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EDITORIAL

The Food Situation It is one of the most significant features of this war, that in the matter of food production, the Allies are at a distinct advantage over the enemy. In the continent of Europe, the sole source of food supply to the Germans, crop production has suffered a terrible set-back. In the occupied regions millions of cattle have been slaughtered for providing food for the Nazis, and Holland, Denmark and France have been depleted of their dairy herds. Even Switzerland with her magnificent milk cattle has not escaped a similar fate. What remaining cattle there are, are in a state of semi-starvation owing to lack of feed and have virtually ceased to be productive. Norway's fishing industry is at a stand still as the enemy has deprived her of her fishing fleets. The entire wheat area of Europe, trampled under the heel of the marching hordes of the belligerent armies has been rendered desolate and unproductive. Famine stalks the land and disease and pestilence are taking their heavy toll. From North Cape to Lisbon and from Greece to Finland, the people are undergoing hardships as never before in history On the other hand, food production in the allied countries has received a tremendous impetus since the war. In Canada and the United States, the surpluses of wheat from past harvests, are finding a market, hitherto denied to them. Almost every empire country has redoubled its efforts with regard to food production and plentiful harvests have been the result. Notwithstanding the submarine menace, and the sinking of considerable quantities of cargo, Britain and her allies have been able to maintain the morale of her fighting men and civil population without any difficulty.

In India, the beginning of the past year saw an acute distress in regard to food, owing to crop failure in the previcus season and the occupation of Burma by the Japanese, which cut off our rice supplies from that source. Added to this, was the inevitable concommitants of war, namely, loss of imports, black markets, unbalanced distribution, transport difficulties and profiteering which aggravated the situation, and hindered production. But thanks to the promptitude and vigilance of the Central and Provincial Governments, vigorous steps were taken to increase food production and regulate its distribution. A "grow more food" campaign was

organised throughout the country, which bore good results. Considerable improvement was effected in providing transport facilities for conveyance of food. Profiteering was checked by control of prices in certain essential commodities Regional self-sufficiency was encouraged and cultivators were given concessions to increase their output. Thus in a short time, the situation in the country as a whole, improved and the goal set at the beginning of the year to increase the acreage under rice and millets by 7·6 million acres has been reached according to Sir Jogendra Singh, Member for Education, Health and Lands. The total acreage under rice has been increased from 73 millions to 75·6 and millets from 51 millions to 56 millions.

During the current season, crop production has been adversely affected in many areas. There has been partial failure of the crop in many parts of the Madras and Bombay presidencies for want of timely rains. Cyclone and flood have been contributory factors to loss of crop in parts of Bengal and Orissa. It is considered, however, that these adverse factors have not in themselves caused more than temporary local shortage and measures are being taken by the Central Government to make good the deficiency of food grains by importing large quantities of wheat from Australia, and to for the more effective mobilisation and distribution of exportable surpluses from the producing provinces to the needy areas.

In this connection, we make an earnest appeal to the agriculturists and traders dealing in food grains, to release their surplus stocks at once to the market and co-operate with the Government in its efforts to ease the situation in the country. There could be no justification for hoarding even in normal times, and much less so in times of stress as at present. Moreover, the recent priority preference for food grain transport should go a long way to remove obstacles in the way of merchants clearing away their stocks. We hope, therefore, that with the co-operation of the public, the food situation will be considerably better in the future than in the recent past.

New Year Honours We are glad to note that in the new year honours Rao Bahadur B. Viswanath, Director of the Imperial Institute of Agricultural Sesearch, New Delhi, has been awarded the insignia of C. I. E. and Mr. R. Thomas, Assistant Sugarcane Expert, Imperial Sugarcane Station, Coimbatore, the title of Rao Saheb. Rao Bahadur Viswanath was actively connected with the Madras Agricultural Students' Union during the time he was at Coimbatore having been its Secretary and Vice-President and the Editor of this journal. Mr. R. Thomas has been associated in cane-breeding work with Sir T. S. Venkataraman, ever since the inception of the breeding station at Coimbatore. We extend our felicitations to both the recipients.

Soil Erosion and Conservation of Moisture in Un-Irrigated Black Soils

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Lecture No. 1*

Soil Erosion is a subject that is receiving world-wide attention today. Although erosion has been going on for centuries, it is recognised that it has begun to assume serious proportions in recent years. America may be said to be the foremost country in the collection and dissemination of knowledge concerning this problem. Through a chain of experimental stations which deal exclusively with the problem of soil erosion in all its varied aspects, a large mass of data is collected and the results made available to the farmers through a series of scientific articles, pamphlets and other publications; wide publicity is given to such results. Farmers are encouraged to form soil conservation districts, which on co-operative lines practise the various control measures advocated by the officers of the Soil Conservation Service, under their expert guidance and advice. The Soil Conservation Service deals comprehensively with the problem of erosion from the agricultural, forestry, engineering and other points of view. The quantity of soil washed down the great river systems of America annually is computed in millions of tons of soil. Some of the erosion surveys of the United States as a whole showed that 35 millions of acres have already been destroyed; out of the 350 millions of acres under cultivation, 125 millions have lost most of their surface soil and 100 millions are eroding seriously. It is stated that at the present rate of soil and water depletion the fertile soil in America will be reduced in another 50 years to a fourth of what it is now. These are some of the results of the erosion surveys of the United States.

In India no such computations of the losses of soil fertility are yet available. According to Dr. L. Dudley Stamp, an authority on land utilisation matters, the problem of soil erosion in Africa is of recent origin, but is assuming very serious proportions as a result of the intensive exploitation of the land for purposes of agriculture. The native system of cultivation known as 'Bush fallowing', which is also called 'shifting cultivation', is best suited to the country. A period of cultivation is usually followed by a long period of fallow—usually 7 to 10 years, during which bushes and trees grow. These form a natural protection against erosion. It is only when the period of fallow is reduced and clean ploughing, clean weeding,

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extensive clearing and such other practices are introduced, erosion is excessive.

A knowledge of certain facts fundamental to the problem of erosion is essential for a proper understanding of the subject. Soil erosion is caused by the action of wind or water in motion. The average depth of soil in the world is estimated to be about 6 to 12 inches. At some places it is deeper and at others shallower. It is this thin layer of soil resting on a rocky core that is responsible for all plant growth and that supports all animal and human life. It is as essential for life on this planet as air, water or sunlight. It is therefore our primary duty to protect this layer of soil and see that its fertility is well preserved.

Under the natural undisturbed conditions, an equilibrium will be established between the climate of a place and the cover of vegetation that protects the soil layer. Vegetation, trees and forests retard the transportation of soil material and act as a check against excessive erosion. A certain amount of erosion, however, does take place even under this natural cover; but it is such a slow process that it happens at the rate at which soil formation takes place. Such erosion is called geological erosion and proceeds in a natural undisturbed environment. As opposed to this we have what is called accelerated erosion. When vegetation is removed and land put under cultivation the natural balance existing between the soil, its vegetational cover and climate is disturbed. The removal of the surface soil takes place at a much faster rate than it can ever be built up by the soil forming processes. Erosion is thus accelerated. When dealing with erosion on cultivated soils we are considering only this accelerated erosion.

The damage due to wind and water erosion assumes different degrees of importance depending on the locality. Whenever soils without a cover of vegetation in a dry state are exposed to high winds, we have wind erosion. The fine portions of the soil are lifted and carried to great distances. In India as a whole wind erosion is not as extensive as water erosion. Light soils are more susceptible to wind erosion than heavy soils. Along rivers like the Hagari and the Pennar in the black soil areas sand blowings are common. During summer, when the river is dry, high south west monsoon winds lift up the sand which is deposited on the black soils making them unfit for cultivation in the course of some years. If this is allowed to go on without hindrance much of the cultivable land will get covered up with sand annually.

The following remarks are mostly confined to the effects of water erosion which is the more serious and extensive type of erosion that occurs in the black soil areas of the Ceded Districts Two fundamental types of water erosion are the 'gullying' and the 'sheet erosion'. In the case of sheet erosion, movement of run-off water and eroded soil takes place in sheets, approximately the same amount of soil being removed from each place. When this moving mass assumes sufficient velocity it has a cutting

action on the soil. A gully or a trench, as it were, forms at any small dent or depression in the field where this moving mass of soil and water collect at a high speed. The run-off water carrying the surface soil flows down the gully with ever increasing velocity. If the velocity of the run-off water is doubled its energy is increased four times and its cutting action is correspondingly increased ; its capacity to carry in suspension the soil material is increased sixty-four times The gullies tend to deepen and widen with every rainfall. They cut up agricultural lands into small fragments and make them unfit for cultivation in course of time. Of these two types of erosion, gullying is the more spectacular type while sheet erosion is the more insidious type, creeping on unnoticed. The destructive action due to sheet erosion may not be felt in the first few years. Only when, due to continuous erosion, the productive capacity of the land is diminished, we begin to realise that the fertility of the soil is being steadily lost. Sheet erosion usually ends in gully erosion. (Vide Fig. 1).

Let us now examine the chief causes of accelerated erosion in black soils. Run-off water and its speed on these soils are controlled by the following factors :

(1) the heavy nature of the soil and its physical condition ;
(2) the nature and distribution of rainfall ; and
(3) the slope of the country.

The black cotton soil or the *Regur* of the Madras Deccan is noted for its high clay content consisting of about 50 percent clay and 30 percent silt, the finest mechanical fractions of the soil. It is the fine colloidal clay that determines all the soil-water relations. It is highly retentive of moisture but on account of the heavy nature, the soil is slow to absorb rainwater. It is sticky when wet and hard when dry. These black soils have been shown by many workers to possess properties similar in many respects to the extensive group of black earths known as 'chernozems', one important difference being, however, that the chernozems are rich in organic matter while these soils are poor, consisting of only one to two per cent of organic matter. What happens when a heavy rain falls on these clayey soils ? The colloidal clay which might be visualised as a thin film existing round the mineral particles swells on wetting. Clay in the flocculated state assists in the formation of compound particles. This aggregation into compound particles known as 'crumb structure' is agronomically the most desirable structure. It offers the least resistance to the passage of implements ; allows water to percolate better to the lower layers. But when rain drops begin to beat on these crumbs or compound particles, apart from the mechanical action of pulverising, deflocculation of the colloids sets in due to the washing away or leaching of the electrolytes ; the crumbs deteriorate and the soil-water mixture flows on the surface as a viscous fluid. Consequent on the loss of structure the fine material flows into the pore spaces in the soil, clogging them and preventing any further percolation of rain water to the lower layers. Absorption is then limited to the rate at which percolation to lower layers can take place, which, however, is very slow. Thus

the soil will not be able to absorb rain water as fast as it is received. The result is run-off.

The run-off carries away the surface soil with it. The amount of the run-off necessarily depends upon the intensity of rainfall. A heavy storm within a short interval might cause as much damage as all the other rains put together during the year. One of the factors conducive to excessive erosion in these soils is that there is no crop or other vegetation on the land during most of the period when the rains are received. The main *hingari* crops, cotton and sorghum, are harvested by March or April; between April and September or October, until the next sowings are done, the land is fallow. The distribution of rainfall is such that out of an annual precipitation of about 20 in. about 12 in. are received in the quarter—August, September and October. It is only after the September rains are received that cotton is sown, sorghum being sown in October. Most of the rainfall is thus received only when the land is fallow. A few *mungari* or early crops like *korra* (Italian millet) and groundnut, if sown, are all the protection that the soil has against erosion consequent on the direct impact of rain. It is not also uncommon to receive a downpour of about 3 in. overnight. One or two such instalments of intensive rainfall occur every year. Added to these the land is slopy in nature. Thus the heavy type of soil, which does not allow rain water to be absorbed as fast as it is received, the undulating nature of the land and the fact that soil is exposed without any protective cover for most of the rainy period are the chief factors underlying accelerated erosion in black soils.

Losses of soil and water due to erosion can be measured accurately. A knowledge of this aspect of the problem is essential for an understanding of the magnitude of the losses. During the last five years soil and water losses due to run-off were studied at the Dry Farming Station, Hagari. Two plots 66 ft. by $8\frac{1}{4}$ ft. (area 1·25 cents) with a gradient of 1 in 80 were selected. On three sides the plots were enclosed by galvanised iron sheets, which project about a foot above the ground level. The run-off was collected in masonry cisterns (6 ft. × 4 ft. × 3 ft.) towards which the plots slope (Fig. 2). The volume of the mixture of soil and water that collected in the cisterns after each rain was measured. Samples of run-off waters were analysed for water and soil separately, from which the amount of water collecting in the cisterns by run-off and the amount of soil that it carries with it are calculated. The samples were also analysed for total salts, lime and nitrate nitrogen.

During 1937–38 both the plots served as duplicates, only hand-hoeing being done before the rainy season in both.

Any method by which the velocity of flow of the run-off waters could be minimised helps in reducing erosion. If small pockets or basins are formed, it will be an effective check against excessive erosion. The effect of 'scooping' on the control of erosion was investigated during 1938–39 and 1939–40. One of the plots had scoops formed in it before the rainy

Fig. 1. Gullying in black soils.

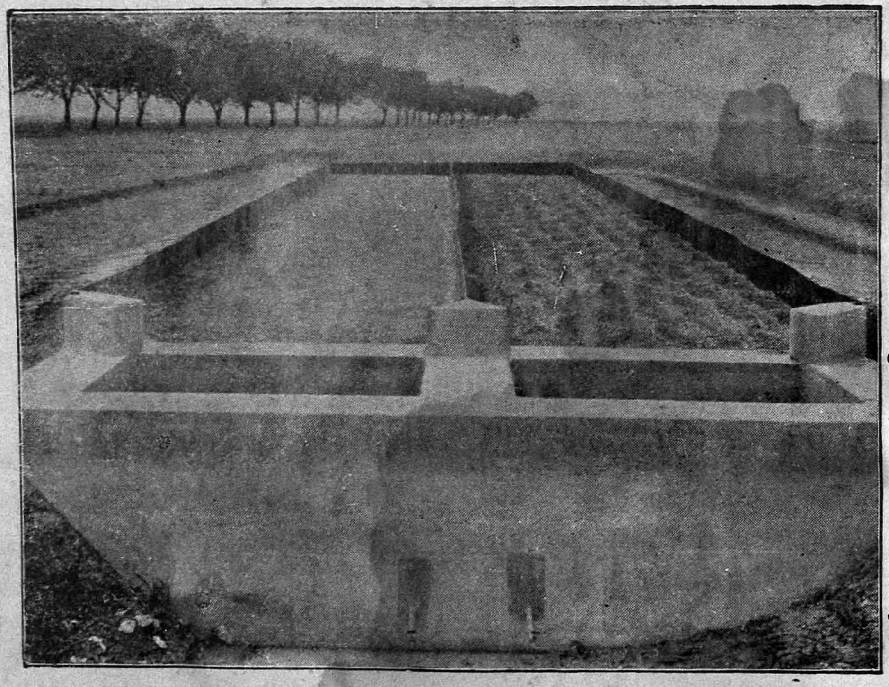

Fig. 2. Run-off plots at Hagari—control and scooped plots.

season, while the other was given hand-hoeing and kept as clean fallow. The latter served as control. The results obtained during the years 1937 to 1940 are given in the following table.

TABLE 1. Run-off results, 1937 - 40

	1937–38 Average of two control plots	1938–39		1939–40*	
		Control	Scooped	Control	Scooped
1. Number of days when there was run-off	11	13	10	16	10
2. Total rainfall on days when there was run-off in either of the plots–inches	9·16	15·66	15·66	8·36	8·36
3. Rain water lost–inches	4·00	7·52	3·29	2·73	1·34
4. Rain water lost—expressed as per cent of rainfall received	43·67	48·01	21·01	32·66	16·03
5. Silt washed off in tons per acre	6·58	9·86	3·60	7·35	2·44
6. Silt washed off in tons per acre per inch of rain water lost	1·65	1·31	1·09	2·69	1·82
7. Total salts lost in lb. per acre	100·60	132·86	95·79	65·00	41·72
8. Lime (CaO) lost in lb. per acre	2·45	20·07	16·79	5·46	2·62
9. Nitric nitrogen lost in lb. per acre	0·11	0·59	0·29	0·19	0·09

* Excluding data on two days when the run-off cisterns overflowed—rainfall being 3·82 in. and 2·61 in. within 24 hours on 10th August 1939 and 25th October 1939 respectively.

It is seen from these figures that in the control plot 44 and 48 per cent of the rainfall was lost by surface run-off during 1937 and 1938. Considerable amounts of silt were lost in the run-off waters. The soil losses amounted to 6·6, 9·9, and 7·4 tons per acre for a rainfall of 9·2 in , 15·7 in. and 8·4 in. respectively. Every inch of run-off water carried away 1·5 tons of silt per acre during 1937 and 1938. It was even more during 1939.

While the actual amount of run-off depends on the intensity of the rainfall and the slope of the plots, some of the American results reported from the Texas Experimental Station on run-off under agricultural conditions were 3 tons per acre per inch of rainwater lost. Grass was found to be 65 times more efficient in the control of soil losses and five times more effective in checking water losses than bare soil.

At the Sholapur Dry Farming Station, it was found that a clean fallow plot lost 25 tons of soil in one year for a rainfall of 14·8 in. when the run-off was only 5·8 in. The soil removed per inch of rainwater lost was 4·3 tons per acre under the same conditions of gradient and size of plot as at Hagari, while the corresponding figures for Hagari were 1·6 tons per acre during 1937 and 1·3 tons per acre during 1938. A plot in which weeds

were preserved gave only 0·58 tons per acre or 1/50th of the losses in the clean fallow plot at Sholapur.

On an average, excluding days of very heavy rainfall as occurred in 1939, about 8 tons of soil per acre was lost by erosion in a clean fallow plot at Hagari, *i.* e., about 16 cart-loads of fine silt.

Intense storms contribute most to run-off. A single storm on the 28/29th of September, 1938, for example, was responsible for nearly a third of the total loss of silt and a fourth of the total loss of water that occurred during the whole year.

	Rainfall, in inches.	Water loss in inches.	Soil loss in tons per acre.
28/29—9—1938	3·57	1·81	3·29
Whole rainy period of 1938	15·66	7·52	9·86

Such instances are very common when the scouring action of an intense downpour does great harm and removes much of the valuable surface soil.

When the soil is very dry and numerous cracks are present, even a heavy precipitation does not give much run-off. Run-offs recorded early in the season are very small ; (e. g.) on 4th July 1939 for a rainfall of 1·14 in. the run-off was only 0·03 in. and the soil loss was 0·03 tons per acre. Run-off data recorded early in 1940—41, illustrating this point is given below.

Run-off data recorded early in 1940—41

Date	Rainfall in inches	Run-off in inches
7—6—40	0·49	0·10
10—6—40	0·52	0·26
13—8—40	0·97	0·02
13—9—40	0·87	0·04
Total.	2·85	0·42

Effect of scooping on the control of erosion It is seen from Table 1, that by scooping or listing the water losses are reduced from 7·5 to 3·3 in. and from 2·7 to 1·3 in. respectively for the years 1938-39 and 1939-40, while the soil losses for the same period were reduced from 9·9 to 3·6 tons per acre and from 7·4 to 2·4 tons per acre respectively. Scooping the land therefore considerably reduced the run-off and consequent losses by erosion. Data on a few occasions when the scoops were very effective in reducing run-off is given below.

TABLE 2. Extract of run-off data for 1938

Date.	Rainfall, in inches	Run-off in inches		Silt lost in tons/acre	
		Control	Scooped	Control	Scooped
6—8—38	1·89	1·12	0·26	1·259	0·409
18—8—38	1·62	0·92	0·15	1·020	0·185
22—8—38	2·39	1·31	0·71	1·570	0·842
24—9—38	1·18	0·60	0·03	0·492	0·036
25—9—38	0·81	0·39	0·09	0·215	0·032
Total	7·89	4·34	1·24	4·556	1·504

The reduction in the run-off in the scooped plot on these occasions of heavy rainfall is due to the mechanical obstruction to the flow of water which the scoops offer.

The total salts washed off the surface are not considerable; the weight of the top 6 in. layer of soil will be about 1000 tons per acre and 100 lb. in this is negligible.

Quality of the soil washed by the run-off waters The soil collected in the run-off cisterns was analysed for the physical and chemical composition. The results are given in the following table.

TABLE 3. Mechanical analysis of silt collected in 1937–38

Heads of analysis	Run-off silt	Soil 0 to 1 ft. layer
Clay (per cent)	56·8	44·9
Silt („)	26·9	17·1
Fine sand („)	8·5	15·7
Course sand („)	1·4	17·5

TABLE 4. Chemical analysis of silt collected in 1937–38

Heads of analysis	Run-off silt	Soil 0 to 1 ft. layer
Loss on ignition	7·14	3·12
Insoluble matter	63·95	75·49
Iron and alumina (Fe_2O_3, Al_2O_3)	20·95	13·19
Lime (CaO)	3·83	3·45
Magnesia (MgO)	1·52	0·92
Potash (K_2O)	1·28	0·29
Phosphoric acid (P_2O_5)	0·041	0·054
Nitrogen (N)	0 043	0·024

These figures for the analysis of silts collected in the run-off cisterns are typical of the data obtained year after year. The analysis of the soil from the top one foot layer is also given in the tables for purposes of comparison. The figures for the mechanical analysis show that the silt washed off the land consists of about 84 per cent of the fine fractions, clay and silt, while the original soil contains only 62 per cent. The difference is due to the fact that during the course of the washes the coarse particles settle out quickly and it is the fine material that gets lost The nitrogen content of the silt was 0·043 per cent while that of the soil was only 0·024 per cent. Potash in the silt was about four times that contained in the soil. Thus from all accounts the silt that is washed off the land is much richer than the original soil Much of the organic matter present in the surface soil gets lost; the loss on ignition for the silt being nearly double that for the original soil. The fertility of the soil is lost. A poorer soil is left behind. A healthy soil is the first essential for the production of a healthy crop. Loss in soil fertility results in a crop which is unhealthy and susceptible to disease.

Effect of a cover crop on the control of erosion During 1940-41 and 1941-42, the effect of a cover crop of groundnut on the control of erosion was studied in the above plots. Groundnut (A H. 25), spreading variety, was sown in one of the plots early in June and it was harvested early in December. If timely rains are received for the sowing of a *mungari* crop like groundnut, it will be on the field practically throughout the rainy period and will be a good protection against erosion.

Table 5. Results of run-off for 1940-41

(Data from 13—6—40 to 13—12—40, the date of sowing and harvest of groundnut respectively, in one of the plots)

	Control clean fallow	Cropped with groundnut
1. Number of days when there was run-off	11	5
2. Total rainfall on days when there was run-off in either of the plots in inches	7·63	7·63
3. Rain water lost in inches	2 81	1·63
4. Silt washed off in tons per acre	1·83	0·98
5. Total salts in lb. per acre	102·61	62·48
6. Lime (CaO) lost in lb. per acre	19·12	7·93

The number of days when there was run-off was 11 in the clean fallow plot while it was only 5 in the cropped plot. Losses of water and soil are also reduced by nearly 50 per cent in the plot with the cover crop of groundnut. The effect of the cover crop in the reduction of the run-off is threefold: *viz.* (1) interception of the rainfall by the crop reduces the intensity of the rain drops reaching the soil; (2) the spread of the crop offers mechanical obstruction to the flow of water; and (3) absorption of moisture by the crop reduces the cropped plot to a drier state than the uncropped one and the soil will readily absorb the rain water when in a dry state. This will tend to lessen run-off. For these reasons losses of soil and water by surface run-off, in the plot with the cover crop of groundnut were reduced to nearly half those occurring in the control plot. As stated earlier, most of the rainfall is received in the period August to October, during the period when the *mungari* crops, if any are sown, are on the field. It will therefore be advantageous to have strips or belts of a *mungari* crop across the slopes during the rainy period, in areas which are subject to severe erosion.

Soil conservation measures The main principle underlying methods of control of erosion is to reduce the velocity of the flowing water If the velocity is reduced its amount naturally gets reduced. Methods of control of erosion may be either mechanical or biological. Bunding, listing or scooping and damming are the purely mechanical methods of control of erosion. The flow of run-off water is checked and greater time allowed for it to soak into the land. In cultural operations like ploughing the soil is brought into good physical condition for absorption. Ploughing on slopy land should never be done along the slopes as the furrows will form

channels of drainage and run-off will be increased. On the other hand ploughing across the slopes greatly adds to the capacity of the soil to absorb rain water.

If all the rain water gets into the land there is neither run-off nor erosion. But this is impossible and we can try by various measures to minimise erosion. We have seen how scooping reduces losses due to erosion considerably. Bunding, as advocated by the Department of Agriculture, is a very simple operation and rain water is held well in the compartments. The "bundformer" which forms bunds about 7 in. high can cover about 10 acres a day, the cost of working being only about four annas per acre. Being an annual operation, it should become part of the preparatory cultivation like the working of the *Guntaka* or the blade harrow.

Bunding as advocated in the Bombay Presidency differs from the system of bunds formed by the "bundformer". They are high bunds, about 2 to 3 feet in height and provided with waste weirs for the flow of surplus water. They are more or less permanent improvements which will be of greater use in very slopy fields. In such fields contour cultivation offers one of the best means of controlling erosion.

Among the biological methods of control of erosion, cultivation of crops should be done in such a way that the maximum protection to the soil is offered for as long a period as possible, during the rainy season. Strip cropping is one of the best examples among the methods of biological control of agricultural erosion. Wide-spaced, clean-tilled crops like cotton offer the least resistance to erosion, while close-growing crops like *korra* or groundnut offer the maximum resistance to erosion. The principle of strip cropping is to alternate strips of erosion-permitting with erosion-resisting crops. Under the local conditions of Hagari, mixtures of *korra* and cotton are sown in the *mungari* season. These can easily be replaced by strips of *korra* and strips of cotton. Not only is this anti-erosive; but it was found that there was minimum of root competition in such an arrangement. Strips of *korra* alternated with strips of groundnut also form an efficient cover against erosion.

I have attempted to place before you the main factors which contribute to excessive erosion in black soils and the magnitude of the soil and water losses that occur due to surface run-off. One example of mechanical method of control of erosion (scooping) and one example of biological method of control of erosion (cover crop of groundnut) were studied in detail as to their effects on the reduction of run-off. The necessity for obtaining such data under different agronomic practices and under different soil and climatic conditions is obvious. Only a beginning has been made in the study of erosion losses. Conservation of moisture in dry areas should necessarily aim at minimising run-off. A more efficient use should be made of the rain water, by making as much of it as possible get into the soil. This aspect of the problem will be dealt with in the next lecture.

A New Millet—*Brachiaria ramosa* Stapf

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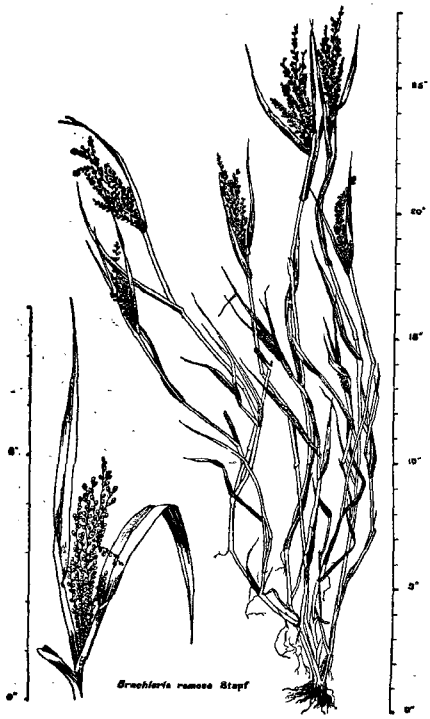
Some common grasses found in the Madras Province enumerated below are recorded to be under cultivation in parts of Northern India for grain which is used as human food. The more important among these are :— (1) *Echinochloa colona* Link. (*Panicum colonum* Linn.), Kan : *Godde votapagante hullu ;* Tel : *Otha gaddi, Koproda gaddi ;* Tam : *Karum pul, Varsanum pullu* It is cultivated in the Montgomery district of the Punjab and the grain is made into a paste, called '*bat*', and eaten with milk. (2) *Echinochloa crus-galli* Beauv. (*Panicum Crus-galli* L.), Kan : *Kadu dabhai hullu ;* Tel : *Pedda wundu ;* Tam : *Oothu pul.* It is cultivated in parts of the Lahore district for its grain which is made into *Khir* and eaten. (3) *Urochloa reptans* Stapf (*Panicum prostratum* Lamk.), Kan : *Kavadaga hullu ;* Tam : *Shani pullu, Muzinkam pul.* The grain is collected and used as food in times of scarcity. (4) *Paspalidium flavidum* A. Camus. (*Panicum flavidum* Retz.), Tel : *Uda gaddi ;* Tam : *Arisi pul.* It is regularly grown in certain districts of the Bombay Province. The grain will keep many years without being attacked by insects. (5) *Setaria pallidefusca* Stapf et Hubb. (*Setaria glauca* Beauv.), Eng : Pigeon or Bottle grass ; Kan : *Korane hullu ;* Tel : *Nakka korra, Narigo, Koranike ;* Tam : *Korali.* It is cultivated in some parts of the Nilgiris. In parts of the Central Provinces and Chota Nagpur the grain of the wild plant is collected, while in parts of the Bombay Province the grain of the cultivated variety is used as food.

Brachiaria ramosa Stapf (*Panicum ramosum* Linn.), Kan : *Bennai akki hullu, Kadu baragu hullu ;* Tel : *Anda korra, Disakolu, Eduri gaddi ;* Tam : *Pala pul, Kamban pul ;* Mal : *Chama pothaval.* It is a grass found throughout the Madras Province which recently attracted the writer's attention as being grown in some parts of the province for its grain. It does not find mention in any standard publication as being cultivated anywhere for its grain even though it is an erect grass and more robust than some of the grain-yielding grasses enumerated above. This omission is probably due to its Telugu name *Anda korra* by virtue of which it is usually regarded as a variety of *korra* (*Setaria italica* Beauv.)—the Italian millet. Moreover, it is included in the revenue records under *korra.* It is, however, botanically very different from *korra* as the following description shows :—

Description It is an annual or often perennial grass commonly met with in cultivated lands. Stem 1—3 ft. high, erect or ascending from a shortly creeping base and rooting from the basal nodes, slender or rather stout, much branched from the base upwards, usually glabrous, leafy ; nodes pubescent. Leaves 2—5 by $\frac{1}{6}$ $\frac{1}{2}$ in , linear-lanceolate, finely acuminate, thin, flat, smooth, glabrous or pubescent beneath, with scaberulous margin, base rounded ; sheaths glabrous or pubescent, ciliate towards the mouth ;

ligule a fringe of short hairs. Panicle 2—6 in. long, subpyramidal, with a long peduncle in the wild forms and short ones in the cultivated forms; rhachis angular; branches of panicle 5—16, distant in wild forms and very close in cultivated forms, 1—2 in. long, alternate, erect or spreading, shorter upwards; rhachis of racemes slender, angular, puberulous. Spikelets alternate, $\frac{1}{10}$—$\frac{1}{8}$ in. long, close or distant, often in pairs (a sessile and a pedicellate one), ovoid, acute, glabrous, turgid, pale green or yellowish; pedicels with a few long hairs near the tip. Glumes 4; lower involucral-glume half as long as the lower floral glume, ovate, acute, hyaline; upper involucral-glume about equalling the lower floral glume, ovate, acute, cuspidate, 5-nerved; lower floral glume similar but slightly broader, with membranous palea, empty; upper floral glume coriaceous, ovoid-oblong, acute, rugulose, with coriaceous palea.



The New Millet.

The panicles in the cultivated forms are very much branched though in some of the wild forms they may consist of only three or four spikes. The spikelets in a spike are more numerous in the cultivated forms.

Specimens of this grass were received from the Agricultural Demonstrators, Vizagapatam and Madakasira, for identification. The following details were furnished by them.

Area About 8,000 acres in Madakasira taluk, Anantapur district, 2,000 acres in the Madhugiri taluk of the Tumkur District of the Mysore State and 5 acres at Nellure village near Vizagapatam town are known to be under this crop. Madhugiri and Madakasira are 2,000 feet above sea-level. The soil is a red loam.

Season of cultivation It is a crop of very short duration, being ready for harvest in three months. It is sown at any time between the latter half of August and the middle of October and is usually harvested before the end of December.

Yield This varies with the situation in which the crop is grown. In places with a fair and well-distributed rainfall, yields as high as 500 lb. are obtained but in drier situations the yield is about 300 lb. The average may be taken as 400 lb. per acre. The yield of straw is about 500 pounds per acre; it is relished by cattle.

Preparation of grain The grain is husked and the glumes are removed just as in the case of the Italian millet. The ratio of pounded grain to whole grain is 3:8 by volume and 40 per cent by weight. The husked grain is mixed with *ragi* (*Eleusine coracana* Gaertn.) flour and made into a pudding commonly known as *kali* in Tamil. Very rarely it is made into *rotties* (cakes). This grain is considered superior to *Panicum miliare* Lamk. (Tam. *samai*). Many *ryots* use this grain during certain months of the year.

Acknowledgment My thanks are due to Sri M. Vaidyanathan, Agricultural Demonstrator, Madakasira taluk, Anantapur district, for the information supplied by him.

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Economic Entomologists and Scientific Names of Insects*

By Dr. T. V. R. Ayyar, Ph. D.

It is not uncommon nowadays to find workers in the economic aspects of zoology, especially Economic Entomologists, finding themselves in very awkward situations when they attempt to call by scientific names some of those organisms with which they have to deal. While the field entomologist is quite sure of the identity and the various features and idiosyncrasies of the beetle, bug, grasshopper or moth he has been dealing with, perhaps for many years, the scientific apellations of those insects get frequently changed at the hands of our systematists. It has of course to be admitted that every one dealing with an insect, or for the matter of that, any organism, has necessarily to know the which particular creature it is that he is dealing with and its correct identity; but having assured himself of the latter by continuous touch with it for years, it becomes rather funny, if not annoying, to find that the name once given to a creature is in some cases frequently changed. Fernald was quite right when he said that "the work of dealing with the constantly changing scientific names is indeed a difficult problem". Most of us know that the names of some of our common insects have been changing from time to time from one to another and in some cases reverting to the same old name which were rejected some time back! Numerous examples could be pointed out of such nomenclatural acrobatics connected with insects. It is felt rather funny when we find the name of our old friend, the common fruit fly-'*Dacus*', changed to '*Chaetodacus*' and then again to find that in course of time he is '*Dacus*' again. The castor semilooper which was at first '*Achaea*' became '*Ophiusa*' and has again been labelled

* Paper read at the Indian Science Congress, Baroda, 1942.

'*Achaea*'! Similarly with numerous specific names of common insects we can point out such funny changes. For example '*Crambus zonellus*' became '*Chilo simplex*' and there was a sudden permutation and combination and the creature became '*Chilo zonellus*'. '*Chloridea armigera*' became '*C. obsoleta*', changed to '*Heliothis obsoleta*' and then again put on the coat of '*Heloithis armigera*'! The nomenclatural thunderstorms and cataclysms through which our friend the rice stem-borer, at present labelled '*Schoenobius incertellus*', has passed have been unique, the insect having passed through not less than twenty or twenty five *aliases!* In the words of Fletcher, "this is one of those unfortunate insects to which so many names have been applied that it is difficult without extensive incursions into literature to ascertain its correct synonymy; within two years after its discovery the insect received no less than six names. God knows whether that poor creature inside the rice stem may not perhaps, have to answer to a different name in the near future." A good deal of confusion in that way has also been created with the names of the borers of sugar-cane and millets, and we cannot be quite sure whether our systematists have as yet come to any definite conclusions as regards the names of these important economic forms. The minute groundnut leaf miner is another victim who has suffered from numerous fresh christenings. It may also be added that often in connection with these ever-changing apellations we are liable to be hauled up for some minor crimes in nomenclatural practice; when you use a scientific name and you omit the author's name with it you are caught; you must not add a comma between the name of the insect and that of the priest who baptized it. Again if you use the abbreviated form of the author's name by using the initial letter or letters of his name as has been done for decades, you are guilty, since recent regulations require that you must use only approved abbreviations. While the writer of this paper knows that he has managed to describe and baptize a few insects and get published a few papers in standard publications without such rigorous restrictions, he has not so far become aware as to what the approved abbreviation is for his name for use in later references! It might at the same time be added that these codes, restrictions and strict rules have not been followed even in some well known books and publications. We are all aware that there are standard works in Entomology where scientific names are used without the author's name. In Lefroy's *Indian Insect Life,* Imm's *Text Book of Entomology*, and in some of the old Reports of our Imperial Entomologist and good many other instances, we do not find such restrictions and systematic dogmas closely followed; and yet those publications continue to be valuable and have not received any black mark or dissatisfaction from any quarters. A very recent publication has appeared on "Indian Forest Insects" by Beeson where too the numerous insects noted stand quite naked without the author's flag.

In placing these facts and observations before you I may add that I am not at all finding fault with the systematists or their ways, since they must

certainly have proper and sufficient reasons for these regulations, frequent changes and codifications. What I plead is that non-systematists who cannot be expected to be in close touch with this subject often suffer from those constant changes in the names of some common and well known insects. It may be emphasised and the fact cannot but be admitted that classification or taxonomy after all is not an end in itself, but only a means to an end and it is therefore highly necessary that there should be some limitations placed on this oft-occurring acrobatics in nomenclature. This was what Lefroy wrote thirty years ago—"It is easy to learn about *Acridium succintum* (this insect too has changed its name, the present one being *Patanga succinta*), as much as it is about the Bombay locust. Persons who see an insect in the field and know that it is *Pentadactylorthopteriodes vigintioctonigropunctulomaculata* N. are often apt to forget whether it is a grasshopper or a bee, or whether it is injurious or not. No good is done by hurling scientific names at an insect in the field. It is far more important to be able to recognise a cock-chaffer, to know that its grub lives in the ground, and eats roots, and to know that if one is found others are likely to be there and should be destroyed before they lay eggs." Though I would certainly not go to the extent of endorsing all these funny remarks of Lefroy, since it is highly essential to know exactly which particular creature we are dealing with, what one often feels is that these nomenclatural changes unfortunately produce a lot of confusion and we, Economic Entomologists, have to find a way to steer clear of these constant and, perhaps, inevitable changes and make our progress smooth in this direction.

It is, perhaps, known to good many of you that the American Association of Economic Entomologists has tried to work out a method to overcome this nomenclatural difficulty by preparing sets of popular names for all well-known insects and get these sets approved for use among Economic Entomologisis. Periodically a set of names is prepared and sent up by different workers for approval to a committee which finally approves or modifies these names and the approved ones are added to the permanent list of common popular names. Thus when any author uses, say a name like 'Fluted scale' in a particular paper or report, any one in the field of Entomology knows he is referring to *Icerya purchasi* whatever mutations and combinations are made in the future by our species-makers with its scientific name. I would invite the kind attention of friends who are anxious to know something about this subject to the pages of the *Journal of Economic Entomology (America) Vols. XXIV* and *XXVI*. I am wondering whether it is not time for us in India to do some such thing and save ourselves from the constant pricks and disturbances from our systematist friends. I may perhaps be wrong in my ideas and remarks, and that is the very reason for submitting my views to you to get your valuable criticisms and suggestions on this subject of nomenclatural acrobatics in systematic entomology.

As a sample I might here add a small list of a few of the many popular names with which most of our Agricultural Entomologists are familiar and

know which these insects are however frequently their scientific apellations change.

Popular Name.	*Present Scientific Name.*
The rice swarming caterpillar ...	Spodoptera mauritia
Rice stem-borer	Schoenobius incertellus
Rice Hispa	Hispa armigera
Rice bug	Leptocorisa acuta
Rice grasshopper	Hieroglyphus banian
Rice case worm	Nymphula depunctalis
Rice gall fly	Pachydiplosis oryzae
Deccan grass-hopper	Colemania sphenarioides
Behar Hairy Caterpillar	Diacrisia obliqua
Cane top shoot borer	Scirpophaga nivella
Cane leaf hopper	Pyrilla perpusilla
Castor semilooper	Achoea janata
Capsule borer	Dichocrocis punctiferalis
Pink bollworm of cotton	Platyedra gossypiella
Cotton leaf roller	Sylepta derogata
Red cotton bug	Dysdercus cingulatus
Dusky cotton bug	Oxycaraenus lætus
Sweet potato weevil	Cylas formicarius
Diamond back moth	Plutella maculi-pennis
Mustard saw fly	Athalia proxima
Anar butter fly	Virachola isocrates
Rhinocerus beetle	Oryctes rhinocerus

SELECTED ARTICLE

Compost and its Fertilising Value

The 'Grow More Food' campaign has of late engaged the serious attention of the public. The cessation of import of rice and wheat coupled with the increase in demand of food stuffs for the army has precipitated a food shortage in our country. The difficulty has been further increased by the fall in production of the food crop and restriction of transport. These difficulties were discussed in a recent Food Drive Conference held at Delhi under the presidency of Hon'ble Mr. N. R. Sarker who drew a food crop map of India and stressed the need of making each province self-sufficient in food crops.

The problem of growing more food now is essentially one of increasing the fertility of the soil. Recently in a 'Grow More Food' meeting held at the Calcutta University Institute Dr. C. R. Harler read a paper on Compost and in a similar meeting at Firpo's Restaurant Mr. E. F. Watson spoke on Compost. The following note is adapted from their papers.

Meaning of the fertile soil At the very outset we should have a clear idea as to what we mean by a fertile soil that will grow a healthy plant to its fullest development. In plant kingdom the word 'healthy' does not simply imply 'free from disease', it means an inherent power on the part of the plant to resist disease. For a long time we have been taught to value our soils on the amounts of nitrogen, phosphorus and pottassium salts present in them. As is generally indicated soil is not a dead inorganic matter, but it is a vast store house of living organisms on whose activity our agriculture largely depends. There is one particular group of microscopic fungi, the micorhiza, living in combination with the roots of plants and eventually absorbed into their tissues, that transcends all

others in importance since it appears to be the living bridge by which alone powers of resisting diseases enter into the plant. The importance of the chemicals we have mentioned lies in the fact they are necessary in the food supply of all soil organisms—the material known as 'humus', a complex product formed after the decay of organic matter. It is particularly the presence of humus which determines the fertility of the soil and we will subsequently notice that the main purpose of processing the soil, or what is better known as composting, is to increase the humus in the soil.

Composting an old process It is not that our cultivators do not realise the importance of preparing the soil before sowing. The cultivator has a tradition of thousand years and has a knowledge of soil almost by intuition. It is a common practice among the *ryots* to allow roots of previous crops, weeds and some surface algae growth to rot and decompose in the soil. Even the practice of composting is known to have existed among the cultivators centuries ago. The Chinese cultivators particularly used to feed their soil with compost—which explains why the Chinese can keep their soil constantly under cultivation. But the early method of composting was however, crude and wasteful. It is only recently that composting has been studied systematically and scientifically with the development of the most useful methods One of the pioneers in this study is Sir Albert Howard, well known in India for his work on Pusa wheat and cotton in Indore. At Indore he studied the composting of sugar-cane trash and devised a method known as the (Indore process). Today the great value of compost need hardly be overestimated. Its contribution to the soil productivity is widely recognised though it has not yet attracted popularity among the cultivators. It will be the purpose of the following paragraphs to discuss the process involved in composting in some detail.

Essentials for Composting Compost is commonly a decomposed mixture of cowdung and vegetable matter like leaves, twigs, weeds, etc. The mixture is generally allowed to rot and decompose before it is buried in the soil as a black mould, resembling soil humus. It is also known that vegetable matters directly buried into the soil also decompose and subsequently turn into soil humus. Naturally the necessity of composting may be called into question. The reason is not far to seek Vegetable matter is turned to soil humus by bacteria which exist both in the soil and in cowdung. If we let the soil bacteria do the work the crop which depends for its growth upon the action of soil bacteria suffers. Hence it is preferable to break down the vegetable matter outside the soil and add it after it has been converted to humus.

There are five essentials for composting. They are;— (1) organic matter and soiled stable bedding, (2) Cattle manure, (3) urine earth, (4) ashes, and (5) water. Organic matter forms the bulk of the compost of which there must be plenty of leaves, twigs, stems and rough stuff. It is waste of time to compost leaves and fine weeds alone, for these very soon form humus if buried straight into the soil. The value of composting is that rough stuff can be broken down.

Cattle manure, however, is another essential requirement. Each night the average cow voids about 10 lb dung or 1¾ tons in a year. This is enough to produce 10 tons compost a year sufficient to dose half an acre of land.

Urine earth, as the very name implies, is earth soaked in urine. It is made by covering the floor of the cattle shed with tramped down earth to a depth of about 9 inches. When a compost pit is being charged, a patch of this urine soaked earth is dug up and replaced with fresh earth. Compost cannot be made without urine which is very rich in potash.

Wood ashes are important for composting owing to their potash and phosphate contents. Besides being valuable plant foods, potash and phosphates,

owing to their alkaline properties, are necessary to reduce the acidity which is set up in the compost pit. In place of wood ashes lime may be used. The necessity of water, however, goes without saying.

A Practical Procedure The compost pit is generally 30 feet by 14 feet and 2 feet deep. One pit is needed for each five head of cattle if sufficient vegetable matter is available. A rough estimate of charge with the proportion of the various constituents will be useful. To charge the pit the following should be added in the given quantity :—

4 to 5 inches sun dried vegetable matter and soiled bedding	1,000 lb.
6 baskets urine earth	168 lb.
12 baskets wood ashes	36 lb.
12 baskets cowdung	300 lb.
Water (to be sprinkled)	60 to 100 gallons.

Partially dried green stuff is desirable, for fresh stuff tends to pack tightly and exclude air. The layers described above should be laid down each day for about six days and the whole thing is then left to decompose. The changes taking place resemble in some way those going on in the cow's stomach. The pit, in effect, turns green stuff into something resembling cow manure.

After 15 days from the start the contents of the pit should be turned over to fill half the pit. This process admits air into the mass. After about 30 days from the start the stuff is again turned back into the first half of the pit. In this way when about two months elapse the stuff is taken from the pit and heaped outside, and after three months the mass becomes black and crumbly, resembling well rotted cattle manure.

The temperature in the compost pit is important. During the breaking down process the pit heats up. After 21 days the temperature should be 130—140°F. The *ryot* will not have a thermometer, but once shown, he will be able to judge the heat for himself. After 60 days the temperature should be 100—110°F. If the temperature rises very high it indicates that the green stuff used is too fine, on the other hand, a small rise in temperature may be due to various reasons. In the first place it might be due to the poverty of urine in the urine soaked earth. It only depends upon the nature of the packing which should not be too tight or too loose and also on the heap which should be neither too wet nor too dry. Experience alone will beget skill in controlling these factors essential for preparing a successful compost. Further more preliminary experiments are sometimes necessary. If the directions given be faithfully followed there is every chance of success. Later on the cattle manure may be reduced or the green stuff increased, but if decomposition does not take place the experimental steps should be retracted.

Importance of Composting The Indore compost costs nothing but the labour. The dose should not be less than 20 tons per acre. The total fertilising value is difficult to assess for its effect is spread over a long period and works in diverse ways. It can be said that a dose of compost has more effect than an equal dose of cattle manure for it is richer in plant food. It is to be noted that after the use of compost there takes place a large increase in the earth-worm population. The earth-worm is the finest cultivator one can have. It works a 7 day week 24 hours a day bringing soil particles from below up to the surface and makes channels for air to reach the lower soil. Chemical manures are often a great danger. Not only do they kill the earth-worm population but they stimulate the plant to use up humus at an increased rate. They should therefore never be applied to soils that have not got a large reserve of humus. And to a soil that has plenty of humus they are quite unnecessary. Anyone who wishes to use

artificials should do so by adding them in small quantity to the compost heap and let them reach the plant that way.

The increase of outturn obtained using compost is by no means, the whole story. Crops grown in fertile soils are found to be so much more satisfying than a smaller quantity suffices both for man and beast. They have moreover the inestimable advantage of handing on to their consumers the disease resisting properties that the crops have themselves attained. One cannot expect to get a healthy people and a healthy live-stock unless their food is obtained from healthy crops grown on fertile soil.

In tropical countries difficulty of a serious nature is often met with when a forest area is cleared up and the tropical sun reaches the soil. The organic matter disappears there at an alarming rate. A few years after opening, a new soil may have lost half its original fertility which decreases to a low level at which it is naturally maintained. Most Indian soils have reached this last stage. The need of tropical soil is, therefore, protection from the sun and the addition of organic matter. The composting of waste vegetable matter, if it is available, will add greatly to the fertility of Indian soils and help us to produce more food. We should become 'compost minded', for this will give us respect and feeling for the soil.

Conclusion All over the world to-day the soil is being raped. In America the grass lands were ploughed up and put under wheat year after year so that the organic matter was used up and the soil lost cohesion and blew away. The 'dust bowl' is the result. In Australia a similar state has arisen, whilst in both continents the cutting down of forests has released the rain water in spates and washed away many areas of fine soil. Wind and water erosion are forming deserts. In Africa overgrazing has had similar results and the desert is advancing at the alarming rate of half a mile a year in some places. In India we see in all sides the harmful effects of deforestation, soil erosion, overgrazing and general soil mismanagement. If we add up the waste of capital that this state of affairs involves we find that the cost of the war amounts to a mere bagatele compared to the value of the inheritance we are dissipating daily. The Royal Agricultural Commission to India a few years ago and other many smaller commissions and committees have all put it down in black and white. The *ryot* himself knows what to do, but he continues to cut down forests, overgraze his land and murder the soil which he is holding in trust for future generation. The problem is not an Indian one but an international one and no doubt post-war planning will take into consideration the methods of preventing fair lands from running into a wilderness. (*Science and Culture, Vol. 8 No 2, August 42.*)

ABSTRACT

Kashmir saffron* and its adulterants K. L. Budhiraja,(*J. Indian Chem. Soc. Ind. News Ed. 5,135—38, 1942*) Saffron consists of the dried stigmas of *Crocus sativas* The stigmas are branched and anthers are extrose. Each piece is about 1" long. The weight of 50 stigmas ranges between 0·0716 g. and 0·163 g. The odour and taste are peculiarly aromatic. If floated on water, it is slowly coloured deep yellow and stigma remains yellow even after treatment with water. It is generally sold in the market in the form of hay saffron.

In India saffron is grown in Kashmir only in particular table lands, inPampur (at a distance of 8 miles from Srinagar) with an altitude of about 5,300 feet above the sea level. The other important conditions besides the soil, peculiar to the growth of saffron, are the climate and the topographical situation of the fields.

* Tamil—*Kungumapu.*

Monsoon does not enter the area. Annual rainfall is about 26". The beds are square with $4\frac{1}{2}' \times 4\frac{1}{2}'$ dimensions and are surrounded by drains. Saffron is grown continuously for a number of years (3 to 5 years). The roots (bulbs) are then transferred to a freshly prepared land. They are not irrigated, excessive moisture being injurious to the crop. The soil must be thoroughly pulverised by continuous ploughing. Transplantation is done in September and the plant flowers in autumn when the crop of yellow stigmata is collected and dried in the sun or by means of a small artificial heat.

Saffron was omitted from 1914 B. P. as being of little medicinal value. In India, however it continues to be a popular drug employed in the indigenous systems of medicine.

Being an expensive drug, it is largely adulterated. Usually it is artificially weighted with sugar, glycerol, oil borax, etc. Sometimes the exhausted saffron is re-dyed. The most common adulterants are the flowers of *Compositae*-Calendula, Arnica, safflower, etc. The reddish brown hairs of the maize fruit after cutting into proper size are also used as adulterants.

Effect of storage on Indian vegetable oils J. S. Aggarwal (*J. Indian Chem. Soc. Ind. News Ed. 5,121—33, 1942*) Vegetable and animal oils and fats deteriorate on keeping, resulting in disagreeable odour and acrid taste, in which state they are commonly described as having developed rancidity. No Industry in which oils and fats are used can afford to overlook the factors which contribute to the development of rancidity. Atmospheric oxidation may be regarded as the most important cause of rancidity. The rate of oxidation varies with the type of fat and the conditions of storage. The majority of oils and fats exhibit a more or less well defined induction period. During this time the fat passes through several preliminary stages of oxidation, the first being the absorption of oxygen followed by the formation of a loose addition compound, in which state the oxygen can be removed by evaporation at elevated temperatures. Various chemical changes follow this stage of absorption.

As regards the effect of the material of the container, it may be seen that all the oils have deteriorated less when stored in glass beakers than in plain steel and tinned steel vessels. For obvious reasons the storing of large amounts of oils and fats in glass containers is not possible, but large earthern pots such as are used in many places in India, may be substituted for glass vessels, if arrangements are made for them to be adequately closed. On account of their having small necks and consequently less surface exposed to air they should be quite serviceable for this purpose, but due to their fragile nature their transport would involve risk of breakage. Such vessels should be internally glazed, otherwise the porous character of the walls will negative the advantage gained by their use.

All the oils in plain steel containers were found to be discoloured after some time. Except ghee and tallow, the other oils oxidised much more in these vessels than in those of tinned steel and glass; this can also be observed from the viscosity values of these oils. Cotton seed and sesame oils deposited a certain amount of gummy matter around the walls of the plain steel vessels, but this did not occur when these oils were kept in glass and tinned steel vessels. It would, therefore, appear that vegetable oils intended for use as lubricants should never be stored in iron vessels. The effect of iron was much more severe in the case of sesame oil than in others; it may not, therefore, be advisable to use sesame oil for lubrication purposes in machinery where it will be freely exposed to bare iron surfaces.

S. V. D.

Closer examination of Fisher's analysis of variance as applied to the data of certain field experiments by Uttamchand Tushnu, M. A. (*Punjab Agri. Coll. Mag. 10, 7—21, 1942*) The paper deals with the results of statistical analysis of four

field experiments in cotton conducted under the cotton physiological scheme financed by the Imperial Council of Agricultural Research in Punjab. The straight forward analysis of variance showed that the treatment differences were not significant in all the four cases. The error variances were high and the author has shown that in such cases partitioning of the degrees of freedom for treatments and for error bring to light certain significant treatment comparisons which were in conformity with field observations. It was also shown by the author, how by replacing certain abnormal values by the missing plot technique and rejection of certain blocks or plots based on field observations, significance was reached between treatment differences In the last example, where the close relation between mean and range implied skewness in the material adoption of the logrithmic transformation of the values helped to bring out significant treatment differences. The author has shown through examples, how the treatment differences which were found in significant by ordinary analysis of variance, should be used for further study instead of rejecting them. T. N.

The effect of washing and cooking on the vitamin B_1 content of raw and parboiled rice M. Swaminathan (*Indian J. Med. Res 30,409–16 July 1942*) The fact that milled parboiled rice has a higher vitamin B_1 content than milled raw rice is now well known. Results of tests on the loss of vitamin B_1 in washing the rice before cooking and in throwing off the cooked water are presented in this paper. It was observed that milled raw rice loses the greater part of its vitamin B_1 (60 per cent) during the process of washing, while milled parboiled rice, in spite of its higher vitamin B_1 content, loses much less (8 per cent). Washed parboiled rice contains on the average four times as much vitamin B_1 as washed raw rice. About 25 per cent of the vitamin contained in both the types of rice is dissolved out in the cooking water. But cooked parboiled rice, even when the cooking water is discarded, contains enough vitamin B_1 to prevent the occurence of beriberi.

In raw rice, most of the vitamin is located at the surface of the grain and is readily washed away. In parboiled rice it is located more deeply and is less easily dissolved out by the washing water. This investigation confirms the original hypothesis of Aykroyd that ' when rice is parboiled the endosperm absorbs vitamin B_1 at the expense of the germ and pericarp, and milling does not remove the vitamin '. M. A. S.

Vitamin C content of guavas by W. W. Boyes and D. J. R. de Villiers (*Farming in South Africa. Vol. 17, No. 194, May 1942*) South African guavas are not yet classified into varieties. Five main types of fruit are described in this article, and it is shown that the vitamin C content depends greatly on the type of guava in question. Early-season guavas are generally lower in vitamin C content than later-season types. The vitamin C content does not always seem to be greatly dependent on maturity, but there may be exceptions. The skin and outer flesh of the guava are richest in vitamin C. Very little vitamin C is lost in the stewing of guavas. Concentrated guava extract lost its vitamin C very rapidly but canned guavas proved to be remarkably stable under adverse conditions. Dried guavas and guava powders have been prepared; though rich in vitamin C, the potency is rapidly lost in warm climates. Investigations regarding the vitamin C content of the guava and guava products and the stability of the product and its vitamin during storage are being continued. (Authors' abstract).

GLEANINGS

Dried food The necessity of shipping powdered and dried foods is keenly felt in these days of drastic shipping shortage. It has been pointed out by a group of foodmen who met recently in Chicago that in consequence of the high percentage of water in fruits and vegetables, e. g 75 to 95 per cent, several thousand tons of water are being shipped every year by U. S. A. to different countries. For instance, last year U. S. A. shipped as much as 150 000 tons of water to Great Britain and a still greater amount to Philippines and Iceland. The dehydrating of eggs and milk is quite well known. The results of scientific dehydration have indicated that the process does not destroy the flavour of the fruits and vegetables and preserves 90 per cent of its vitamin value. In this connection mention may be made of a new technique developed by the Sardik Food Products Corporation of Manhattan, which consists in making a pulp of the fruits and vegetables and then spreading it in a thin film of $\frac{1}{100}$ in. width on revolving drums. In this state the application of heat removes as much as 96 per cent of water in a few seconds. Steaming food-stuffs stand little risk of oxidation, and where it is still apprehended heating can be performed in vaccum. It is interesting to note that the food stuffs come out like an endless sheet of paper which easily crumples into fine particles. Tomatoes, peaches, peas, squash, potatoes, apples, bananas, etc. can be dehydrated in this way, and keep well for more than three years. The food can be best served after slightly warming it with water.

It has been estimated that apart from the simplification of handling, packing and shipping difficulties, the mass production of dried foods will be 20 per cent cheaper. In Germany the number of dehydrating plants has increased from six before 1935 to 114 in the current year. The National Dehydrators Association of U. S. A. has adopted schemes of expansion which will enable them to quick-freeze an estimated $ 90,000,000 worth of food in the current year, that is, about 180 times the volume that was handled ten years back. *(Science and Culture Vol. 8, No. 2, August 1942.)*

Storage of food in wartime Britain. The Ministry in Britain are building about 150 single storeyed, pre-fabricated steel buildings with concrete floors, brick walls and steel and asbestos roofs, called "national store cupboards" for conserving tons of the nation's reserve foods and raw supplies. The structural work will protect the food against damp and insects and the danger of bombing. *(Science and Culture, Vol. 8, No 2 August 1942.)*

Wax from sugar-cane During the war of 1914—18, sugar-cane wax was obtained as a by-product in South Africa; the manufacture continued up to 1930 when it was no longer a paying process. During the present war, U. S. A. is attempting to manufacture it at Louisiana, the estimated amount is stated to be 6 to 7 million pounds.

The wax is present on the stalks of sugar-cane as a thin layer; the amount, however, is very small, even less than 2 lb. per ton of sugar-cane *(i. e.*, less than 0·1 per cent) The dried press-cake of mud from the clarification of cane-juice, is solvent extracted—the wax representing 5–17 per cent of the cake. Some fat always accompanies the wax, and makes the latter sticky. It also lowers the melting point of the wax. The fat suffers putrefaction to some extent on standing and a harder wax is possible to obtain therefrom. But the unpleasant odour associated with the wax thus obtained has been found to be largely due to the putrefied fat. Toluene has been suggested as a suitable solvent, practically all of which can be recovered. Efforts are being made to separate the fat from the

wax. This can be done by a cold diffusion process using acetone as a selective solvent. It has been proposed to set up a pilot plant in Louisiana to study the problem on a semi-industrial scale.

It seems worth while whether or not the problem can be taken up by the Imperial Institute of Sugar Technology at Cawnpore. In case the process proves successful in India, it will, to some extent, reduce the cost of production of cane sugar and may thereby mean some relief to the poor consumers of sugar in this country. P. B. S. (*Science and Culture, Vol. 8, No. 4, October 1942.*)

Groundnut oil for diesel engines Since the publication of laboratory results on the subject by J. S. Aggarwal and others an opportunity was awaited to supplement the information by results obtained under actual working conditions. The difference in prices of crude oil and groundnut oil and the general apathy and fear for anything new delayed taking any trials so far.

To obtain continuous supply of crude oil in the mofussil is getting more difficult every day. Where the water supply, as of this place (Sangli), depends for its power requirements ultimately on crude oil and alternative arrangements are not possible, the water service may have to be maintained irrespective of considerations of costs. It was thought proper therefore, to try groundnut oil (available in plenty locally) as an experiment for future use and guidance.

The local power house has two '*Deutz*' diesel engines rated 165 bhp. and coupled to a three phase AC generator each. Both the sets have to run together for most of the time the power house is working. Without disturbing the routine work, one of these engines was run on groundnut oil for ten days. It was also possible to run this engine for a short while on 103 kw., its normal load when the consumption came out to be 0 452 pounds per kwh. Taking the efficiency of the generator as 90 per cent., it works out as 0·303 lb. bhp—hr.

The makers recommend light diesel oil (commonly known as "A" grade) for this engine and the test certificate of the engine gives 0·384 lb. bhp-hr. as the consumption of fuel. Presumably, the test is carried out with a fuel similar to "A" grade oil, and comparing these results it can be seen that the groundnut oil bids fair to be a substitute for "A" grade crude oil. However, from the end of 1939 to this day, only "B" grade crude oil has been used and now a comparison with this oil shows the following in favour of groundnut oil:—

(1) Absence of black smoke from the exhaust.

(2) Less carbon deposit on the piston top or in the combustion chamber.

A slight deposit of organic matter was observed round the spray nozzle but it did not interfere with the working of the engine in any way. The consumption on an average load of 64 kw. did not materially differ in the case of the two fuels.

These observations are published in the hope that many others will try groundnut oil and pool their experience so that a war time difficulty may be solved. R. V. Barave and P. V. Amrute. (*Current Science, Vol 11, No. 10, Oct 42.*)

Some significant findings of the U. S. A. Agricultural Experiment Stations in 1941 In a search for cheaper sources of nitrogen in animal feeding, experiments with urea, a non-protein compound in which the nitrogen generally costs only from one fourth to one third as much as its equivalent in the usual protein supplements, have been carried on in several States and Hawaii. The Wisconsin Station obtained very favorable results with urea as compared with linseed meal for dairy cows as to milk production, butterfat, protein, and vitamin C content of the milk, and the production of normal calves. In lamb feeding a lower value for urea than for linseed meal has been obtained by the New York (Cornell)

Station when used as a practically exclusive source of nitrogen, but with equal parts of the two feeds the combination was only slightly less valuable than linseed alone.

Wide variations in fertilizer requirements of sugarcane under different environmental conditions have made economical use of fertilizers difficult of determination. The Hawaii Station, in co-operation with the Hawaiian Sugar Planters Association, has found that, by sampling the sheath of the young mature leaf and determining the content of sugar, water and minerals, a very reliable guide for fertilizing and irrigating can be obtained, based on known responses on soil types under local conditions of light and temperature. Such intensive applications of fundamental scientific knowledge promises to decrease costs of production by securing sugar accumulation close to the highest level possible. This is an important contribution to the economic stability of a territory largely dependent on its efficiency in production on a little over a quarter of a million acres.

The Missouri Station has succeeded in chemically combining the proteins of skim milk with iodine to produce an artificial thyroprotein which has the physiological properties of thyroid substance. In short feeding trials, milk production of goats was increased by feeding 5 to 10 gm. daily of the artificial thyroprotein, and cows which were falling off in milk production were stimulated to produce more milk by feeding 50 to 100 gm daily. This cheap source of thyroprotein may prove a practical way of increasing milk production of dairy cattle. —*Experiment Station Record.* (*Science, New Series, Vol. 96, No. 2482.*)

The conservation of activity in Papain The precise nature of the enzymic activities of papain has been the subject of considerable uncertainty and disagreement The differences in the properties of freshly tapped latex obtained from fruits at different stages of development, variations in activity of preparations made by different methods from the latex, deterioration in activity on keeping, the action of "activators", notably hydrogen cyanide, in increasing or restoring activity, and the presence of natural activators and inhibitors in the latex, have all been the subjects of contributions to technical journals.

Reference may be made in particular to a communication made to *Nature* (*1937, 139, 249*) by M. Frankel, R. Maimin and B. Shapiro, of the Hebrew University, Jerusalem, and to various papers by A. K. Balls, of the United States Department of Agriculture and his collaborators (*J. Biol Chem., 1937, 121, 737*; *ibid., 1939, 130, 669*; *Ind. Eng. Chem., 1940, 32, 1144*; *ibid., 1940, 32, 1277*).

Pending clarification of these various problems a practical interest attaches to United States patent No. 2,257,218, September 30, 1941, granted to A. K. Balls, H. Lineweaver and S. Schiwmmer, assignors to the Secretary of Agriculture of the United States, entitled "Process for the Preparation of Papain". It is claimed by the patentees that whereas papain as ordinarily prepared by drying the latex of the green fruit is less potent per unit of dry weight than the latex from which it is prepared, and deteriorates on storage even for periods as short as few weeks, the new process results in a product which retains nearly all the original activity of the latex and may be stored for many months without apparent deterioration It is stated that the natural activator of the proteolytic enzymes, which occurs in the latex in considerable quantity, remains in the finished papain.

The process consists simply in adding common salt to the latex, either before or after it is clotted, mixing thoroughly, and then partially drying the mixture, preferably in a vacuum and at a temperature not exceeding 55°C. The quantity of salt used may vary within wide limits, but with latex of average

water content may be about one-tenth of the weight of the fresh latex. The evaporated product, consisting of a greyish white thick paste, should be kept in airtight containers. (*Bull. Impl. Inst. Vol 39, No. 4, October-December 1941.*)

Cement as a fire extinguisher. In the January twenty-third issue of *Science* there is a short article on the use of pitch as the best incendiary extinguisher by Dr. R. Sayres, Director of the U. S. Bureau of Mines

It would seem to the writer that a good deal of caution must be used in the application of pitch to extinguish fire, even though it originates from a magnesium incendiary bomb. It has been the experience of the writer with a great variety of small fires in oil, metals and other materials, there is nothing so satisfactory and so foolproof as Portland cement as it is placed on the market. In many cases in the writer's experience it has been highly successful in extinguishing fires where water, carbon tetra-chloride, foam and similar substances have been unsuccessful. This very common material so easily available and so safe to use should be placed at points where there is danger from fires either from incendiary bombs or from normal causes.

In our own laboratory, we provide such material easily available in kegs and find it far more successful than the usual fire extinguishers. Furthermore, it gives off no injurious gases and is in itself not combustible, as in the case of pitch. Roy Cross, Kansas City Testing Laboratory. (*Science, March 13, 1942*)

A simple treatment for preserving gunny bags. A simple method of rot proofing sand bags, sacks and hessian is described by Dr. C. J Magee, Acting Chief Biologist of the Department of Agriculture, New South Wales, Australia. The treatment consists of dipping the bags in a preserving solution, wringing and drying them; (for use on the farm, about one-eighth or one-quarter of the quantities given below should be ample) The method is as follows:—

Dissolve 10 lb. of bluestone (copper sulphate) in 35 gallons of water in a wooden vessel—not one of iron or galvanised iron. Dissolve separately in another vessel 11½ lb. of washing soda crystals (or 4½ lb of soda ash) in 5 gallons of water. Then, while stirring, add the soda solution slowly to the bluestone solution. Add a wetting agent, for example, Wetsit or Agral 3, and stir the mixture well. (If a wetting agent is not procurable merely increase the time of treatment.)

Immerse the sandbags one by one until the fabric and stitching thread are thoroughly wet which may take up to five minutes. Also dip the twine which will be later used for sewing the bags Take out the bags and remove the excess liquid by running through a clothe wringer or mangle. The bags are then ready for immediate use or they may be dried and stored. (*Agri. Gas. N. S. W. April 1942.*)

RESEARCH ITEMS

***Cryptostegia Gradiflora* R. Br. (*Asclepiadacea*)—a promising short term rubber vine**

Rubber is one of the most essential requirements in the modern civilized world. It is not only a necessary commodity in times of peace but is an essential and indispensable necessity in times of war where mechanised armies travel on rubber and the building of the modern weapons of warfare would have been impossible without it. Rubber is primarily a vegetable product. Though it is obtained from several species of plants, the chief source of rubber of commerce is the Para Rubber tree *Hevea brasiliensis* M. Arg., which is a native of Brazil and other South American countries. It is from here that the plant spread to Ceylon, Burma, Malaya, French Indo-China, Dutch East-Indies and other Pacific islands, where it is planted on extensive areas. The area under rubber in our country is

very limited and at present chiefly confined to parts of Travancore, Cochin and Malabar. Owing to the great demand for rubber that is felt at the present day, various attempts are being made for an immediate increase in the output of rubber in this country. The rubber tree, *Hevea braziliensis* M. Arg., yields rubber only after 6 or 8 years of growth and hence an immediate increase in the output of rubber production by planting more of these trees is not possible. Moreover for successful plantation of this species a heavy humid and warm tropical climate with a fairly heavy rainfall, as is obtained in Travancore, Cochin and parts of Malabar, are essential. These facts therefore necessitated the search of other sources for obtaining rubber almost immediately. Two lines of investigation present themselves. The first is the search for such plants as would produce rubber and that might be existing in the jungles in abundance and which could be tapped for rubber almost immediately. The second is the finding of quick growing plants with rubber content that could be cultivated on a large scale and rubber extracted within a short time, almost the same year they are planted.

Preliminary investigations on this problem were carried out very recently at the Agricultural Research Institute, Coimbatore, at the instance of the Madras Government. A large number of latex-bearing plants have been tested for their rubber content. In most cases the latex (milky juice) could not be coagulated by any of the common methods known. In a few instances, the latex was coagulated, but the resulting substance was very high in resin content and consequently too sticky to be useful as rubber or rubber substitute. One plant alone, *i.e.*, *Cryptostegia grandiflora* R. Br., has given very satisfactory results so far. This plant is very rich in latex and the latex was easily coagulated by dilute acetic acid and the rubber thus obtained was of a very good quality very nearly equal to Para Rubber in its physical properties.

Cryptostegia grandiflora R. Br.—the rubber vine. 1. An old vine climbing over a babul tree. 2. An young plant of about 2 years old. 3. A branch with two pairs of fruits (follicles); note the paired nature of the follicles. 4. Seeds with tufts of silky hairs.

Cryptostegia grandiflora R. Br., is an attractive woody climber and when allowed to grow by itself without support, attains a beautiful bushy growth of about 10 feet high. If allowed to climb on other trees, it grows up to the very top and spreads over on all sides. The plant is very conspicuous with its large showy rosy flowers and fairly big triangular fruits in pairs without stalks. Each fruit (follicle) is about 5 in. long and from 1 in. on each of the three faces gradually diminishes to a point towards the free end. The fruits, when ripe, dehisce by means of longitudinal slits along the middle of the outer triangular face liberating a large number of small flattened wedge-shaped seeds which are provided with long silky hairs, with the aid of which they float in air like parachutes and are carried to considerable distances from the parent plant. This plant is a native of tropical Africa and was introduced into this country many years

ago and has become more or less naturalised. It is said to occur in this Province but its exact distribution and extent are yet to be ascertained. Investigations are under way as to the best method of propagation of this plant on a large scale, its growth habits, latex-producing properties, best method of extraction of latex, the methods of coagulation of the same, etc., with a view to finding out the possibility of its being grown as short term rubber crop.

Agricultural Research Institute, Coimbatore, 9—1—1943 } S. N. Chandrasekhara Ayyar, T. V. Reddy

(The authors will be thankful, if any of our readers give early information regarding the occurrence of this type of plant in any locality.—*Ed.*)

The mode of inheritance of a "Dwarf bushy" type in *G. herbaceum*

A "dwarf bushy" plant was first observed in the F_2 population of a cross between 1027 A. L. F. and H_1, two strains of *Gossypium herbaceum* var. *frutescens*. The two parents were in general 40 to 50 cm. in height at this station, and had internodes of about 2 to 2·5 cm. in length The "dwarf bushy" plant, when fully

Normal Dwarf bushy

grown was only 20 cm. in height and had an internodal length of one cm. on an average and 5 to 6 monopodial branches at the base as compared to one or two in the parents. The short habit coupled with the presence of a number of monopodia at the base gave a bushy appearance to the plant (see Plate). Only a few bolls set in this plant. Their seeds when sown, gave rise to plants similar to

the parent indicating it to be homozygous for the character. This plant was crossed with H_1, the standard strain of this station. The F_1s resembled the normal parent in appearance. In the next year, height, number of internodes and number of monopodial branches were studied in the parents as well as in the F_2 population.

Season	Generation	Selection Number	Average height of plants	Average number of internodes	Average length of internodes	Average number of monopodia	Number of plants
1940–41	F_1		86 cm.	33	2·6 cm.		
1941–42	P_1	H_1	48 ,,	19	2·5 ,,	1·2	
	P_2	"Dwarf bushy" parent	21 ,,	19	1·1 ,,	5·6	
	F_2—	Normals	37 ,,	19	2·0 ,,	1·2	307
	H_1 ×	"Dwarf bushy"	18 ,,	18	1·0 ,,	5·1	106

Inheritance When counts of each type of segregate were made in the F_2 generation, there were 307 normal plants to 106 of the "dwarf bushy" type. The fit for a monohybrid ratio was good, the value of P being >·50. When progenies of 6 normal segregates of F_2 were studied in F_3, two were pure for normal, while progenies of four plants showed segregation for normal and "dwarf bushy", the actual figures being 177 and 61 respectively. The fit in this case too was good (P>·5). It was clear from this that the new type was a simple recessive to normal and should have arisen as a point mutation. The symbol of Db is given to this gene.

Summary A plant was observed as a mutant in *G. herbaceum* cotton with short internode and a high number of monopodia at the base, at the Agricultural Research Station, Hagari. This character when crossed to the normal was found to behave as a simple recessive to the normal. The gene responsible for this is designated as Db.

Dry Farming Station, Hagari,
23—11—1942.

M. Venkoba Rao
C. K. Ramachandran

Hints for Bee-keepers*

For January

During normal years this month is quite favourable for bee activity. Pollen is available in plenty from a variety of plants and trees such as *cholam, cumbu, maize, Peltophorum, ferrugineum, Ailanthus excelsa*, etc., and nectar from the indigenous and Cambodia cottons The weather is mild and agreeable. The bees collect and store their food materials in large quantities. There is brisk breeding and rapid comb construction. Comb foundation sheets or clean combs of the previous season may be given to economise the energy and labour of the bees. Along with the workers drones also are bred in large numbers during the month. As the latter serve no useful purpose after fertilising the queen, they should be eliminated. The adults can be controlled by the use of the drone-trap and the brood itself may be cut out and destroyed. The accelerated breeding of workers and drones generally forestalls swarming and one has, therefore, to keep a sharp lookout for the issue of swarms. The firstone may be hived and kept as a separate colony and the issue of further swarms, if any, from the original stock should be prevented. This may be achieved by allowing the first queen to emerge

* It is proposed to publish every month practical hints for bee-keepers.—*Ed.*

and destroying all the other queencells. This month also happens to be the season for the birth of new queens and it is likely that some of them may get lost during their mating flights, thus rendering their respective colonies queenless. Immediate steps must be taken to re-queen such colonies. The season is also favourable for the increase of stock. Wild nests are usually in prime condition and these may be hived with advantage. It may also be worth while to be on the look out for stray swarms, which may issue from the wild colony. Old mud pots can be kept under shady bushes and hedges or at convenient places on trees to attract these swarms. The month is also favourable for rearing queens.

In localities having luxuriant vegetation in bloom colonies may attain sufficient strength to gather and store honey. These must be provided with supers. The two side combs of the brood-chamber, which are usually stocked with honey may be cut and fixed on the super frames as it will encourage the bees to come up and work in the supers. Apart from these the hives should be kept clean and stray enemies such as lizards, ants, wasps, etc., must be eliminated.

For February

The general flowering season for most plants, shrubs, and avenue trees commences from this month and as such it happens to be one of the best periods of honey flow. The pollen sources of the previous month continue to be in flower and the nectar supply is augmented by the profuse flowering of Cambodia and indigenous cottons. Apart from these a number of minor sources of pasturage such as *Holoptelia integrifolia*, drumstick, citrus, garden plants and a variety of weeds also come into flower. The weather comprises of bright, warm and dry days and cool nights. Such extremes of temperature are said to be conducive to a copious secretion of nectar from flowers. As regards the care and management of the bees, the aspects such as comb construction, breeding, swarming and its control etc., dealt with in the note for January hold good for this month also. The bees continue to exhibit remarkable field and hive activity. The availability of honey is evinced by the distended abdomen and the consequent bigger size of the bees as well as by their amenability to handling. Inside the hive, the plentitude is evident from the liberal secretion and use of pure white wax in patching up crevices, sticking up together frames, etc. Comb-building actually continues both by building fresh combs as well as by elongating the cell walls of old combs mostly for storing honey. The newly extended portions have a glistening silvery colour. Appreciable quantities of honey may be found stored in the combs. The bee-keeper should take advantage of these indications and provide the necessary facilities for storing honey. The first step is to add a super and the necessity for the same would be indicated by the crowding of a large number of bees under the top and at the entrance during nights. To start with, one super may be given and its number increased later, if necessary. As already mentioned, the side combs of the brood chamber which are usually stocked with honey may be cut and fixed to the super frame as the bees are generally slow in constructing them there. The combs have to be occasionally examined as the bees often exhibit a tendency to paste them together.

As swarming happens to be at its peak during this month, a few hints on having swarms and their after-care may not be out of place here. The bees which issue from the hives usually settle in the open in a cluster and remain there for some time. This cluster is known as a "swarm". This can be transferred to a hive by holding an open box with a frame of unsealed brood under it, in such a way that half the cluster is inside the hive. The bees being attracted by the brood quickly get into the hive. If they do not, they may be gently brushed with a broom or transferred with the hand. If the swarm has settled in an inaccessible place, the hive can be slung on to a pole and then held beneath

the swarm. The hive may then be filled with the other frames and kept in a convenient place.

Generally swarms work very briskly and with a little care they can be made to yield honey within a couple of months after hiving them. Old combs or comb-foundation sheets may be given to the empty frames to save the time and energy of the bees. Feeding with a little sugar syrup or dilute honey will also accelerate their activity.

M. C. Cherian & S. Ramachandran.

Press Notes

Backyard Cultivation*

The production of an adequate supply of fresh vegetables and a few fruits for the family use is the primary object of backyard cultivation. Few people realise the large number of different crops that can be grown successfully in their backyards. To many, backyard is essentially a waste ground, ill-kept, to be screened away from the eyes of visitors. Here we find the place for dumping the kitchen refuse, cattle-house rubbish and an assortment of discarded household articles. That a backyard can be converted into a place of pleasure and profit is realised by few. Under the present emergency conditions it is almost a crime to waste such valuable land, which can be easily utilized for growing food crops or vegetables to make up their existing shortage. Self-sufficiency is an important part of our war effort, and the home compound can contribute to an appreciable extent to increase our food supply. The cultivation of backyards should therefore be viewed as a duty which every one owes to himself and his family under the stress of circumstances imposed by the war.

In recent years the importance of vegetables in the diet to supply vitamins, mineral salts and cellulose is being stressed more and more by medical authorities and nutrition experts. Because of these various valuable properties, vegetables and fruits are termed as "protective" foods and their daily use in our diet is strongly recommended for safeguarding health, growth and efficiency. They are specially valuable to vegetarians to whom egg and meat are proscribed. The laxative properties of these foods are of value in preventing chronic constipation.

It is also to be remembered that fresh vegetables and fruits when harvested from the backyard and used within a short time are far superior in taste to those purchased from the bazaar. The home garden is also a centre of interest for the children. Besides meeting the needs of the family in the matter of food supply, the home garden can also be made a source of revenue. The surplus water from the wells and washing rooms, the litter and trash from the kitchen and stables and the spare time of every member of the family can also be put into profitable use. Loss by the frequent deterioration of bazaar-purchased vegetables is avoided. The increased production of vegetables at home relieves to a considerable extent the transportation difficulties and marketing problems, which are bound to be acute during the present emergency period. Home-grown vegetables and fruits are also more economical, as in their case no transportation charges are added to swell the cost. Above all, the pleasure of seeing plants grow, and the satisfaction of converting a piece of bare neglected piece of land into an attractive garden should give an added interest to every member of the family.

Broadly speaking, our vegetable and fruit crops can be divided into two main groups, one suited to the higher altitudes like the Nilgiris and the Kodaikanal

* Radio talk from the A. I. R. Stations, Madras and Trichinopoly, in Telugu and Tamil, on 25th and 28th November 1942.

and the other suited to the plains. Under certain conditions, however, a large number of hill vegetables can be grown on the plains and *vice versa*. Cabbage, cauliflower, knol-khol, lettuce, peas, radish, turnip, carrots, potato among the vegetables and cape gooseberry, strawberry, tree tomato among the quick growing fruits primarily fall under the hills crops. On the plains brinjal, chillies, cowpeas, cluster beans, sweet potato, tapioca, alocasias, colocasias, yams, coriander, *bendi*, *dondakai*, *basala*, onions, garlic, cucumbers, melons, pumpkins, gourds, papayas and bananas are the chief backyard crops in the plains. Tomato is one of the outstanding garden crops which thrives both on the hills and plains. There are a large number of slow growing trees which can also be grown in backyards either for their fruit or for culinary purposes, such as bread fruit, mango, tamarind, phyllanthus, drumstick, carambola and spondias. These, however, require more space and considerable time to yield fruits and do not always therefore appeal to the home gardener as much as quick growing vegetables and fruits, mentioned previously.

The home garden offers, however, little choice in the matter of soil or location. The owner is compelled to make the best of the available land. Fortunately, however, there are a very large number of vegetable and fruit crops which can stand adverse conditions, and this permits the backyard cultivation even in less favoured sites. If there is a choice open, it is best to select a sandy loam soil which suits most vegetables. A heavy soil can also be improved considerably by applying coarse manure or organic matter. Raising of green manure crops like daincha, sunnhemp and *pillipesara* for ultimate incorporation into the soil is a useful devise to bring heavy soils into a proper physical condition.

Since no one garden plan will suit all conditions and all tastes it is best to make a plan before the crops are sown. A plan will simplify the future work and economise home gardening. The main objective of the plan should be to provide a supply of fresh vegetables and fruits to the family throughout the year. Before making the plan, the exact area available for gardening should be determined. Separate plots should be allotted for vegetables and fruit according to their duration and time taken for producing fruit and also according to their cultural requirements. Perennials should be grown in a separate place. The available space should be divided into two or three plots to permit the raising of different seasonal vegetables separately and to allow successive sowings to be made. Vegetables that require pandals for support should be allotted a separate area. The plan should also provide for the growing of short duration crops in between long duration types. This will lead to economy of space. As the same kind of vegetable does not come up well in the same site, when grown year after year and as certain diseases will be perpetuated thereby, the plan should provide for rotation of crops. Vegetables and fruits which require more ample irrigations should be planted close to the wells. These various hints as well as instructions on the culture of each vegetable are discussed in detail in a series of leaflets which are to be published by the Department of Agriculture shortly. The listeners are requested to obtain the leaflets from the nearest Agricultural Demonstrators.

Good seed is the foundation of vegetable culture, as good plants are essentia for successful fruit growing. It will be to the advantage of the grower to obtain seeds and planting material from firms of established reputation or from the neighbouring houses where excellent crops have been raised. In the case of certain crops seed setting is not always favourable in this province, while in some others the home grown seed deteriorates in quality after one or more seasons. The help of the Agricultural Demonstrator should always therefore be sought in making the purchase of seeds and plants.

The home gardener is usually deterred from taking to vegetable and fruit growing on the fear that he lacks practical experience. It will not take long for him to find out that the subject is not such a mystery that cannot be mastered by any lay person. The publications on the subject shortly to be issued by the Department of Agriculture will contain all the practical hints that an average home gardener should need. With some enthusiasm and with an urge to safeguard the family's food supply and health, home gardening should prove to be an avocation of absorbing interest and profit. (*Department of Agriculture, Madras*).

Crop and Trade Reports

Statistics—Paddy—1942-43—Second forecast report The average area under paddy in the Madras Province during the five years ending 1940-41 represents 13·3 per cent of the total area under paddy in India. The area sown with paddy up to 25th November 1942 is estimated at 9,149 000 acres. When compared with the area of 8,737.000 acres estimated for the corresponding period of the previous year, it reveals an increase of 4·7 per cent.

The area estimated is the same as that of last year in Chittoor and the Nilgiris. An increase in area is estimated in the other districts of the Province except in Bellary, Chingleput, North Arcot, Coimbatore and Tinnevelly. The variations are marked in Vizagapatam (+100,000 acres), Kistna (+70,000 acres), South Arcot (+105,000 acres), and Tinnevelly (−65,000 acres).

The first crop of paddy is being harvested in parts of the Province. The yield per acre is expected to be normal in Salem, Madura, Ramnad, Tinnevelly, Malabar, South Kanara and the Nilgiris and below the normal in the other districts of the Province due generally to insufficient rains and inadequate water-supply for irrigation during the growing period of the crop. The crop was affected to some extent by insect attack in parts of the districts of East Godavari, West Godavari and Tanjore. The seasonal factor for the Province as a whole works out to 91 per cent of the average as against 97 per cent in the corresponding period of the previous year.

Paddy—1942-43—Intermediate report The main crop of paddy has been or is being harvested in parts of the Circars, the Deccan, the Central districts, Tanjore and Madura. The yield per acre is expected to be generally below the normal due to insufficient rains and inadequate water-supply for irrigation during the growing period.

The main or first crop of paddy in parts of the Circars (deltas excepted), the Deccan, the Carnatic, Chittoor, North Arcot and Trichinopoly, the semi-dry and dry paddy crop in Ramnad and the second crop paddy in Malabar have been affected by drought. The rains received in December 1942, have improved the late sown crops in parts of the Carnatic, North Arcot, Tanjore and Ramnad. The condition of the crop is generally satisfactory in the other districts of the Province.

The wholesale price of paddy, second sort, per imperial maund of 82 ⅔ lb. as reported from important markets on 14th January 1943 was Rs. 6—15—0 in Chittoor and Tinnevelly, Rs. 6—10—0 in Madura, Rs. 6-3-0 in Virudhunagar, Rs. 5—12—0 in Kumbakonam, Rs. 5-7-0 in Cuddalore and Trichinopoly, Rs. 5-6-0 in Vellore, Rs. 5—4—0 in Hindupur, Rs. 5—0—0 in Conjeevaram, Rs. 4—14—0 in Nagapatam, Rs 4—12—0 in Bezwada and Masulipatam, Rs 4—11—0 in Guntur, Rs. 4-10—0 in Rajahmundry and Ellore, and Rs. 4—5—0 in Cocanada. When

compared with the prices published in the last report i. e., those which prevailed on 7th December 1942, these prices reveal fall of approximately 23 percent in Conjeevaram, 12 per cent in Vellore, 11 per cent in Guntur, 9 per cent in Cocanada, 6 per cent in Rajahmundry, Ellore and Bezwada, 5 per cent in Trichinopoly and 3 per cent in Cuddalore and a rise of approximately 10 per cent in Chittoor, 5 per cent in Madura, 4 per cent in Hindupur, 3 per cent in Nagapatam and 2 per cent in Kumbakonam the prices remaining stationary in Masulipatam.

Statistics—Sugarcane—1942—Intermediate forecast report The sugarcane crop is reported to have been adversely affected to some extent by insufficient rainfall in the growing period and want of water for irrigation in parts of the districts of East Godavari, Bellary, Chingleput, South Arcot, Chittoor, North Arcot, Trichinopoly and Ramnad. The cane in the northern taluks of the Vizagapatam district is reported to have been damaged to some extent by cyclone. The condition of the crop is generally satisfactory in the other districts of the Province and the yield per acre is expected to be normal. In the South Kanara district, the yield is estimated to be slightly above the normal because of the larger area under improved canes.

The wholesale price of jaggery per imperial maund of 82⅔ lb as reported from important markets on 7th December 1942 was Rs. 13—12—0 in Adoni, Rs. 12—8—0 in Salem, Rs. 12-2-0 in Mangalore, Rs. 10-8-0 in Cocanada, Rs. 10-5-0 in Vellore, Rs. 9—14—0 in Rajahmundry, Rs. 9—12—0 in Coimbatore Rs. 9—11—0 in Trichinopoly, Rs. 9—4—0 in Chittoor, Rs. 9—2—0 in Vizianagaram, Rs. 7-13-0 in Bellary, and Rs 7—12—0 in Vizagapatam. When compared with the prices published in the last report. i. e., these which prevailed on 9th November 1942, these prices reveal a rise of approximately 14 per cent in Mangalore and 11 per cent in Vizianagaram and a fall of approximately 32 per cent in Chittoor, 24 per cent in Vellore and Coimbatore, 21 per cent in Trichinopoly, 12 per cent in Bellary, 11 per cent in Adoni, 9 per cent in Cocanada and 8 per cent in Rajahmundry, the price remaining stationary in Salem.

Statistics—Castor—1942—First or final report The average area under castor in the Madras Province during the five years ending 1940-41 represent 18·4 per cent of the total area under castor in India. The area under castor in the Madras Province up to 25th November 1942 is estimated at 273,300 acres. When compared with the area of 244 900 acres estimated for the corresponding period of last year, it reveals an increase of 11·6 per cent. The estimate of last year was more than the actual area of 243,954 acres by about 0·4 per cent.

The crop is mainly grown in Guntur (24 000 acres), the Deccan (148,000 acres), Nellore (36,500 acres) and Salem (21,000 acres). It is not grown in Chingleput. The area is estimated to be the same as that of last year in Vizagapatam, Guntur, South Arcot, Tanjore and Tinnevelly. An increase in area is estimated in West Godavari, the Deccan, Chittoor Salem, Coimbatore and Ramnad and a decrease in area in the other districts of the Province.

The yield per acre is expected to be normal in Vizagapatam, East Godavari, West Godavari, Nellore, South Arcot, Salem, Tanjore, Madura, Ramnad, Malabar and South Kanara and below normal in the other districts of the Province. The seasonal factor for the Province as a whole is estimated at 90 per cent of the normal. On this basis, the yield is estimated at 24,800 tons as against, 24,300 tons estimated for the corresponding period of last year and 23,400 tons estimated in the Season and Crop Report of last year.

The wholesale price of castor per imperial maund of 82⅔ lb. as reported from important markets on 21st December 1942 was Rs 11—1—0 in Nandyal, Rs. 10—8—0 in Cudapah, Rs. 10 in Vizianagaram, Rs. 9—14—0 in Anantapur, Rs. 9—5—0 in Hindupur and Rs. 7—15—0 in Bellary. When compared with the prices which prevailed on 22nd December 1941, these prices reveal a rise of approximately 126 per cent in Hindupur, 121 per cent in Cuddapah, 119 per cent in Anantapur, 108 per cent in Nandyal, 87 per cent in Bellary and 70 per cent in Vizianagaram.

Statistics—Pepper—1942—Final report The area under pepper in 1942 in Malabar and South Kanara is estimated at 108,200 acres (99,500 acres in Malabar and 8,700 acres in South Kanara) as against the final area of 105,019 acres (96,368 in Malabar and 8,651 acres in South Kanara) in the previous year.

The condition of the crop is satisfactory and the seasonal factor is estimated to be normal in both the districts as against 95 per cent in Malabar and 100 per cent in South Kanara in the previous year. On this basis, the yield is estimated at 40,390 tons (9,550 tons in Malabar and 840 tons in South Kanara) as against 9 030 tons (8850 tons in Malabar and 830 tons in South Kanara) estimated in the previous year.

The wholesale price of pepper per imperial maund of 82⅔ lb. as reported from important markets on 11th January 1943 was Rs. 27—4—0 in Calicut, Rs 29—15—0 in Tellicherry and Rs. 33—4—0 in Mangalore. When compared with the prices published in the last report, i. e,. those which prevailed on 15th September 1942, these prices reveal a rise of approximately 22 per cent in Calicut, 30 per cent in Tellicherry and 36 per cent in Mangalore.

Statistics—Cotton—1942-43—Third forecast report The average area under cotton in the Madras Province during the five years ending 1940-41 represents 9·7 per cent of the total area under cotton in India. The area under cotton up to the 25th November 1942 is estimated at 1,931,000 acres. When compared with the area of 2,036,200 acres estimated for the corresponding period of last year, it reveals a decrease of 5·2 per cent.

The estimated area is the same as that of last year in Tanjore and South Kanara. An increase in area is estimated in the Circars (Guntur excepted), Kurnool, Cuddapah, Nellore, Chittoor, Trichinopoly, Ramnad and Malabar and decrease in area in the other districts of the Province. The variations are marked in Kurnool (+50,000 acres), Cuddapah (+11,000 acres), Bellary (−60,000 acres), Anantapur (−17,000 acres), Coimbatore (−28,000 acres), Madura (−26,000 acres) and Tinnevelly (−47,400 acres).

The area under irrigated cotton, mainly cambodia is estimated at 225,900 acres as against 243,700 acres in the corresponding period of last year which represents a decrease of 7·3 per cent.

The yield per acre of the mungari or early sown crop is expected to be below normal in the Deccan on account of drought. The hingari or late sown crop is stunted in growth in parts of the Deccan on account of insufficient rainfall.

Normal yields are expected in all the districts except Vizagapatam, Kistna, Guntur, Kurnool, Bellary, Anantapur, Cuddapah and North Arcot. The seasonal factor for the Province as a whole works out to 90 per cent of the average as against 96 per cent for the corresponding period of the previous year. On this basis, the total yield is estimated at 393,900 bales of 400 lb. lint as against 441,100 bales estimated for the corresponding period of the previous year, representing a decrease of 10·7 per cent. The crop is young and is too early to estimate the yield with accuracy.

The estimated area and yield according to the varieties are given below:—

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

Variety	Area from 1st April to 25th November		Corresponding yield	
	1942	1941	1942	1941
1	2	3	4	5
	Acres	Acres	Bales	Bales
Irrigated Cambodia	2159	2357	1350	1474
Dry Cambodia	2714	2716	577	569
Total, Cambodia ...	4873	5073	1927	2043
Uppam in the Central districts ...	191	164	31	27
Nadam and bourbon	340	330	17	17
Total, Salems ...	531	494	48	44
Tinnevellies*	3280	4080	819	1017
White and red northerns ...	1850	1300	185	154
Westerns	7640	8350	765	965
Warangal and Cocanadas ...	1060	1002	186	181
Chinnapati (Short staple) ...	76	63	9	7
Total ...	19310	20362	3939	4411

* Includes Karunganni in Coimbatore, Uppam, Karunganni and mixed country cotton in Madura, Ramnad and Tinnevelly.

Statistics—Cotton—1942-43—Intermediate report Pickings of the mungari or early sown crop in parts of the Deccan are nearing completion and the yield is expected to be below the normal. In parts of the districts of Vizagapatam, Kistna and Guntur and in the Deccan, the crop has been affected by drought to some extent. The condition of the crop is generally satisfactory in the other districts of the Province.

The average wholesale price of cotton lint per imparial maund of 82⅔ lb or 3,200 tolas as reported from important markets on 11th January 1943 was Rs. 27—3—0 for Cocanadas, Rs. 30—1—0 for white Northerns, Rs. 23—1—0 for red Northerns, Rs. 27—11—0 for Westerns (mungari), Rs. 25—15—0 for Westerns (Jowari) Rs. 59—8—0 for Coimbatore Cambodia, Rs. 47—2—0 for Coimbatore Karunganni and Rs. 36-12-0 for Nadam cotton. When compared with the prices published in the last report, i. e., those which prevailed on 7th December 1942 the prices reveal a rise of approximately 9 per cent in the case of Westerns, (mungari), 7 per cent in the case of Cocanadas and 4 per cent in the case of Westerns (Jowari) and a fall of approximately 3 per cent in the case of Coimbatore Karunganni and 2 per cent in the case of Nadam cotton. the prices remaining practically stationary in the case of Coimbatore Cambodia and stationary in the case of Northerns (red and white varities).

(Additional Joint Secretary, Board of Revenue, Madras).

Cotton Raw in the Madras Presidency The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February 1942 to 8th January 1943 amounted to 715,070 bales of 400 lb. lint as against an estimate of 559,700 bales of the total crop of 1941—42. The receipts in the corresponding period of the previous year were 637,371 bales. 698,168 bales mainly of pressed cotton were received at spinning mills and 2,739 bales were exported by sea while 85,369 bales were imported by sea mainly from Karachi and Bombay.

(Director of Agriculture, Madras).

Moffussil News and Notes

Lalgudy An Agricultural Exhibition on a fairly large scale was held at Lalgudy from 8th to 10th January 1943 during the 17th Anniversary celebrations of the Lalgudy Sivagnanam Co-operative Agricultural Society, in the spacious hall of the Local District Board High School. The exhibition was opened in the presence of a distinguished gathering by Rao Sahib G. Rajagopal Pillai, the President of the District Agricultural Association, Trichinopoly. Besides the usual labour-saving implements, the departmental strains of paddy, millets, oil seeds and sugarcane were kept on show. An impetus was given to the "grow more food" campaign and placards concerning it were hung in prominence. Specimen crops of daincha, sunhemp *pillipesara*, *Kolinji* and indigo were raised in small plots and their importance was explained. A live bee-colony was also put up A model cattle shed and manure pit were erected. (The Kangayam stud bull maintained by the Society was also stalled nearby).

A special feature of the exhibition was that the local *ryots* brought their own production of paddy, sugarcane, vegetables, fruits and flower plants and the Society awarded silver medals and certificates of merit to the worthy exhibits. The Veterinary, Health and Co-operative Departments and the Hand-loom Weaver's Society, co operated and in the evening cinema films were shown on dairying and lectures with lantern slides were delivered on agriculture, bee-keeping, animal husbandry and epidemic diseases. The exhibition attracted a large number of visitors and it was very much appreciated by them. T. G. A.

Estate News and Notes

Students' tour The students of B. Sc. Ag. class III were taken on a week-end trip to Dindigul and those of class II on a study tour to Mettur, Trichur and Pattambi, during the second fortnight of the month.

Students' Club On the 13th January Dr. G. F. Scudder, District Medical Officer, Coimbatore, delivered an interesting address on 'War time medicine' under the presidentship of Sri V. T. Subbiah Mudaliar

Cyclone Relief Fund A further sum of Rs. 6 was collected and remitted to the Mayor's fund by the students, making up the total contribution to Rs. 212.

Games In connection with the Inter-tutorial competitions the following matches were played during the month. *Cricket*—Sri C. M. John's wards won against Sri Y. G. Krishna Rao's; Sri K. M. Thomas's wards won against Sri C. N. Ayyangar's; *Hockey*—Sri M. C. Cherian's wards won against Sri B. M. Lakshmipathi's; *Foot-ball*—Sri Y. G. Krishna Rao's won over Sri B. M. Lakshmipathi's and Sri C. M. John's won over Sri M. C. Cherian's.

Economic Biologists Association Under the auspices of the Association Rao Bahadur B. Viswanath, C. I. E Director, Imperial Institute of Agricultural Research, New Delhi, delivered an illuminating address on 'What next' on 18th January. The speaker dealt mainly with the importance of agricultural development in post-war reconstruction.

King's Commission We are glad to note that Sri T. K. Mukundan, Farm Manager, Central Farm, has been selected for King's Commission in the Indian Air Force and is proceeding shortly to Ambala for training.

Radha Kalyanam The residents of the Estate celebrated *Radha Kalyanam* with great success on 17th January after the termination of the '*Dhanuramsa Pujas*'.

College Day Sports The thirty first annual athletic sports of the College which could not be held in July 1942, has been arranged to be conducted on Saturday 30th January under the auspices of the Madras Agricultural Students' Union.

Senate Elections We are glad to announce that Sri S. N. Chandrasekhara Ayyar, Lecturer in Botany, is seeking elections to the Senate of the Madras University by the Registered graduates' constituency. He has over 22 years teaching experience and was the Editor of this journal for more than a year. We hope all the registered agricultural graduates will support him with their first preference votes. It is unnecessary to point out the great advantage of having an agricultural man in the Senate, to represent fully the interests of agricultural education.

Grow More Food. The Director of Agriculture convened a conference of some of the District Agricultural Officers at the Agricultural College on the 15th and 16th to discuss the ways and means of growing vegetables on a large scale and production of more food crops. Messrs. Dharmalingam Mudaliar, Kantiraj, M. U. Vellodi. Chokalingam Pillai and Abhishekanatham, District agricultural officers and S. N. Venkatraman, Assistant Marketing Officer were present.

Visitors. The following were the distinguished visitors to the College during the month. Sri P. H. Rama Reddy, Rao Bahadur B. Viswanath, C. I. E., Sir Jogendra Singh, Sri V. C. Vellingiri Gounder, Sri K. Venkataswami Naidu, and Sir Cameron Badenoch, Auditor—general and Chief Commissioner, St. Johns Ambulance Brigades in India.

OBITUARY

We regret to record the death in England of Sir Bryce Burt, who was formerly Agricultural Expert to the Government of India and afterwards for some time Vice Chairman of the Imperial Council of Agricultural Research, New Delhi.

Departmental Notifications.

Gazetted Service.

Posting.

Sri R. Swami Rao, D. A. O. Guntur to be D. A. O. for special duty on Pest Act Work.

Leave.

Sri P. Venkataramiah, Govt. Agricultural Chemist and Principal, Agricultural College, Coimbatore, l. a. p for 1 month from date of relief.

Sri T. S. Ramasubrahmanya Ayyar, Asst, Agricultural Chemist, Coimbatore, extension of l. a. p. for 1 month and 15 days from 16—12—1942.

Sri Samuel Jobitha Raj, D. A. O. Madura, l. a. p for 4 months from the date of relief.

Subordinate Service.

Appointment.

Sri M. Narasimham, Agricultural Demonstrator, Tenali is posted as a technical assistant in the office of the Director of Agriculture for a period of one year

Transfers.

Name of officer.	From	To
Sri M. Kandaswami	Asst. in Mycology, Coimbatore,	Asst. Tobacco Research Scheme, Guntur.
„ K. Balaji Rao,	A. D. (on leave)	A. D. Rayadrug.
„ S. Mahadeva Ayyar,	A. D. Kodaikanal,	A. D. Thirumangalam.
„ N. S. Rajagopal,	Asst. in Fruits, Pamological Station, Coonoor,	Asst. in Fruits, Fruit Nursery Scheme A. R. S. Taliparamba.
„ P. Narayanan Nayar,	F. M. A. R. S. Taliparamba,	F. M. A. R. S. Nanjanad.
„ K. Gurumurthi,	Asst. Marketing Officer, (on leave)	Special Officer, Tobacco Market Committee, Bezwada.
„ D. Achyutarama Raju,	Special Officer, Tobacco Market Committee, Bezwada,	Marketing Asst., Rajahmundry.
„ J. Suryanarayana,	A. D. Vinukonda,	A. D. Bapatla.

Leave.

Name of officer	Period of leave.
Sri M. Satyanarayana, F. M. A. R. S. Samalkot,	Extension of l. a. p. for 3 months from 27-12-42.
„ K. Ambikacharam, A. D. (on leave),	Extension of l. a. p. on m. c. for 2 months from 7—1—43.
Janab A. Abdul Samad, Asst. in Paddy, Coimbatore,	Earned leave for 60 days from 19-1-43
Sri B. L. Narasimha Murthi, Millet Asst. A. R. S. Anakapalli,	Earned leave for 30 days from 8-1-43.
„ M. Suryanarayana, Asst. in Chemistry, Coimbatore,	Extension of leave on half average pay for 4 months from 27—1—43.
„ P. R. Subramania Ayyar, F. M. A. R. S. Koilpatti,	Extension of l. a. p. for 1 month from 21—12—42.
„ V. Chidambaram Pillai, A. D. Sankarankoil,	L. a. p. for 2 months and 29 days from 20—1—43.
„ P. K. Natesa Ayyar, A. D. Rasipuram,	L. a. p. for 1 month from the date of relief.
„ V. K. Kunhunni Nambiar, A. D. Udamalpet,	L. a. p. for 4 months from the date of relief.
„ K. P. Anantanarayanan, Asst. in Entomology, Coimbatore,	L. a. p. on m. c. for 1 month from 4—1—43.
„ Mayandi Pillai, Cotton Asst. (on leave),	Extension of l. a. p. for 1 month and 6 days from 25—12—42.