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EDITORIAL

The place of Universites in Agricultural Research. Agricultural research embraces a wide range of basic sciences so that research on a multitude of agricultural problems of the Indian sub-continent demands the marshalling of a great variety of scientific talent available in the country. Taking a cue from the experience of even highly industrialised countries of the world, it is apparent that the universities of those countries are taking an equitable share in research on agricultural sciences and are working hand in hand with the official ministries of Agriculture for the solution of specific problems calculated to enhance the prosperity of the agricultural population. We are aware that here and there in India some of the universities are beginning to realise the importance and utility of collaborative effort with other research organisations in the country. But it is well-known that the sum total of such efforts is still meagre when we consider the number of universities functioning in the land or the number of professorial chairs held by them. The old criticism that Indian Universities bestow undue emphasis on teaching and examinations is evidently a thing of the past. In recent years there has been a welcome awakening among the older universities and the newer ones are constituted with an avowed purpose of doing research, with the result that the importance of fostering research as one of the primary functions of a university is now universally recognized. Most, if not all, of our universities are to-day adequately equipped in men and materials for undertaking at least some aspects of the most exacting problems confronting the Indian tiller of the soil. It is often said that most of the universities lack the facilities and the resources to run a first class experimental station for the study of agricultural problems. But those holding this view forget the patent fact that by virtue of the high standard of pure science studies maintained and by the possession of excellent laboratory equipment, the universities are often more favourably placed than most agricultural research stations for the study of several fundamental principles and the purely scientific aspect of agricultural problems which elude the average agricultural investigator. We are of the opinion that with some additional facilities like a pot culture house and small strips of cultivable land, any university in India should be in a position to undertake the study of subjects like drought-resistance in crop plants, the function of rare elements and plant hormones, the assay of active

principles of drug plants and vegetable insecticides, the function of stickers and spreaders in spray mixtures, the chemistry of milk products and the cytogenetics of crop plants. We have often heard eloquent pleas from several platforms on the need for greater co-ordination of research work between agricultural workers and the universities; but apart from these appeals there has been little progress. To our mind, the chief impediment in the growth of such a healthy institution is the lack of contact between the two categories of research workers and the consequent ignorance that prevails among one class of what the other is doing. Perhaps another impediment which is apparently peculiar to India is that as our present system of scientific education is constituted, the parting of ways between the votaries of pure sciences and applied sciences begin at a stage which is too early in the career of our university students so that there is no scope for the cultivation of mutual appreciation of each other's talents. Nevertheless, it is undisputed that there exists the need for finding ways and means to effect the much-needed co-ordination by which one class of workers can supplement the work of the other. The time has arrived when in the interests of the country, all differences are sunk, prejudices cast aside and a genuine desire is cultivated to work for the common good of the motherland. It will not be possible for any one to formulate a division of labour between universities and Agricultural research stations into water tight compartments. The chief factors for success in any scheme of research are the personal capacity of the research worker and the materials at his disposal. Bearing this point in view, a very rough demarkation alone is possible. Some overlapping of effort is inevitable in the beginning but this need not be a serious obstacle to orderly progress.

The time is ripe for an organised and representative body like the Imperial Council of Agricultural Research to make a definite move by inviting representative research workers from all the universities and agricultural departments in India and take stock of the facilities that now exist for inaugurating research on specific agricultural problems. The next step would be to invite from the universities definite schemes each of which can be considered on its merits.

Industrial uses of Cashew and its Products.*

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Introduction. The cashew (*Anacardium occidentale*, L.) has, of late, received commercial importance chiefly on account of the great demand for its edible kernels. Believed to be a native of South America, the cashew that was introduced on the West Coast of India by the Portuguese, has now established itself as a commercial crop in the States of Cochin and Travancore and in the districts of Malabar and South Kanara. It is now seen to be spreading to other parts of this Presidency, on account of its capacity to thrive under widely varied conditions of soil, climate and rainfall. The possibilities of further extension in its cultivation in regard to its occupation of land now left uncultivated due to subnormal fertility, indifferent rainfall or other reasons, cannot be under-rated.

The importance of the cashewnut in industry can easily be gauged when we note that according to the latest available figures, about 10,192 tons of cashew kernels valued at Rs. 11,411,170 were exported from British India during the year 1936—37. Of this, S. India contributed 8,799 tons valued at Rs. 9,971,567 while Bombay was responsible for the remainder. The value of exported cashewnut kernels from India is about 82 per cent of the world export trade in them which amounted to $3\frac{1}{2}$ million American dollars in 1936 (i. e., about 14 million rupees).

Commercially, to-day, the cashew kernels alone are known to any extent. The cashew, however, yields certain other products, each of which foster possibilities of industrial utilisation. Though the economic uses of these products have been established, they form, as yet, only a fertile field of unexplored wealth. This note collates the already recorded uses to which the products of cashew can be put, and it is hoped that it would stimulate interest both in regard to the extended cultivation of cashew and its increased industrial use.

The cashewnut. The cashew is chiefly cultivated for the valuable kernels that it yields. In India the cashew kernels both "raw" and "roasted" find a place in a variety of household preparations. In Europe and America the kernel is largely used as a "dessert" nut and for making confectioneries, particularly in the manufacture of nut chocolates. It provides a cheap source of protein and is considered better than other nuts

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because of its high biological value. Table I below gives a comparative statement of the protein content, true digestibility and biological value of cashew and other commercial nuts.

TABLE I. Protein content, true digestibility and biological value of cashew and other nuts.*

Descripton of nuts.	Protein % (Crude)	True digestibility.	Biological value.
Cashewnut fresh	19·52	96 23±0·16	72·50±0·66
Blanched almonds	21·94	93·95±0·23	50·84±0·37
English walnuts fresh	21·16	84·11±0·22	55·89±0·92
Groundnut raw	28·25	97·39±0·27	57·90±1·1

* From Mitchell, and Readles (1937).

The cashewnut is also said to contain vitamins A and B_2. It contains about 40 per cent of oil of high nutritive value equal to that of almond oil and superior to olive oil. The oil, it is reported, can be utilised with advantage in certain pharmaceutical preparations. It is not of much interest commercially at present as the price of the kernels is too high to be utilized for production of oil.

In spite of all these advantages the cashew kernel is marketed in India in a very indifferent manner. No proper grading or hygienic packing of the stuff is undertaken in the internal markets though some attempt in this line is made with the stuff exported. Joachim (1936) in his studies in the "Vita-pack" process for preserving cashewnuts has found that the packing of well dried cashewnuts in well sealed receptacles containing dry carbon di-oxide gas is a very effective means of preserving them for no less than eight months (the duration of the experiment). The trials also appear to indicate that provided that the nuts are thoroughly dried, they can be preserved for this period of time in well filled and well sealed containers without carbon di-oxide. An organized production, grading, packing and marketing, would thus, certainly induce greater utilisation of the produce in the confectionery trade and better sales both in the home and foreign markets.

The Shell. The cashewnut shell contains 29 per cent of a reddish brown oil of which 10 to 15 per cent is obtained during the roasting of the nuts, which is commonly done in open pans over a small circular earthern furnace. As nuts get roasted the oil exudes out and is drawn off at one end. The oil contains anacardic acid, gallic acid and cardol. The shell oil finds extensive use in the preparation of varnishes, synthetic resins, moulding compositions, insulating coating, inks etc., as a preservative paint for boats and fishing nets, and as a protective for floor and wooden rafters against termite attack. The acrid oil is medicinal and "has been used as an anaesthetic in leprosy and as a blister in warts, corns and obstinate ulcers". In combination with kerosine or crude oil, it is lethal to mosquito larvae. In addition to these uses, further interest in anacardic acid which

forms 90 per cent of the corrosive oil has arisen recently as an antiseptic for textiles, the anilide and analagous derivatives of the acid being expected to combine the antiseptic properties of "shirlan" with a wetting power from its polar hydroxyl and hydrophobic long chain alkyl residue.

It is estimated that about 11,000 gallons of this oil are annually exported to Europe and particularly to America under the trade name of "Cardole oil" The price of the oil varies from 8 to 12 annas per gallon. It is also computed that "about 32,000 tons of raw cashewnuts are roasted every year in India and thus at the present rate of kernel production nearly 13,000 tons of roasted shells containing nearly 18 per cent of oil are available which could yield 53,000 gallons of the roasted nut shell oil". It may be possible to improve the process of roasting with a view to greater recovery of the oil.

The cashewnut shell is at present largely used as fuel in the process of roasting the nuts. The partly burnt shells from a previous charge form the fuel for the next charge of the nuts. This method is wasteful for the shell is valuable for other purposes. It gives on destructive distillation a combustible gas of a calorific value which compares favourably with coal gas. A ton of cashew shells gives about 6,000 cubic feet of gas. The shell charcoal which is one third of the shell has a calorific value of coal and is smokeless.

The Cashew Apple. The apple which is the swollen pedicel of the fruit is edible and on a small scale is eaten fresh or preserved with sugar. It has antiscorbutic properties containing as it does vitamin C. It is determined that 1 ounce of the fruit contains 120 milligrams of vitamin C and the normal requirement for a man is 50 milligrams. By fermentation either alcohol or vinegar can be obtained from it. "Dr. F. Marsden finds that 100 gms. of the apple yields 70 c. c. of juice containing 11·2 grams of invert sugar and on an average 3·8 per cent of alcohol". The invert sugars of the apple are valuable for inclusion in infant and invalid foods. These can be made available by converting the juice of the apple into a syrup which preserves the invert sugars. When mixed with iron sulphate the juice is said to make a good hair dye.

The cashew apple, thus, should be given further attention. An attempt should be made to utilise this fruit in the different ways indicated above instead of allowing it to be wasted. Preservation of the apples particularly of the sweeter varieties in sugars can be organised as a cottage industry.

The Cashew Wood. Cashew timber is used for making country boats and packing cases. The wood is red, moderately hard, close grained and weighing 38 lb to the cubic foot. The resinous gum which exudes from the bark of the tree is said to be deterrent to insects and can therefore be used for book binding. It is also useful in tanning. The sap obtained from the incisions on the bark is utilized as an indelible marking ink. The charcoal of the wood is highly estimated by the iron smiths of *Tavoy* and West Coast.

Conclusion. These are but a few of the many and diverse uses to which cashew and its products can be put. Many of them easily lend themselves to industrial exploitation. More than that, the products of cashew can replace many of the materials that are at present of necessity being imported into this country. Where India could be self sufficient in its needs of small scale industries, by the utilisation of the wealth that is so easily procurable, cashew has abundant potentialities. A little more research on the side of industrial utilization of the different products should put the cashew industry of India on a sound basis for fuller expansion.

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Revised Names for some of the Madras Grasses.

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Among plants that are useful to man, grasses are by far the most important. The crops that provide the staple food for the greater part of mankind, namely, paddy, wheat, maize, sorghum, ragi, *cumbu* and *tenai*, belong to this group. The animals that furnish food and labour, wool and leather live principally on grasses. Besides giving us food, grasses are sources of starch, alcohol and sugar. In America enormous quantities of cooking oil are secured from the germ of corn (*Zea Mays*). A good many grasses furnish material, for making brooms and brushes, and some are important sources of fibre for the manufacture of paper and cordage. Some yield essential oils. In many parts of India and a great part of Asia, bamboo which is a giant grass forms the principal timber for the construction of dwellings of the poor and bridges over village streams and also furnishes material for a variety of articles of domestic use and cheap furniture.

The family Gramineae to which the grasses belong is a very large one consisting of 500 genera and 4000 species of which in the Madras Presidency we have 132 genera and 388 species The list of genera and species in the Madras Presidency has been revised by C. E. C. Fischer, late of the Indian Forest service, and was published in the year 1934 as Part X of the Flora of the Presidency of Madras by J. S. Gamble. The Revision has been done after considerable scrutiny at Kew. The material for the Madras Flora was mostly from the Madras Herbarium at the Research Institute, Coimbatore, and in the preparation of the Flora, Mr. C. E. Hubbard of Kew gave considerable help and guidance. The genera are those adopted by Mr. Stapf in the Flora of Tropical Africa wherever possible.

Since there has been considerable revision and change of names, both in the genera and species, and in Madras, the names of as many as 211 species have been changed, the revised names are all brought together here with the old names given opposite to each of them , so that the list may be of help to the research student for ready reference.

It may be seen from a perusal of the revised list of names that among the genera that have undergone change the following deserve mention viz., *Andropogon, Panicum, Eragrostis* and *Ischaemum*, as in their case several of the species have now been placed entirely under new genera while some others have been given new specific names.

I am very much indebted to Sri Rao Bahadur G. N. Rangaswami Ayyangar, Millets Specialist and Geneticist, for the encouragement he gave me to write up this short note.

The revised names are as follows :—

	Revised Names.	*Old Names.*
1.	Coix gigantea, Roxb.	Coix Lachryma—Jobi, Linn. var. gigantea, Stapf.
2.	Chionachne semiteres, C. E C. Fischer, n. comb.	Polytoca semiteres, Benth ex. Hook. f.
3.	C. Koenigii, Thw.	Polytoca barbata, Stapf. ex. Hook. f.
4.	Spinifex littoreus, Merr.	Spinifex squarrosus, Linn.
5.	Imperata cylindrica, Beauv.	Imperata arundinacea, Cyr.
6.	Saccharum ciliare, Anderss.	Saccharum arundinaceum, Retz.
7.	Dimeria avenacea, C. E. C. Fischer, n. comb.	Dimeria pusilla, Thw.
8.	D. Thwaitesii, Hack.	D. pusilla, Thw. var. pallida, Thw.
9.	D. tenera, Trin.	D. ornithopoda, Trin.
10.	D. Lawsoni, C. E. C. Fischer, n. comb.	D. pusilla, Thw. var. Lawsoni, Hook. f.
11.	Pogonatherum paniceum, Hack.	Pogonatherum saccharoideum Beauv.
12.	Eulalia quadrinervis, O. Ktz., var. Wightii, Hook. f.	Pollinia quadrinervis, Hack. var. Wightii, Hook. f.
13.	E. tristachya, O. Ktz.	P. argentea, Trin.
14.	E. phaeothrix, O. Ktz.	P. phaeothrix, Hack.
15.	Pseudopogonatherum contortum, A. Camus.	P. articulata, Trin.
16.	Microstegium ciliatum, A. Camus.	P. ciliata, Trin.
17.	M. nudum, A. Camus.	P. nuda, Trin.
18.	Pollinidium binatum, C. E. Hubbard.	Ischaemum angustifolium, Hack.
19.	Ischaemum aristatum, Linn.	I. ciliare, Retz.
20.	I. Thomsonianum, Stapf. MS., n. nom.	I. murinum, Hook. f. non Forst.
21.	I nilagiricum, Hack.	I. hirtum, Hook. f. non Hack.
22.	I. semisagittatum, Roxb.	I. conjugatum, Roxb.
23.	I. Rangacharianum, C. E. C. Fischer.	I. aristatum, Rang. et Tad. non Linn.
24.	I. mangaluricum, Stapf M. S. n. comb.	I. ,, Hook f. non Linn. var. mangaluricum, Hack.
25.	Sehima nervosum, Stapf.	I. laxum, R. Br.
26.	S. sulcatum, A. Camus.	I. sulcatum, Hack.
27.	Arthraxon echinatus, Hochst.	Arthraxon spathaceus, Hook. f.
28.	A. Quartinianus, Nash.	A. ciliaris, Beauv. a.
29.	A. hispidus, Makino	A. cilaris, Beauv. b.
30.	A. lancifolius, Hochst.	A. microphyllus, Hochst.
31.	Capillipedium glaucopsis, Stapf.	Andropogon assimilis, Steud.
32.	C. Huegelii, Stapf.	A. Huegelii, Hack.
33.	C. filiculmis, Stapf.	A. filiculmis, Hook. f.
34.	Amphilophis pertusa, Stapf.	A. pertusus, Willd.
35.	A. pseudoischaemum, C. E. C. Fischer, n. comb.	A. pseudoischaemum, Nees.
36.	A. Foulkesii. C. E. C. Fischer, n. comb.	A. Foulkesii, Hook. f.
37.	A. insculpta, Stapf.	A. pertusus, Willd. var. insculptus, Hack.
38.	A. Kuntzeana, Haines.	A. Kuntzeanus, Hack.
39.	A. glabra, Stapf.	A. intermedius, R. Br.
40	Vetiveria zizanioides, Nash.	A. squarrosus, Hack.

Revised Names.	*Old Names.*
41. Vetiveria Lawsoni, Blatter et McCann.	A. Lawsoni, Hook. f.
42. Pseudosorghum fasciculare, A. Camus.	A. fascicularis, Roxb.
43. Sorghum nitidum, Pers.	A. serratus, Thunb.
44. S. Stapfii, C. E. C. Fischer n. comb.	A. Stapfii, Hook. f.
45. S. halepense, Pers.	A. halepensis, Brot.
46. S. durra, Stapf. var. coimbatoricum, Snow.	Andropogon Sorghum. Brot. Tam. *Periamanjal cholam*
47. S. cernuum, Host var. globosum.	do. Tel. *Tella Jonna*,
48. S. subglabrescens, Schweinf, et Aschers. var. compactam.	do. Tam. *Chunnamanjal cholam*
49. S, subglabrescens, Schweinf, et Aschers. var. Irungiforme.	Tam. *Peria Vellai, Chitrai Vellai.* do.
50. S. durra, Stapf. var. mediocre.	do. Tel. *Patcha jonna*
51. S. Roxburghii Stapf. var. hians, stapf.	Tam. *Talaivirchan cholam.*
52. S. dochna, var. irungu.	do. Tam. *Irungu cholam.*
53. „ var. melliferum.	do. Tam. *Irungu cholam.*
54. „ var. obovatum.	do. Tam. *Sen cholam.*
55. Chrysopogon aciculatus, Trin.	A. aciculatus, Retz.
56. C. asper, Heyne ex Hook. f.	A. asper, Heyne ex Hook. f.
57. C. verticillatus, Trin.	A. verticillatus, Roxb.
58. C. orientalis, A. Camus.	A. Wightianus, Steud.
59. C. zeylanicus, Thw.	A. zeylanicus, Nees.
60. C. montanus, Trin.	A. monticola, Schult.
61. C. Hackelii, C. E. C. Fischer n. comb.	A. Hackelii, Hook. f,
62. C. polyphyllus, Blatter et McCann.	A. polyphyllus, Hack. ex Hook. f.
63. C. velutinus, Arn. ex Hook. f.	A. velutinus, Hook. f.
64. Dichanthium annulatum, Stapf.	A. annulatus, Forsk.
65. D. caricosum A. Camus.	A caricosus, Linn.
66. D. pallidum, Stapf. MS n. comb.	Apocopis pallida, Hook. f.
67. D. nodosum, Willem.	Andropogon caricosus, Linn. var. mollicomus, Hack.
68. D. polyptychum, A. Camus.	A. polyptychus, Steud.
69. Heteropogon contortus, Beauv. ex Roem. et Schult.	A. contortus, Linn.
70. H. polystachyos, Schult.	A. polystachyos, Roxb.
71. H. oliganthus, Blatter et McCann.	A. oliganthus, Hochst.
72. H. bellariensis, C. E. C. Fischer, n. comb.	A. bellariensis, Hack.
73. Themeda triandra, Forsk.	Anthistiria imberbis, Retz.
74. T. quadrivalvis, O. Ktz.	A. ciliata, Linn. f.
75. T. laxa, Stapf ex Haines	A. laxa, Anderss.
76. T. tremula, Hack.	A. tremula, Nees.
77. T. cymbaria, Hack.	A. cymbaria, Roxb.
78. Apluda aristata, Linn.	Apluda varia, Hack, sub sp. aristata, Hack.
79. A. mutica, Linn.	A. varia, Hack sub-sp. mutica Hack.

	Revised Names.	*Old Names.*
80.	Eremopogon foveolatus, Stapf.	Andropogon foveolatus, Del.
81.	Schizachyrium brevifolium, Nees.	Schizachyrium brevifolius, Sw.
82.	S. exile, Stapf.	A. exilis, Hochst.
83.	Andropogon ascinodis, C. B. Clarke.	A. apricus, Hook. f. non-Trin.
84.	Cymbopogon Nardus, Rendle.	A. Nardus, Linn.
85.	C. flexuosus, Wats.	A. Nardus, Linn. var. flexuosus, Hack.
86.	C. confertiflorus, Stapf.	A. Nardus. Linn. var. nilagiricus, Hack.
87.	C. coloratus Stapf.	A. Nardus, Linn. var. coloratus Hook f.
88.	C. Martini, Wats.	A. Schoenanthus, Linn. var. Martini Hook, f.
89.	C. caesius Stapf.	A. Schoenanthus, Linn, var. caesius, Hack.
90.	C. polyneuros, Stapf.	A. Schoenanthus, Linn. var. versicolor, Hack.
91.	C. Gidarba, Haines	A. Gidarba, Ham. ex. Hook, f.
92.	Hackelochloa granularis, O Ktz.	Manisuris granularis, Lion.
93.	Ophiuros exaltatus, . Ktz	Ophiuros corymbosus, Gaertn.
94.	Manisuris Myurus, Linn.	Rottboellia Myurus, Benth.
95.	M. acuminata, C. E. C. Fischer, n. comb.	,, acuminata, Hack.
96.	M. forficulata, C. E. C. Fischer.	,, divergens, Lisboa non— Hack.
97.	Mnesithea laevis, Kunth.	,, perforata, Roxb.
98.	Hemarthria compressa, Kunth.	,, compressa, Linn.
99.	Digitaria marginata, Link.	Digitaria sanguinalis, Scop, var extensum, Rang et. Tad.
100.	D. marginata, var. fimbriata, Stapf.	,, sanguinalis, Scop. var. ciliaris Rang. et. Tad.
101.	D. Griffithii, Stapf.	,, sanguinalis, Scop. var. Griffithi, Rang. et. Tad.
102.	D. ternata, Stapf.	Paspalum ternatum, Hook. f.
103.	D. longiflora, Pers.	, longiflorum, Retz.
104	D. chinensis. Hornem.	,, ,, Hook f. non— Retz.
105.	D. pedicellaris, Prain.	,, pedicellare, Trin.
106.	D. Royleana, Prain.	,, Royleanum, Nees.
107.	D. Wallichiana, Stapf.	,, Perrottetii, Hook.
108.	Alloteropsis cimicina, Stapf.	Axonopis cimnicius, Beauv.
109.	Pseudechinolaena polystachya, Stapf.	Panicum uncinatum, Raddi.
110.	Eriochloa procera, C. E. Hubbard.	Eriochloa polystachya, H. B. et K.
111.	Brachiaria distachya, Stapf.	Panicum distachyum, Linn.
112.	B. milliformis Chase,	,, ,, Linn.
113.	B. mutica, Stapf.	,, muticum, Forsk.
114.	B. eruciformis, Griseb.	,. Isachne, Roth.
115.	B. ramosa, Stapf.	,, ramosum, Linn.
116.	B. semiundulata Stapf.	,, villosum, Lamk.
117.	B. semiverticillata, Alston.	P. semiverticillatum, Rottl.
118.	B remota, Haines.	P. remotum, Retz.
119.	B. Kurzii, A. Camus.	,, Kurzii. Hook. f.
120.	Paspalum orbiculare, Forst.	Paspalum scrobiculatum, Linn.
121	P. vaginatum, SW.	,, distichum, Linn.
122.	P. longifolium, Rox	, scrobiculatum, Linn.
123.	Stenotaphrum dimidiatum, Brogn.	Stenotaphrum glabrum, Trin.

	Revised Names.	*Old Names.*
124.	Paspalidium flavidum, A. Camus.	Panicum flavidum, Retz.
125	P. punctatum, Stapf.	,, punctatum, Burm.
126.	P. geminatum, Stapf.	,, paspaloides, Pers.
127.	Urochloa panicoides, Beauv.	,, javanicum, Hook.
128	U. setigera, Stapf.	,, setigerum Retz.
129.	U. reptans, Stapf.	,, prostratum, Lamk.
130.	Echinochloa colona, Link.	,, colonum, Linn.
131.	E. colona, Link. var. frumentaceum.	,, Crusgalli, Link. var. frumentaceum, Hook f.
132.	E, crusgalli, Beauv.	,, Crusgalli, Linn.
133.	E. stagnina, Beauv.	,, ,, Linn,
134.	Ottochloa nodosa, Dandy.	,, nodosum, Kunth.
135.	Holcolemma canaliculatum, Stapf. et. Hubb.	,, canaliculatum, Nees.
136.	Panicum oreades, Domin.	,, aequiglume, Hook f. Non. Hack.
137.	P. paludosum, Roxb.	,, proliferum, Hook, f. Non-Lamk.
138	P. brevifolium Linn.	,, ovalifolium, Poir.
139.	P. Gardneri, Thw.	Isachne Gardeneri, Benth.
140.	Hymenachne pseudo-interrupta, C. Muell.	Panicum Myurus, H. B. K.
141.	Cyrtococcum trigonum, A. Camus.	,, trigonum, Retz.
142.	C. oxyphyllum, Stapf.	,, pilipes, Nees et. Arn.
143.	C. patens, A. Camus.	,, patens. Linn.
144.	C. radicans, Stapf.	,, ,, Linn.
145.	C longipes, A. Camus.	,, longipes, W. et. A.
146.	C. sparsicomum, A. Camus.	,, sparsicomum, Nees.
147.	Saccolepis interrupta, Stapf.	,, interruptum, Willd.
148.	S. indica, Chase.	,, indicum, Linn.
149.	S. myosuroides A. Camus.	,, myosuroides, R. Br.
150.	S. curvata, Chase.	,, curvatum, Linn.
151.	Setaria palmifolia, Stapf.	,, plicatum, Lamk.
152.	S. pallidifusca Stapf. et. Hubb.	Setaria glauca, Beauv.
153.	Pseudoraphis aspera, Pilger.	Chamaeraphis spinescens, Poir.
154.	Rhynchelytrum villosum, Chiov.	Tricholaena Wightii, Nees.
155.	Pennisetum typhoides, Stapf. et. Hubb.	Pennisetum typhoideum, Rich.
156.	Cenchrus ciliaris, Linn.	,, cenchroides Rich.
157.	C. ciliaris, Linn. var. echionoides, Hook. f.	,, ,, Rich, var. echionoides.
158.	C setigerus, Vahl.	Cenchrus biflorus, Roxb.
159.	C. barbatus, Schum	,, catharticus, Del.
160.	Thysanolaena maxima, O Ktz	Thysanolaena Agrostis, Nees et Arn.
161.	Arundinella setosa, Trin.	Arundinella nervosa, Nees.
162.	A. pumila, Steud	,, tenella, Nees.
163.	A. holcoides, Trin.	,, agrostoides, Trin.
164.	A. nepalensis, Trin.	,, brasiliensis, Hook. f non Raddi.
165.	A. mutica, Nees.	,, capillars, Hook. f.
166	Avenastrum asperum, C. E. C. Fischer, n. Comb.	Avena aspera, Munro.
167.	A. asperum var. schmidii, C. E. C. Fischer, n. Comb	,, ,, ,, var. schmidii, Hook f.

	Revised Names.	*Old Names.*
168.	Venastrum var. polyneuron, C. E. C. Fischer, n. Comb.	Avena polyneura, Hook. f.
169.	Coelachne perpusilla, Thw.	Coelachne pulchella, R. Br. var. gracillima, Hook. f.
170.	Neyraudia arundinacea, Henr.	Neyraudia madagascariensis, Hook. f.
171.	Aristida depressa, Retz.	Aristida adscencionis, Linn.
172.	Agrostis stolonifera, Linn.	Agrostis alba, Linn.
173.	A. pilosula, Trin.	Calamagrostis pilosula, Hook. f.
174.	A. Schmidii, C. E. C. Fischer n. Comb.	,, Schmidii, Hook. f.
175.	Garnotia scoparia, Stapf. ex. Hook. f.	Garnotia tenuiglumis, Stapf. ex. Hook. f.
176.	Trachys muricata, Steud.	Trachys mucronata, Pers.
177.	Tragus biflorus, Schult.	Tragus racemosus, Hook. f. non. All.
178.	Perotis indica, O. Ktz.	Perotis latifolia, Ait.
179.	Zoysia matrella, Merr.	Zoysia pungens, Willd.
180.	Demostachya bipinnata, Stapf.	Eragrostis cynosuroides, Beauv.
181.	Eragrostis spicata, Jedwabn.	Eragrostis phleoides, Stapf.
182.	E. riparia, Nees.	,, tenella, Roem, et. Sch. var. riparia, Stapf
183.	E viscosa, Trin	, tenella, var. viscosa, Stapf.
184.	E. plumosa, Link.	,, , var plumosa Stapf.
185.	E. japonica, Trin.	,, interrupta, Beav. var. tenuissima Stapf
186	E diarrhena, Steud.	,, ,, var. diarrhena, Stapf.
	,, var. Koenigii C. E. C. Fischer n. Comb.	,, ,, var. Koenigii, Stapf.
187.	E. unioloides, Nees.	,, amabilis, W. et. A.
188.	E. gangetica, Steud	,, elegantula, Steud.
189.	E. nutans, Nees	,, stenophylla, Hochst.
190.	E. cilianensis, Link.	,, major, Host.
191.	E. poaeoides, Beauv.	,, minor, Host.
192.	E bifaria, Wight ex. Steud.	,, coromandeliana, Trin.
193.	Microchloa indica, Beauv	Microchloa setacea, R. Br.
194.	Melanocenchris monoica, C. E. C. Fischer, n. Comb. non-O. Ktz	Gracilea mutans, Koen.
195.	M. Royleana, Nees.	G. Royleana, Hook.
196.	Enteropogon monostachyos, K. Schum.	Enteropogon melicoides, Nees.
197.	Cynodon dactylon, Pers. var. intermedius C. E. C. Fischer. n. comb.	Cynodon intermedius, Rang et. Tad.
198.	Eleusine lagopoides, Merr.	Eleusine brevifolia, R. Br.
199.	Dactylotenium aegyptium, Beauv.	E. aegyptiaca, Desf.
200.	Dinebra retroflexa, Panz.	Dinebra arabica, Jacq.
201.	Enneapogon elegans, Stapf.	Pappophorum elegans, Nees.
202.	Elytrophorus spicatus, A. Camus.	Elytrophorus articulatus, Beauv.
203.	Aelurophus lagopoides, Trin. ex. Thw.	Aelurophus villosus, Trin.
204.	Oryza Meyriana, Baill.	Oryza granulata, Nees et. Arn.
205.	Anthoxanthum Hookeri, Rendle.	Hierochloa Hookeri, C. B. Clarke ex. Hook f.
206.	Vulpia Myuros, Gmel.	Festuca Myuros, Linn.

	Revised Names.	*Old Names.*
207.	Bromus catharticus. Vahl.	Bromus unioloides, H. B. K.
208.	Streptogyna gerontogea, Hook. f.	Streptogyna crinata, Thw.
209.	Triticum dicoccum, Schrank.	Triticum vulgare, Vill. F. B. I. VII. 367.
210.	Hordeum hexastichon, Linn.	Hordeum vulgare, Linn. var. hexastichon, Ait.
211.	Teinostachyum Beddomei, C. E. C Fischer, n nom.	Teinostachyum Wightii, Bedd.
212.	Oxytenanthera monadelpha, Alstom.	Oxytenanthera Thwaitesii, Munro.
213.	Ochlandra scriptoria, C. E. C. Fischer n. Comb.	Ochlandra Rheedii, Gamble.
214.	O. Wightii, C. E. C. Fischer, n. Comb.	,, Brandisii, Gamble.

Groundnut Oil-cake as Manure and Cattlefeed.*

By C. M JOHN, B. A.,

Oil Seeds Specialist, Coimbatore.

The international situation brought about by the present war has, among other things, affected the export trade of most of the countries of the world due to the closure of foreign markets resulting in an upset of agricultural economy. The situation is particularly embarassing to a country like India which is essentially a producer of raw materials entirely dependent upon other countries for the disposal of most of its agricultural produce Of the many such products produced in the country on a large scale and marketed elsewhere groundnut figures prominently.

In spite of the offer of the United Kingdom to purchase all its requirements of oil seeds from India and attempts being made to explore new markets, the total production of groundnut in this country is bound to leave a surplus for which use has to be found. Restriction in area can be done only to a certain extent, for groundnut is a crop that is easily raised in the poor dry lands of the Province with little investment or care and is one of the few attractive crops for the dryland farmer. It becomes, therefore, necessary to absorb this anticipated excess production in the country itself by developing the Indian oil-seed crushing industry on a sound and planned basis and utilizing the oil and the residual cake *(poonac)*.

1. **Grades of groundnut poonac.** There are two grades of groundnut *poonac* recognised in trade and available in Madras. The one is the "expeller" quality and the other the "chekku" quality. The former is the residual matter left after the extraction of oil from the kernels, in power-driven oil mills or hand presses, while the latter is the residual cake left after the extraction of oil in the indigenous wooden *chekku* or *ghanni*. *Chekku* cake generally contains a little more of oil due to incomplete extraction and is consequently valued slightly higher than the expeller quality.

* Contribution No. 17 from the Oil Seeds Section of the Madras Department of Agriculture.

2. **Groundnut *poonac* as manure.** Groundnut *poonac* contains about 7 to 8 per cent of nitrogen and is considered a good organic nitrogenous fertilizer. Its manurial value compares very favourably with some of the other oil-seed cakes available in our country as can be seen from the following comparative figures of analysis.

	N	P_2O_5	K_2O
Groundnut cake	8·0	1·4	1·2
Castor cake	4·5	1·9	0·7
Coconut cake	3·4	1·5	1·3
Pungam *(Pongamia glabra)* cake	3·6	1·3	0·7
Neem cake	5·0	1·3	1·7

The use of groundnut *poonac* as a fertiliser for paddy and sugarcane crops is a well established practice in Madras. For sugarcane the *poonac* is particularly suitable and considered better than ammonium sulphate from the point of view of jaggery making and sugar refining. Experiments have shown that groundnut *poonac* at 400 to 600 lb. per acre to supply 30 to 40 lb. of N for paddy and at about a ton to supply 150 to 200 lb. of N per acre for sugarcane have given increased yields. In places where green manuring is not possible or practicable, groundnut *poonac* can be safely adopted as a manure for paddy. Taking the paddy crop into consideration even if 10 per cent of the total area of $10\frac{1}{2}$ million acres under paddy takes to the application of groundnut *poonac* as manure, at the rate of 600 lb. per acre, it will easily account for a consumption of nearly 281,000 tons of the *poonac* in the Province itself. Again the total area of one lakh of acres under sugarcane in our Province can easily consume another one lakh tons of *poonac*. Thus there is a possibility of utilizing nearly 381,000 tons of groundnut *poonac* in Madras itself for manuring paddy and sugarcane alone not taking into account an appreciable quantity that can be used for crops like coffee, tea, oranges, plantains, vegetables etc. This extensive scheme of manuring if brought into operation will account for nearly 700,000 tons of groundnut kernels out of normal estimated production of 1,200,000 tons of shelled nuts in our presidency.

The chief impediment that hitherto stood in the way of its extended use was the high price the commodity commanded in the local markets during the pre-war period due to the large demand of groundnut kernels from foreign markets at attractive prices leaving only a limited quantity for crushing in the country. Moreover, ammonium sulphate with nearly 20 per cent nitrogen in an easily available form was then procurable at comparatively cheaper prices and proved attractive.

The absence of adequate export trade in groundnuts has brought about a marked decline in the prices of *poonac*. The current price-trend of groundnut *poonac* in the various markets in the Presidency has shown a fall of about 50—75 per cent from the pre-war level, making it at present a fertiliser definitely much cheaper (based on nitrogen content) than ammonium sulphate. In the appended statement the actual price of groundnut *poonac* per ton which existed before the outbreak of war and as it prevailed in

September 1940 is furnished in respect of the important groundnut crushing centres in the Presidency. It may be seen therefrom that the highest price of expeller groundnut *poonac* per ton is about Rs. 50 in Cuddalore (South Arcot) while in Vizagapatam, Guntur, Kurnool and Anantapur districts, the price is about Rs. 25 to Rs. 30 per ton. These prices are equivalent on the nitrogen basis to about Rs 135 per ton of ammonium sulphate at Cuddalore and about Rs. 70 to Rs. 85 in the northern and central districts—prices which are far less per unit of nitrogen than even the pre-war prices of ammonium sulphate. With a further fall in the price of groundnut *poonac* which at the time of writing is about Rs. 16 per ton in several producing centres, it seems to be definitely economical to use the *poonac* as manure where-ever ammonium sulphate or other nitrogenous fertilizers were utilised before. It will not only supply the required quantity of nitrogen but, being an organic manure will also improve the soil texture. Moreover, groundnut is grown in almost all the districts of the Province barring perhaps the West Coast and the Nilgiris. This facilitates the crushing of the produce locally and using the *poonac* in the centres of production themselves without the necessity for large scale movements over long distances. This local sufficiency is likely to keep the price of *poonac* at reasonable levels due to the low cost of short-range transport.

Further, due to the war the availability of imported artificial fertilisers such as sulphate of ammonia, niciphos, ammophos etc., is very restricted. There is a great shrinkage in their imports, and attendent to lack of suitable transport facilities, future supplies are likely to be affected seriously. Prices have also soared and are still on the upward trend and may even become prohibitive. Ammonium sulphate, for example, which was selling at about Rs. 120 per ton in normal times is now being sold at Rs. 240 per ton subject to availability of stock. It is, therefore, expedient under existing conditions to bring into greater use in their place, a material like groundnut *poonac* which is locally available at economic rates.

Groundnut *poonac* as cattle feed. The importance of oil cakes as feed for work animals and milch cattle is widely recognised. Of the many sorts, groundnut *poonac* is perhaps the cheapest and the one very largely used, though preference is shown to gingelly *poonac* in some places for feeding milch cattle. It may be easily seen from the figures of analysis of the different oil-cakes furnished below that groundnut *poonac* is a rich source of protein and fat and is a useful concentrated feed.

	Moisture.	Ash.	Crude protein.	Carbo-hydrates		Fat.
				Crude fibre	Nitrogen free extract.	
Groundnut cake	10·7	4·9	47·6	5·1	23 7	8 0
Coconut cake	10·5	5·2	21·4	11·7	42·7	8·5
Gingelly cake	9·5	10·7	39 8	6·8	20·6	12·6

(From "Principles of Feeding Farm Animals" by Bull and Carroll)

Nutrition experiments conducted by the Government Agricultural Chemist, Coimbatore, have shown that groundnut *poonac* is a very healthy cattle feed and that there is no ground for the prejudice shown against it in some tracts. It has been determined that where paddy straw is used as roughage for feeding cattle about 14 oz. and where *cholam* (sorghum) straw is used about 4 oz. of groundnut *poonac* per day per head of cattle is a necessary maintenance ration if we are to improve the condition of our livestock and increase its efficiency and utility to us. Taking at the lowest level of 4 oz. per day, each head of cattle can consume about 90 lb. of *poonac* per annum. This ration at the present level of prices works out to only about a rupee per annum. Even if only about 25 per cent of the total estimated 17 million head of cattle in the Province is fed with the maintenance ration it could easily account for about 170,800 tons of groundnut *poonac*. Nearly four times or more of this quantity will be required when the question of feeding milch cattle or animals at work or those fed with the poorer bulk fodder like paddy straw is considered. Thus a drive in favour of the proper feeding of our cattle with groundnut *poonac* would appreciably enhance the utilization of more *poonac* and account for the local consumption of a good bit of the groundnut produced in the country and formerly exported. This would also improve the present impoverished condition of our cattle and indirectly increase the manurial value of the dung and result in the increased production of crops.

From the above statement of facts it can easily be seen that the only way to meet the difficult situation arising out of the lack of export trade in groundnuts is to utilise the produce in our country itself and to our great advantage remembering the fact that the foreign countries were purchasing this commodity at such high prices and transporting the stuff to long distances because they fully realised the value of the different products that can be obtained from this oil seed.

Current and prewar prices of groundnut cake—expeller quality.

Centre.	Prewar price.	Sept. 1940 price (per ton.)	Percentage fall.	Calculated equivalent price of ammonium sulphate per ton based on current price of cake*
	Rs.	Rs.		Rs.
Anantapur district				
1. Pamidi, Gooty taluk	50 to 55	29	45	77·3
2. Hindupur	46	30	35	80
North Arcot District				
3. Tirupattur	58·2 to 62·7	39·2 to 40·3	34	106
South Arcot District				
4. Cuddalore	63·3	50·6	20	134 9
Bellary District				
5. Adoni	42 to 51	27·5	41	73·3
Coimbatore District				
6. Pollachi	67·2 to 71·7	35·8 to 38·1	47	98·5

Centre.	Prewar price.	Sept. 1940 price (per ton.)	Percentage fall.	Calculated equivalent price of ammonium sulphate per ton based on current price of cake*
Guntur District				
7. Guntur	53·8	44·8	17	119·5
8. Narasaraopet	53·8 to 58·2	26·9 to 29·1	50	74
9. Tenali	53·8 to 62·7	31·2 to 35·8	32	77·7
10. Ongole	44·8 to 53·8	34 7 to 38·1	26	97·1
Kistna district				
11. Bezwada	58·2 to 60·5	30·8 to 33·6	46	85·9
Kurnool district				
12. Kurnool	49·3 to 53·8	26·9 to 28	47	73·2
13. Nandyal	58·2	29·1	50	77·6
Tanjore district				
14. Pattukottai	49·3	45·9	7	122·4
Tinnevelly district				
15. Virudhunagar	58·2	49·3	15	131·5
Vizagapatam district				
16. Anakapalle	56	29·8	46	79 8
17. Vizianagaram	67 2	26·9	60	71·7

* Calculated on the basis of 7·5% of N in groundnut cake and 20% in ammonium sulphate.

SELECTED ARTICLE

Economic Factors in Agricultural Development.*

By K. C. RAMAKRISHNAN, M. A.

I. Economic Aims. Handicaps and Incentives. The ultimate aim of all agricultural development should be to ensure as high an income as possible for every worker on land, and not merely raise the yield per acre or secure a larger return on the capital invested. Comparisons are commonly made in agricultural publications of acreage yields of particular crops in different countries without reference to the diverse conditions, social as well as physical, in which they are produced. For instance, it is not so well known that in China, which is quoted for high yield per acre of rice and wheat, that the peasant had to sweat more than in any other country on his tiny holding, especially because of the lack of cattle power; and for manure he has to depend largely on night-soil. In Japan, again, which has next to Italy the highest yield of rice per acre, the tenant cultivator has not only to put in very hard work but he remains for ever in debt on account of the forced use of fertilisers at the behest of his money-lending landlord, and is often obliged to pay off the interest due by sending his children to toil in the small industries run by the same landlord. It is no doubt necessary in old settled countries, where scope for expansion of cultivation is limited and population is already pressing on the soil, that all efforts should be made to raise the yield per acre, if only as a means to raise it per worker. But it is necessary to reckon, in addition to items paid for in cash or kind, the human cost involved in such production. It is not altogether a matter for satisfaction

* *Substance of three Lectures delivered at the Agricultural College, Coimbatore, in November 1939 under the Maharaja of Travancore Curzon Endowment, University of Madras.*

that the Indian ryot "will struggle on patiently and uncomplainingly in the face of difficulties in a way that no one else could".

The fundamental handicap to the development of Indian agriculture is the smallness of most of the holdings, to which a parallel cannot be found in any western agricultural country. China and Japan alone have tinier farms. Hard work and ample manuring account for phenomenally high yields per acre in these two countries. In the newer lands of America and Australia where cultivation is extensive the yield per acre is low, but not the yield per worker. In Western Europe, where holdings are smaller than in America but bigger than in Asia, the yield per worker as per acre is high because of intensive cultivation an the efficiency of the former. It is only in India that the yield per acre as well as per man is low. Holdings are uneconomic and farmers are inefficient according to modern standards. Our holdings need to be enlarged as well as consolidated to become economic. It is a sign of the low standard that prevails in India that the common conception of an 'economic holding' is different from that which prevails elsewhere. A holding that provides substance for the farmer's family is called economic here, while among economists in the West an economic holding generally implies a holding that can fully engage the productive powers of the farmer and his family with the best available equipment. But whatever be the standard adopted, the optimum size of holding would vary with a number of factors: the nature of the crops, the conditions of soil, climate and water-supply, the capacity of cattle, the kind of equipment and the efficiency of the farmer; so that it is not easy to lay down a particular size under all conditions. Granting that the lower, subsistence standard is adopted and sizes are prescribed with reference to particular circumstances, it will not be easy in several provinces to secure even the minimum for the agriculturists who need it, unless perhaps the so-called 'cultivable' lands are all reclaimed. We have little precise data on the nature of these cultivable wastes, of the physical and economic difficulties in reclaiming them. Opinions are on the whole more pessimistic than optimistic. In a country with so much need for further land settlements, it is imperative that the State should set up an expert body to investigate and suggest ways and means of utilising these wastes and alloting them to farmers who show enough evidence of capacity to cultivate them, reserving for the State the power to resume them in case of bad cultivation.

Another evil commonly associated with small holding, but not exclusively confined to it, is the fragmentation of lands of the same holder. A revenue holding in Madras has been called "a conglomeration of fields and sub-divisions in a single village." The big holder has his holding as fragmented as the small one and makes little attempt to consolidate it. Most of the fragments are leased out to different tenants, the holder himself at best retaining a few acres for cultivation by farm servants A case for fragmentation is often made out on grounds of diversity of soils and variety of water resources in one and the same village, which permit diversity of cropping and the spread of risks. But surely it would not be difficult to divide all the lands in a village into three or four blocks of arable land of different degrees of fertility or lying in different levels or irrigated by different systems. The re-allocation can be made in such a way that no holder need be refused any particular class of arable land of which he had owned a fragment, unless it was too small and it would be better to allot a compact holding of workable size in one block. No reformer desires to pool wet and dry and garden lands or pasture and wood lands. Every owner of plots in these lands is bound to carry on much better if he gets a compact field in each class of land. This is indeed the *sine qua non* of a number of agricultural improvements—of better animal husbandry in particular. In Europe the open field

system with scattered strips of holdings—where, however, a medley of crops in different stages of growth was not permitted as is done on our wet lands—has been doomed for over a century now, though its extinction seems to be a slow and painful process in some countries. The consolidation of fragmented holdings has been brought about in many countries by means of legislation which permitted and aided a majority in an area to have all the holdings properly restripped and allotted, even if a small minority was obstructive. The Punjab has succeeded in consolidating, by the more difficult co-operative methods, about a million acres. The Central Provinces more recently resorted, like European countries, to coercive legislation. Though the law has been enforced in only one Division, the area consolidated exceeds that of the Punjab, which has since enacted similar legislation, though it continues also co-operative methods. Co-operative consolidation is being tried in Madras, but with feeble results so far. Only about 500 acres have been consolidated, all in one district.

Even if the reform is brought about by coercive legislation, it should be realised that consolidation once effected cannot be proof against further subdivision and fragmentation, unless the law and custom of inheritance are changed and other avenues of employment are found for the future generation—whose numbers are bound to grow more and more in excess of the requirements of land judged by the trends in the growth of population on the one hand and the possible progress of agriculture on the other. In fact, in every country where agriculture has been held in high esteem, there is a striking shrinkage in the proportion of agricultural population to the total population in the last 50 or 60 years. For instance, the fall in France was from 52 to 40 per cent, in Germany from 42 to 30 per cent, in Denmark from 50 to 30 per cent, and in the United States it has gone down in the last 40 years from 33 to 22 per cent. The same has happened in Scandinavia and Netherlands and in Canada and Australia.

There is a fear that consolidation may mean more rural unemployment on account of the scope it may offer for the use of labour-saving machinery. This is likely; but it only shows up the waste of labour that has been going on. It is also possible, on the other hand that in a compact holding the scope for labour is widened by the digging of wells and lift irrigation or by the cultivation of more valuable crops demanding along with other things more labour per acre, e. g. sugarcane, plantains, Cambodia cotton, tobacco, fruit trees and vegetables and the production of milk—the demand for all of which is bound to grow with an increase in general prosperity.

In India with land so scarce, capital so shy and labour so abundant and cheap, the scope for the use of labour-saving machinery is limited in the vast majority of holdings, even if they be consolidated. There is a slowly growing demand for a few types of power machinery like the tractor plough, the oil engine or electric water lift, and the sugarcane crusher, which only the bigger landholders can afford to purchase. Even they do not want sowing or harvesting machinery. But the small holders can be encouraged to use less expensive labour-aiding or labour-improving implements like the mould-board iron plough the seed-drill and the bullock hoe, on dry soils in particular. It is also possible, if they co-operate, to buy or hire jointly and use in turns the costlier tractor-plough and the cane-crusher There is little excuse, however, for even smaller farmers in scattered holdings failing to use the better seeds and adopt the methods of conservation of local manures recommended by the Department of Agriculture. The cost in either case is only a trifle higher, and it is the least expensive way of increasing the return from the land.

India though old in the art of agriculture is still an infant in the adoption of scientific ways of production and improved methods of economic organisation.

These are the means by which the European peasants have been repeatedly able to defer the operation of the law of diminishing returns on land. Indian cultivators have still to try so many known improvements in the art (rather the science) of agriculture, that the law of diminishing returns, whose ultimate validity may not be questioned by us, need not be a bug-bear now.

An important negative cause of the slow response of the Indian ryot to the efforts made by the scientists and other agricultural reformers is the lack of stimulus in India comparable to the severe competition felt by peasants of Western European countries in the seventies of the last century from the import of cheap grains from the virgin soil of America. It is this that drove them into new and more efficient lines of agricultural production and co-operative organisation. It is only in the last ten years, that is since the Depression began, that India has come to feel the effect of the growing competition, in foreign and even in home markets, from the tropical possessions of European States which have been most of them developed in the twentieth century. Whether the Depression has, on the whole, depressed more than it stimulated the Indian agriculturist, it is too early too say. But there are not wanting signs of an increased interest on the part of enterprising ryots in certain districts in the improvement of agriculture on modern lines. Strange as it may seem, it is in the proximity of industrial and commercial centres that the greatest progress has been made in the technique and organisation of agriculture.

A more rapid industrial development of India is desirable not only from the point of view of self-sufficiency of the country and an all-round efficiency of the people but also for the relief it will afford to land which is overcrowded and subjected to morselment by the increasing number of heirs. Not all new industries need be large or giant industries. Village industries might at first be adversely affected, but there would still be spheres in which small scale production would survive and supplement large scale manufactures, if aided by better tools and cheap electric power as in Japan. Not only the artisans, but agriculturists will stand to gain by the adoption of better tools and implements easily manufactured in industrial centres. More chemical manures (the by-product of heavy industries) and more organic manures (the refuse of populous cities) can be obtained for the benefit of agriculture. More capital, managerial ability and skilled labour are easier to procure in an industrial than in an essentially rural environment. Better business methods of credit, purchase, processing and sale are almost always available in urban areas and they can be slowly imbibed by rural folk in the neighbourhood. The market not only for the raw materials of industry but also for staple foodstuffs and agricultural specialities —in particular, fruits, vegetables, eggs, milk and ghee—is greater in a prosperous industrial community than in a predominantly agricultural society. But for the expansion of industries and the consequent widening of markets, there would have been little development of the dairy or any other intensive form of agriculture in Europe.

Let us not also forget that in Western countries like Germany, Italy and Ireland the impulse and inspiration for rural reconstruction came from leaders, who were not agriculturists but were products of urban civilisation, like Raiffeisen, Luzzatti and Horace Plunkett.

II. Co-operative Organization of Agriculture. It is a melancholy fact that after 35 years of working of the reorganised Departments of Agriculture in India the land under improved varieties is only a fraction of the total area under the particular crops. For instance, of rice and groundnut, the improved strains do not cover more than 5 per cent of the area under each, while of cotton the proportion is 20 per cent. A very important cause of the feeble response made by

the Indian ryots to the efforts of the Department is the lack of capital not only for permanent and substantial improvements but even for current cultivation expenses. In fact many of them have not the wherewithal to maintain their families some months after the harvest. The proceeds of the harvest are nearly exhausted in paying off the taxes and rates in making part payments to creditors, and in buying long needed clothing and foodstuffs not grown on their own lands. All are not able to lay by enough grains and other food-stuffs grown on their very fields for the rest of the year. They sell them at a low price and later on purchase at a much higher price swelling thereby the profits of the merchants. A good harvest is a doubtful blessing as it only enables the money-lender to recover more of his dues.

Not even seeds are preserved for the next sowing by all. If they are, they are not carefully selected. There is either inadequate appreciation of the superior seeds evolved by the Department or inability to buy them. Inability to buy arises partly from lack of funds and partly from lack of such seeds near at hand. Any seeds stocked by merchants or money-lenders are purchased or borrowed at exorbitant rates. Ryots in some tracts have learnt to value superior strains like GEB 24 of paddy and Co2 of Cambodia cotton. But no agency, steady and reliable, has been organised to multiply those varieties and distribute them at reasonable rates, as trained nursery-men do in western countries. This is a work eminently fit to be undertaken by the agricultural graduates who hanker in vain for salaried service. Seed farms should be organised on co-operative lines in much larger numbers all over the country. A few stray farms here and there are hardly adequate.

The value of manures, even of chemical manures like sulphate of ammonia, not to speak of concentrates like oil-cakes and bonemeal, is well understood in many wet land and garden land tracts; but ryots suffer from a lack of credit facilities at reasonable rates free from any taint of exploitation, and from the absence of an organisation of their own which will supply these manures free from adulteration and at an economic price. That is why even South India, which is said to be more 'fertiliser-minded,' consumes so little of these manures.

Implements like iron ploughs, seed-drills and bullock-hoes are slowly getting into favour, specially where speed and thoroughness of cultivation are essential, as in the sugarcane and cotton tracts. And yet the number of implements actually sold in South India is far below the number that agricultural and industrial enthusiasts, like Sir A. Chatterton, expected. There is an important physical limitation in our province which makes the problem economically more difficult of solution. We have a variety of soils and climates that call for a variety of implements in different tracts. This hinders standardisation of implements and their manufacture on a large scale, which alone can reduce the costs of production and marketing and facilitate the supply of spare parts.

For over sixty years in Europe co-operative organisation has been considered to be the only means of salvation for petty peasants, as without it the economies realised by larger farms in securing credit, purchasing agricultural requirements, processing and selling produce could not be realised by the smaller farms—though in farming technique the small holders could at least hold their own with the bigger ones in certain lines of farming, e. g. dairy and poultry farming and the cultivation of fruits and vegetables. The supply of improved agricultural requirements was among the earliest type of co-operative services organised in Western Europe. One of the ways to meet the growing competition from the New World was to intensify cultivation by the use of better seeds, manures and implements. The supply of these at reasonable rates and free from fraud was best done by co-operative societies of producers Another way to meet American

competition was to transform the system of agriculture into one of animal husbandry, the disposal of whose products in distant markets was very much facilitated by co-operative processing and marketing. In Germany though Raiffeisen began his experiments with credit societies, he urged them to undertake the supply of agricultural and domestic requisites, the processing and selling of members' produce and to promote the moral as well as material interest of members.

In India the Raiffeisen credit societies had dominated the field of co-operation for over 25 years and eclipsed all other forms of co-operative activity until recently. Yet not more than 25 per cent of the villages have been at all touched by co-operative credit. Even where the Raiffeisen system has spread, for all appearances, the working of the system has revealed a number of grave defects which are the subjects of enquiry by a committee. Over-dues have mounted up with no prospect of clearance in the near future. At least 25 per cent of the old societies will have to be liquidated at once. A New type of society may be tried in these and other villages.

A fatal flaw in the adaptation of the Raiffeisen credit system in India was that loans might be granted for unproductive, if necessary, as well as productive purposes. The rule was liberally interpreted and even ostensibly productive loans were utilised for the clearance of pressing prior debts, which could seldom be repaid within the stipulated period. It took more than a quarter of a century for those in charge of the movement to realise the need for a separate land mortgage banking system to finance long-term credit needs. Here again it is a matter for regret that our land mortgage banks have been so far doling out loans to clear off the prior debts of members, incurred generally for unproductive purposes, rather than helping them to effect permanent improvements on land or equip the farms with durable machinery. Provision has been recently made for loans for the sinking of wells, the installation of oil engines or electric plant for lifting water or crushing sugar-cane etc., but as yet little has been done. The demand for such loans does not easily come from the ryot. It is for the banks to take the initiative and educate the cultivator in the better use of long-term credit facilities. The Government has been for over 55 years offering what are known as Taqavi loans for permanent improvements; but for a variety of reasons, such loans are hardly popular with the ryots. Taqavi loans have also been granted for short term cultivation expenses, but not in normal years generally. The recent practice in Madras of entrusting the grant of such loans to the officers of the Agricultural instead of the Revenue Department is a welcome change.

Agricultural improvements have seldom constituted the real purpose of a co-operative loan, either short-term or long-term. So, whatever may be the technical success of some of our co-operative credit institutions from the purely financial point of view, it cannot be said that the earning capacity of our agriculturists has been increased.

In India rural credit societies, modelled as they were on Raiffeisen's, had among the objects provision for the supply of the agricultural and domestic requirements of members, the purchase and hire of machinery for the use of members, the sale of members' produce and the dissemination of the knowledge of the latest improvements in agriculture and handicrafts. This imposing array of aims was seldom taken up seriously, and there were not even a hundred out of 11,000 rural credit societies in the Madras Presidency that supplied or encouraged the use of improved agricultural implements, manure and seeds. The *ad hoc* supply societies were small and spasmodic in functioning. The Loan and Sale societies, of which they were more than a hundred, did supply some

improved seeds and manures. There were also a few Agricultural Improvement Societies that had supply as one of their functions and did business to the tune of Rs. 1·4 lakhs for the whole Presidency for a year. Other Provinces did not have a more creditable record in promoting agricultural improvements and supplying the requirements of modern agriculture. This is in striking contrast to the work done by co-operative societies in Western European countries and Japan. The Agricultural syndicates of France and the societies of peasants in Belgium, guided by the Catholic clergy, have done more to improve agriculture than departments of State. In Japan, though co-operative societies were not pioneers of new agriculture, 80 per cent of the 15,000 agricultural societies supplied seeds, fertilisers, implements, etc. to the tune of 70 million yen or Rs. 5 crores per annum—for a country with but 18 million acres of cultivated land.

Whether it is wise to separate supply from credit societies in view of the scare the enforcement of unlimited liability has created in the minds of well-to-do ryots or to stick to multi-purpose societies in view of the lack of human material to manage a variety of societies might be a moot point in India. But, whether alone or in combination, the supply of agricultural requirements was among the most important activities of co-operative societies in Europe and abroad. So powerful have some of the societies grown that in a number of countries they have through their wholesales taken up the manufacture of implements and manures and even the multiplication of seeds for distribution to members.

Marketing of agricultural produce in a raw condition was the most difficult and the latest of co-operative ventures to succeed in Europe. As long as produce was neither uniform nor graded and it met a local want, it was difficult to make a success of co-operative sale. Producers of better quality would not accept the same price as for inferior crops and it was difficult to pool produce of different members. The Society could not negotiate for a better price with uneven qualities and it was often left with unsaleable surpluses of members' produce. Production did not improve until a free and sure flow of surplus produce to the world's market was secured for the farmers. But the outside world would not care for produce that was not improved. This vicious circle was broken by leaders who organised at the same time co-operative sale and agricultural improvement.

Of all attempts at co-operative sale that have so far been made in India, the most successful are those of cotton sale societies particularly in Bombay and Madras—judged by the volume of sales and profits earned for producers. The success of these societies has depended largely on the response made by producers to the efforts of the Agricultural Department to spread improved strains of cotton. Some of them indeed started as seed societies, controlled and guided by the officers of the Department of Agriculture, who naturally strove to find buyers of the new cotton at higher prices than of the older varieties. Even after conversion into sale societies they did not give up the work of spreading new varieties, for which they received some subsidy from the Indian Central Cotton Committee. The Agricultural Officers supervised cultivation work and also graded and classified the cottons. Such graded cottons naturally commanded higher prices. They would not do so unless the varieties were very widely adopted and a large and steady supply of uniform quality were pouring into the market systematically. Small quantities offered by a few individual improvers could not withstand the competition or boycott of a ring of merchants Indeed such breakdown would be a setback to agricultural improvement in the tract. There is thus an intimate connection between co-operative sale and agricultural improvement.

Co-operative sale of milk is coming into prominence in the cities and large towns of India. The usual organisation is the milk supply union with its headquarters in or near the city to which are affiliated a number of societies in the neighbouring villages with members having cows or buffaloes, more often as a side line to agriculture. The milch cattle live under better conditions than in the congested city environment and the quality of milk is richer. But conditions of transport are far from satisfactory and pasteurisation of milk done at headquarters in the bigger unions is not as effective as it would be if conditions of transport and of handling in the initial stages in villages were better. The more serious handicap is the continuance of milch cattle in the city, which really ought to be shifted to rural tracts in their own interests as well as in the interest of public health. A great deal of improvement in the methods of breeding milch cattle and of growing fodder is necessary before the milk supply can be made a paying proposition for producers and brought within the reach of masses of poor consumers in our country. The help of a host of livestock and agricultural experts would be needed if the problem of milk supply should be satisfactorily tackled by co-operative organisations. Co-operative supply cannot for long compete with private suppliers and survive them without a vigorous programme of improvement of breeds and of fodder supply. This programme cannot be carried out in a country where the individual herd is so small without a co-operative organisation of producers Animal husbandry is bound to be a side line to the growing of cereal or other crops in most parts of the country and especially in wet land areas To be economic and to utilise the by-products of the farm, the individual herd must be small, especially where draught cattle have also to be maintained.

Outside India the most successful of agricultural co-operative societies is the society for production and sale, the earliest and the most typical of which is the co-operative creamery or dairy. The surplus milk in rural tracts, far removed from populous centres of consumption, is converted into butter and sold abroad by the butter export organisation which could bargain for the best price. The skimmed milk is returned to members for feeding the pigs kept for bacon production—invariably a by-industry in the dairy tract. Denmark was the earliest home of the co-operative dairy where all the butter produced was exported, through a bottle neck as it were, to Britain. Later on other countries in Europe and overseas have developed a formidable dairy industry mostly on co-operative lines. India, however, does not have any dairy society of the Danish model. Our demand is not for creamery butter but of ghee. Cold drawn creamy butter does not yield good ghee; it becomes waxy and does not have the grain or flavour of home-made ghee, and it does not keep like the latter.

The supply of pure ghee is far short of the demand and with the advent of hydrogenated and refined vegetable oils like Marvo, adulteration has become far too tempting. There is practically no pure ghee available in the urban or even in the larger rural markets. Ghee societies have been organised in the United Provinces which merely collect and sell the ghee made at home by individual members. It is doubtful whether with the best precautions of societies and even good intentions of members, genuine ghee can be collected and marketed. In our view large quantities of uniform, clean and pure product can be guaranteed only when ghee production becomes amenable to centralised manufacture as in the case of butter in Denmark. The Imperial Dairy Institute's method of making ghee by the use of citric acid is claimed to yield better and more ghee compared with the country method 'of natural souring.' Making of ghee direct from cream by heating it in a special boiler is also in the experimental stage. If these experiments are successful and good ghee can be made

on a large scale and use be found by propaganda and otherwise for all the skimmed milk and buttermilk—not so well relished now—the day will not be far distant when we may have a flourishing ghee industry more or less on the model of the Danish Co-operative Creamery.

There is a strong case for the co-operative manufacture of sugar or at least cream jaggery from sugarcane. South India is better fitted to grow the best varieties of cane than Northern India but it has a disproportionately small acreage under cane. A formidable obstacle to the expansion of the area is the difficulty of the disposal of cane after it is harvested. There are not enough factories to absorb the canes at a reasonable price. If it is too much for small farmers to establish a factory of their own on co-operative lines as at Vuyyur, it is up to them or to their well-wishers to organise smaller jaggery making societies with power crushers and improved furnaces. Not only would this reduce the cost of production of jaggery and thus stimulate the market for it, but it could help the producers concentrate their attention on cultivation.

There is ample scope, and from the point of view of agricultural improvement, great need, for the co-operative ginning and pressing of cotton and decortication of groundnut. Success in these lines has been demonstrated in Bombay and Madras. What is needed is further extension.

(To be continued).

ABSTRACTS

Methods for improving germination and final yield of cane. Mathur, R. N.—*Indian Sugar* 4 (1941) : 22—26,

Germination of seed cane pre-soaked in limewash and water was respectively, 18 per cent and 20 per cent superior to the unsoaked cane at the time of early sowing of cane which at Shahjahanpur was done on February 9. In the case of middle and late plantings on March 7 and April 12, soaking in water gave no special advantage. Pre-soaking in limewash again gave better germination by 16 per cent in the middle and 8 per cent in the late sowing date. Final yield of millable cane was correspondingly better in the early sowing. An increase of 42 per cent was obtained when pre-soaking was done in water. No such increase was visible in the case of middle and late sowing dates with water. Soaking in limewash increased cane yield by 17 per cent in early, 20 per cent in middle and 24 per cent in the late sowing dates, respectively, on February 9th, March 7th and April 12th at Shahjahanpur. It is pointed out that where soil moisture is generally deficient as in an average cultivatior's field, pre-soaking should materially contribute towards a better germination and a better stand of the crop. If other conditions are favourable, proportionate increase in yield should also be expected Seed cane called "good" derived from crop well supplied with nitrogen and water gives better germination and also germinates quicker than "poor" quality seed from crop starved of nitrogen and water. The improvement in germination was seen to be of the order of 8·5 per cent in early 13·7 per cent in middle and 6·9 per cent in the late sowing date. The number of shoots formed, yield of cane and of sugar follow a similar course. For the early, and middle sowing dates increase in cane yield of the order of 51·2 and 82·5 maunds per acre were obtained. No special advantage is derived when planting of "good" seed is delayed to April 12th under Shahjahanpur conditions. Attention is also drawn to the indirect disadvantage of a deficient supply of nitrogen and water to the crop, The "poor" crop thus raised, in turn, provides seed material of inferior quality which gives poor germination and poor yield. The advantage of harvesting earthed up cane deeper than generally practised, by

first dismantling the trenches, is clearly brought out by the data obtained. The loss of underground cane accruing from harvesting at the level of the ridges is approximately 6 per cent of the over ground cane and can be prevented by breaking up of the ridges before harvesting which permits of deeper cutting of cane. (Author's summary).

Soil and Water Conservation in the Southern Great Plains. By Hugh H. Bennet.—*Soil Science* 506 : 435.

The co-operative accomplishments of farmers and technical men in Soil Conservation service work areas have proved once for all that soil erosion *can* be controlled if farmers have the will, the ingenuity, the energy and necessary knowledge to carry out the job. Permanent control of erosion involved the following methods: Conservation and more efficient use of rainfall. Recent climatic research indicates that neither ground cover nor lack of it has any appreciable effect on the amount and distribution of rainfall. The only sensible course is to increase the efficiency of rainfall through conservation and utilisation. Contour tillage, level terracing, strip cropping and basin listing help to hold rainfall on land and cover crops and crop residues serve to keep the ground surface open, absorptive and resistant to erosion. For the latter mentioned reason, establishing a vegetative cover is important. The chances of producing a successful crop are almost directly proportional to the amount of water in the soil at planting time. Evaporation of conserved moisture during hot summer is reflected in subsequent yields. In an experiment where (a) decayed straw ploughed in (b) fresh straw ploughed in (c) fresh straw disked (d) straw spread on ground and partially worked in, were the treatments, the last treatment was the best. In the case of basin-listing there was no run off but evaporation from surface tended to offset the gains of prevention of run off. The dunes are stabilised by spreading straw mulch over the entire area or by planting them to grass. Establishing wind breaks and adjusting flocks and herds to bearing capacity of soil are other methods to prevent erosion. The net result of erosion control and water conservation work has been a better diversified, more self sufficient and profitable type of Agriculture. S. V. P.

A New Economic Chemical for the Fruit Industry by H. E. Davis, *Agri. News Letter* 8 : (1940).

In the field of fruit growing, insect and fungus attacks are common and their control is an active subject pursued by investigators. A different type of economic waste, namely that caused by the yearly fruitfall just at preharvest time is also well known Fruits which thus dropped were found to be free from insect or fungus attack. To avoid waste, farmers harvest apples and other fruits before they attained satisfactory size, maturity and colour. The United States Department of Agriculture interested itself in the new so-called hormone sprays in preventing such fruit fall. Two chemical compounds, viz., naphthalene acetic acid and naphthalene acetamide proved effective. So low a concentraction as 0·0005 to 0·001 per cent was found adequate. Spravs stronger than the above were found to "stick" the fruit so tightly that difficulty was often encountered in picking. These hormones are not readily soluble in water and so proprietary commercial preparations which dissolve readily in water are in the market. The effective period of the spray for most varieties of apples is from, two to three weeks. Because of the relatively brief period of effectiveness, it is important that application be delayed as long as possible preferably just prior to dropping or soon after its beginning in order to have the effect there when needed most. The material takes effect within one or two days after application. As a result of spraying no toxic effect or visible residue is noticed

nor is there any injury to fruit, foliage or tree. In the case of the fruit the only effect appears to be that of delaying drop thereby allowing for better colour development and some improvement in size. The author then refers to the use and cost of a proprietary product by name "Parmone" which the du Pont Company (Inc) Wilmington, Del., U. S. A., have put in the market.

(R. R.)

Gleanings.

The Soybean Crop in the United States. Production and processing of the soybean in the United States has grown to a multi-million-dollar industry. Today a ubiquitous plant, the soybean is useful as food for human consumption, feed for livestock and in manufacture of many useful goods. As a component in scores of manufactured products such as paints, soap, plastics, linoleum and waterproof materials, the soybean has gained an important place in the American industrial scene.

Forty-seven U. S, manufacturing establishments last year were engaged primarily in the production of soybean oil, cake and meal, according to the 1939 Census of Manufactures In 1937, only 26 establishments were reported in this industry, The value of products of the soybean processing industry was $ 43,946,647, manufacturers reported to the Census Bureau, compared with the 1937 figure of 24,312,433, an increase of 80·8 per cent. The factories covered in the 1939 report gave employment to 1,481 wage-earners, who drew wages amounting to 1 889 457 and to salaried personnel numbering 199 who drew 663,469 in salaries.

The soybean first was introduced to American farmers in 1893. In 1909, the Census of Agriculture shows, this country produced only 16 835 bushels of soybeans. Cultivation was reported on 339 farms.

Twenty-five years later, in 1934, according to the latest available figures from the Census of Agriculture, the output had soared to 23,014.703 bushels, grown on 148,124 farms, and accounted for more than 25,000,000 cash income for farmers. A considerable part of this increase of more than a thousand-fold took place during the depression years, for production was only 8,661,188 bushels in 1929. In addition, the value of the crop used for livestock feed amounts to many millions of dollars more. According to the Department of Agriculture, the cash farm income from soybeans in 1937 was $ 28,030,000 and by 1938 it had risen to 31,933,000.

Soybean oil made from this Oriental immigrant to our farms is used primarily in shortening and oliomargarine. Of the 369,760,000 pounds of soybean oil consumed in American factories during 1939, census reports show that 201,599,000 pounds were used in the manufacture of shortening. Another 70,822,000 pounds became an ingredient of oleomargarine. The oil also is used in manufacturing candles, celluloid, core oil, disinfectants, electrical insulation, enamels; fuel. glycerin, insecticides linoleum, lubricants, oilcloth, paints, printing ink. rubber substitutes, varnish, waterproof goods and food products such as butter substitutes, cooking oil, lard substitutes and salad oils and medicinal oil. Lecithin is derived from soybean oil and is used as an emulsifier and in the manufacture of candies, chocolate, cocoa, margarine, medicines and in dyeing of textiles. (Egg yolk was the chief source before).

Dried soybean flour is used in baked products, breakfast foods, candies, diabetic foods, health drinks, ice-cream cones, ice-cream powder, infant foods, macaroni products and as filler in meat products. Soy sauce and sprouts are

produced from dried beans. Vegetable milk derived from soybeans is converted into casein, which is used in paints, size for paper, textile dressing and waterproofing. The meal is used for foods, fertilizers and manufacture of glue and celluloid substitutes.

More than a hundred named varieties of soybeans are grown in the United States, according to the Department of Agriculture. The cultivated soybean is derived from a variety which grows wild in Eastern Asia.

The first record of the plant is in the writings of Emperor Shang Nung of China in 2838 B. C. In Chinese mythology, it was first planted by Hou Tsi, one of the Chinese gods of agriculture, and has for centuries ranked as one of the five sacred grains necessary to Chinese civilization—perhaps one of the oldest crops grown by man.

Europe knew of soybeans in the seventeenth century, and they were tried in Germany, England. France and Hungary but were not commercially important until recent years. In 1898, the U S. Department of Agriculture began introducing soybeans on a considerable scale.

In the United States, the soybean is grown chiefly in the cornbelt states. Illinois, Indiana, Iowa, Missouri and Ohio lead. Manchuria is the biggest soybean producer in the world. Japan and South China rank high. too. In the Far East, foods based on the soybean supply the protein which is obtained from meats in the diet of western people. (*Science*, 93 : No. 2404, pp. 86—87).

Research Notes.

An Abnormal Tobacco Plant.

During the course of our field observations tobacco plant with highly congested nodes, and leaves slightly reduced in size was first noticed in a local type (*natu* cigar type). The plant was found to possess nearly twice the number of leaves as its neighbours which is certainly a very desirable character, specially in tobacco, where the yield is in the form of leaf. The neighbouring plants were all topped, the usual practice in local tobacco cultivation, and this particular plant was allowed to grow without being topped. It is quite gratifying to note, that it continues to grow having given so far 120 leaves and though all other plants in the field have completed flowering and were harvested by the middle of March, this plant is still growing, without any signs of flowering. It has so far grown to a height of 8 feet, and vegetative buds from the leaf-axils are being fixed for cytogenetic studies. Detailed data regarding this plant in comparison with the normal, are being collected and further developments will be watched with care.

Agri. Res. Station, Guntur
May 1, 1941

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To

The Editor, Madras Agricultural Journal.

Paper from water hyacinth.

I wish to invite the attention of the readers to a very interesting article entitled, "Utilisation of Water Hyacinth in the manufacture of paper and pressed boards" by M. A. Azam, of the Industrial Research laboratory, Department of Industries, Bengal, Calcutta that has appeared in *Science and Culture* Vol. VI, No. 2, May 1941. It is of great interest to us in that Water Hyacinth (*Eichhornia crassipes*, Solms.) is becoming every day an increasingly important

Left: Abnormal tobacco plant.
Right: Normal plant of same age.

pest in South India as in other parts of the world. The readers of this Journal may well remember that when Mr. S V. Ramamurty was Director of Agriculture, Madras, he rightly insisted on finding ways and means to utilise plants which could not be easily eradicated. Water hyacinth is one such, and the article referred to indicates an immense scope for the utilisation of this plant. As the author has pointed out, the utilisation of the plant would also mean the gradual and finally the ultimate eradication of this noxious weed. Among other things the author has been able to manufacture wrapping paper, writing paper, pressed boards and articles resembling the modern 'masonita' products. It is already known that water hyacinth could be employed as a good manure and I learnt that Messrs P. S. G. Sons Peelamedu, Coimbatore, have been wisely making use of it in this direction from the abundant material available on either side of the railway line between Coimbatore and Podanur. The article is worth the attention of Indian industrial magnates who would be in a position to start industries like paper-making from raw materials available in our own land, especially in the days of war, when importation of foreign articles is difficult.

Agricultural College and Research Institute, Coimbatore,
Dated 22nd May 1941.

Yours etc.,

S. N. Chandrasekharan.

Review.

The Nutritive value of Indian foods and the planning of satisfactory diets. Health Bulletin No. 23. Manager of Publications, Delhi, 1939—Price annas 2.

Foodstuffs supply fuel for the body, and they contain proteins, fats, carbohydrates, vitamins and various mineral salts. Proteins, fats and carbohydrates are sometimes known as the energy-yielding food factors since they are "burnt" or oxidized in the body to provide the energy necessary for life. Vitamins and mineral salts do not supply energy in appreciable quantities but they play an important part in the physiological functions of the body.

2 **Total caloric requirements** The minimum 'caloric' needs of an average Indian, engaged in ordinary easy-going agricultural or coolie work may be reckoned as 2,500—2,600 calories per day. Those who perform heavy manual work will probably require about 2,800 to 3,000 calories per day.

With the help of the tables furnished in the Bulletin, the caloric contents, etc., of diets can be worked out and compared with requirements as suggested.

3. **Daily requirements of food constituents.**

(a) *Protein.* This supplies building material for the body and makes good the loss of tissue and also supplies energy. Men and women of all ages ranging from 18 to 60, require 65 and 55 grammes per day respectively. All common food-stuffs contain protein but the amount they contain varies widely. Animal foods such as milk, eggs, fish and meat are rich in protein. The common cereals such as rice and millet, contain a fair proportion, rice being the poorest of all in this respect. The outer layers of the grain are richer in protein than the inner starchy kernel, hence the use of mill polished rice is not advocated. Among the vegetable foods, the pulses are richest in protein.

(b) *Fat.* It is advisable that not less than 45—60 grammes (1½—2 ozs.) should be consumed daily. Animal fats such as butter and ghee, contain vitamin A. Coconuts are rich in fat.

(c) *Carbo-hydrates.* These are the body's chief source of energy. Grain foods and root vegetables are largely composed of carbohydrates and sugar is wholly carbohydrate.

(d) *Mineral salts.* These are the elements which are most likely insufficiently supplied by average human diets.

(i) *Calcium.* This is found abundantly in whole milk, skimmed milk, butter milk and green leafy vegetables. Amaranth, (*Amaranthus spp*) fenugreek (*Trigonella foenum groecum*) and drumstick are rich in calcium. Rice is very deficient in calcium and there is evidence that insufficiency of calcium is one of the most important defects of the rice eater's diet. The daily requirement of calcium is 0·68 gramme per day per adult. The best source is milk. Green vegetables and ragi are particularly rich in calcium. The habit of chewing betel leaves coated with slaked lime, increases intake of calcium.

(ii) *Phosphorus.* More than 1·0 gramme should be daily supplied by the diet. Cereals in raw state are fairly rich but considerable loss of this element occurs on washing and cooking.

(iii) *Iron.* This is needed for blood formation. A well balanced diet should contain 20 mgs. per day.

(e) *Vitamins.*

(i) Vitamin A, is found in whole milk, curds, butter, pure ghee, egg, liver, fish, etc. While vegetable foods do not contain vitamin A, the pigment carotene (sometimes called provitamin A) which is present in many vegetables, appears to fulfil the physiological functions of vitamin A in the body. Leafy vegetables such as spinach, cabbage, amaranth leaves, coriander leaves, drumstick leaves and ripe fruits such as mangoes, papayya, tomatoes, oranges, etc., are rich in carotene. A well balanced diet should contain a daily minimum of 3,000 International units.

In the case of leafy vegetables, a good rough indication of carotene content is their greenness. The greener the better and the fresher the better. Ordinary cooking does not destroy the carotene present in vegetables.

(ii) *Vitamin B.* This is found in unmilled cereals, pulses, eggs, fruits, most vegetables, liver, meat and milk. Par-boiled rice, even when milled, contains this vitamin. The requirement of an adult may be estimated at 300 International units per day. The smaller the supply of vegetables, pulses and fruits, the more important it becomes to avoid a preponderance of 'milled' cereal in the diet. If rice is subjected to several washings, a large portion of this vitamin is lost. Milk which is a good source of most of the important food factors is not rich in vitamin B_1.

Vitamin B_2 (a term covering several vitamins) is an important food factor. All cereal foods are poor sources of it, milled rice being the poorest. Certain of the common pulses—Bengal gram, black gram and red gram, contain it fairly abundantly. Its richest sources are whole milk, skimmed milk, butter milk, curds, liver, eggs, green vegetables, pulses and lean meat.

(iii) Vitamin C is found in fresh fruits and vegetables. Pulses and cereals in the ordinary state do not contain it, but when they are allowed to sprout the vitamin is formed in grain and in green sprouts. The adult diet should contain 30—50 mgs per day. This vitamin is sensitive to heat and loss occurs in cooking.

(iv) *Vitamin D* is found in liver, egg, whole milk and ghee. The cheapest way of supplying is by exposing the body to sunlight.

4. **Effect of cooking on nutritive value.** Ordinary cooking causes loss of proteins, fats, carbohydrates in cereals, pulses and meat, in case of vegetables however there may be some loss when boiling particularly when salt is used.

During washing there is considerable loss of minerals. Frying does not lead to much change in the nutritive value. The addition of washing soda tends to promote vitamin destruction, while addition of tamarind has a preservative effect.

5. **Malnutrition.** The state of the skin is a sensitive index of faulty feeding; a rough dry skin or a skin covered with a papillary eruption suggests faulty feeding and in particular vitamin A deficiency.

This well got-up publication of 52 pages is perhaps the cheapest issued by the Govt. of India; but the fund of information contained in it is worth a hundred times the low figure of annas 2 at which it is priced. The possession of the publication and frequent reference to it for the planning of satisfactory diets in the home should be the aim of every housewife. To health workers, medical practitioners and managers of residential schools and other institutions, the book should prove a companion of inestimable value. The translation of the bulletin into the important languages of the country should be well worth the trouble taken to do it. M. K. R.

Imperial Council of Agricultural Research.

Annual Report for 1939 – 40.

The Agricultural Research Council's report for 1939—40 gives a review of the progress of agricultural research schemes undertaken during the year and in immediately preceding years. From the inception of the Agricultural Research Council it had solely to depend on annual discretionary grants from the Central Government. The financial position of the Council was thus quite insecure and it was not possible to plan and execute long term research programmes. To remedy this defect and to give the Council a stable financial footing the Government of India introduced in the Central Legislative Assembly, the Agricultural Produce Cess Act, in March 1940 which was duly passed and received the assent of the Governor-General. The Act provides for levying a cess of ½ per cent *ad valorem* on a number of agricultural exports. This will yield an income of about Rs. 14.00,000 in a normal year and the whole amount will be spent up in agricultural research schemes. The Council is thus ensured of a larger and more stable income unaffected by the financial vicissitudes of the Central Government.

The report deals with the activities in various centres in connection with the Council's rice research schemes. As a result of Sir John Russell's recommendation, the Council accepted the principle of limiting its assistance to work on rice genetics, water requirements and manurial experiments leaving rice breeding to be tackled by Provincial Governments. This policy has been generally followed Efforts are being made in different parts of India to evolve varieties of rice suited to local conditions of growth, such as varieties which will stand salt, acid and flood, or would grow at an altitude of between 2000 and 5000 feet.

The preservation of fruits and vegetables by cold storage has received the attention of the Council for the last few years. In Bombay, cold storage trials have been made with practically all the important fruits and vegetables grown in India and their suitable cold storage temperatures have been ascertained.

Experiments on an American variety of tobacco, *Bonanza*, have shown that it is a suitable variety of cigarette tobacco for India. As decided by the Council in 1939 a tobacco officer was sent out for training in the United States of America, Canada, Japan, Singapore and Ceylon. Two other officers will be sent to U. S. A.. in 1941 for studying different aspects of tobacco cultivation viz, cultivation, curing, grading, re-drying and reconditioning, packing and storage etc.

The Council initiated a standardized pure-line trial of groundnuts at 27 different stations throughout India. Three new species of potatoes collected by

the Empire expedition to South Africa and Mexico were received in Simla and used for trials in this country.

Dry farming research throughout India is now being conducted on a common programme. The main line of work is agronomic, which will enable workers to evolve a system of farming capable of securing a crop even in a year of drought.

A large number of medicinal plants were chemically and pharmacologically analysed during the year and pyrethrum was tested for its value as an insecticide A monograph on the poisonous plants of India has been published. A large amount of information relating to the distribution of medicinal and poisonous plants has also been collected.

To give effect to the recommendations of Mr. A. Wilson, who was appointed by the Council to enquire into the prospects of increasing cinchona cultivation in India, the Council is considering a scheme of research providing for two research stations—one in the North and one in the South. To each of these stations a State nursery will be attached. These research stations will carry out a comprehensive programme of research and investigate the immediate problems of cultivation. The State nurseries will supply planting material to new concerns and test plots in selected areas will be laid out to determine the suitability of land for growing cinchona.

The central fodder and grazing committee of the Council considered during the year schemes on mixed farming from a few provinces and recommended a standard scheme capable of application throughout India, with modifications to suit local conditions.

A comprehensive scheme for an all-India soil survey is now under the consideration of the Imperial Council of Agricultural Research. The crops and soil wing of the Board of Agriculture and Animal Husbandry passed a comprehensive resolution for co-ordinated action in the provinces and States to check the menace of soil erosion in India,

The Council's bi-monthly Journal *Agriculture and Livestock in India* is appearing as a monthly magazine under a new title *Indian Farming* from January 1940. This magazine publishes the latest news of agricultural and veterinary research and new developments in theory and practice of farming. It aims to present a picture of research and developments in agriculture and animal husbandry in India. (*Science and Culture* 6 (1941) : 574—575).

Crop and Trade Reports.

Statistics—Cotton—1940-41—Fifth or final report. The average of the areas under cotton in the Madras Province during the five years ending 1938-39 has represented 9·7 per cent of the total area under cotton in India.

The area under cotton in the Madras Province in 1940-41 is estimated at 2,390 600 acres as against 2,206,200 acres for the corresponding period of last year and 2,320 600 acres according to the forecast report issued in February. The present estimate for the Province represents an increase of 7·6 per cent as compared with the finally recorded area of 2,222,197 acres in 1939-40. The final estimate of last year fell short of the actuals by 0·7 per cent.

The increase in area in the current year as compared with the area in 1939-40 occurs in all the important cotton growing districts of the Province outside Kurnool, Nellore, Ramnad and Tinnevelly. The increase is marked in Guntur,

Anantapur, Cuddapah, Salem, Coimbatore (+98,300 acres) and Madura (+61,700 acres). The area estimated in respect of Coimbatore is the highest reported in recent years, whilst the area estimated in respect of Nellore is the lowest reported in recent years. Picking of cotton is in progress and may be finished in about a month. The crop was affected to some extent by the attacks of insects in Kistna, Guntur and Coimbatore and by heavy rains in Coimbatore, Ramnad and Tinnevelly.

Normal yield is expected in Vizagapatam, Chingleput, Chittoor, North Arcot, Salem, Trichinopoly (irrigated Cambodia only), Tanjore, Madura and South Kanara. A yield below normal is reported from the other districts of the Province. The estimated yield is very low in Tinnevelly (60 per cent for unirrigated cambodia and 63 per cent for irrigated cambodia, Kurnool (77 per cent) and Nellore (71 per cent).

The seasonal factor for the Province as a whole works out to 91 per cent of the average for both irrigated and unirrigated cotton, the corresponding figures according to the Season and Crop Report of last year being 92 and 94 per cent respectively. On this basis, the yield works out to 503,500 bales of 400 lbs. lint as against 455,390 bales of last year which represents an increase of 10·6 per cent. The yield in an average year is estimated at 545 630 bales. It is, however, too early to estimate the yield with accuracy as much will depend on future weather conditions and their effect on the second crop and on the amount of damage done by insect pests.

The estimated area and yield under the several varieties are given below :—

(Area in hundreds of acres, i.e. 00 being omitted; yield in hundred of bales of 400 lb. lint i.e. 00 being omitted.

Variety.	Area		Corresponding yield.	
	1940–41 Acres.	1939–40 Acres.	1940–41 Bales.	1939–40 Bales.
1	2	3	4	5
Irrigated Cambodia	2.726	1,785	1,572	883
Dry Cambodia	2,503	1,913	502	338
Total, Cambodia ...	5,229	3,698	2,074	1,221
Uppam in the Central Districts ...	176	258	26	28
Nadam and Bourbon	264	251	13	6
Total, Salems ...	440	509	39	34
Tinnevellies*	7,047	7,093	1,592	1,575
White and Red Northerns	1,800	1,950	173	232
Westerns	8,170	7,660	957	948
Warangal and Cocanadas	1 135	1,072	189	189
Chinnapati (Short staple)	85	80	11	10
Province	23,906	22,062	5,035	4,209

* Includes Karuganni cotton in the Coimbatore district and Uppam, Karunganni and mixed country cotton grown in the South.

The table below gives final information so far as it is available on the crop of 1939—40.

(*Figures in hundreds of bales of 400 lb. lint i. e. 00 being omitted*).

Item	Particulars.	South		Deccan Northerns & Westerns.	Rest of the Province Cocanadas and others.	Total
		Tinnevellies and Salems.	Cambodia.			
1.	Pressed at presses and loose cotton received at mills in 1940—41	1,531	2,148	1,396	344	5,419
2.	Subtract crop of 1938—39 pressed at presses and loose cotton received at mills in 1940—41 i. e. stocks of loose cotton held by the trade, ginneries, presses and mills on 31st January 1940	118	137	22	40	317
3.	Add loose cotton of the crop of 1939—40 held by the trade, ginneries, presses and mills on 31st January 1941	Information not available.				
4.	Add estimate of extra factory consumption	37	nil	38	25	100
5.	Total crop of 1939—40	1,450	2,011	1,412	329	5.202
6.	Yield as estimated in April 1940	1,631	2,074	1,130	200	5,035
7.	Yield as estimated in the Season and Crop Report of 1939—40	1,621	1,329	1,308	196	4,554

Note (1) The year 1940—41 relates to the period February 1940 to January 1941, when the crop of 1940—41 generally comes to the market. The early sown crop in the Deccan, however, generally comes into the market from December in each year. The figures are taken from the weekly returns furnished by mills and presses.

(2) Items (2) and (4)—The figures are approximate.

The average wholesale price of cotton lint per imperial maund of 82$\frac{2}{7}$ lb. equivalent to 3200 tolas as reported from important markets on 7th April 1941 was about Rs. 14—0—0 for Cocanadas, Rs. 17—6—0 for White Northerns, Rs. 18—2—0 for red Northerns, Rs. 13—9—0 for Westerns (Mungari crop), Rs. 20—13—0 for Westerns (Hingari crop), Rs. 32—13—0 for Coimbatore Cambodia, Rs. 29—15—0 for Southern Cambodia, Rs. 32—13—0 for Coimbatore Karunganni, Rs. 29—4—0 for Tinnevelly—Karunganni, Rs. 27—14—0 for Tinnevellies, and Rs. 26—4—0 for Nadam cotton. When compared with the prices published in the last report, i, e. those which prevailed on 3rd February 1941, these prices reveal a rise of 27 per cent in the case of Nadam, 22 per cent in the case of Coimbatore Karunganni, 19 per cent in the case of Westerns (Hingari crop), 16 per cent in the case of Tinnevelly Karunganni, 14 per cent in the case of Coimbatore Cambodia, 11 per cent in the case of Tinnevellies, 10 per cent in the case of red Northerns, 6 per cent in the case of Cocanadas, 4 per cent in the case of white—Northerns and 3 per cent in the case of Westerns (Mungari crop).

(Director of Industries and Commerce).

Cotton Raw in the Madras Presidency. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st May 1941 amounted to 225,886 bales of 400 lb. lint as against an estimate of 503,500 bales of the total crop of 1940—41. The receipts in the corresponding period of the previous year were 222,392 bales. 218,162 bales mainly of pressed cotton were received at spinning mills and 21,332 bales were exported by sea while 85,963 bales were imported by sea mainly from Karachi and Bombay.

(Director of Agriculture, Madras).

College News and Notes.

The Entomological Society of India—South Indian Branch. A meeting of the Society was held on the 7th May 1941, when the following papers were read:—

1) Preliminary studies on the pollen-carrying capacity of the Indian bee by M. C. Cherian and S. Ramachandran and V, Mahadevan.

2) Description of a new species of *Trichospilus* parasitic on the pupae of the sugarcane moth borer—*Diatra venosata.*

3) *Apostocetus krishnaieri* Mani a new internal parasite of the Amaranthus stem borer weevil—Hypolixus truncatulus.

Eight interesting insect specimens were also presented.

Foot and mouth disease. Foot and mouth disease broke out among some of the animals in the Central Farm in the last week of April 1941. Stringent steps were taken to observe quarantine precautions The dairy herd was completely isolated and the area kept cordoned off from the farmyard. Only half the number of animals in the Farm were affected and the disease has subsided now. The dairy herd was affected with the disease and the disease is being allowed to run through the herd, the affected animals being given Chemio-therapy with iodine injections.

Personal. Sri K. Unnikrishna Menon, Senior Lecturer in Agriculture and Superintendent, Central Farm who is on 4 months leave preparatory to retirement handed over charge on 15—5—41 forenoon to Rao Bahadur Sri G. N. Rangaswami Ayyangar, Principal and Millets Specialist and Geneticist.

We are glad that Mr. R. C. Broadfoot who was on long leave for reasons of health has completely regained his health and has resumed his duties as Principal of the College, Senior Lecturer in Agriculture and Superintendent, Central Farm.

Consequent on the return of Mr. Broadfoot from leave, Rao Bahadur Sri G. N. Rangaswami Ayyangar, Principal and Millets Specialist and Geneticist who was granted four months leave, handed over charge of Principal and Senior Lecturer in Agriculture and Superintendent Central Farm to Mr. R. C. Broadfoot and that of Millets Specialist and Geneticist to Sri C. Vijayaraghavan on 24—5—41 afternoon.

Sri P. Abraham, B.A., M. Sc., Assistant to the Cotton Specialist who was permitted to enter foreign service for appointment as Scientific Officer to the Bombay Burmah Plantations Ltd., of South India, was entertained at dinner by the members of the Cotton Specialists section.

St. John's Ambulance Brigade. A Division called the Agricultural College and Research-Institute Division, Coimbatore was formed on the 8th May 1941 with Dr. K. Narayanan as Divisional Surgeon and Sri D. Natarajan as Divisional Superintendent. Ambulance classes are being held thrice a week. A second batch of 16 students commenced their training in "First Aid" on the 23rd April 1941 with Dr. K. Narayanan as Instructor and had their examination on 17th May 1941.

Visitors. Rao Bahadur K. T. Alwa and Dr. T. V. Ramakrishna Ayyar visited the Agricultural College in connection with the B. Sc., Ag. examinations.

Dr. P. K. Sen, Physiological Botanist, Fruit Research Station, Sabour, Biha and Sri K. C. Naik, Superintendent, Fruit Research Station, Kodur visited the Research Institute during the month.

UNIVERSITY OF MADRAS

B. Sc. Ag. Degree Examination—1941

LIST OF SUCCESSFUL CANDIDATES

First Examination. Dasaradhi, T. B; Devadas Kamath; Dhanvantari Reddi; Ganesan, K. R.; Gopalakrishna Sarma, M. V.; Govindaswami, C. V.; Krishnamurthi, C.; Krishnaswami, S.; Kuppuswami, B. S; Kuppuswami, K. P.; Kutumba Reddy, K.; Mirza Answer Baig.; Narasimhamurti, Y. V. S. S. S.; Narasimha Rao, I. L.; Narasimha Reddy, R.; Padaki, G. R.; Palaniswami, T. V.; Rajagopal Reddi, V,; Ramachandran, T. K.; Ramakrishna Sastri, K.; Rama Rao, V.; Ramesh Adyanthaya, N; Sridhara Sastri, D.; Srinivasan, C.; Subramanyan, R.; Sundara Rao, T. R.; Tiruvengadam, C. R.; Ummerkutti, O. V.; Venkataraman, T. M.; Venkataramanan, C. R; Prabhakara Reddy, G.; Suryanarayanamurti, K. V. S.

Second Examination. Adivi Reddy, A.; Anantakrishna Rao, P. N.; Dharmakkan Isaish.; Duraiswami, K. N.; Gurubasappa, H.; Krishnan, B. S.; Madhimaidas, V.; Nageshwara Rao, J. P.; Pitcheswara Rao, M.; Radhakrishna Reddi, A.; Raja Rao, K.; Ramakanta Reddy C; Ramamohana Rao, K.; Ramanadham, S.; Sankara Rao, C.; Sethuraman, M. S.; Sivasubrahmanyan, P. K.; Srinivasa Rao, B.; Subba Raju, A.; Subrahmaniam Reddy, C.; Subrahmanyam, A.; Sundararajan, C. L.; Suryanarayana, K. S.; Suryaprakasa Rao, P. V; Theophilus Chellappa.; Vijayaraghavan, K. S.; Yegneswara Chintamani, P.; Gopalakrishna Gokhale, V.*; Koulutlayya, M. C.; Narappa Reddi.; Santanaraman, T.; Vengala Rao, K. C.*; Venkateswara Chayanulu, U*; Atchutarama Raju, I.; George, C. M.; Monappa Hedge, H.; Narayana Kamath, H.; Ramana Rao, D. V.; Somanna, K. M.; Thyagaram, U. V.

Final Examination. George C. M.; Monappa Hedge, H.; Narayana Kamath, H; Ramanamurthi, P. V.*; Somanna, K. M.; Thyagaram, U. V.; Bhaskara Reddy, N.; Chinnappa Reddi, D.; Daniel Sundararaj, D.; Hanumantha Rao, B.; Jagannathan, N.; Minakshisundaram, M. N.; Muhammad Ibrahim, P. A.; Narasimham, B.; Narasimhamurti, D.; Narayanan Nambiar, M.; Paramananda Panda; Rajagopalan, V. R.; Ramalingam, G.; Ramalingam, M.; Rama Rao, G.; Ramasubramanian, S. N.; Sanyasi Rao, U.; Seshavataram, B.; Shaukat Ali, K. A.; Sheenappa, K.; Srinivasan, N. V.; Srinivasan, S. T.; Srinivasan, S. V.; Srinivasalu, N.; Tiruvengalachari, T. K.; Vasudeva Rao, B.; Venkataramanamurti, C.; Venkateswara, P.; Venkateswara, T.; Mohan Punja, M.; Murti Raju, K.; Padmanabha Raju, B.; Raghavulu, G. V.

The following candidates have references in the subjects noted:—

Second Examination. *Engineering.* Subba Rao, K.; Mrutunjaya Sastri, R.; Thandavarayan, K,; Ramanamurthi, P. V.; *Animal Hygeine,* Anantakrishnan, N.; Jaganatha Rao, Y.; Krishnamurthi Rao, S.; Subramanyam, J.; Venkataramana Reddy, G.; *Agricultural Zoology.* Subba Rao, K,; Hanumantha Rao, K.; Kutumba Rao, V. V.; Syed Muhamad, D. A. *Agriculture Plant Husbandry.* Edward, J. J. D.; Ramaratnam, W. S.

Final Examination. *Agricultural Botany.* Achutarama Raju, I.; Ramana Rao, D. V.; *Chemistry.* Narayanamurthy, R.; Sambamurthi, K.; *Agricultural Economics and Farm Management.* Narayanamurthi, R.; Radhakrishna Rao, D. and Sambamurthi, K.

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* Already passed B. Sc. Ag. final examination.

** Yet to pass one subject in the 2nd B. Sc. Ag.

Mofussil News.

Anakapalle. The annual honey day which was celebrated at the Agricultural Research Station on 4—4—41 was largely attended by the public of this place and the neighbouring ryots. Sri. D. Satyanarayana Raju Garu, Land-lord and Honorary Magistrate, Anakapalle, presided on the occasion. All the modern appliances for bee-keeping and a sample of honey extracted at the Station were exhibited. Sri K. Venkataraman in a brief speech in Telugu explained to the audience the advantages of bee-keeping and exhorted them to take to it as a subsidiary industry while Sri. D. V. Reddy gave a talk in English on bee-keeping as a cottage industry. An agricultural drama advocating improved methods of agriculture was also enacted on the occasion by the members of the Juvenile labour school of the Station. The audience evinced a keen interest in the proceedings of the evening and the function was a success. K. V.

Atmakur. An Agricultural exhibition was held during the car festival of Sri. Ranganayaka Swami at Tartur from 10th to 14th April 1941. About 15,000 people mostly ryots from all over the District gathered here, of whom about 10,000 visited the exhibition. Improved strains of paddy, groundnut, Italian millet, sorghum, ragi and sugarcane, insecticides and fungicides for the control of crop pests and diseases and improved implements useful to the tract were exhibited. B. R. R.

Bhadrachalam. A large scale exhibition was held at Bhadrachalam for the Sriramanavami Kalyana Mahostavam when thousands of pilgrims gathered from far and wide between the 4th and 8th April 1941. The important exhibits were chief varieties of paddy and rice of the Samalkota, Anakapalli and Maruteru Agricultural Research Stations, ragi varieties, earheads of E. C. 593 and *Poona Ganti* from Agricultural Research Station, Anakapalli; blocks of jaggery prepared from Co. 419 and Co. 421; cream jaggery; samples of *gangabondams* of Amalapuram; seed coconuts of Kasargode; plantain bunches of Samalkot; malt foods and biscuits sent by the Government Agricultural Chemist, bee hives, accessories and samples of honey, various labour saving implements, dusting and spraying machines and several charts and posters on agricultural subjects. One special feature of the exhibition was the poultry section where White Leghorns and Rhode Island Reds popularised through the efforts of the Agricultural Demonstrator. Specimens of Co. 419 cane and silage prepared locally were also exhibited. T. R.

Bhimavaram. The Andhra Cultural Conference and the Swadesi Industries exhibition was arranged by the Secretary of the East Godavari District Commercial Museum in the newly constructed museum buildings to synchronise with Sreeramanavami festival. Agricultural and other exhibitions were arranged in specially constructed sheds. Exhibits from Kodur Fruit Research Station, and those put up by the Chemistry, Entomology and Mycology crops and bee-keeping sections and implements of Messrs. P. S. G. & Sons, Coimbatore gave prominence to the whole show and thousands of visitors had the opportunity of seeing the several demonstrations. It is interesting to note that the practical demonstration conducted by Sri. M. Suryanarayana, Assistant in Chemistry, Coimbatore, in the manufacture of cholam malt attracted many visitors.

On the 14th April in connection with the Andhra Cultural Conference an Agriculturists' conference was held under the presidentship of the Maharaja of Jeypur in the Vikrama hall of the building. Sri. T. Lakshmipati Rao, Agricultural Demonstrator, Bhimavaram, spoke on 'Better methods of agricultural

propaganda'. Sri. M. Suryanarayana, Assistant to the Agricultural Chemist delivered a lecture on the preparation of cholam malt.

The president, said that the suggestion given by the lecturers in carrying on agricultural propaganda with the aid of poets, *Bhagavathars* etc. by singing the folk songs and producing suitable gramaphone records would be successful and easy and the ryots should co-operate and help the propagandists. Unless agriculture was well developed, there would be no possibility for developing any industry. He advised all to take up cholam malt manufacture as a cottage industry and to use the same in place of foreign foods. T. L. R.

Mannargudi. An agricultural exhibition was held in connection with the 'Vennaithali festival' at Mannargudi from the 26th March to 2nd April 1941. Besides the usual paddy, rice and oil seeds samples and improved ploughs and other implements recommended to the rice growers, specimen plots of different varieties of green manure and fodder crops and an attractive display of citrus fruits, vegetables and potato varieties formed a special feature of the exhibition. The other exhibits included different breeds of poultry, bee hives and bee-keeping appliances, varieties of sugarcane, mango grafts and budded citrus varieties malt foods and canned fruits. The exhibition attracted large crowds daily and the different exhibits were explained to them Lantern lectures were given on improved methods of agriculture. About 5000 people visited the exhibition stall. At the close of the show, there was a rush for the purchase of many exhibits which included vegetable seeds, pine apple fruits, green vegetables, orange and mango grafts and honey. M. A.

Trithala. A Rural exhibition was held at Trithala under the auspices of Trithala multi-purpose Cooperative Society on 22nd and 23rd March 1941. The exhibition was opened by Sri. K. Unnikrishna Menon, Senior Lecturer in Agriculture and Superintendent, Central Farm, Coimbatore. Stalls were separately opened by the Agriculture, Veterinary Health and Cooperative Departments. A number of ryots from surrounding villages attended the show. Ploughing competitions for labourers, and spinning and elocution competitions for students of the neighbouring schools were an important adjunct to the show. Sports by the school children as well as by elders were other items on the programme. The judges appointed by the Exhibition committee made visits to ryots' lands and inspected *in situ* the improvements adopted in their fields for awarding prizes. Meetings were held and lectures were delivered on various subjects pertaining to agriculture veterinary science, health, cooperation, cottage industries. The Agricultural Departmental stall was arranged tastefully with a liberal complement of coloured pictorial and world posters. The visitors evinced considerable interest in the Pattambi and Taliparamba strains of paddy and other specimens of seeds and graft plants, grasses and silage. Bee keeping and insect pests and diseases of paddy, coconut, arecanut and other important crops formed a separate section in the stall. Practical demonstrations with improved implements in the neighbouring fields held during the period attracted a large crowd. A large number of prizes were offered for which there was keen competition.

Social. A very pleasant farewell party was arranged at the Agricultural Reserch station, Guntur on the afternoon of the 8th April to bid farewell to Sri. S. V. Doraiswami Iyer, Farm Manager on the eve of his transfer to Coimbatore. Sri. M. Narasimham, Demonstrator, Guntur on transfer to Tenali, and Sri. Mukundarao, and Sri. Muthuswami Achari to the office of the District Agricultural Officer, Chittoor. Besides several of District officers from Guntur and Krishna districts Messrs. R. Swami Rao, S. Sitaram Patrudu and L. Narasimhachari were also present. B. S. M,

Weather Review—APRIL 1941.

RAINFALL DATA

Division	Station.	Actual for month	Departure from normal @	Total since January 1st	Division	Station	Actual for month	Departure from normal @	Total since 1st Janaruy
Circars	Gopalpore	0·6	−0·2	0·8	South	Negapatam	0·9	+0·3	4·7
	Calingapatam	0·0	−0·9	0·4		Aduthurai *	2·3	+0·7	4·1
	Vizagapatam	0·0	−0·7	2·7		Madura	7·7	+5·7	9·1
	Anakapalli*	0·7	−0·2	2·9		Pamban	0·6	−1·0	7 9
	Samalkota*					Koilpatti*	2·1	−1·0	3·8
	Maruteru*	0·0	−0·5	0·2		Palamkottah	4·9	+2·4	6·3
	Cocanada	0·0	−0·6	1·7					
	Masulipatam	0·0	−0·6	0·1					
	Guntur*	0·0	−0 7	0·1	West Coast	Trivandrum	3·1	−1·5	5·8
Ceded Dists.	Kurnool	0·2	−0·4	0·3		Cochin	2·9	−1·8	4·9
	Nandyal*	0·4	−0·6	1·0		Calicut	2·6	−0·7	3·2
	Hagari *	0·8	−0·2	1·1		Pattambi *	1·6	−2·1	1·6
	Siruguppa*	0·2	−0·8	2·6		Taliparamba *	2·5	−10·5	1·6
	Bellary	1·2	+0·4	1·9		Kasargode *	1·7	−1·2	1·7
	Anantapur	0·0	−0·5	0·8		Nileshwar*	2·6	+0·8	2·8
	Rentachintala	0·0		0·5		Mangalore	0·1	−0·2	0·1
	Cuddapah	0·9	+0·4	1·7					
	Anantharaju-pet*	0 0	−1·4	1·1	Mysore and Coorg	Chitaldrug	0·8	−0·1	1·0
						Bangalore	3·2	+1·9	3·4
Carnatic	Nellore	0·0	−0·4	0·2		Mysore	5·2	+2 9	5·3
	Madras	0 2	−0·3	0·9		Mercara	3·0	+0·4	3·2
	Palur*	0·7	−0·7	3 4					
	Tindivanam *	0·1	−1·0	1·4					
	Cuddalore	1·2	+0·6	5 5	Hills	Kodaikanal	3·0	−1·3	7·5
Central	Vellore	0·0	−1·0	0·5		Coonoor			
	Gudiyattam*	0·0	−0·8	0·6		Ootacamund *	1·9	−2·1	3·2
	Salem	2 5	+0·7	2·6		Nanjanad *	3·0	−0·2	4·0
	Coimbatore	2·3	+0·9	3 1					
	Coimbatore A. C. & R. I *	1·7	−0·2	3·1					
	Trichinopoly	1·1	−0 6	1·3					

* Meteorological Stations of the Madras Agricultural Department.

@ From average rainfall for the month calculated up to 1937 (published in Fort St. George Gazette).

Weather Review for April 1941.

The weather at the beginning of the month was characterised by high temperatures, but between the 10th and 15th the passage of a low pressure wave over the south of the peninsula occasioned widespread thunderstorms and rain in the south of the peninsula. The activity of the low pressure wave was most marked between the 10th and 12th. Thereafter, hot weather conditions set in over the peninsula with high day temperatures and scattered thunderstorms. Temperatures rose about the middle of the month and were generally appreciably above normal over the central parts of the country, the highest maximum temperature recorded being 115° at Rentichintala on the 30th of the month when temperatures were appreciably above the average over the whole of India ranging from +16° in South West Punjab and Sind to 4°—8° over the peninsula.

Rainfall for the month was in excess in the southern districts and locally in the Central Districts, Mysore and Coorg and generally in defect elsewhere.

The chief falls reported were :

(i) Madura 5·1" (12th).
(ii) Palamkottah 4·5" (10th).

Weather Report for the Agricultural College and Research Institute Observatory.

Report No. 4/41.

Absolute maximum in shade	...	99·5°F
Absolute minimum in shade	...	70·8°F
Mean maximum in shade	...	96·6°F
Departure from normal	...	+1·0°F
Mean minimum in shade	...	75·0°F
Departure from normal	...	+1 9°F
Total rainfall for the month	...	1·65"
Departure from normal	...	-0·23"
Heaviest fall in 24 hours	...	1·01" on 11th
Total number of rainy days	...	2
Mean daily wind velocity	...	1·20 m. p. h.
Departure from normal	...	-1·43 m p. h.
Mean humidity at 8 hours	...	68·7%
Departure from normal	...	-2·4%

Summary. The weather during the month was generally dry except for the period between 10th and 15th when rain was received during the passage of the low pressure area across the south of the peninsula. Day temperature was slightly above normal while the night temperature was appreciably above normal. The total rainfall was in slight defect. P. V. R. & S. V. K.

Departmental Notifications.

Gazetted Services.

1. Appointment.

Sri C. Jagannatha Rao, Assistant in cotton section, Agricultural Research Station, Nandyal, is appointed to officiate as Gazetted Assistant, Mungari Cotton Scheme, Adoni on a pay of Rs. 190 per mensem in category 7 Class I, Madras Agricultural Service Vice Sri V. K. Subrahmanya Mudaliar granted leave.

Subordinate Services.

Appointments.

The services of Sri M. B. Venkatanarasinga Rao, permanent Assistant, Paddy section, Agricultural Research Station, Maruteru, are placed at the disposal of the Government of India for appointment as temporary Assistant under the Imperial Council of Agricultural Research in connection with the scheme far the preparation of a monograph on " Rice Breeding and Genetics in India " for a period of 18 months.

Sri K. Satyanarayana Murthi, Probationer in category i class I Madras Agricultural Subordinate Service, who has been discharged for want of a vacancy is reappointed as Officiating Upper Subordinate, Science Section and is posted to officiate as Cotton Assistant in the Mungari Cotton Scheme, Adoni, *Vice* Sri N. G. Narayana granted leave.

Sri S. Lakshminarayana Pantulu, probationer who has been discharged for want of vacancy is reappointed to officiate as Upper Subordinate, Agricultural Section and is posted as Agricultural Demonstrator, Pattikonda *Vice* Sri N. Ranganathachari transferred.

P. Abraham, Assistant to the Cotton Specialist has been permitted to enter foreign service for appointment as Scientific Officer to the Bombay Burmah Plantations Ltd.

Transfers.

Name of officers.	From	To
Sri M. Gopalan Unnithan,	A. D., Tirupattur	
„ P. Nagadhara Nayudu,	Asst. A. D., Nandyal	F. M., A. R. S., Nandyal.
„ V. Kurma Rao,	A. D., Repalle	A. D., Vuyyur Factory.
„ S. L. Narasimha Rao,	Asst. A. D., Vuyyur	A. D., Repalle.
„ C. V. Sundaram Ayyar,	Asst. in Entomology, Coimbatore	A. R. S., Aduthurai.
„ S. Madhava Rao.	F. M, Central Farm, Coimbatore	F. M., G. B. G. and Park, Ootacamund.
„ K. Krishna Hegde,	Asst. F. M., G. B. G. and Park, Ootacamund	F. M., Nanjanad.
„ K. Govindan Nambiar,	F. M., A. R. S, Nanjanad	F. M., C. F., Coimbatore.
„ T. K. Thangavelu,	A. D, Ootacamund	A. D., Avanashi.
„ K. H. Subrahmania Ayyar,	A. D., Avanashi	A. D., Ootacamund.

Leave.

Name of officers.	Period of leave.
Sri C. S. Sankaranarayana Ayyar, A, D., (on leave)	Extension of L. a. p. for 1 month from 22—5—41.
„ B. Sivarao, A. D., Tuni,	Extension of L. a. p. on m. c. for 4 months from 5—4—41.
„ P. Lakshminarayana, A. D., Chodavarm,	L. a. p. on m. c. for 3 months from 30—4—41
„ N. Sobhanadri, Supdtt. Market Yard Committee, Guntur,	L. a. p. for 90 days from 1—4—41.
„ J. David, Asst. A. D., in Mycology Coimbatore,	L. a. p. for 2 months from 21—5—41.
„ S. Varisai Muhammed Sahib, Asst. in Oil Seeds. A. R. S., Tindivanam,	L. a. p. for 30 days from 6—5—41.
„ G. Narasimhamurthi, F. M., A. R. S., Siruguppa,	Extension of L. a. p. for 30 days from 16—5—41.
„ N. Ranganathachari, A. D., Done,	L. a. p. for 42 days from 4—4—41,
Janab A. Gulam Ahmed Sahib. F. M., A. R. S., Koilpatti,	Extension of L. a. p. for 1 month on m. c. from 7—5—41.
Sri K. G. S. Bhandari, A D. Coondapur,	L. a. p. for 1 month from 5—5—41.
„ C. S. Balasubrahmanya Ayyar, Asst. in Entomology, Cuddapah,	L. a. p. for 2 months from 3—5—41.
„ V. Krishnaswami, Asst. A. R. S., Aduthurai,	L. a. p, for 1 month and 10 days from 5—5—41.
„ M. Ratnavelu, A. D., Bhavani,	L a. p. for 3 months from 7—5 -41.
„ V. Karunakaran Nair, Dairy Manager, Coimbatore,	L. a. p. for 1 month and 10 days from 22nd May 1941,
„ M. Gopalan Unnithan, A. D., Tirupattur.	Extension of L. a. p. for 1 month from 16—5—41.

Applicability of the Agricultural Produce (Grading and Marketing) Act to Sann Hemp.

G. O. Ms. No. 829, DEVELOPMENT DATED MAY 2, 1941,

No. F. 3—9 (3)/41—A. In exercise of the powers conferred by section 6 of the Agricultural Produce (Grading and Marketing) Act, 1937 (I of 1937), the Central Government is pleased to direct that the provisions of the said Act shall apply to the following article of agricultural produce, namely *Sann Hemp.*

—Ft. St. George Gazette.