs and paid out costs were also higher in the dairy clusters as compared to non-dairy clusters. Though no specific relationship could be established between the size of the dairy unit and the per unit cost, the latter was higher in small size groups. With the increase in the size of dairy enterprise, while the percentage share of feed in the total cost increased, the percentage imputed share of family labour showed a decline.
- (iv) Dairy enterprise was found profitable only when paid out costs were considered. On the basis of total costs it was neither profitable for the dairy enterprise as a whole nor for milch animals only.
- (v) Taking the dairy enterprise as a whole the average farm business income in the dairy clusters worked out to 80 paise per animal unit per day in 1967 and Rs 1.15 per unit per day in 1968. In the non-dairy clusters it was less, being 50 paise and 62 paise respectively. Taking into account milch animals only, the average farm business income was much higher.
- (vi) The farm business income as also net income did not show any specific trends, with changes in size groups. However, in the dairy clusters the farm business income was minimum in the lowest size group for the dairy enterprise as a whole. Taking into account milch animals only, this size group incurred a net loss in farm business income both during 1967 and 1968. This group also incurred the maximum loss in net income in the dairy enterprise.

4.6.11 The above analysis of dairy economy in Mehsana district of Gujarat revealed that the situation in 1967 and 1968 was far from satisfactory. An examination of the production base of dairy enterprise revealed that only about 33 per cent units produced milk in both the clusters during 1967. During 1968 the percentage in dairy clusters increased to nearly 37 per cent while in the non-dairy clusters it dropped to 26 per cent. Thus, a very large proportion of animals remained unproductive on the selected farms. There was a close association between the proportion of animals in milk to total animal units, and the per day per unit loss. As the percentage of animals in milk increased the per unit per day loss declined. Hence, the large proportion of dry animal units appeared to be the basic cause behind the loss on selected dairy farms.

4.6.12 A number of factors have contributed to the unprofitability of milk production enterprise. As already mentioned farmers, whether big or small, have not taken up this enterprise on a commercial basis and there is no systematic and organised effort to secure a remunerative price for the quantities marketed. Secondly, as a major part of the cattle population consists of dry and decrepit animals, expenditure on their maintenance pushes up the cost of milk production. Thirdly, Indian milch breeds are low yielders compared to some of the exotic breeds. The average annual milk yield¹ of cow in India is only 157 kg, perhaps the lowest in the world. It is somewhat higher in the case of buffalo-504 kg per year. Lastly the management of cattle and buffaloes on the farms leaves much to be desired, which leads to all-round inefficiency.

4.6.13 The above studies have borne out that the dairy enterprise is not generally profitable. Even so, the farmer engages in milk production, and small and marginal farmers particularly try to make some additional income from this enterprise. Under the existing conditions it is imperative for farmers to maintain cattle for crop production. Milk production is thus only an ancillary activity. Secondly, the out-of-pocket expenses involved in milk production are much less, being of the order of 25 to 30 per cent only. The other costs involved are met within the existing farm resources. Lastly, producers generally consider the costs incurred on feeds alone as most relevant and important, followed to some extent by the cost of depreciation on animals. The cost of human labour, which is predominantly that of the family has very little opportunity cost. Thus, as long as the price fetched by milk sold outside covers these costs primarily, these producers are prepared to lean upon this enterprise as a source of additional income, howsoever small this income may be.

4.6.14 While the above studies related to the sixties, there are indications that significant improvements have been taking place in dairy enterprise as a result of new programmes particularly the Intensive Cattle Development Project initiated in the mid-sixties. According to an assessment made in the intensive cattle development block of Hyderabad in 1970-71², as a result of the programme, the daily average milk yield of cows increased between 1966-67 and 1970-71 from 1.04 kg to 1.45 kg or by 39 per cent and that of buffaloes from 1.93

1 Daroga Singh, V. V. R. Murty & B. B. P. S. Goel, 1970, March. Monograph on Estimation of Milk Production, New Delhi, Institute of Agricultural Research Statistics (Indian Council of Agricultural Research).

2 1971, Impact of Intensive Cattle Development Block, Hyderabad on the Rural Economy (Mimeographed) Hyderabad, Animal Husbandry Department, Government of Andhra Pradesh.

kg to 2.23 kg or by 16 per cent. The average age of cows at maturity decreased from 3 years 8 months to 3 years 3 months. The crossbred cow brought about a significant improvement by lowering the age at maturity by about a year.

4.6.15 An independent enquiry¹ carried out in the Bangalore milk shed areas, where crossbred cows are being popularised revealed that these animals had brought about significant improvements in yields and over all production of milk. On an average a crossbred cow yielded 3.0 litres of milk compared to 0.33 litre from indigenous cows and 0.67 litre from buffaloes. In the city area, a much higher yield of 5.3 litres was obtained from crossbred animals because of the better care and management of these animals. In Ludhiana², the average lactation yield of a crossbred cow was assessed at 2,286 litres compared to 1,743 litres obtained from a buffalo. However, both the studies revealed that because of greater investment and cost of maintenance of crossbred cows, these animals were kept mainly by large farmers. Productivity of these animals was also comparatively higher when managed by large farmers.

4.6.16 The new possibilities held out by dairy development are best illustrated by KDCMPU, popularly known as 'Amul' started with a handful of members in 1948. At present it comprises 794 primary societies with a membership of 235,000. In 1972-73 the Union collected about 147.8 million kg of milk for supply to Bombay milk scheme and for processing butter, cream, ghee, powdered milk, baby food, casein, cheese, chocolate etc. Its turn-over was close to Rs 40 crores in 1972-73. It is a big complex today with a number of processing plants for milk and milk products; besides it has also built up a cattle feed compounding factory, a lime juice plant and a rice mill. According to a study³ made in 1970, animal productivity in the cattle development area of Kaira increased by 50 per cent during 1966-69 compared to 1960-61. Compared to neighbouring areas, lactation period and yield of buffaloes in the development area were higher; income obtained per milch animal was 62 per cent more. Above all the Union has been a very powerful force for modernisation of dairy business. It maintains about 580 artificial insemination centres

1 Kalus Nyholm, Henrik Schaumburg-Muller & Kirsten Westergaard, 1974, December, Socio-Economic Aspects of Dairy Development, Report from the Bangalore Milk Shed Area : Economic and Political Weekly (Review of Agriculture) : A-127-136.

2 Gill, S. S. & Gill, G. S. 1974. An Analysis of Economic and Social Changes though Dairying in an IADP District in "Dairying as an Instrument of Change", International Dairy Congress, India.

3 Srivastava, R. K. Impact of Cattle Development Programmes on Rural Economy in the Kaira District (Mimeographed), Anand, Gujarat.

which carry out over 0.15 million artificial inseminations every year and popularises green fodder cultivation. The mainstay of KDCMPU for years has been its *Surti* buffaloes. Lately it has taken up a programme for maintaining exotic breeds of cows and crossbreeding of cows in the milkshed area with a view to increasing milk production to a much higher level through crossbred animals. The Kaira story is being repeated in the districts of Mehsana, Baroda, Surat, Banskantha and Sabarkantha.

4.6.17 There is, however, need for urgent studies on the different economic aspects—inputs, cost, output, income and employment—of such complexes as KDCMPU in different agroclimatic regions in the country. Even in case of KDCMPU there is need for a study in greater depth. These studies should be designed to bring out the potential of dairying both as a means of providing employment with a reasonable level of income and as a means of supplementing income and reducing under-employment. There are certain socio-economic aspects which need to be kept in view while undertaking these studies. Performance of crossbred cows which are being popularised in the Intensive Cattle Development Projects needs to be assessed critically in all aspects as compared to purebred exotic cows, improved indigenous breeds and buffaloes. Such studies made under proper expert guidance would help formulation of policies in future. As dairying is closely linked with crop production in most production units, some items of cost incurred are on a joint basis. It is, therefore, necessary to evolve appropriate procedures and principles of allocation of joint cost to the two sectors viz. dairying and crop production and valuation of inputs that go into milk production particularly the farm based inputs.

Bullock

4.6.18 Bullock which is the main source of draught power on most farms in the country has an important role in the rural economy. If farm power is considered as comprising bullock labour, human labour, tractors and power tillers, bullocks accounted for over 75 per cent of the available power reserve in terms of horse power units in 1971. Though tractors have made some inroads into wheat areas, particularly in the northern States, bullocks are still in use in these parts whereas paddy cultivation is mostly dependent upon bullock power. Farm management studies contain data about employment aspects of bullocks, operationwise. These studies indicate that bullocks are not fully and economically utilised, though they remain a charge on farm resources all through the year. Even so, it has to be recognised that farming will not be possible without them over large areas. As the new technology spreads, not only that farming would turn to be more intensive,

but double or multiple cropping would also increase, leading to greater production. These changes would mean greater employment of bullocks on the farm for ploughing, levelling etc. and more particularly for transport-fetching inputs from supply sources, carrying these inputs to the farm and taking the greatly increased produce to markets for disposal. A major problem about these animals, however, is their number. There is need for some regionwise diagnostic studies about efficiency aspects of bullock deployment and also to assess the optimum requirements of bullocks, atleast for major size groups of farms.

Poultry Farming

4.6.19 Poultry farming has certain features which favour its adoption on a larger scale in the country. Its land requirement is low, investments needs moderate and gestation period for capital short. Poultry can readily utilise byproducts of foodgrains like bran, rice polish, oil cake and broken grains. It can be organised as an independent business or combined with one or several other activities like crop production, dairying etc. These considerations make it very suitable for adoption as a subsidiary occupation, particularly by small and marginal farmers and labourers who are in need of augmenting their incomes. The demand for eggs and meat has been growing in recent years with increasing per capita incomes and awareness of the need for a balanced diet; this provides a favourable climate for egg and meat production business to thrive.

4.6.20 Poultry farming earlier was considered as an occupation of certain backward groups in the society. There are, however, indications that these prejudices are fast disappearing. An investigation of poultry units in Meerut district¹ made in September 1964 showed that all major caste groups were engaged in poultry farming.

4.6.21 Only a few studies are available on the economic aspect of poultry farming. The Economic and Statistical Organisation of the Government of Punjab organised an enquiry² into the economics of this activity in that State during 1967-68. A similar study was also undertaken in Delhi in 1968-69. These studies provide some useful data about cost aspects and income and employment generating potential of poultry enterprise.

4.6.22 The Punjab study : The study covered parts of Patiala

- 1 Jaggi U.S. and Robertson C.A. 1965, Economic and Social Aspects of Egg Production. A study in Meerut District, Uttar Pradesh : 4. Delhi (Mimeographed) Agricultural Economics Research Centre, University of Delhi
- 2 1972, Studies in the Economics of Poultry Farming in Punjab; New Delhi. Directorate of Economics and Statistics, Ministry of Agriculture & Irrigation

Ludhiana and Rupar districts. Fortysix poultry units with more than 100 birds and 40 persons who had left the business before March 1967 were investigated. Of the 46 units studied, 45 were owned by single individuals and one was a joint venture. All owners/operators were found to be literate persons; the bigger the unit, the higher the level of education possessed. There were 8 units each in the size groups less than 200 birds, and 200 to 300 birds; 11 each in the next two groups of 300 to 500 and 500 to 1,000 birds and 8 in the largest size group of over 1,000 birds. The first two groups accounted for 9 per cent of the total stock of birds and the largest group for 59 per cent. In the case of 23 units, poultry farming was the sole or main business; the remaining 23 units pursued it as a subsidiary line. Smaller units predominated in the latter category. White Leghorn variety of birds was found most popular; they constituted about 78 per cent of the total bird population with sample units. Rhode Islands Red birds and crossbred varieties constituted 11 per cent each. There were no *desi* birds at all in the stock maintained by farmers. Significant variations in the age-composition of birds was observed over time. The proportion of layers and young stock at the peak egg production period was around 79 per cent and 6.5 per cent respectively which changed to 38.8 per cent and 48.5 per cent respectively during the lean period.

4.6.23 Assets of poultry farms : The assets or investment of poultry farmers consisted mainly of land, buildings including fencing, electric fittings, water arrangements, equipment and birds. Buildings accounted for the largest proportion (55 per cent) of the total investment followed by birds (24 per cent), equipment (10 per cent) and land (8 per cent). Generally the proportion of investment on buildings increased and those on land decreased with increase in size of poultry farms. Investment in birds did not, however, show any significant trend. Incubators accounted for more than 50 per cent of the expenditure on equipment. The appliance, however, was in use mainly in the bigger size units of 500 birds and above. Average investment per farm and per 100 birds is indicated below :

TABLE 4.6
Investment per Farm and per 100 Birds according to
Size Groups

Size groups	(Rupees)	
	Average per farm	Average for 100 birds
Less than 200 birds	3,519	2,270
200—300 birds	4,564	1,700
300—500 birds	4,962	1,230
500—1,000 birds	17,098	2,360
1,000 and above	51,768	1,815
Overall	15,684	1,865

Investment per 100 birds was high in smallest size group and lowest in the third size group mainly due to economies of scale. Investment again showed an increase in the size group 500 to 1,000 birds, which reported comparatively greater outlays in land, buildings, equipment and birds. Average investment per farm in this size group was more than 3 times the investment in the units with 200 to 500 birds. Economies of scale again brought down investment per 100 birds in the larger units (with more than 1,000 birds).

4.6.24 Labour : Poultry farms were organised mainly as family enterprise and managed mostly by family labour, supplemented with casual labour whenever required. Majority of the units (28) did not employ any permanent hand; such units belonged mostly to the first three size groups. In all only 33 servants were employed, 23 in large units with 1,000 birds or more, 8 in the size group 500-1,000 birds and one each in the smaller size groups. Family labour predominated; 75 persons were engaged; three-fourth of them males. Total number of hands working in poultry farms was 108 of 2.3 per farm; and 77 per cent of them came from the farm family itself. Generally employment per farm in terms of man-days worked was found to increase with the size and scale of operation. number of mandays worked per farm was 147 in small units keeping less than 200 birds, 294 mandays in the 200-300 birds group, 418 mandays in the 300-500 group, 889 in the 500-1,000 group, 1,817 mandays in the largest size group and 683 mandays in respect of average farm. However, family labour accounted for only 59 per cent of the labour input whereas in terms of work force they accounted for 77 per cent. The main work in poultry farms consisted of providing feed and water to birds and collecting, packing and marketing of eggs which accounted for 50 per cent and 33 per cent respectively of the mandays.

4.6.25 Average cost and returns per farm : The poultry units studied were mainly engaged in production of eggs for the market. Sale of birds, though not a primary objective of business was resorted to by way of culling of stock. The main inputs* consisted of the following :

- (i) cost of purchase of birds during the year;
- (ii) cost of litter;
- (iii) cost of labour (including family labour);
- (iv) rental value of land;
- (v) cost of feeds;
- (vi) cost of medicines;

Value of birds at the beginning of the survey was included as one of the input items in the original study. However, as birds constitute the 'production plant' as it were they cannot rightly be considered as an input item. Hence this item has been excluded in the aggregation.

- (vii) cost of electricity and fuel;
- (viii) miscellaneous cost;
- (ix) interest on fixed capital;
- (x) interest on investment on poultry birds;
- (xi) interest on working capital; and
- (xii) value of depreciation of assets.

The input structure of the poultry enterprise in terms of total cost per 100 birds is given in Appendix 4.8. On an average, total value of inputs used in the units during the year aggregated Rs 2,719 per hundred birds. Cost of production was comparatively higher in the small size groups (Rs 2,893) and less in the next size group of 200 to 300 birds (Rs 2,703). Production costs were again higher in the next two size groups. Large units with 1,000 birds or more reported the least average cost—Rs 2,586 per hundred birds. The most important single item of input was feed which accounted for 67 per cent of overall cost. There was only marginal variation in this proportion from size group to size group. Next in importance were cost of labour, bulk of which was accounted for by family members, and purchase of birds; these items accounted for 9.2 per cent and 6.5 per cent respectively of total cost. Single input items showed some variation from size group to size group but not necessarily in the same direction. Large units managed to effect substantial economy in expenditure on many items, especially feed, labour, purchase of birds, etc.

4.6.26 Main source of income for poultry units were eggs, sale of birds and poultry manure. Value of gross income per 100 birds according to different size groups are indicated below; comparable figures of investment and total inputs are also juxtaposed in the table.

TABLE 4.7
Investment, Inputs and Gross Income: per 100 Birds—
Size-Group-wise

Size group	Investment	Total input	(Rupees)				
			Output				
			Eggs	Birds sold	Poultry manure	Gross income	Net profit
Less than 200 birds	2,270	2,893	2,619	627	121	3,367	474
200—300 birds	1,700	2,703	2,179	477	132	2,788	85
300—500 birds	1,232	2,845	2,303	353	190	2,846	1
500—1,000 birds	2,360	2,961	2,498	581	205	3,284	323
Over 1,000 birds	1,815	2,586	2,494	263	89	2,846	260
Overall	1,865	2,719	2,456	371	131	2,958	239

Average gross income obtained per 100 birds and net returns were highest in small size group. Income from egg production and sale of birds was also maximum. Gross income was equally high in units keeping 500 to 1,000 birds. Net income reported by large units, however, was comparatively less—only about 55 per cent of what was earned by small units. Net returns were found to be the least in the size groups 200 to 300 birds and 300 to 500 birds. Larger units with 500 to 1,000 birds and more than 1,000 birds did make profit, more by the former, but it was much less compared to the profit made by small units. In fact the margin of profit made by smaller units would be even more if value of family labour is removed from the cost side. Taking the number of egg per layer as an index of productivity it was found that the small units got the maximum of 180 eggs per layer compared to 170 in the next size group and 153 in the larger unit. Small poultry units with less than 200 birds emerged as the most efficient production units, from the point of view of productivity and profit. An average investment of Rs 2,500 in non-recurring items and an equal amount on current inputs (excluding family labour) on 100 birds brought nearly Rs 750 to the small units.

4.6.27 The reasons for the popularity of White Leghorns with poultry farms was also evident from the data relating to cost and return. While costs of maintaining these birds was 4 per cent cheaper as compared to Rhode Island Red birds, egg production per 100 layers was 17 per cent more. Net returns obtained was about 11 per cent of total cost in the case of White Leghorns and only 4 per cent from Rhode Island Red birds. The new crossbred varieties were found quite comparable in performance to white Leghorn birds.

4.6.28 Factors for closure of farms : Forty persons who were in poultry business and wound up before March, 1967 were contacted for ascertaining the reasons. Most of them reported financial losses due to one or more of the following :

- (i) mortality of birds;
- (ii) low production of layers;
- (iii) lack of knowledge about poultry farming;
- (iv) non-availability of chicks of superior birds;
- (v) non-availability of quality feed; and
- (vi) lack of arrangements for marketing.

4.6.29 A quick re-survey of the farms studied in 1967-68 was undertaken in September, 1970 to make a fresh assessment of difficulties and problems faced by poultry units and to collect some additional information. It was found that 11 out of the 46 units studied earlier had been closed. Maximum closure (50 per cent) was in the size group 200 to 300 and minimum (9 per cent) in the size group 300

to 500. In most cases the closure was due to non-economic reasons like shifting of residence, death of owner, departure of experienced farm servants etc.

4.6.30 The breedwise composition of birds in the various size group of farms showed some significant changes. The proportion of White Leghorn birds declined from 78 per cent to 60 per cent and that of Rhode Island Red birds from 11 per cent to 3 per cent. Meanwhile, there was a significant increase in the proportion of crossbred birds which rose from 11 per cent to 37 per cent. Compared to 1967-68, on an average there was an increase of about 26 per cent in the number of birds maintained by the poultry units. It was observed that 54 per cent of the poultry units were preparing their own poultry feed at home, whereas only 39 per cent did so two years ago.

4.6.31 Poultry farms are required to renew their stock periodically by acquiring chicks of quality to maintain the production cycle and flow of eggs for the market. Most of the farms depended upon outside agencies for one-day chicks or for hatching arrangements. The resurvey revealed that nearly 60 per cent of chicks purchased were from outside the State, mostly from hatcheries in Karnal. Government agencies within the State met only 14 per cent of the demand, leaving private agencies to meet most of the requirements. Hybrid chicks which were proving more profitable than pure exotic breeds were not available within the State and, therefore, had to be obtained from Karnal and Delhi. Other major difficulties faced by poultry units were non-availability of medicines, veterinary aid and quality poultry feed.

4.6.32 Delhi study : The study made in Delhi in 1968-69¹ covered 40 per cent of the existing units. Investments and cost pattern of these farms were similar to those of the Punjab units except that labour accounted for slightly more (one-eighth of the total cost) and feed slightly less. Share of family labour in total mandays of employment decreased from 45 per cent in small units to 23 per cent and 14 per cent in medium and large units respectively. Average cost and returns were estimated size group-wise for 100 layers as against 100 birds in the Punjab study. These are indicated in Table 4.8.

1 Singh C.B. & R.K. Patel, 1974. (i) Resource Allocation and Efficiency in Poultry Farms in Delhi State and (ii) Human Labour Employment and Efficiency on Poultry Farms in the Union Territory of Delhi (Mimeographed) : Studies in Dairy Economics, Statistics and Management, National Dairy Research Institute, Karnal.

TABLE 4.8
Average Costs and Returns on Poultry Farms in Delhi
(Rs per 100 layers)

	Feed	Labour	Total cost	Gross income	Net return
Small farms (100-500 layers)	3,630	847	6,083	6,833	750
Medium farms (500-900 layers)	3,579	809	5,961	7,101	1,140
Large farms (Over 900 layers)	3,480	549	5,456	6,185	729
Over all	3,563	735	5,834	6,706	872

These figures show that while greater economy in input cost was effected by units with increase in scale of operation, returns were maximum in medium units with 500 to 900 layers. Smaller units made higher profits than large farms. Though evidence regarding scale effect on profits in the two studies appeared to be conflicting, there could not be any doubt that small units both in Punjab and Delhi did well.

Problem of Increasing Cost of Feeds

4.6.33 Availability of feeds at economic price is an important pre-requisite for the development of poultry farming. Cost of feed accounts for about 60-69 per cent (based on enquiries conducted in Delhi and Punjab) of the total cost incurred in poultry farming. The price of compounded poultry feeds had shot up in recent years from Rs. 630 per tonne in March, 1972 to Rs. 1,200 per tonne. A study of the price trends during the last two to three years of some of the selected constituents of poultry feed viz. maize, groundnut oil cake, rice bran, wheat bran, molasses, fish meal, bone meal etc. confirms the fact. The index of maize prices showed an increase of 96 per cent during 1972 to 1974. Again, study of groundnut oilcake prices for three centres (Bombay, Madras and Kanpur) indicated a rise of about 85 per cent during 1972 to 1974. Similarly, prices of rice bran (Madras Centre) and wheat bran (Bombay Centre) registered increases of about 60 per cent and 64 per cent respectively during the same period. It is further understood that prices of molasses, fish meal and bone-meal also had gone up. Meanwhile prices of egg increased only by 39 per cent. Keeping in view the rise in prices of poultry feed and its adverse effect on the development of poultry farming, there is a strong case for providing damaged grain from storages, ports-

etc. at concessional rates for manufacturing livestock and poultry feed. Research should continue to give attention to finding replacements of grains by cheaper agricultural or industrial byproducts and wastes in poultry feed.

Piggery Development

4.6.34 Pig population in the country is a little more than 1 per cent of the total livestock population; compared to world pig population, it is less than 1 per cent. There were 6.5 million of them in 1972 concentrated mainly in a few States like Uttar Pradesh, Bihar, Andhra Pradesh, Tamil Nadu, Assam and Madhya Pradesh. Number of pigs of exotic breeds or crossbred varieties is very small.

4.6.35 Pigs are prolific breeders with short generation interval; it is, therefore, possible to bring about significant changes in their litter size, growth rate, feed conversion efficiency etc. through genetic improvements and modernisation of rearing practices. Piggery can make sizeable contribution to household income if developed as a low cost enterprise. As piggery production is concentrated mainly in the hands of socially backward and economically weaker sections of the people, it offers good scope for being developed as a special programme for weaker sections. A study of piggery units made in Krishna district of Andhra Pradesh¹ showed that other sections too would have no aversion to take up piggery production, particularly the rearing of exotic breeds, if adequate prospects are available in the form of a ready market. Pig farming fits in well with mixed farming and can also be complementary to intensive agricultural operations.

4.6.36 Very little information is available about economic aspects of piggery development at the farm level. The Progressive Agro-Industrial Consultants undertook for us a study² to assess the current position in regard to production, marketing and processing of pork and pork products and to identify problems in these areas. It was based mainly on general investigations in typical areas like northern parts of West Bengal, Assam, Meghalaya, South Bihar, Andhra Pradesh, Maharashtra and Uttar Pradesh, and some case studies made in these States. In addition, the cities of Calcutta, Bombay and Delhi were also covered. The main focus of the study, however, was marketing and processing. Some of the findings of the study have been cited in this section.

1 1969, Report on the Economics of Pig Breeding in Krishna District of Andhra Pradesh; 3-4, Madras, Agricultural Economics Research Centre, University of Madras.

2 Pork and Pork Products in India—Study by Progressive Agro-Industrial Consultants.

4.6.37 Annual average cost of maintaining *desi* pigs in rural areas unders actual village conditions was reckoned at about Rs 10 and in semi urban/urban areas at Rs 20. In rural areas the animals are generally left to fend for themselves. According to a case study, whereas a piglet costs between Rs 15 to 25 at the stage of weaning, after a year of growth and fattening it fetches about Rs 130 to 150 giving a margin of profit of Rs 105 to 115. A few animals, if maintained properly, could supplement the household income to a significant extent. However, the same case study further revealed that the primary producer got only 50 per cent of the margin, the other half having been appropriated by village money lenders who generally advanced the amount for initial investment on piglets. The practice in vogue in large areas of Bihar etc. was that *mahajans* or intermediaries provided piglets to primary rearers for fattening, and the initial cost as also an equal share of the profit margin were realised from the producers at the time of disposal. The returns appropriated by the *mahajan* on small investments ranged from 150 to 400 per cent. The primary need, therefore, is to free the primary producers from the grip of the *mahajan*/intermediaries and provide them with the necessary assistance through institutional sources.

4.6.38 Very little information is available on the performance of indigenous pigs and of superior exotic and crossbred stock sired by boars of exotic breeds reared in the country. Advantages of rearing crossbred pigs cannot be achieved unless the breeding programme is well supported by necessary infrastructural facilities. Such has been the case with several crossbreeding programmes undertaken so far. Due to lack of proper facilities, a number of farmers were compelled to treat crossbred pigs at par with their *desi* counterparts in terms of feed, health cover and housing facilities. As a consequence the performance of the crossbred stock was below optimum.

4.6.39 Exotic breeds give large litter size—about 8 to 10 piglets which are excellent weight gainers. The performance of these animals, however, depends upon the care taken. The economic viability of maintaining these animals has to be reckoned in terms of cost, particularly, that of feed. On the basis of a feed conversion ratio of 1 : 4 and price of feed per kg at Re 1, the cost per kg of live weight works out to Rs 4. Assuming that feed costs account for 75 per cent of the total cost in the case of improved stock, the total cost of production per kg live weight comes to Rs 5.30. If to this is added 10 per cent as margin of profit the producer should expect a price of Rs 5.83 for a kilogram of live weight. As against this the current price at farm heads per kg live weight ranged from Rs 3 to Rs 4. It is obvious that the cost structure and present prices of pork are not con-

ducive to the development of piggery on modern lines. The present situation is to a large extent due to the bacon factories/pork processing plants operating very much below their installed production capacities; besides the production capacity is also small in many plants. The cost of raising pigs can be lowered to a considerable extent if suitable low cost feeds are formulated and made easily available to the pigs farmers. Various steps that can be taken in this direction have been discussed in greater detail in Chapter 32 on Other Livestock. Another important factor responsible for the low price procured by the farmers is the location, in many instances, of pig breeding centres far away from the main consuming centres.

4.6.40 An effective way to make pig rearing more economical would be to locate pig greeding farms in concentrated areas in the neighbourhood of bacon factories/pork processing plants. Suitable locations around such establishments offer considerable scope for largescale commercial piggery units and colonies of small units operated by individual breeders. There should also be adequate marketing facilities for their produce. The Krishna District Study referred to earlier indicated that the prospects of establishment of a bacon factory gave an impetus to modernisation of pig development in that district. The study also revealed that the delay in putting up the factory halted the spurt of growth. A further study in depth would bring out in proper perspective the process of growth of the commercial complex, the constraints thereon and the remedial actions for organising units in future.

4.6.41 Marketing margins in pork and pork products : Consumption of pork and pork products was estimated at 50 thousand tonnes in 1966-67. This constituted about one-tenth of the total meat consumption in the country. Study of the consumption pattern in respect of pork products in Calcutta market showed that the demand for it is generally inelastic. There is scope for raising the demand for pork or pork products, if quality can be ensured.

4.6.42 However, due to lack of any organised channels for marketing, the pig farmers do not generally obtain a reasonable price for their pigs. These people are in such an unorganised state that they have no option but to dispose of their animals at distress prices. Pig dealers operate in the main rearing tracts like Uttar Pradesh, Madhya Pradesh, Bihar and West Bengal; they buy pigs from farmers directly or through their agents but offer only low prices. Regular pork processing establishments also do not offer reasonable prices. The price spread noticed between primary producing areas and final consuming areas, for instance between Uttar Pradesh and Calcutta, between Uttar Pradesh and Delhi and between Purnea and Saharasa districts in Bihar

and terminal markets in the eastern region are indicated in Table 4.9.

TABLE 4.9
Price Spread from Producer to Consumer

	Uttar Pra- desh to Calcutta*	Uttar Pra- desh to Delhi**	Purnea and Saharsa to terminal markets in eastern re- gion
	Rs.	Rs.	Rs.
1. Price paid to primary producer (per kg. live weight)	2.00	2.25	2.00
2. Price received from final consumer	3.60(a)	6.00(a)	3.34(b)
3. Difference between (2) and (1)	1.60	3.75	1.34
4. Transport & processing and incidental charges	0.60	2.75	0.09
5. Margin of profit			
(i) Intermediaries	0.50	—	0.25 (primary) 1.00 (Secondary)
(ii) butcher-retailers	0.50	—	—
(iii) private sector processing plant	—	1.00	—

* Relates to *desi* pigs purchased by butchers-retailers.

** Relates to graded pigs purchased by a private sector processing in plant.

(a) Price received for pork derived from 1 kg live weight of pig.

(b) Price of pig at the terminal market.

Price received by the primary producer constituted 40 to 60 per cent of the price paid by consumers. Thus, a good proportion of profit in the marketing of pigs has been taken away by middlemen and processing establishments. The position could be changed for the better if only the pig breeders are helped to organise themselves into cooperatives. These cooperatives will then be able to bargain for a better price for the pigs.

4.6.43 Future possibilities : If the study of Gannavaram-Gudivadavijayawada area of Krishna district referred to earlier provides any indications, the prospects of breeding exotic strains like Yorkshire White and Land Race are quite promising. The study showed that progressive breeders who took to rearing of these exotic breeds could not only develop a market for its produce, but also popularise pig breeding among farmers to such an extent as to attract the establishment of bacon factory in the area. According to an estimate of profit

tability made by us¹ a small piggery unit consisting of 3 sows required an initial investment of Rs 1,700 (of which 25 per cent was subsidised) and maintenance expenditure of Rs 4,935 per annum, of which animal feed alone accounted for Rs 4,640. The gross return anticipated was of the order of Rs 6,125, giving a net income of Rs 1,190. These estimates assumed a feed conversion efficiency of 4 kg of feed for 1 kg gain in live weight and feed price of 50 paise per kg. The margin of profit can be increased if cost on feed can be reduced by utilising food wastes from breweries, food processing units, etc.

4.6.44 However, one thing that the review indicates is that the data presently available on piggery woefully lack in coverage and content. It is necessary to organise more studies in the economics of the rearing of indigenous, crossbred and exotic pigs, to focus on cost elements, particularly the measures for reducing cost of feed, and on organisation of marketing for reducing the middlemen's margin. There is also need for a study of some piggery complexes (bacon factories with pig farms in the neighbourhood) to reflect piggery development in all its aspects.

4.6.45 Before concluding discussion in this Section, we should emphasise, as in paragraph 4.6.2 that the analytical studies and surveys conducted in early and late sixties do not fully reflect the income and employment potential of livestock development programmes based on recent advances in the field of livestock production. With the implementation of various livestock development and health cover programmes recommended in the concerned chapters in the Report, the productive capacity of livestock will considerably increase and livestock rearing would become more market-oriented and profitable. The need for more comprehensive, better organised and continuous studies at different stages of livestock development have been identified earlier in this Section.

7 FISHERIES

4.7.1 Population of fishermen in 1970 was about 1.84 million. Of this 1.06 million were dependent on marine fisheries and 0.78 million on inland fisheries. The former group was concentrated mainly in Kerala, Tamil Nadu, Andhra Pradesh, Maharashtra and Gujarat while the latter mainly in the eastern States of West Bengal, Bihar and Orissa. Very little information, however, is available on the economic aspects of fish culture as also the economic condition of the fishing population.

¹ 1973, August, Interim Report on Poultry, Sheep and Pig Production, through Small and Marginal Farmers and Agricultural Labourers for Supplementing their Income : 58, New Delhi, National Commission on Agriculture.

Inland Fisheries

4.7.2 At the instance of the Commission, the Indian Institute of Management, Calcutta organised an investigation into the economics of inland fisheries in 5 eastern States viz., West Bengal, Orissa, Bihar, Assam and Tripura, in 1972. The main objective of the study was to determine costs and returns of inland water fishing enterprises. The study covered four distinct categories viz., village tanks, fish farms, fishermen's families and fishermen's cooperatives.

4.7.4 Village tanks : It is generally believed that the fish culture in village tanks is neglected owing to factors like multiplicity of ownership, silting up of tank-bed and infestation of tanks with vegetative growth etc. The investigation revealed that 83 per cent of tanks were under private ownership; of these as many as four-fifths were under single ownership. Two-thirds of the tanks were found free from vegetative undergrowth or overgrowth and only one third reported such problems as hampering fish culture. However, as for size distribution of tanks it was found that majority of them were of size less than two-thirds of a hectare or 5 bighas. Only one-fifth of tanks were of size 0.67 ha and above and they accounted for two-thirds of total water area of tanks. One-tenth of the tanks, being very shallow, dried up during summer. Only about one half of tanks investigated had more than a metre of water considered minimum for purposes of stocking etc. It was, therefore, obvious that all tanks were not endowed adequately to undertake fish culture; it was also clear that siltation of tank bed had adversely affected the water holding capacity of tanks.

4.7.4 About 76 per cent of village tanks investigated were used for fish culture, particularly that of carp. A little more than half the number of tanks was in West Bengal, one-fourth of them in Orissa, about one-tenth in Bihar and the remaining in Assam and Tripura. The annual average catch of fish per tank with an average water area of 0.55 ha was 143 kg; (i.e. 260 kg per hectare water spread); it however varied between 39 kg in Assam and 248 kg in Orissa. Average costs, returns (in value terms) and net profit per tank are indicated below :

(Rs per tank)

	Total cost	Value of total catch (Rs)	Net profit
West Bengal	219	542	323
Bihar	272	554	282
Orissa	359	878	519
Assam	219	230	11
Tripura	684	1,075	391
All States	295	654	359

4.7.5 Main components of cost were (a) stocking (i.e. expenditure on spawn, fry and fingerlings, (b) feed, (c) maintenance of tanks, (d) purchase of fishing nets etc. and (e) collection cost. These five items accounted for 46 per cent, 9 per cent, 17 per cent, 6 per cent and 22 per cent respectively of total cost. Stocking cost was higher at 55 to 57 per cent of total cost in West Bengal and Tripura. In case of tanks in Bihar and Orissa cost of collection of the fish was as much as the cost of stocking, each accounting for 36 to 37 per cent of the total cost. Generally fishermen were employed on a catch-sharing basis for collection of fish; the former's share ranging from 8 per cent to 50 per cent of the catch. Expenditure on stocking appeared to exert a definite influence on the final yield. Tanks in Assam reported very meagre expenditure on stocking—hardly Rs 24 per tank—and ended up with a catch valued only at Rs 230 and a net profit of Rs 11. Though average yield of Tripura tanks was the highest, the disproportionately higher stocking cost (Rs 392 per tank compared to Rs 132 in Orissa and Rs. 120 in West Bengal) reduced the margin of profit considerably. Net profit per tank was highest in Orissa. Besides taking care of the stocking problem, tank owners also paid attention to excavation of tanks and their maintenance free of vegetative growth etc. These efforts appeared to have yielded good dividends.

4.7.6 The average net income obtained per tank ranged between Rs 300 to Rs 580 in four States. Tanks generally provided a subsidiary source of income to rural households. There appeared to be considerable scope for augmenting income from this source if adequate attention is paid to deepening of the tanks, maintaining them properly and stocking them periodically with right type of fry and fingerlings.

4.7.7. The average catch of 260 kg per hectare of water spread obtained from tanks in these areas should be considered very low. A catch of 1,000 kg per hectare is considered possible even by following conventional practices. Experiments have shown that fish production could be raised manifold if improved technology is adopted. The main elements of modern fish production technology are (a) use of manures and fertilisers to augment biological production of natural foods; (b) use of supplementary artificial feeds and (c) intensive stocking. The current practice consists mainly of stocking of seedfish but that too not in adequate numbers. Experiments conducted on major carps in small tanks and ponds upto 0.4 ha by Central Inland Fisheries Research Institute have shown that fish production could be raised to 3,000 kg per hectare with use of modern inputs like manures, fertilisers and artificial feeds. However, culture with major indigenous carps alone did not show adequate response to inputs, particularly supplementary

feeds. Experiments on composite carp culture, combining major carps with some exotic species like grass carp and silver carp showed that yields, as much as 5,000 to 8,000 kg per hectare could be obtained under conditions of efficient management, giving a much higher profit. This no doubt would entail considerable additional expenditure on renovation and repair of tanks and use of new inputs.

4.7.8 The possibilities of carp culture from a 0.4 ha tank, under 3 different sets of conditions viz. (a) raising Indian carps, following only the practise of stocking of seed fish, (b) raising Indian carps with inputs comprising increased stocking, manure and fertilisers and (c) composite culture of Indian carps and exotic carps with inputs comprising seed fish, manures, fertilisers and artificial feeds are indicated below. It is assumed that the renovation/repairs would cost about Rs. 3,000 per tank for which institutional finance would be available at 10 per cent interest and that one-tenth of the capital loan and interest would be repaid every year. Input items were the same as those indicated in Appendix 37.3 of Chapter 37 on Inland Fisheries and agriculture except that charges on account of water supply to tanks are excluded. They are based on the quantities used in culture experiments and evaluated at prices prevalent in 1972. An average price of Rs 3 per kg of fish has been assumed at the producer's level

TABLE 4.10

Costs and Returns of Carp-culture from a Typical 0.4 hectare Tank

	(a)	(b)	(c)
Fish production on 0.4 ha. (in kg) . . .	400	1,200	2,000
(in Rs)	1,200	3,600	6,000
Inputs (in Rs)			
(a) seed fish	100	200	250
(b) manures, fertilisers and feed	—	425	1,145
(c) Loan repayment and interest charges	517	570	647
(d) Labour charges etc.	420	420	420
Total cost (rounded)	1,040	1,615	2,460
Sale proceeds deducting 5 per cent commission	1,140	3,420	5,700
Net return (in Rs)	100	1,805	3,240

NOTE :—(a), (b) and (c) are the situations indicated in para 4.7.7.

The table shows that profitability increases manifold when exotic species are raised with indigenous species of carps and modern practices are adopted. The new opportunities in intensive carp culture in

ponds and tanks have been discussed in detail in Chapter 37 on Inland Fisheries and Aquaculture.

4.7.9 Fishermen's households : The investigation covered 1085 fishermen's households with a population of 5683 mostly engaged in capture fisheries. About 34 per cent of the households was drawn from West Bengal, 21 to 22 per cent each from Bihar, Orissa and Assam and 2 per cent from Tripura. Nearly three-fourths of them were illiterate. Only 1 per cent had passed the school final stage. The work force comprised 27 per cent of the population; among them 83 per cent were engaged in fishing and fish trade—84 per cent as main occupation and 3 per cent as subsidiary occupation.

4.7.10 These households did not possess much land. Average land held per household was about 0.27 ha in Assam, 0.20 ha in Orissa, 0.14 ha in West Bengal and less than 0.14 ha in Bihar. They possessed fishing equipment, mostly nets and boats. Average value of such equipment held was about Rs. 560 per household.

4.7.11 Data collected on income and expenditure of fishermen's families are presented in the following table :

TABLE 4.11
Average Income and Expenditure per Household

(In rupees)

	Income			Expenditure		
	From fishing & fish trade	All sources	On fishing	Cost of living	Total	Net savings
West Bengal . . .	2,226	2,670	232	1,777	2,009	661
Bihar . . .	1,273	1,980	273	1,619	1,892	88
Orissa . . .	1,730	2,139	152	1,671	1,823	316
Assam . . .	2,008	3,149	232	1,875	2,107	1,042
Tripura . . .	1,757	2,463	141	1,731	1,872	591
All States . . .	1,864	2,507	221	1,741	1,962	545

Average annual gross income per household from all sources ranged between Rs 2,000 to 3,150. Besides fishing, households received income from other occupations as also from supplementary sources like land and livestock. On an average, 74 per cent of income accrued from fishing and fish trade, 16 per cent from other occupations, 9 per cent from land and about 1 per cent from livestock. Whereas proportion of income received from fishing was as much as 82 per cent in West Bengal and Orissa, it was only around 64 per cent in

Bihar and Assam. Bihar households reported a sizeable proportion of income from other occupations and Assam and Tripura households from land.

4.7.12 The operating cost on fishing reported by the households was only in the range of Rs 141 to Rs 273 which constituted hardly 8 to 21 per cent of the gross income from fishing alone. Annual per capita cost of living in these States varied from Rs 310 to Rs 340. The data collected however revealed a small surplus of income over expenditure. A major limitation of the study relating to household was that it did not give any quantitative information about the catch.

4.7.13 The investigation also covered some fish farms and fishermen's cooperatives. Fish farms were generally intended to supply fry and fingerlings to fish tanks etc. Of the 107 fish farms studied, 58 were government farms, 43 private farms and the remaining coopeatives. Government farms were mainly experimental fish seed farms. A major drawback of this enquiry was that it did not make any distinction between the government farm and the private farm. The invstigation also covered 129 fishermen's cooperatives of which only 69 were functioning at the time of investigation. The main activities of these cooperatives consisted of leasing in fishing grounds from Government and other source of income of these societies was the commission they charged for them also maintained nets and boats for purposes of renting out. Main source of income of these societies was the commission they charged for their services and sale proceeds of fry and fingerlings. It was overserved that the accounts of the functioning and dormant societies were mixed up in the analysis with the result that no meaningful conclusions could be drawn.

Marine Fisheries

4.7.14 The Programme Evaluation Organisation organised a survey¹ of marine fisheries during November, 1969 to April, 1970. The major objective of the study was to focus on the operational efficiency of mechanised boats in the public, cooperative and private sectors, in terms of cost, returns and employment, vis-a-vis country boats. Total number of mechanised boats in operation in 1969 was estimated at 6,515 of which 75 per cent were in the private sector, 20 per cent in the cooperative sector and 5 per cent in the public sector. There was concentration of privately owned mechanised boats in Maharashtra and Gujarat. Tamil Nadu and Karnataka too had a sizeable number of them. Country boats in operation numbered 90,425 most of which were in the private sector. The sample for the field study consisted of

1 1971, Evaluation of the Programme of Mechanisation of Fishing Boats; New Delhi, Programme Evaluation Organisation, Planning Commission

382 mechanised boats, 67 country boats and 1,214 fishermen households. While about 6 per cent of the mechanised boats were covered by the investigation, the sample of country boats constituted only an insignificant proportion of its total population.

4.7.15 **Investment :** The average investment on a mechanised boat was about Rs 39,500 compared to Rs 5,400 made on a country boat. There was considerable variation in investment on mechanised boats between sectors and States, stemming mainly from difference in power of engines, their make and origin and fittings on the boats. Investment per boat was highest in the cooperative sector and minimum in the private sector. While institutional finance, government loans, loans outstanding in Kerala, Andhra Pradesh and Maharashtra on mechanised boats in the cooperative sector and 62 per cent in the private sector, country boats were largely self-financed. Cooperative sector, however, was badly in arrears in the matter of repayment of loans, loans outstanding in Kerala, Andhra Pradesh and Maharashtra ranged from 83 per cent to 100 per cent.

4.7.16 **Operational cost :** The average annual cost of operating a mechanised boat in 1968-69 was about Rs 17,684. Main components of cost were fuel, wages and repair which accounted for 36 per cent, 37 per cent and 18 per cent respectively. The operational cost ranged from Rs 11,186 in the public sector to Rs 19,787 in the cooperative sector. The low operational cost in the public sector was presumably due to the low level of operation during the year. Number of days for which boats were out into-sea for fishing was only 96 for public sector boats, whereas it was 152 for boats in the cooperative sector and 181 for those in the private sector. Public sector boats also did not go far into the sea, average distance covered by them was 16.7 Nkm* compared to 20.3 Nkm and 21.5 Nkm by boats in the cooperative and private sectors respectively. At least to this extent, expenditure on fuel and lubricants was avoided. Operational cost of a country boat was only Rs 4,610 or merely one fourth of the operational cost of mechanised boats. More than three fourths of the cost was incurred on wages and 15 per cent on repairs. These boats on an average worked for 178 days and operated upto a distance of 13 Nkm into the sea.

4.7.17 **Gross returns :** Average annual gross return per mechanised boat, in terms of catch was estimated at 29.4 tonnes pr annum valued at Rs 26,900. Relevant figures for public sector boats were 19.3 tonnes valued at Rs. 14,800 and for the private sector boats 31.2 tonnes valued at Rs 29,000. Annual average haul of a country craft was estimated at 17.7 tonnes valued at Rs 8,900. The latter, however

* Nautical kilometres.

appeared to be an overestimate and therefore needs scrutiny. This point is also made in para 38.8.3 of Chapter 38 on Marine Fisheries.

4.7.18 Average rate of gross return on an investment of Rs 100 on mechanised boats worked out to Rs 69. It was substantially higher at Rs 81 in respect of private sector boats and lowest at Rs 30 in the public sector. These returns, however, compared very unfavourably with that obtained in respect of country boats, estimated at Rs 165. The picture is very much the same if another variant of operational efficiency viz. gross return on operational cost is taken as the criterion.

4.7.19 On the basis of data relating to investment, cost, return and operational efficiency collected through the enquiry, it would seem that mechanised boats were not more efficient than country boats and that the mechanised boats operating in the private sector were more efficient in terms of returns to investment and operational cost than those in the other two sectors. Least satisfactory performance was that of boats belonging to the cooperative sector. This sector reported highest unit investment and cost but did not show commensurate returns nor efficiency. Country boats on the other hand appeared to do well. Considering that average investment and operational cost in respect of country boats was only one seventh and one-fourth respectively compared to mechanised boats, the average catch obtained by them was as much as 60 per cent of the latter in quantitative terms and one-third in value terms. These boats gave 165 per cent return (in gross terms) on investment whereas mechanised boats gave only 69 per cent. It may be noted that in both cases depreciation has not been taken into account. However, as pointed out earlier, the catch estimates in respect of country boats are highly suspect. A major limitation of the enquiry was the inadequacy of the sample size of the country boats. It is, therefore, necessary to attempt a more rigorous cost accounting survey with extended coverage of country boats before we commit to any particular view regarding the relative efficiency of different sectors, particularly between the mechanised and non-mechanised sector. It is further suggested that while in future studies, the comparison is made mainly between similar fishing methods adopted by mechanised and non-mechanised boats, the comparative economics of different fishing techniques adopted by mechanised boats like trawling, gill-netting, long-lining etc. should also be studied.

4.7.20 Employment, earnings and levels of living : The average size of fishermen's families studied consisted of 7 members; it varied between 5.4 in West Bengal and 9.3 in Kerala. However, work force available with the family did not appear to have any direct

relationship with family size. Orissa households reported the maximum strength of work force (2.4) and Tamil Nadu and West Bengal, the lowest. Fishermen were mostly engaged in fishing, which also included operations such as repairs to nets and boats, painting of boats etc. An inter-sectoral comparison of employment revealed maximum overall employment in the public sector and minimum in the cooperative sector. Fishermen in the private sector, however, recorded the highest number of days of work in fishing proper while employment in other fields was highest in the public sector. Average family income obtained was highest in the private sector being Rs 3,612 and the least in the cooperative sector being Rs 1,909. Per capita incomes obtained followed the same pattern; Rs 514 in the private sector, Rs 339 in the public sector and Rs 269 in the cooperative sector and Rs 471 for the mechanised sector as a whole. Statewise, family income from all sources was maximum in Gujarat, followed by Maharashtra and West Bengal and the least in Kerala. The same trend was evident in respect of per capita income.

4.7.21 A fisherman operating a country boat was employed for 166 days in fishing and 40 days in other pursuits or in all for 206 days during the year compared to 210 days in the mechanised sector. Average family income of a country boat operator in 1968-69 was Rs 3,167 as against Rs 3,322 earned in the mechanised sector. Per capita income worked out to Rs 449 in the non-mechanised sector and 471 in the mechanised sector. The pattern of consumption of foodstuff and possession of household effects did not show any significant variation between households belonging to the mechanised sector and the non-mechanised sector.

APPENDIX 4.1

Gross Output, Paid-out Cost, Farm Business Income and Net Income per Hectare by Size Groups 1954-55 to 1959-60*
(Paragraphs 4.3.3., 4.3.5 & 4.4.1)

Size-groups (hectares)	Average size of farm (hectares)	Rupees per hectare					Output/ input ratio	Farm business income per capita			
		gross output	paid out cost (A2)	total cost (C)	farm business income	net income					
1	2	3	4	5	6	7	8	9			
Punjab (Amritsar and Ferozepore) 1954-57											
Below 2.02	.	.	.	1.52	497	259	593	238	-96	0.84	77
2.02-4.05	.	.	.	2.99	460	255	502	205	-42	0.92	88
4.05-8.09	.	.	.	5.81	428	227	445	201	-17	0.96	121
8.09-20.22	.	.	.	11.77	381	193	381	188	--	1.00	209
20.22 & above	.	.	.	31.87	353	168	314	185	39	1.13	630
Overall	.	.	.	7.11	403	208	408	195	-5	0.99	170
Uttar Pradesh (Meerut and Muzaffarnagar) 1954-57											
Below 2.02	.	.	.	1.34	722	442	665	280	57	1.09	58
2.02-4.05	.	.	.	3.08	660	368	534	292	126	1.24	128
4.05-6.07	.	.	.	4.90	561	334	452	227	109	1.24	155
6.07-8.09	.	.	.	6.84	563	326	435	237	128	1.29	172
8.09 & above	.	.	.	11.17	578	346	452	232	126	1.28	216
Overall	.	.	.	4.16	603	343	482	260	121	1.25	142

APPENDIX 4 1 (Contd.)

APPENDIX 4.1 (Contd.)

Size-groups (hectares)	Average size of farm (hectares)	Rupees per hectare				Output/ input ratio	Farm business income per capita	
		gross output	paid out cost (A2)	total cost (C)	farm business income			
1	2	3	4	5	6	7	8	9
Tamil Nadu (Salem and Coimbatore) 1954-57								
Below 1.01	0.64	550	463	675	87	-125	0.82	16
1.01-2.02	1.49	481	289	634	192	-153	0.76	56
2.02-3.03	2.42	417	246	377	171	40	1.11	83
3.03-4.05	3.52	425	221	364	204	61	1.17	131
4.05-6.07	4.81	248	159	253	88	-5	0.98	71
6.07-8.09	6.91	175	115	216	60	-41	0.81	69
8.09-10.12	9.15	165	110	183	55	-18	0.90	67
10.12 & above	15.12	204	95	161	109	43	1.27	253
Overall	3.10	319	171	292	148	27	1.09	85
Maharashtra (Akola and Amraoti) 1955-57								
Below 2.02	1.17	259	110	217	149	42	1.19	37
2.02-4.05	2.95	219	100	195	119	24	1.12	68
4.05-6.07	5.06	231	109	187	122	44	1.24	130
6.07-8.09	6.92	201	89	168	112	33	1.20	119
8.09-12.14	9.79	208	92	158	116	50	1.31	188
12.14-16.18	14.00	209	88	162	121	47	1.29	233

16-18-20-23	.	.	.	.	17-89	239	109	178	130	61	1-34	391
20-23 & above	.	.	.	.	34-56	226	109	172	117	54	1-31	645
Overall	.	.	.	.	8-90	210	104	166	106	44	1-27	161
Maharashtra (Ahmednagar) 1955-57												
0-2 02	.	.	.	.	1-07	226	148	282	78	-56	0-80	14
2-02-4-05	.	.	.	.	3-10	232	132	228	100	4	1-02	53
4 05-6-07	.	.	.	.	4-86	145	83	160	62	-15	0-91	57
6 07-8-09	.	.	.	.	6-80	363	225	300	138	63	1-21	134
8-09-10-12	.	.	.	.	8-96	98	53	101	45	-3	0-98	65
10-12-12-14	.	.	.	.	11-17	129	66	108	63	21	1-19	95
12-14-20-23	.	.	.	.	15-18	173	104	155	69	18	1-12	106
20-23 & above	.	.	.	.	26-93	81	40	70	41	11	1-17	108
Overall	.	.	.	.	8-58	151	87	138	64	13	1-09	76
Maharashtra (Nasik) 1955-57												
0-2 02	.	.	.	.	1-17	303	250	387	53	-84	0-78	12
2 02-4 05	.	.	.	.	3-12	296	171	291	125	5	1-02	62
4 05-6-07	.	.	.	.	4-96	159	106	177	53	-18	0-89	45
6 07-8 09	.	.	.	.	6-94	140	75	147	65	-7	0-95	69
8 09-10 12	.	.	.	.	9-13	129	69	124	60	5	1-04	82
10 12-12 14	.	.	.	.	11-15	147	65	117	82	30	1-26	117
12-14-20-23	.	.	.	*	14-97	171	115	162	56	9	1-06	109
20-23 & above	.	.	.	.	26-75	105	67	96	38	9	1-09	144
Overall	.	.	.	.	7-41	158	94	156	64	2	1-01	71

APPENDIX 4.1 (Contd.)

Size groups (hectares)	Average size of farm (hectares)	Rupees per hectare				Output/ input ratio		Farm business income per capita
		gross output	paid out cost (A2)	total cost (c)	farm business income	net farm income	8	9
1	2	3	4	5	6	7	8	9
Andhra Pradesh (West Godavari) 1957-60								
0-0.51	0.29	1280	722	1265	558	15	1.01	44
0.52-1.01	0.74	1127	712	1161	415	-34	0.97	59
1.02-2.02	1.41	895	566	924	329	-29	0.97	85
2.03-3.03	2.54	746	509	806	237	-60	0.93	104
3.04-4.04	3.63	843	650	971	193	-128	0.87	111
4.05-6.07	5.01	939	647	937	292	2	1.00	234
6.08-8.09	6.90	1008	736	1035	272	-27	0.97	241
8.09 & above	12.15	922	539	909	383	13	1.01	716
Overall	3.35	929	605	944	324	-15	0.98	198
West Bengal (Hooghly and 24 Parganas) 1954-57								
Below 0.51	0.26	583	262	576	321	7	1.01	18
0.51-1.01	0.73	598	282	526	316	72	1.14	39
1.01-1.52	1.24	573	346	519	227	54	1.10	42
1.52-2.02	1.85	599	320	455	279	144	1.32	71
2.02-3.03	2.44	583	289	484	294	99	1.20	78
3.03-4.05	3.82	551	230	418	321	133	1.32	137
4.05-6.07	4.31	400	198	366	203	35	1.09	70
6.07 & above	6.67	437	198	385	240	52	1.13	109

Overall	.	.	.	.	.	1.22	546	259	472	287	74	1.16	55
Orissa (Sambalpur) 1957-60													
Below 1.01	.	.	.	.	.	0.59	329	143	299	186	30	1.10	26
1.01-2.02	.	.	.	.	.	1.38	316	136	274	180	42	1.15	50
2.02-4.05	.	.	.	.	.	2.75	287	146	262	141	25	1.09	74
4.05-6.07	.	.	.	.	.	5.31	255	138	222	97	33	1.14	77
6.07 & above	.	.	.	.	.	8.62	311	166	245	145	66	1.27	158
Overall	.	.	.	.	.	2.17	301	151	259	150	42	1.16	64

* 1. 1966 Farm Management in India, Directorate of Economics and Statistics.

2. Farm Management-combined reports of Punjab (Amritsar & Ferozepur) 1954-57; Uttar Pradesh (Meerut & Muzaffarnagar) 1954-57; Tamil Nadu (Salem & Coimbatore) 1954-57; Maharashtra (Akola & Amraoti) 1955-57; Maharashtra (Ahmednagar) 1955-57; Maharashtra (Nasik) 1955-57; Andhra Pradesh (West Godavari) 1957-60; West Bengal (Hooghly & 24-Parganas) 1954-57; Orissa (Sambalpur) 1957-60, New Delhi, Directorate of Economics and Statistics, Ministry of Agriculture.

NOTE : 1. 1 Per capita figures have been worked out by multiplying per hectare figures by average size of farm and then dividing the same by family size.

2. In case of Andhra Pradesh (West Godavari) cost A2 arrived at by deducting farm business income from gross output.

3. In the case of Tamil Nadu (Salem and Coimbatore) Family size is assumed to be closer to the pattern in Andhra Pradesh (West Godavari).

APPENDIX 4.2

(Paragraph 4.3.22)

Paid out Cost, Gross Return and Farm Business Income from High Yielding Varieties

(1967-68 and 1968-69)

(190/100 ann 15.00-05)

States	(Rs per Hectare/Quintal per Hectare)										
	Paid Out Cost (Rupees per hectare)						Average yield (Qdls/ Hect)	Procure- ment price (Rs)	Gross income (Rs)	Farm business income (Rs)	
	seeds	fertilisers	Plant protec- tion	labour charges	irrigation charges	total@ exp.					
1	2	3	4	5	6	7	8	9	10	11	
	paddy (kharif) 1967*										
Bihar	41	49	2	260	33	506	12.40	56.25	697	191	
West Bengal	41	378	25	515	73	1,051	32.57	56.25	1,832	781	
Uttar Pradesh	24	315	42	487	34	903	38.45	56.25	2,163	1,260	
Orissa	11	287	26	156	10	495	9.56	48.00	459	(-)-36	
Andhra Pradesh	29	332	21	335	19	759	33.11	46.00	1,523	764	
Tamil Nadu	33	443	16	522	31	1,107	22.76	45.00	1,024	(-)-83	
average	35	375	16	475	32	1,003	23.21	51.29	1,190	187	
	paddy (kharif) 1968+										
Bihar	33	341	75	225	45	658	32.00	56.25	1,800	1,142	
West Bengal	52	391	255	470	36	981	37.40	56.25	2,104	1,123	
Uttar Pradesh	66	529	435	408	178	1,260	35.90	56.25	2,019	759	
Orissa	36	234	28	170	10	508	29.00	48.00	1,392	884	
Andhra Pradesh	44	496	42	617	39	1,373	48.00	46.00	2,208	835	
Tamil Nadu	53	395	29	449	16	1,128	39.90	45.00	1,795	667	
average	47	438	34	497	39	1,171	42.05	51.29	2,157	986	

paddy (rabi) 1967-68**										
West Bengal	65	366	48	421	21	924	43.76	56.25	2,462	1,538
Orissa	24	335	6	246	20	668	53.65	48.00	2,575	1,907
Andhra Pradesh	32	345	42	371	13	812	43.39	46.00	1,996	1,184
Tamil Nadu	26	277	14	265	—	649	29.16	45.00	1,312	663
average	34	341	37	357	14	798	43.52	51.29	2,232	1,434
paddy (rabi) 1968-69++										
West Bengal	48	238	33	548	110	993	65.65	56.25	3,693	2,700
Orissa	42	326	24	257	20	718	59.38	48.00	2,850	2,132
Andhra Pradesh	47	571	106	614	69	1,565	47.33	46.00	2,177	612
Tamil Nadu	47	384	20	331	25	914	31.34	45.00	1,410	496
average	46	449	63	477	54	1,201	46.88	51.29	2,404	1,203
wheat 1967-68**										
Haryana	65	166	2	73	54	416	28.42	78.50	2,231	1,815
Punjab	70	261	2	172	66	654	27.58	78.50	2,165	1,511
Uttar Pradesh	86	231	2	222	70	631	22.56	82.50	1,861	1,230
Rajasthan	49	230	19	390	16	720	29.46	81.00	2,386	1,666
average	74	236	3	192	63	620	25.95	80.13	2,079	1,459
wheat 1968-69++										
Haryana	102	203	—	63	100	532	26.65	76.00	2,025	1,493
Punjab	97	232	—	100	80	564	25.89	76.00	1,968	1,404
Uttar Pradesh	97	174	1	225	67	602	22.28	76.00	1,693	1,091

Haryana	35	77	—	56	21	192	16-61	54-00	897	704
average	31	120	11	82	8	261	11-06	53-00	586	325
				bajra 1968 +						
Rajasthan	27	355	19	268	32	701	7-20	50-00	360	(—)341
Maharashtra	18	193	5	53	9	302	7-50	51-00	382	80
Uttar Pradesh	37	544	14	104	38	765	13-10	55-00	720	(—)45
Haryana	37	96	—	45	56	254	9-70	54-00	524	270
average	24	238	8	115	22	424	7-82	52-50	411	(—)13

* 1968, August. Evaluation Study of the High Yielding Varieties Programme — Kharif-1967.

+ 1969, June. Report on Evaluation of the High Yielding Varieties Programme-Kharif-1968.

** 1968, Evaluation Study of the High Yielding Varieties Programme. Report for Rabi, 1967-68.

++ 1969, Nov. Evaluation Study of the High Yielding Varieties Programme Report for Rabi, 1968-69 All studies prepared by :
Programme Evaluation Organisation, Planning Commission, New Delhi.

@ Total expenditure include miscellaneous items also.

\$ Adjusted figures.

NOTE. 1. In the case of paddy, average yield relates to unhusked grain.

2. Average figures given are weighted average for the States listed, weights being the area under high-yielding varieties of the crop as given in the studies.

APPENDIX 4.3

(Paragraph 4.3.22, 4.3.25, 4.3.29)

Additional Cash Expenditure, Additional Gross and Net Return and Ratio of Additional Gross Return to Additional Cash Expenditure for High-Yielding Varieties over Local Varieties (Participants) 1968-69

Centres	(Rs per hectare)						
	Cash expenditure per hectare		Additional expenditure	Additional gross return	Additional net return	Ratio of additional gross return to additional expenditure	7
	HYV	Local					
1	2	3	4	5	6		
paddy							
West Godavari							
kharif (1R-8)	1,271	793	478	587	109		1.22
rabi (1R-8)	1,845	1,429	416	1,126	710		2.70
East Godavari							
kharif (1R-8)	1,306	640	666	441	(-)/225		0.66
rabi (1R-8)	1,439	1,008	431	1,484	1,053		3.44
Thanjavur							
kharif (ADT-27)	556	316	240	289	49		1.20
rabi (1R-8)	725	548	177	1123	946		6.34
Birbhun	966	362	604	996	392		1.64

Varanasi	.	.	.	.	.	.	.	279	169	110	160	50	1.45
pur	.	.	.	.	.	.	.	570	436	134	676	542	5.04
										wheat			
Kotah S. 227	.	.	.	.	.	.	.	544	207	337	598	261	1.77
Amritsar Kalyan	.	.	.	.	.	.	.	751	361	390	1355	965	3.47
P.V. 18	.	.	.	.	.	.	.	686	361	325	994	669	3.05
Karnal Kalyan	.	.	.	.	.	.	.	519	334	185	603	418	3.25
S. 308	.	.	.	.	.	.	.	581	334	247	511	264	2.06
Faizabad H.Y.V.	.	.	.	.	.	.	.	611	456	155	362	207	2.33
Tikamgarh H.Y.V.	.	.	.	.	.	.	.	608	183	425	734	309	1.72

NOTE :—Data as culled out from respective studies on High-Yielding Varieties carried out by the Agro-Economic Research Centres, and published in the article "High-Yielding Varieties Cultivation—Some Economic Aspects" by Ram Saran in the Agricultural Situation in India, August—1972.

APPENDIX 4.4

(Paragraphs 4.3.32, 4.4.1)

Farm Cost and Returns in Selected Districts, 1966-70

Size-Groups (Hectares)	(Rs per hectare)					
	Gross out-put	Paid-out cost (A2)	Total cost (C)	Farm business income	Net farm income	Average size of holding per capita
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Surat-Bulsar (Gujarat) 1966-69					
Below 2.50	910	727	1,253	183	(-)-343	31
2.51-5.00	965	563	973	402	(-)-8	222
5.01-7.50	1,004	560	964	444	40	280
7.51-10.00	944	541	921	403	23	352
10.01 and above	1,009	566	1,010	443	(-)-1	566
Overall	974	574	994	400	(-)-20	217
	Deoria (Uttar Pradesh) 1966-69					
0.01-1.04	2,409	896	1,780	1,513	659	141
1.05-1.79	2,097	769	1,545	1,328	552	233
1.80-3.07	2,168	796	1,487	1,372	681	319
3.08 and above	1,907	752	1,327	1,155	580	529
Overall	1,993	768	1,394	1,225	599	374
	Muzaffarnagar (Uttar Pradesh) 1966-69					
Below 2.87	3,836	1,096	2,165	2,740	1,671	612
2.88-4.71	3,494	869	1,841	2,625	1,653	969

4.72-6.96	3,263	798	1,719	2,465	1,544	1,443	5.6
6.97-10.65	3,295	731	1,606	2,564	1,689	1,959	8.1
10.66 and above	3,132	682	1,535	2,450	1,597	2,779	14.1
Overall	3,285	763	1,661	2,522	1,624	1,603	6.5

Thanjavur (Tamil Nadu) 1967-70

Below 1.16	2,103	1,328	1,939	775	164	113	0.87
1.17-2.02	1,862	1,207	1,779	655	83	187	1.6
2.03-3.05	2,065	1,186	1,722	879	343	395	2.5
3.06-5.71	1,868	1,105	1,760	763	108	465	4.2
5.71 and above	1,682	832	1,497	850	185	1,196	9.4
Overall	1,840	1,024	1,648	816	192	437	3.1

Ferozepur (Punjab) 1967-70

Below 6.00	1,837	934	1,909	903	(-)-72	582	4.3
6.00-9.00	1,757	845	1,614	912	143	923	7.5
9.00-14.00	1,793	884	1,618	909	175	1,191	11.2
14.00-24.00	1,769	839	1,508	930	261	1,590	17.5
24.00 and above	1,972	723	1,376	1,249	596	4,109	33.9
Overall	1,832	867	1,643	965	189	1,413	12.4

Cuddapah (Andhra Pradesh) 1967-70

0-1.62	1,122	687	1,278	435	(-)-156	87	1.1
1.63-3.23	801	553	1,031	248	(-)-230	107	2.5
3.24-6.07	968	506	979	462	(-)-111	259	4.3
6.08-11.33	783	421	802	362	(-)-19	378	8.3
11.34 and above	856	423	807	433	49	942	15.5
Overall	854	452	865	402	(-)-11	345	5.8

APPENDIX 4.4 (Concld.)

Size-Groups (Hectares)	Gross out-put	Paid-out cost (A-2)	Total cost (C)	Farm business income	Net Farm income	Farm business income per capita	Average size of holdings
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Cuttack (Orissa) 1967-70						
0-0.81	1,723	674	1,399	1,049	324	87	0.5
0.82-1.32	1,527	609	1,075	918	452	145	1.1
1.33-2.03	1,527	623	1,094	904	433	178	1.7
2.04-3.64	1,294	536	894	758	400	203	2.5
3.65 and above	1,161	468	798	693	363	254	4.8
Overall	1,363	556	964	807	399	178	1.8

Data compiled from the Reports listed below :

Studies in the Economics of Farm Management in :

- (a) Surat-Bulsar (Gujarat); (b) Deoria (Uttar Pradesh); (c) Muzaffar nagar (Uttar Pradesh); (d) Thanjavur (Tamil Nadu); (e) Ferozepur (Punjab); (f) Cuddapah (Andhra Pradesh) and (g) Cuttack (Orissa)—Mineographed Directorate of Economics and Statistics, Ministry of Agriculture and Irrigation.

APPENDIX 4.5
 Cost per Litre of Milk at Different levels of Production
 (Based on Studies conducted in Delhi Villages)

(Paragraph 4.6.6)

(Rupees)

Levels of production (litres)	Number of holdings	Average milk production per farm (litres)	Cost of producing a litre of milk by considering								
			only animals in milk			all milch animals					
			A	B	C	A	B	C	A	B	C
1	2	3	4	5	6	7	8	9			
Upto 935	6	665	0.60 (0.43)	0.71 (0.62)	0.81 (0.68)	1.20 (0.76)	1.60 (1.15)	1.85 (1.25)			
936-1870	(1) 23	(854) 1471	0.38 (0.32)	0.46 (0.42)	0.53 (0.48)	0.58 (0.55)	0.75 (0.75)	0.88 (0.88)			
1871-2805	(13) 19	(1417) 2265	0.34 (0.32)	0.45 (0.45)	0.50 (0.50)	0.48 (0.46)	0.68 (0.65)	0.77 (0.75)			
More than 2805	(16) 12	(2298) 4087	0.29 (0.29)	0.42 (0.42)	0.46 (0.46)	0.39 (0.39)	0.56 (0.56)	0.63 (0.63)			
Overall average/total	(10)	(4257)									
all farms	60	2165	0.33	0.45	0.50	0.98	0.68	0.77			
seller farms	(40)	(2465)	(0.31)	(0.43)	(0.48)	(0.44)	(0.64)	(0.73)			
Non-seller farms	20	1565	0.43	0.48	0.56	0.64	0.79	0.93			

NOTE: Figures in brackets are obtained from holdings engaged in sale of milk.

APPENDIX 4.7

(Paragraph 4.6.10)

Gross Income, Farm Business Income and Input Costs of Dairy Enterprise in Melsana District (Gujarat)*

(Rupees per day per dairy animal unit)

Dairy unit group/year	Dairy clusters					Non-dairy clusters					
	gross income	paid out cost	total cost	farm business income	net income	gross income	paid out cost	total cost	farm business income	net income	
1	2	3	4	5	6	7	8	9	10	11	
A—Dairy Enterprises As A Whole											
below 500	1967	—	—	—	—	1.26	0.46	2.06	0.80	—0.80	
	1968	0.42	0.08	2.45	0.34	—2.03	0.32	1.67	0.78	—0.57	
500-01 to 1000-00	1967	0.71	0.36	1.96	0.35	—1.25	0.39	1.72	0.47	—0.86	
	1968	1.33	0.19	1.78	1.14	—0.45	0.22	1.42	0.58	—0.62	
1000-01 to 1500-00	1967	1.20	0.33	1.90	0.87	—0.70	0.35	1.65	0.53	—0.77	
	1968	1.25	0.21	1.88	1.04	—0.63	0.19	1.45	0.64	—0.62	
1500-01 to 2000-00	1967	1.56	0.40	2.04	1.16	—0.48	0.28	1.62	0.41	—0.93	
	1968	1.99	0.37	2.13	1.62	—0.14	0.16	1.20	0.54	—0.50	
2000-01 to 2500-00	1967	0.94	0.27	1.77	0.67	—0.83	0.30	1.65	0.61	—0.74	
	1968	0.86	0.13	1.48	0.73	—0.62	0.14	1.44	0.55	—0.75	
2500-01 and above	1967	—	—	—	—	—	—	—	—	—	
	1968	1.37	0.30	1.71	1.07	—0.34	0.12	1.75	0.78	—0.85	
total	1967	1.13	0.33	1.89	0.80	—0.76	0.35	1.68	0.60	—0.83	
	1968	1.40	0.25	1.82	1.15	—0.42	0.18	1.45	0.62	—0.65	

			B—Milk		Animal Only								
			1967	1968	0.09	0.36	1.66	—0.27	—1.57	2.51	0.44	1.96	2.07
Upto 400			1967	1968	0.13	0.33	4.60	—0.20	—4.47	1.35	0.33	1.92	1.02
400.01 to 700.00			1967	1968	1.51	0.78	3.10	—0.73	—1.59	1.25	0.52	2.09	0.73
			1967	1968	1.90	0.27	2.01	—1.63	—0.11	1.33	0.38	1.89	0.95
700.01 to 1000.00			1967	1968	1.57	0.39	2.01	—1.18	—0.44	1.14	0.46	1.90	0.68
			1967	1968	1.69	0.27	1.95	—1.42	—0.26	1.09	0.28	1.57	0.81
1000.01 to 1300.00			1967	1968	1.94	0.59	2.36	—1.35	—0.42	1.01	0.45	1.88	0.56
			1967	1968	2.68	0.41	2.30	—2.27	—0.38	0.86	0.23	1.52	0.63
1300.01 to 1600.00			1967	1968	1.49	0.42	2.17	—1.07	—0.68	0.82	0.28	1.58	0.54
			1967	1968	2.24	0.53	2.33	—1.71	—0.09	0.66	0.15	1.32	0.51
1600.01 and above			1967	1968	1.14	0.24	1.53	—0.90	—0.39	0.51	0.36	0.99	0.15
			1967	1968	1.01	0.17	1.55	—0.84	—0.54	0.87	0.18	1.65	0.69
Total			1967	1968	1.55	0.46	2.18	—1.09	—0.63	1.07	0.44	1.80	0.63
			1967	1968	1.86	0.34	2.01	—1.52	—0.15	1.02	0.26	1.61	0.76

* Studies in the Economics of Dairying in Gujarat 1967-68 (Melsana District) Agro-Economic Research Centre, Vallabh Vidyanagar

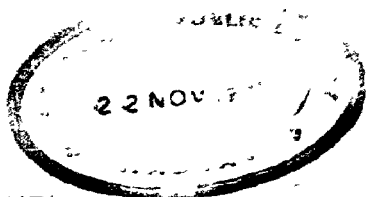
APPENDIX 4.8

(Paragraph 4.6.25)

Cost Structure of poultry Farms : Average Input Cost per 100 Birds according to size Groups*

Size group (Birds)	Av. investment	Input cost per hundred birds													dep- total
		pur- chased of birds	litter	labour	rent of land	feed	med- icines	elec- tri- city	misc.	int. on fixed capital	int. on in- vest- ment birds	int. on working capital	re- ciation		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
less than 200	2270	120	20	248	57	1957	90	44	60	101	50	15	133	2893	
200-300	1700	232	19	288	39	1695	97	43	56	78	36	13	106	2703	
300-500	1232	223	31	276	28	1946	74	47	45	54	29	15	76	2845	
500-1000	2360	210	29	333	16	1838	93	30	73	123	46	14	140	2961	
1000 and above	1815	152	13	207	6	1795	48	20	55	104	39	14	133	2586	
overall	1865	177	19	250	15	1824	66	28	58	100	38	14	130	2719	

*1972. *Studies in the Economics of Poultry Farming in Punjab* : Tables 5 and 5.27 New Delhi, Directorate of Economics and Statistics, Ministry of Agriculture.



ERRATA

PART I—REVIEW AND PROGRESS

Page No.	Paragraph/ Appendix/ Table No.	Line	As printed	As desired
1	2	3	4	5
8	1.4.2	4	far	for
8	1.4.3	1	group:	groups:
9	1.4.4	1	Panel	Panels
11	1.6.3 (iv)	1	Deveopment	Development.
14	1.7.13	1	Inputs,	Inputs.
18	6	1	agriculture	agriculture caters
22	Appendix 1.2	sr. no. 10	Singh, M	Singh, M.P.
24	4	10	eliminaated	eliminated
28	first new para	6	Maxico...Maxico	Mexico....Mexico
29	—do—	5	scourage	scourge
29	—do—	6	wiuld	would
31	Table	Col. 5 heading	May*22-23	March 22-23
31	—do—	Col. 6 heading	May 7, 1976	May 7, 1971
31	—do—	Col. 23 heading	Sep. 29, 197	Sep. 29, 1975
39	14 (vi)	1	1967-68 and	1967-68 to
39	18(x)	1	June	June
45	Sub-heading 2(viii)		CAMELS AND YARKS	CAMELS AND YAKS
55	5(xiv)-Sub- heading		VEGETABLEES	VEGETABLES
56	5(xvi)—,,		GROVING VEETABLES	GROWING VEGETABLES
57	7(i)—,,	2	SOIFTING	SHIFTING
58	7(iii)	Heading	TRENDS AED	TRENDS AND
58	7(iii)	fast but one	Westren	Western
67	9(ii)	heading	REGION	REGIONS

1	2	3	4	5
68	sub-section 9(v)	line 5 (right)	Zachariaha	Zachariah
70		14 (left)	Prorf.	Prof.
77		13 (right)	of co.	of Eco.
80		8 (left)	DCM	DGM
80	sub-section 15(ii)	2 and 3 (right)	Commissiонт	Commission
80	„ 15 (iii)	heading	GRANDING	GRADING
81	„ 16	„	AGRICULTUAL COMMONDITIES	AGRICULTURAL COMMODITIES
84	„ 17(ii)	„	CORPPING	CROPPING
84	„ 17(iii)	„	ZONSING	ZONING
84	„ 18	„	CORPS	CROPS
87	„ 18(v)	heading	BOJRA	BAJRA
87	„ 18(viii)	„	CORPS	CROPS
87	„ 18(viii)	„	LINUM	LINSEED
88	„ 18(ix)	„	CORPS	CROPS
89	„ 18(x)	„	CORPS	CROPS
89	„ 18(xi)	„	„	„
90	„ 18(xiii)	„	„	„
91	„ 19	1	Chaudhury	Chaudhry
95	„ 20(ii)	heading	UNIAERSITY	UNIVERSITY
104	„ 26(i)	8 (left)	Emiritus	Emeritus
108	Appendix 1 · 10	Sr. Nos. 8, 10 and 11	Machanisation	Mechanisation
109	—do—	Sr. No. 15. line 2	And	An
119	80	2 and 3	reclaiming developing	reclaiming and developing
124	2.1.7	6	1900	1906
124	2.1.8	1	developed	devolved
126	footnote	last	(p. 126)	(p. 123)
127		2	labour "2	labour "1
127	footnote		2 Ibid. 1 (p. 126):12 and 14	1 Ibid. 1 (p. 123):12 and 14
128	2.3.1	last	respectively ¹	respectively ²
130	2.4.2	6	sugar	sugar

1	2	3	4	5
131	2.4.5	5	co-shares	co-sharers
139	2.5.14	last	threefold	threefold:
139	2.5.14	last	deleted	depleted
142	section 6	heading	INDEPNENCE	INDEPENDENCE
142	2.6.3	3	intance	instance
143	2.6.4	6	prompted	prompted
143	2.6.4	17	as is	as its
147	section 7	heading	PLAN	PLANS
147	2.7.1	5	gation power	gation and power
151	2.7.7	12	withholding	with holdings
152	2.7.10	7	delatory	dilatory
157	2.7.25	10	mailly	mainly
158	2.7.28	6	Agrculture	Agriculture
159.	2.7.31	9	Hirkud	Hirakud
159	2.7.32	1	implements	implements
160		7	varities	varieties
160		11	machanisation	mechanisation
160	2.7.34	15	machinery, hiring	machinery hiring
162	2.7.39	10	partership	partnership
164	2.7.45	1 and 2	implement the	implementing the
165	2.7.47	5	assigned in	assigned to
166	2.7.52	7	integral	internal
166	2.7.52	7	produe	produce
167	2.7.54	3	Price	Prices
168	2.7.57	last	was	were
169	2.7.59	4	deficiencies some	deficiencies. Some
169	—do—	14	reforms	reform
173		8	Korapur	Koraput
174	2.7.73	12	properly	proper
175	2.7.76	2	anthrax	anthrex
178	2.7.87	9	[and for	for
185		6	committees these	committees; these
189	2.7.119	2	production in	production; in

1	2	3	4	5
189	—do—	3	brought	drought
190	2.7.120	1 and 2	Vengatappiah	Venkatappiah
191	2.7.123	11	rate a	rate; a
192	sub-heading		Aid Technical	Aid and Technical
193	2.7.130	13	(WFP) Operation	(WFP); Operation
196	3.2.7	3	or	For
196	—do—	last	concept	concept
200		4	declined in	declined to
201		2	only between	only and between
204	footnote 1	1	Bhattarjee	Bhattacharjee
211	Table 3.10	line 5 col. 4	312.9	132.9
212	3.3.14	last	frequent "	frequent." 1
213	footnote			(to go to page 212)
215	sub para (vi)	10	faired	fared
216	3.3.19 (i)	1 and 2	semination	dissemination
218	Table 3.13	last footnote	*1945-46	**1945-46
220	3.3.26	2	or	on
221	section 4	heading	PLAN	PLANS
221	3.4.1	13-14	became	became
222	Table 3.15	footnote 1	1947	1974
222		4th after the table	agricultural	agriculture
223	Table 3.16	last footnote last line	and periods	end periods
235		7	hlghe	higher
236		15	through	trough
248	Table 3.18	heading	1954-65*	1964-65*
253	3.4.45	2	Yield. This	yield; this
259		5	has	have
264	3.4.70	7	per cent). While	Per cent.) while
267	3.4.76	6	year	years
271	3.4.80	25	increases	increase
273	3.4.87	8	was	were
276		3	pland	plant
276	3.5.3	2	input source	source

1	2	3	4	5
278		14 (after the Table	production about	production of about
279	Table 3.23	Col. 2 heading	P ₂ O ₅	P ₂ O ₅
282	„3.25	7	Zoue	Zone
283	„3.26	heading	covered High	covered under High
283	-do-	note	paranthesis	parenthesis
284	3.5.14	2	evolved	evolving
291	3.5.27	22	1972-72	1971-72
314	3.7.5	last	country; to	country, to
317	Table 3.33	footnote (ii)	Diviscion	Division
320	3.7.11	10	requisites	requisite
328	Table 3.37	line 1 col. 1	A. Minor	A. Major
331		10	forces	forest
336	3.10.2	7	years	year
337		14	Kalyan/	Kalyan
338	3.10.6	5	Kalyan/	Kalyan
339		5	Morality	mortality
341	Appendix 3.1	Col. 3 heading	Papulation	Population
342	Appendix 3.2	Note	all crop	all crops
347	Appendix 3.6	footnote	*Some	*Same
360	„ 3.13	line 4 col. 4	18.8	(—) 18.8
360	-do-	line 3 col. 10	5.	5.1
362	Appendix 3.13	line 7 Col. 5	157	57
363	-do-	line 1 Col. 9	472	742
363	-do-	line 13 Col. 10	—	(—) 1.2
363	-do-	sub-heading	Oilseeds	Oilseeds†
366	Appendix 3.14	Line 8 Col. 4	243	1243
367	-do-	line 6 Col. 9	129,000	129,000†
367	-do-	line 17 col. 4	6,690	690
368	-do-	line 10 col. 2	650	50
369	-do-	line 10 col. 1	Madhya Pradesh	Madhya Pradesh
369	-do-	footnote against**	agregated	aggregated
379	Appendix 3.16	note against @	aggregate on	aggregate to
382	Appendix 3.18	footnote (b)	Jammmu	Jammu

1	2	3	4	5
383	App. 3.19	Line 8, col. 11	26,100	25,100
384	-do-	Col. 4 heading	inaccessible	inaccessible
392	App. 3.21	Cols. 52 & 53 heading	manufacturers	Manufactures
392	-do-	Footnote against @	fodder bran	fodder, bran
393	4.1.1	18	economic	economics
394	4.2.2	2	was	were
395	4.2.3	2	195-51	1950-51
397	4.2.9	7	1 ha	10 ha
401	4.2.19	11	within	with in
402	4.2.21	2	is	in
404		2	implements; Machinery	implements, machinery
405	4.3.5	25	seed, instance	seed, for instance
407	4.3.7	8	income viability	income. Viability
407	-do-	last but one	242 Parganas,	24 Parganas,
408	4.3.8	13	income crop	income from crop
408	-do-	last	received	receive
409	footnote 1	2	Economic	Economics
409	footnote 4	1	Chennarddy	Chennareddy
409	footnote 4	2	Agricultural	Agriculture
409	footnote 6	2	Agriictural	Agricultural
412	4.3.16	26	continue	continued
414	4.3.21	12	employer	employed
415	Table 4.4	line 11, col. 1	1976-68	1967-68
415	4.3.23	5	itsel	itself
415	-do-	6	Hharif	Kharif
415	-do-	8	varities	varieties
416		4	contract	contrast
416	4.3.24	1	versis	versus
416	-do-	7	rabi summer	rabi/summer
416	4.3.25	3	on	no
417		2	Unifortunately	Unfortunately
418	4.3.28	1	foregoing	foregoing that

1	2	3	4	5
419	4.3.29	4	studies	studied
420	4.3.31	8	(Hamil Nadu)	(Tamil Nadu)
422	4.3.34	11	is	in
423		1	equalitative	qualitative
424		5	emonic	economic
424		15	where withal	wherewithal
426	4.3.40	5	period, in	period; in
427	4.3.42	2	study	study ¹
427	4.3.43	4	hybrid; jowar	hybrid jowar
427	-do-	last	parties	practices
430	4.3.50	20	ever	over
431	4.4.1	13	4-4 Krishna	4-4. Krishna
432	footnote	6	trend output	trend in output
434		2	aquaculture	aquaculture
434	footnote	4	Natural	Neutral
436		12	obtain	to obtain
437	4.5.2	1	employment rural	employment to rural
438	4.5.5	11	water	wheat
440	4.5.10	2	facilities	facilitates
442	4.5.15	1-2	following Employment	following: employment
445	4.5.20	2	Nagpur	Nagaur
445	-do-	4	abvailability	availability
450	4.6.9	9	defenition	definition
452	4.6.13	11	than	tant
453	footnote 1	1	Kalus	Klaus
456	table 4-6	Title	1-00 Birds	100 Birds
457	4.6.24	9	108 of	108 or
464	4.6.40	2	greeding	breeding
464	4.6.42	last	Saharasa	Saharsa
465	table 4.9	footnote**	processing in plant	processing plants
467		8	4.7.4	4.7.3
469	4.7.8	12	agriculture	aquaculture

1	2	3	4	5
471	4.7.13	11	source of income charged for	sources and then subletting or leasing out to members. Some of
471	4.7.14	1 and 2	sur-vey	Sur-vey
471	4.7.14	7	6.515	6515
472	4.7.15	8	loans outstanding Maharashtra	and subsidy account- ed for about 95 per cent of total in- vestment.
472	-do-	12	loans, loans	loans; loans
473	4.7.19	20	smagle	sample
485		Col. 1 line 2	pur	Raipur
487	Sub-heading (Ferozepur)		19677-0	1967-70
490	App. 4 6	Row 4, Col. 8	43.87	43.97
491	footnote (ii)		cost A ₂ -Gross	cost A ₂ =Gross
492	App. 4.7	line 13, col. 10	0.60	0.50
493		lines 3 to 14, col. 5		delete the sign (—)
494	App. 4.8	Col. 3 heading	purchased	purchase

