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THE MADRAS AGRICULTURAL JOURNAL

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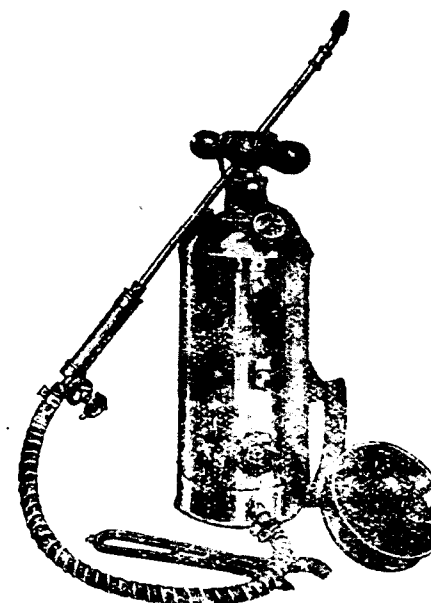
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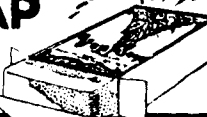


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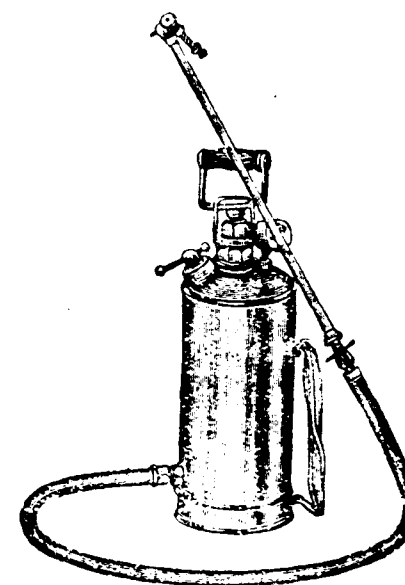
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EDITORIAL

Madras Debt Relief Act upheld. The validity of the Madras Agriculturists Debt Relief Act was challenged before the Federal Court, New Delhi in the form of an appeal in which it was contended that the Provincial legislation encroached upon a forbidden sphere viz., Negotiable instruments or promissory notes which fall exclusively within the domain of the Central legislature, and as such the inclusion of debts due under negotiable instruments under the Madras Act had rendered the Act wholly or partly invalid. In dismissing the appeal, the court by a majority verdict upheld the Act and declared it valid. The learned judges held that it was inevitable that legislation purporting to deal with subjects in one list may touch those in another list and consequently different provisions of an enactment may be so closely intertwined that a strict verbal interpretation would unjustifiably invalidate several statutes. They therefore felt that as per the rules evolved by the Judicial Committee, the statute should be examined to ascertain its 'pith and substance'. Under this test, the Madras Debt Relief Act was not meant to be a legislation with respect to negotiable instruments or promissory notes and the overlapping of the Provincial Act was only incidental. Moreover the alleged repugnance of the Madras Act to the existing Indian Law was cured by the previous assent of the Governor General and consequently there was no justification to declare the Act wholly or in part inoperative. The judgment of the Federal Court in what may be considered as an important 'test case' is of great consequence to the agricultural community of the province. The possibility of the overthrow of the Madras Act by the highest legal authority of the land spelt disaster on the economy of the small agriculturists who were just beginning to benefit from a piece of wise legislation calculated to salvage them from a condition of age-long indebtedness to the usurious money-lender and the extortionist land-lord. The Act has now passed through several vicissitudes and it is a matter of satisfaction that it has steered clear of another dangerous corner.

India to grow flax. We are glad to note from a recent press announcement that attempts are being made in some parts of India to grow flax. An essential commodity in peace, flax has assumed great importance during the war. Flax fibre forms the foundation of such important materials like seaming twine and high class cordage so essential for the manufacture of

Canvas goods, leather goods, tents, tarpaulins, fire-hose etc. which are required for equipping the army, navy and air force. Though India has no reputation for growing flax as a fibre she happens to grow 4 million acres of the linseed plant (*Linum usitatissimum*) which is botanically the same as the one which yields flax. We are aware that the strains of *Linum* which produce high grade flax are different from those which yield linseed. Yet it sounds strange that in a great continent like India which possesses an astonishing variety of soil and climatic conditions, no serious efforts have been made to study the possibilities of flax culture. In 1938, the world produced 800,000 tons of flax fibre of which the contribution of the British Empire was only 1 per cent while her domestic requirements were ten times as much. The deficit was supplied by important producing countries like the Soviet Union, Poland, Latvia, Lithuania, Estonia, France and Belgium. With the outbreak of the war, these sources were closed to Britain and she had to fall back on the resources of the Empire. The importance of the commodity can be gauged from the fact that last year the British Ministry of Supply sent 400 tons of flax seed to Australia to sow 13,000 acres, the condition being that growers would be paid £5 per ton of flax straw produced.

Flax is reputed to grow luxuriantly in moist areas with a mild climate. Being a crop of about 3½ months' duration, it should be possible to find suitable localities in the Madras province which should prove suitable for flax culture. Even in western countries like Ireland, Russia and Belgium human labour is largely employed for such operations like pulling, rippling, retting, drying, rolling and scutching. For these reasons, the cultivation of the crop and the preparation of the fibre for the market open out great possibilities for the province. We trust that the Government of Madras will launch some experiments to study the possibilities of flax culture in the province.

Land Reclamation Methods—*Sequelae to Soil Erosion* *

BY M. SATYANARAYANA, B. A., B. Sc. (Ag.).

Farm Manager, Agricultural Research Station, Samalkota.

Introduction. In the agricultural countries of the Old World, farming for several centuries has not significantly reduced the productive capacity of the land, because Nature-induced erosion was always kept under control, through *conservation* farming, as opposed to *exploitative* farming which is the primary cause of man-induced erosion. In the words of Sir Daniel Hall, "the methods practised by the pioneers in the development of a new country are rarely those of sound agriculture...". To capture the international trade in agricultural commodities, all opportunities, as they arose in the last World War, were harnessed and soil fertility was bartered away for the precious metal, as so much produce exported is so much soil fertility driven out of the land. Deforestation, to meet the needs of wood for fuel, cellulose, explosives, newspaper, books, rayon, match sticks, paints, varnishes &c. and to bring more land under the plough, for agricultural produce, brought in its wake, floods, erosion and the desert. Forty million acres were worked in this way, in the U. S. A. (Africa is no better) and were abandoned during the World Economic Depression, from the erosion that resulted through faulty land utilisation, mainly mono-culture. Wild floods are unknown in areas not tampered by man. The cities, railways, roads, hydro-electricity, water supply schemes, irrigation and navigation projects, all secured through forced production converted to astronomical bank balances, are shaken in their very foundations, by erosion induced by man, through deforestation and floods. To quote Jacks and Whyte, "more soil was lost from the world between 1914 and 1934 than in the whole of previous human history." The combined effects of boom, slump and drought produced a catastrophic biological and physical deterioration of whole regions, culminating in dust storms and floods which threatened to become fixed events in the calendar of North America.

The toll of erosion. The uneven surface of the land, the incapacity of the soil to permit of percolation of rainwater as quickly as it is received, the annual uneven distribution of rainfall and the whole of it finishing off in a few downpours are the familiar causes of soil erosion. In the stupendous quantities of soil let down annually, fabulous losses in nitrogen, potash, lime and humus occur, when compared to the normal intake of plant foods, in such soils. The muddy water of rivers, laden with the eroded soil, silts up the spawning beds. Turning into the up-country, the soil originally teeming with life, is rendered lifeless. None can gainsay Nature's decree. Land is never restored to its original state, but is reclaimed to some extent, by some of the methods given below.

* Paper read at the Twenty-ninth College Day and Conference of the M. A. S. U.—July 1940.

Methods of Reclamation. All reclamation methods of eroded land go under four broad groups. They are (i) Mechanical, (ii) Agronomical, (iii) Biological and (iv) Socio-economic.

(i) **Mechanical Methods of Reclamation.** The slow but persistent removal of the final fractions of valuable soil under 'sheet erosion', the wash out with squally violence in 'gully erosion', the dune and desert formations from 'wind erosion' and the engulfing of productive land by 'sea erosion' may all be arrested, by adopting suitable courses of action, individually, communally or regionally, by resorting to minor works such as contour terracing; contour hedging; contour trenching; contour ridging; tilling across the field gradient; damming ravines; throwing embankments across 'dongas'; erecting dikes; arranging 'pockets and spill' ways and providing storm water drains.

Individual. The use of these methods to counter-act erosion, are known to the Indian peasantry, from time immemorial. All agriculture on the slopes of the Ghats have been rendered possible, by a knowledge of the above. In the slack periods the peasantry annually mend the havoc of past denudation and attend to necessary work to prevent future erosion. The thousands of small seed bed tanks and ponds spread over the vast Godavary Western delta are no more than the "pockets and spill ways" that are suggested on the subject to control erosion. Quite apart from the various measures cited above, there is nothing to equal the will of the farmer in averting on his holding, a distant catastrophe of whatever magnitude, by the timely close up of the imps that tend to gnaw the entrails of the soil. The orchards, in the villages of Nandarada and Dosakayalapalle of Rajamundry taluq, are some of the best that deserve mention in this connection, notwithstanding the erosive nature of the light soils on which they are raised.

Communal. In the Godavary Western delta, a number of Joint Stock companies are working in projects like the Losari- Gultlapadu, Vemuladeevi, and Kalipatnam, in reclaiming lands, from a number of evils, of which erosion is one. The soil of these projects rendered into a syrup, by the floods overflowing the embankments of the drains, is transported bodily. In some of the States in America, the Soil Conservation District Laws give scope to farmers to co-operate and undertake demonstration projects, of soil conservancy. 'Badava' lands all along the sea-board, in which paddy and finger-millet are cultivated, are periodically overrun by tidal action. Such lands in the villages of Komaragiri and Neman of East Godavary are protected by bunding against the sea-flow.

Regional. The larger interests of a province, or a country can never be served, by a few joint stock companies. State effort in bunding in Belgaum, Dharwar and Bijapur districts, in contour ridging (Watt-bundi) in the Kangra district and in contour trenching in the Punjab and the U. P., has already achieved substantial results.

What is required for this Province is (1) the conduct of a survey of the areas suffering from erosion and needing reclamation; (2) long-range planning for taking up and finishing the ameliorative operations, by zones and under stated periods of time; and (3) the inauguration of a minor engineering department, for tank formation and tank restoration. Erosion, in areas of poor soil binding, is a great menace. In such, the preservation of the catchments to be formed with forest reserves and vegetation, and the rivetment of the bunds to be put up, may never make the works 'productive' in the P. W. D. sense. The tank formation and the tank restoration, in the province, may easily cost several times the estimated cost of the Tungabhadra project; but the resources of the country will be permanently improved in a manner comparable to the State drive in Italy, where a swampy expanse has been metamorphosed into arable land and the scourge of malaria driven out. The Tennessee Valley in America, would be spending to the tune of nearly 400 million dollars, for the ten years ending 1943, in the reclamation projects of eroded lands. In Japan with the "operation of the natural forces of sedimentation, plant succession and re-vegetation" under the check-dams of the Forest Engineer, erosion is checkmated. Japan and Java, "two islands with highly erosive topography and climate and supporting 500 and 680 people per sq. mile", have erosion under full control.

(ii) **Agronomical Methods of Reclamation.** The free play of sun, wind and rain on bare soil brings about erosion. It is therefore necessary to have 'plant cover' on the land, at least during periods in which erosion is the greatest.

Sound rotations. The rotations to be practised are to be such as would (1) minimise the periods of fallow, (2) produce crops producing a dense stand and a soil binding root system and (3) provide for recuperative crops that give nitrogen to the soil. Unoccupied cultivable waste, when brought under cultivation is first put under horse gram, which is a leguminous recuperative crop producing good plant cover. Cotton, maize and tobacco, that require to be spaced widely, are generally unsuitable as reclaimers and have to be rotated with those which produce a good plant cover. The experience of Mr. Kanitkar, of the Bombay department, of Agriculture quoted by Dr MacLagan Gorrie, goes to show that sorghum, which figures prominently, in the rotations of the eroded black soil tracts, is a good controller of erosion. The following typical, age-long, dry-land rotation, of the loams and the clay loams of the Telugu districts, is a protector of the soil and affords plant cover for a great part of the year.

1st year :— Mixture of dry paddy and red gram;

2nd year :— Chillies with rows of cotton at intervals;

3rd year :— Groundnut followed by coriander; or Bengal gram, or fodder sorghum, when conditions permit.

Unfortunately such rotations are not regularly practised by the cultivators who are lured away by money crops like chillies which are raised annually, as at Gollaprole in Godavari district. Mono-culture systems as maize in the

corn-belt and cotton in the Southern States of America, and cotton followed by maize in Uganda are said to be the causes of the disastrous erosion, in those countries.

Green manuring. Sometimes in preventing one evil, we may bring about another. Incessant cropping done with the object of securing a plant cover may bring about soil exhaustion. Secondly, with the onset of the monsoons, heavy masses of soil are rolled down streams, breaching embankments. A number of wild streams between Bezwada and Kovvur play havoc on the country, every year, in their traverse to the Kollair lake. Raising green manure crops is a panacea to these evils. The matted root system, binds the soil and prevents to some degree, this scouring of soil by floods.

Mixed Farming. For a country dependent on cattle for its agriculture, mixed farming provides the cattle with diversified feeds, and conserves the land by warding off erosion. A Telugu proverb condemns the practice of raising of pure crops under rainfed conditions. Run off and erosion figures collected for a number of years at the Missouri Experiment Station, Columbia and the observations of Dr. MacLagan Gortie in this country, indicate that in the order of their importance bare fallow, sound rotation and pasture aid soil conservancy.

Limit of safe productivity. Under the perennial irrigation system of the deltas, raising two or three crops of paddy, in an year or garden crops which are gross feeders on soil fertility may impoverish the soils.

Site of plots and soil blow. The fragmentation and the disintegration of holdings are a blessing in disguise, in lessening erosion. Plots of half to two acres are found to be fairly free from erosion, in the Bombay Presidency. Such divisions of land are a necessity, in the light soils of Anantapur, where the harvest of groundnut with bullock hoes turn the soil to the fineness of flour and render it liable for wind erosion.

Strip cropping. Strip cropping with arable crops alternating with 'dense sod crops', is now under practice, all the world over, as a conservancy measure.

Selective weeding. This is in vogue in plantation agriculture, for soil conservancy. Obnoxious weeds above are eradicated, while the less harmful are left untouched, in the tea, coffee and rubber estates, in Ceylon and South India.

(iii) Biological Methods of Reclamation.

Regulation of the strength in livestock and controlled grazing. Strangely, the very factors that retard progress in livestock improvement, also assist erosion. Greater destruction of plant cover and heavier indiscriminate trampling arise with the maintenance of a higher proportion of cattle than is justified by the cultivated area. The Vizagapatam district (specially the Vizianagaram taluq) is one of those suffering greatly from soil erosion.

It may be due either to its red loams; it may also be due to the stock-rearing industry, in that district. The trodden paths of cattle and goats assisted by scouring in rainy periods bring about gully erosion. The village commons and the unreserves thrown open to grazing get greatly eroded, through such indiscriminate trampling. The pasture grasses grazed bare, fail to recover in time, to be economically useful. Controlled grazing and cutting the grasses periodically sound well toward stock improvement as well as the prevention of soil erosion. But to do away with the over-stocking and un-economic herds in a country that is averse to the destruction of life is no easy matter. Are sufficient areas available even for the indispensable tilling cattle, to arrange for grazing by rotation in blocks, for the permanent preservation of pastures? In the tracts of intensive cultivation, as well as in wetland areas, it is hardly possible to have standing room for the village cattle, especially during the inclement weather. This has been a thorny subject receiving attention for several decades. Educative propaganda and slow state intervention, with caution, would secure the desired object of getting rid of the un-economic herds, over-stocking, promiscuous grazing and the want of organised pastures.

Regulated forestry. The forest policy should not be pursued as a commercial revenue proposition. Forest preservation and controlled grazing are antagonistic to the world's needs of wood and meat, but all the same they are to be helped in the interests of national economy. The very many uses which wood is now put to, may bring in, a time, when forestry may be encouraged and made to encroach on agricultural land. Submarginal exhausted agricultural land may be re-forested, or brought under controlled grazing, as under the Taylor Grazing Act of 1934, in America.

Ecological engineering and re-vegetation. Ecological observations of the flora and the fauna on the land, as also a study of the habits of the communities settling on the land are necessary to practise ecological engineering, for soil conservation. New fauna (from the domesticated) should not be introduced, if they bring in degeneration of the flora *in situ*. Nor should man be permitted to dominate and disturb the balance existing between the land and the flora it is supporting.

Extensive cultivation is going on, in the sandy loams of the coast-wise areas, under *doruvu* wells and along the banks of the rivers Hagari, Pennar &c. that have sand in them and no water flow for a greater part of the year. In both the kinds of tracts, the water bed is fairly high and manure being the only limiting factor of production in them, quite a variety of valuable crops is raised. Unfortunately, the play of strong winds on the coast, as well as in the areas of low rainfall of the said rivers has led to erosion on the wind-ward side and dune formation on the lee-ward side. Wind-breaks and shelter belts in which bare land alternates with crop land are the main ways to deal with. *Casurina* is widely grown on the coast and to some extent on the afore-mentioned river banks and adjacent to the banks.

Shelter belts are greatly used in the Jutland peninsula, of Denmark and are claimed to give protection to areas "equal to ten to twelve times their height". In addition to the moderating influences on soil temperature, wind, humidity and evaporation, high crop yields up to thirty per cent are also reported.

Soil binding may be effected with re-vegetation by suitable ecological material. The trees that are used for the purpose, in the several countries of the world are *Acacias*, *Cassia siamea*, *casurina*, *Eucalyptus*, *Festucas*, *Pines*, *poplars*, *spineless cactii* and *willows*.

The following are the vines, creepers and grasses, in vogue for the purpose, in the various countries.

Botanical name.	Common name.	Country of use.	Remarks.
Vines and Creepers			
<i>Pueraria thumbergia</i>	Kudzu vine	U. S. A. and S. Rhodesia	Originally a native of China; propagated from roots and crowns
<i>Bignonia radicans</i>	Trumpet creeper	U. S. A.	
<i>Strophostyles helvola</i>	Trailing wild bean	do.	
<i>Lespedeza striata</i>	Lespedeza	do.	
<i>Ipomoea biloba</i>	Sand-binding weed.	India	Used by the rail-ways on the permanent way.
Grasses			
<i>Eruaria villosa</i>	Pyp grass	Africa	
<i>Cyanodon dactylon</i>	Hermuda grass	India	'Hariali', or lawn grass
<i>Agropyron scabrum</i>	Blue grass	New Zealand	
<i>Aristida pennata</i>	Sand grass	Russia	
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Besides possessing the property of soil or sand binding, the material chosen should be drought resistant, rhizomiferous, stoloniferous and of the seeding kind, for rapid establishment. It should as far as possible be unpalatable (e. g. rabbit menace in S. Australia and locusts in Kenya), hardy in withstanding soil and sand blow and as far as possible indigenous. Turfs and sods serve the purpose quicker than vegetation through seed propagation.

(iv) Socio-Economic Methods of Reclamation.

Restriction of international trade in soil fertility. The soil is a mine from which fertility is drawn and transported across the seas, in the name of

produce. The high tariff wall built by U. S. A., against the import of agricultural commodities, after the last World War and its non-acceptance of payments of war debts in goods, assisted soil conservation and thus arrested erosion in a measure, though countries solely dependent on agriculture under the falling prices, following the boom had to resort to over-production, to make both ends meet.

The higher the standard of living of the ryots, the greater is the erosion. The impact of western civilisation, on the agricultural populations of the East, raised the standard of living of the latter, during the last three or four decades. The agriculturists of Egypt and India, for centuries adjusted their mode of living to the productive capacity of the soil. Better living enjoins over-production and therefore erosion ultimately. Present rural uplift work should countermand this evil, by necessary propaganda.

Capitalist farmers and industrial magnates. Capitalist farmers emulate industrial magnates, in the possession of wealth and style of living. Agriculture is not organised, in the same way as Industry. Agricultural produce cannot be preserved, nor can it be held over, for years, to regulate prices, as industrial goods. Where the capitalist farmers ape the industrial magnates in the bank balances and style of living, there it is at the expense of the soil, degradation and denudation coming in much quicker in this capitalist farming than under any other system.

The Agricultural Adjustment Act, in America, restricts agricultural production, by the allotment of areas, to the limits of the local and reasonable foreign demand, based on a sound national economy. The co-operation necessary for the working of the Act is secured by compensating for the reduced production.

Agricultural prices to be on a par with the industrial. For an agricultural country like India, agricultural prices must, at least, be set at par with those in Industry, marshalling all the resources of economics, so as to keep the soil fertility intact. The soil of the country, the capital legacy of past generations should be handed down to posterity, by the present generation, without consuming any part of its capital.

Society and the Soil. A stable soil keeps a civilisation stable and free from social unrest. The society that settles on the soil should be symbiotic in its nature and its habits, with the farming system the soil is capable of. In this vast agricultural country, each soil type can have its counterpart in society, be it aboriginal, tribal, *ryotwari*, or any other. The Soil Physicist and the Agronomist are the councillors, to determine the type of Federation that is best suited to perpetuate agricultural India.

Imposition of quotas. In the national economy of the country imposition of quotas on cultivation and production may, when necessary, be introduced, to avoid the burning of wheat and the leaving of the cotton crop un-picked. The creation of an economic bureau, for sound economic nationalism, would go a great way, to stem the tide of soil erosion.

Urbanisation promotes soil erosion. As urban prosperity is at the expense of the rural agriculturist, the burden of taxation should be shifted from the country to the town and from Agriculture to industry.

Land tenures. The system of tenures, on which land is held by communities, is responsible in some measure, for soil erosion. Southern Rhodesia has been a victim to it. Russia passed from Feudalism, Communal Field Farming, Capitalism and Collectivism, to Socialism. How far the last survives the earlier systems, on the steppes of Russia is yet to be seen.

The holdings of owner-cultivators are less liable for erosion than those under tenants. With the ease-loving habit of man, the strength of the owner-workers is falling and that of tenants increasing. Short term tenancy is a result of rack-renting and lands under this system are the worst liable for erosion. The systems of tenures that should prevail, between land-lords and tenants, for soil conservancy and doing away with erosion are also subjects for the bureau of economic suggested for creation.

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Tenants' Needs and Departmental Limitations.*

By M. BALAKRISHNAN NAYAR, B. Sc. Ag.,
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Introduction. This paper is based on my study of a few holdings in Malabar with regard to the economics of paddy cultivation. It has been my experience in the course of the investigation, which is being conducted under the auspices of the Madras University, to find the people mostly indifferent and sometimes critical about the doings of the Agricultural Department. The causes of such indifference, as I see them, are presented in this article.

General. Earnings in Agriculture may be generally poor but the level is particularly low in the conditions existing in the Malabar district. With no mixed cropping or rotation in crops, paddy is grown in wet lands year after year with the success of the crop depending largely on the south-west and north-east monsoon rains. The cultivation is further complicated by the

* Paper read at the Twenty-ninth College Day and Conference of the M. A. S. U., July 1940.

system of land tenure peculiar to the tract. The ownership of land is vested in a comparatively small section of the people styled *Jenmis*, while cultivation is carried on by a large body of tenants and under-tenants. Rice is the staple food of the people; and the tenants who are mostly small-holders, bear the brunt of food productions.

Needs of the Tenant Farmer. The fields have to be prepared before sowing seed and the tillage operations involve the use of cattle and human labour. Implements have to be assembled and some provision made to meet the recurring expenditure till the maturity and harvest of the paddy crop. Lacking an alternative occupation, the Malabar farmer has taken to the plough and he is faced with the problem of cultivation. The owner generally pays the land revenue and the tenant-farmer need only raise the crop and remit the rent after harvest. The minimum expenditure on cultivation when approximately analysed, has been found as follows:—

Average calculated from 27 holdings examined in Ernad Taluk, Malabar District.

Area under Rice cultivated by one pair of cattle.	Expenditure.		Remarks.
	Item.	Percentage.	
5.4 Acres	Cattle	33.3	
	Implements	4.2	
	Seed	13.2	
	Cultivation expenses	49.3	
	Total	100.0	

These average figures are, of course, misleading because a few big-sized farms exist beside a greater number of smaller ones. As a matter of fact the holdings are much smaller than the average area under paddy as indicated above. If the members of the tenant cultivator's family do all work on the farm, "cultivation expenses" could be considerably reduced. But he must perforce buy his cattle, plough and seed, and to find funds for all this is his main problem.

Nature of Government help Loans are granted to the agriculturists under the Land Improvement Loans Act of 1883 and the Agriculturists' Loans Act, 1884, for the construction of wells and tanks, and for the purchase of seed, grains, work cattle, implements and other agricultural operations. Such help is rendered by the Government through its various departments noted below.

(a) **Revenue.** Distribution of loans to the agriculturist, to help him with his primary requisites such as cattle, seeds, etc., is mainly the work of the Revenue Department. The loans are given on landed or personal security. The tenant-farmer, who is in the main a simple-lease holder for one year, has neither of these to offer. He is not credit-worthy enough to take advantage of such loans.

(b) **Co-operative.** The prosperity of the small holder may lie in the direction of co-operative institutions, but before much good can be expected,

the masses should be better educated in the principles of co-operative effort and more "Raiffiesens" should spring up even in interior villages.

(c) *Industries.* Loans are distributed by the Industries Department for the purchase of oil engines and pumps, but they do not figure prominently in the Malabar tenant farmer's economy.

(d) *Agricultural.* The Department exists for the welfare of the ryots and for improving agriculture by scientific means. But the poor tenant in Malabar cannot derive the full benefits of such improvements unless the departmental help extends beyond mere advice. It does not help him effectively as it has no powers to grant loans for the purchase of cattle, and seed. Loans are, of course, sanctioned by the Agricultural Officers for the purchase of implements, but in Malabar, the small-holder finds himself more at home with his cheap and native tools, which have stood the test of time, rather than with the improved machinery. With many tenants, manuring is a matter of capacity or convenience and few are able to pay the necessary attention to the fertilizing of the paddy fields. Whatever manure is available from his stock is applied to his fields and sometimes supplemented by green leaves and green manuring. With the rice cultivator the Department has established a name and is popular for its pure seeds of strains. But as he looks to the Department for fresh supplies of seed instead of multiplying it on his own farm, he is necessarily disappointed since only a fraction of his needs can be satisfied at present. Thus with limited scope for work among the poor paddy cultivators, the Agricultural Demonstrator in Malabar is constrained to restrict his sphere of activity still further because he is bound by rules to adopt the only procedure of "cash and carry".

Public Opinion. The views and opinions freely expressed by the public could be brought under two categories: (1) the "ill-informed" and (2) the "informed".

(1) *Ill-informed opinion.* The educated section of the public who have generally no interest in land or its cultivation is often guilty of such opinions. Their complaints are not often based on facts and could have been set aside but for the thought that every one of these educated critics, by propagating incorrect views about the Department creates an atmosphere which is not conducive to 'bridge the gulf' that exists between research and the ryot. They should have correct information before levelling their criticisms for then alone will their criticisms have real value. Much of this ill-informed opinion could be corrected if the Director of Agriculture, supported by this House, presses on the Government and the Universities the need to include "The Activities and Achievements of the Government Research Departments" in the text book of our educational institutions. Propaganda and publicity should be intensified on more modern lines and greater information made available to the public regarding the different branches of Agricultural Education and Research.

(2) *Informed opinion.* This should be welcomed by the Department. The Agriculturist expresses such informed opinion with a closer knowledge

of his difficulties which are mostly of a pecuniary nature. And when he finds that its advice has no financial backing, not only the Department but also the whole of Agricultural Research falls low in his estimation. Difficulty in getting money to begin cultivation and delay or absence of effective help in times of need tend to prejudice the agriculturists against the Department. And the incidence of droughts, pests and diseases in crops, should they occur, only aggravates the tendency. Much of his criticism is real. But, in despair, he forgets the scope and limitations of the Agricultural Department. It has, however, yet to be empowered to give him more material help before it could effectively assume the natural role of existing for the 'Sons of the Soil'. The problem is difficult and many aspects will have to be studied, but it should not be an impossible task to find out an arrangement whereby the department is given the responsibility with power for improving the lot of the agriculturists.

An analysis of the situation calls for the following remedial measures.

Granting loans. To win him over and gain his complete confidence may land the Government in much capital investment, but the Agricultural Department could be immediately helped to appear in brighter light if whatever loans are at present distributed by the Government are done by the Agricultural Officers themselves, or through them.

Avoiding delays. There are inevitable delays in administration which the ryots cannot often understand. If he does not get in time his seed remedies or prescriptions for pests and diseases for which he expects spectacular results, he drags the whole Department into the mire without considering the inadequacy of the present staff to cope with the heavy work. But it will be worth while for the Department to simplify its procedure or dispense with certain formalities to cater better to the needs of the farmer.

Affording Irrigation facilities. It might appear strange that in Malabar, crops fail for lack of water. But as they are entirely dependent on rainfall, the cultivation can only be "a gamble with the rain." The contour of the country is irregular, the rainfall unevenly distributed. Difficient precipitation, especially in the months of October and November, reduce the outturn of paddy considerably. It is poor consolation then that the average annual rainfall for the tract is 118 inches, nearly $2\frac{1}{2}$ times the average for the province. The starting of many minor irrigation works requires investigation and the agricultural officer should take an effective part in initiating such schemes.

Faith in Research. What has been said so far is only to indicate some probable ways of restoring the ryots' confidence in the Agricultural Department. It has been assumed that the agricultural research workers themselves have infinite faith in research and in the potential utility of their methods, for, without faith in themselves and in the work they do, they cannot hope to persuade others to take them seriously. The research

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workers should also realise their responsibility as joint investors with the agriculturists and the administrators in national progress. They should be ever mindful of the fact that the ultimate test of their labours is in the fields of the farmer; success there is their reward; failure, their incentive.

Conclusion. I shall close my paper with an appeal that this Conference now and in all its future deliberations, may discuss this subject in all its aspects and reflect the hopes and fears, the needs and necessities of the man behind the plough. It should evolve ways and means of bringing the ryot and the research worker nearer. It is my hope that the College Day and Conference of the Madras Agricultural Students' Union, will form the Central Observatory, where once a year rural observations and their bearing on the trials and triumphs of Research will be recorded.

Preliminary Observations on the Insect-free Storage of Grains.

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Introduction. The successful storage of his grains free from insects is a serious problem for the ryot. The grains have to be stored for some time, longer or shorter, before a ryot can dispose them off for food or for seed and during this period they are liable to be spoiled in various ways; their suitability for food may deteriorate or they may suffer in their germinating capacity; and insects contribute largely to this damage, the loss from which may amount to several lakhs of rupees in a year. It has been calculated that *cholam* (sorghum) grains alone are liable to damage upto 25 per cent during the course of storage for a year; in very bad cases it may be more. According to the Season and Crop Report for the year 1938-39 published by the Madras Government 1,265,300 tons of *cholam* were produced in this Presidency in that year, valued at Rs. 94,867,500. At a low estimate of 10 per cent the loss due to insects would come to 9½ millions of rupees. This loss has been calculated to be caused by only one species of insect - the rice weevil. If we take into consideration also other insects that take their toll, we can easily imagine, how great the loss caused to *cholam* grains in our presidency would be due to insects. Insects attacking grains are many; this paper deals with observations regarding only two of these, viz., the rice weevil on *cholam* and the paddy-borer beetle on paddy. The rice weevil, though commonly so called, is more a serious pest of *cholam* grains here than of paddy.

Methods of Storage of Grains in this Presidency. Paddy and *cholam* grains are stored in different ways in various parts of the presidency. (1) In some places they are stored openly in the pials of cattlesheds and dwelling houses rarely covered over with a loose layer of straw; in many cases they are neither cleaned well nor dried before they are stored, so that the facilities for insect infestation are plenty; such simple methods of

storage are common in parts of Trichinopoly and Pudukotah. (2) In parts of Malabar, Pudukotah and Trichinopoly, grains are stored in closed earthen masonry or wooden granaries inside houses after they are well dried in the sun. These granaries do not generally admit of the entrance of insect pests and being more or less air-tight they afford facilities for the fumigation of the grains if and when they get infested. Some of the wooden granaries in Pudukotah are ideal in this respect because they are divided into a number of independent compartments, well raised from the ground and provided with trap doors at the bottom through which the grains can be removed. (3) In the Trichinopoly District, Madura and parts of Coimbatore there is a system of storing grains in open rooms in houses after the grains are well dried in the sun; this system gives free scope for the entry of insects. In some cases the ryots put leaves of Pungam (*Pongamia glabra*) or Neem (*Azadiracta indica*) over the grains in the belief that these prevent insect attack. (4) In certain parts of Coimbatore *cholam* is stored in underground pits inside houses or in the open in the yard or on the roadside. There are two kinds of underground pits. One consists of large masonry cellars 8-10 feet square at the base and 15-20 feet deep with a small rectangular opening about 2 feet square at the top covered over by wooden planks or stone slabs and plastered over flush to the ground level with clay. This type keeps the grains free from insects and grains stored in this manner for over two years have been found to be absolutely free from insects. The other type consists of round pits of uniform diameter dug in the ground: they are generally smaller than the previous type, being only 5 or 6 feet deep and 2-3 feet in diameter; these pits are lined on all the sides top and the bottom, by *cholam* stubble and old gunny bags, evidently to prevent the grains from coming in contact with the earth. Any space left over the level of grains is filled with earth and every time the grains are removed from these pits, more earth is put in to fill the pit completely leaving no empty space above the grains. This system of storage does not seem to have any value in preventing insect attack as grains stored like this for over 6 months were found badly infested with beetles. The grains stored in both these kinds of pits are said to lose their germinating capacity completely and therefore, they are useful only for food. Moreover, this kind of storage is said to be suitable only for *cholam*. During the storage much heat is produced inside the pit and the air trapped inside becomes suffocating so that grains from these pits could be removed only 12 hours or more after the pit is opened. (5) In the east coast districts grains are stored in round granaries known as *Kudirs* erected inside or outside houses; in the latter case they are provided with thatched roofs. The sides are made of twisted straw plastered over with clay. Some of them are made of several circular rings of straw piled one over the other and plastered together. They have an opening at the top which is closed and plastered with mud after the grains have been put in. Some of these are provided with a hole at the bottom which is kept plugged and through which the grain can be drawn out. Being practically air-tight these are expected to be insect-proof;

but they do not appear to be so in fact. Many of these were found to harbour insects which infested the grains stored in them. (6) In the Ceded Districts, South Kanara, Northern Circars and other places grains are stored in *Mooras*, *Mudikattus* or *Puries* which are only packages made of twisted straw and sometimes plastered over with mud. (7) Storing grains in big bamboo baskets smeared with cowdung on the outside is common in certain parts of Malabar. The prevention of insect infestation is very remote in this case. (8) Mud pots with their mouth covered and the covering plastered over with mud and tins with tight-fitting lids are commonly used for storing grains especially where the quantity is small; in these cases, of course, insect infestation is prevented to some extent. (9) A common method of storage of grains is in gunny bags in go-downs and here insects usually have free access to the grain.

These are some of the common methods of storage of grains obtaining in this presidency. It will be seen that our ryots do not seem to have attempted much in the direction of prevention of insect infestation in the grains except in such cases where a few leaves of *neem* or *pungam* were scattered over the stored loose grains with the idea of keeping off insects. It is interesting to note that in certain localities the presence of the paddy moth in the grains in storage is considered to be auspicious as it is believed that such granaries would not get empty.

The Problem of Storage. The problem of storage of grains can be approached in two ways: either by preventing the entry of insects that may be in the grains before they are taken into the granary or by tackling the insects in the store; of course the former is easier and more efficient. Some of the insects that attack grains in the store start their activity when the grains are in the field and are carried into the granary along with the harvested grains. These can be prevented from entering the granary by thoroughly drying the grains in the sun and cleaning them well before storage or by fumigating the grains, i. e., subjecting the grains held in airtight chambers to the action of certain poisonous gases. In either case the insects in the grains are killed to a great extent. Fumigation is a laborious process requiring great care and technical skill, entailing the use of extremely poisonous and often inflammable material; moreover, it requires special facilities for making the granary airtight, so that under the existing conditions in the average Indian village, it will not be possible for the ryot to undertake it. He has, therefore, only one alternative viz. to prevent insect entry and that is thorough cleaning and drying of the grains before storage. This will also be useful in keeping down the number of insects in the store as many species are unable to thrive in whole and dry grains while others require a certain amount of moisture in the grains for completing their life cycle. The weevil is indifferent to oxygen supply so that airtight storage does not prevent the insect from normal development. According to Dr. Cole "A non-ventilated atmosphere at about 80°F charged with water vapour (no matter how poor in oxygen and contaminated with carbon-di-oxide)

provides most favourable conditions for the life and reproduction of the weevil."

Insects can also be checked from multiplying in the store or even from entering the store by mixing with the grains substances distasteful to them. Some work is being done with this end in view. Experiments were conducted to test the efficacy of various substances which suggested themselves as possible protective agents against insect damage to stored grain. As far as possible only those materials that are used by the ryot or are easily available to him or have a reputation for keeping off insects were selected. Paddy and cholam grains were stored in gunny bags, as is generally done by the ryots and kept in the central farm stores allowing free access to insects. The following treatments were under trial:— (a) Leaves of *Pungam* (*Pongamia glabra*), *Tulsi* (*Ocimum sanctum*), and *Neem* (*Azadirachta indica*) dried in the shade and mixed with the grains before storage at the rate of 5 pounds per bag; (b) Powdered *Acorus* (Tamil-*Vasambu*), *Derris*, *Pyrethrum*, and lime to which a small quantity of creosote has been added, mixed with the grains at the rate of 2 pounds per bag; (c) Jeypore talc powder—a cheap substance which the manufacturers claim to be very effective in protecting grains from insects (as much as would be necessary for a thorough coating; it took 2½ pounds for a bag of grain); (d) a thorough drying of the grains in the sun for a day once a month. One bag of grain was kept as a control without any treatment. Every month one Madras measure of the grains was taken at random from each bag and counts of the population of the insects—rice weevil (*Calandra oryzae*) in cholam and paddy borer beetle (*Rhizopertha dominica*) in paddy were taken.

Loss of weight of grain and number of beetles collected in each lot of 200 lbs. in one year.

Treatments.	Cholam.		Paddy.	
	Loss in weight.	No. of calandra beetles.	Loss in weight.	No. of calandra beetles.
1. Control	43.2 lbs.	66135	12 lb.	10717
2. Monthly drying	23.8 "	11048	11.6 "	2400
3. <i>Pungam</i>	36.6 "	36580	14 "	7086
4. <i>Derris</i>	35.6 "	53861	11.6 "	2077
5. <i>Paracide</i>	30.4 "	34404	10.8 "	5758
6. <i>Tulsi</i>	46.8 "	41508	31.2 "	7841
7. <i>Acorus</i>	21.2 "	48792	8 "	2287
8. Lime and creosote	16.2 "	39904	8 "	4170
9. Talc powder	164.2 "	32970	13.2 "	13221
10. <i>Pyrethrum</i>	65 "	39901	9.2 "	8151
11. <i>Neem</i>	44.4 "	56990	34.8 "	7870

The above table which depicts the results of one year of experiments shows that in general *cholam* suffers more from damage by insects than paddy and that in the case of *cholam* and paddy periodical drying of the grains once a month keeps the insect population very low, that *pungam* and *neem* leaves generally used by the ryots do not give as much protection as is

claimed for them and talc powder has totally failed to give any protection at all—as a matter of fact the number of insects and the percentage of damage in this lot was the highest; the substance seems to have a further disadvantage of damaging the gunny bags in which the grains are stored; the gunny bags had to be renewed more than once during the course of the experiment. Acorus powder and lime with creosote have given very encouraging results. These and other methods of storage are being tried again for another year.

Co-operation in Agriculture with special reference to sugarcane crop in Coimbatore District.*

By P. V. KRISHNA AYYAR, M. A.

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That Agriculture is the mainstay of the vast majority of the population in this country and that the prosperity of the country depends on the condition of agriculture and those engaged in it, are obvious facts which do not call for elaborate arguments to convince anyone. In a world of large scale business, the agriculturists are in need of organisation, and co-operation offers the most ideal form of organisation for them. Co-operation has worked wonders for agriculturists in countries like Denmark, Ireland, Canada and the United States. In India, till recently, co-operation among agriculturists confined itself to one aspect of the problem namely credit. Such a one-sided development had consequences which made themselves felt seriously in the great Depression which set in from 1930. Now it is recognised on all hands, that the rural problem, if it is to be tackled properly, should be tackled on all its fronts. Any attempt to improve the economic condition of the agriculturists must therefore include in its scope, finance for production purposes, supply of requirements and marketing of produce.

On account of the circumstances of its origin and early history, the co-operative movement is still largely a credit movement but the lesson taught by the depression referred to above has had its effect and societies other than credit are being started in large numbers. Taking the position in the districts of Coimbatore and Nilgiris, there were on 30th June 1940, 725 societies in the former and 96 in the latter. Of these 586 and 72 respectively are credit societies while the rest are for other purposes.

The following classification is intended to give an idea of the nature of work done by the different types of existing societies.

No of societies classified.	Coimbatore district.	Nilgiris district.
1. Land Mortgage Bank	11	1
2. Central Bank	1	—
3. Supervising Unions	16	2
4. Audit Union	1	—
5. Language Federation	1	—

* Paper read at the Twenty-fifth College Day and Conference of the Madras Agricultural Students' Union, July 40.

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6. Loan and sale and Marketing societies	6	1
7. Building societies	13	2
8. Stores—general	4	5
9. do. for mill hands	9	—
10. Students stores	6	2
11. Urban Banks and other limited liability credit societies other than salary earners	17	4
12. do. do. for salary earners	14	6
13. Agricultural Primary Credit societies.	586	72
14. Miscellaneous	40	1
Total.	725	96

The best results have been achieved only by societies in the working of which both the Co-operative and Agricultural departments took joint interest. The aim of both the departments being the same, viz., increasing the income of the agriculturists, coordination of their activities is absolutely necessary and that such coordination yields the maximum results, has been proved by the limited experience gained so far. The Co-operative Societies gain immensely by making use of the results of years of patient research and labour put forth by the Agricultural department and that department has in the co-operative societies an organisation that enables it to propagate the results of its studies to a larger clientele in much quicker time and in a more efficient manner. An outstanding instance of such success is the Tiruppur Cotton Sale Society. What it has done for cotton, similar organisations are trying to do for potatoes in the Nilgiri hills and for groundnut, turmeric and sugarcane in Coimbatore district. The seed distribution schemes for potatoes and groundnut which the Agricultural department have taken on hand are sure to be of great help to the societies.

Taking sugarcane, one of the most important money crops, and in the improvement of which Rao Bahadur T. S. Venkataraman, the Sugarcane Expert, has achieved striking results, it is admitted on all hands that, on account of fluctuations in the price of jaggery, the sugarcane grower is often in a precarious position. From the year 1937 with the help of Government of India grants, attempts have been made in all sugarcane growing areas in the presidency to organise the growers on co-operative lines and to secure for them a greater yield and a better price for the yields. The Government of India has set apart a portion of the excise duty levied on sugar for distribution among provinces where white sugar is produced for purposes of assisting of the organisation and operation of co-operative societies among sugarcane growers so as to help them in securing fair prices and for other purposes directed to the same end. The Madras scheme covers a period of 5 years from the date of adoption and it is administered by the Registrar of Co-operative Societies, Madras, who will spend the grant through co-operative societies or unions of co-operative societies of sugarcane growers in factory areas. The Director of Agriculture will give the necessary technical advice to stimulate the cultivation of sugarcane. The scheme is meant

to help the unions and societies to do their work efficiently with the help of the Demonstrators and Inspectors of the Co-operative Department.

The objects of the Societies and the Unions are—

- (1) to introduce and grow varieties of cane best suited to the locality and factory;
- (2) to introduce early and late maturing varieties to feed the factory and to enable it to crush cane for as long a period as possible.
- (3) to maintain a supply of vigorous seed material by adopting "short crop" method in different varieties found suitable to the locality.
- (4) to adopt measures to protect the cane crop from insect pests and diseases.
- (5) to take such measures as are recommended for improvement in the methods and for reduction in the cost of cultivation such as interculturing, manuring and irrigation.
- (6) to concert measures to improve means of transporting canes to factories.
- (7) to give facilities for the ryots to check weighment of cane at the factory and avoid delay in the disposal of cane etc.
- and (8) to take measures to finance cane growers through co-operative societies at the right time for the purchase of seed, manure, etc. and for harvesting the crop.

In the Coimbatore Sugarcane Growers' Co-operative Union, Ltd. formed and registered under Madras Co-operative Societies Act VI of 1932, there is an organisation to help the cultivation of sugarcane. The Union has started work in January 1936. The Government have been pleased to place the services of an Agricultural Demonstrator and a Maistry, besides a subsidy of Rs. 1,000 towards purchase of implements, sugarcane setts and manure. So far 252 members have joined the union and subscribed Rs. 8,890 by way of share capital. The Union has introduced high yielding varieties of sugarcane namely Co. 413, Co. 419 and Co. 421 recommended by the Agricultural Department. It purchased 40,000 setts of Co. 419 and Co. 421 from the Tudiyalur village and supplied them to members in Thoppampatti and Jangamansickenpalayam villages. The Union had also supplied to the members suitable manures worth about Rs. 6,000. It has financed the members to the extent of Rs. 22,434 for meeting their cultivation expenses. Ploughs, cultivators, bund-formers and other implements have been purchased by the union from the Government subsidy of Rs. 1,000 and were placed at the disposal of the members of whom as many as 50 have utilised them to their best advantage.

With the introduction by the Agricultural Department of high yielding varieties of canes like Co. 419 and Co. 421 and using proper manure, there has been a marked increase in the average yield per acre followed by an extensive cultivation of sugarcane crop especially within the last 3 years. The area under sugarcane cultivation has almost doubled, resulting in over-production. This and other reasons have led to a fall in the price of

jaggery. The average yield of jaggery has also increased from 30 to 35 pothies (one pothy = 280 lb.) per acre. There has not been a corresponding demand for it. Even the little export from Coimbatore of lump jaggery to Bombay, Sholapur, Hyderabad and Calcutta has decreased of late. By selling jaggery at Rs. 6 per pothy, barring incidental expenses, the ryot can, hope to get only a margin of Rs. 3 per pothy. If the cultivation is extended the cane cultivator stands to lose heavily.

By way of a complement to the activities of the Sugarcane Growers' Union, with a view to give a greater income to its members and other sugarcane growers it is proposed to organise a sugar factory on co-operative basis, to convert the surplus sugarcane into white sugar. Fifty per cent of the canes grown in this district will be consumed at the factory for conversion into sugar.

Calculated on a modest basis, the ryots will get an extra return of about Rs. 6 lakhs every year even if the price of sugar goes down to Rs. 27—8—0 per bag of 2 cwts. It will be gratifying to note that this will also yield to the Central Government an excise duty of about 6 lakhs.

The necessary finance for running a sugar factory on a large scale has to be raised by way of share capital and loans from the Coimbatore District Urban Bank. The Coimbatore Sugarcane Growers' Co-operative Union has enthusiastically come forward to work up the scheme proposed. The proposal for the establishment of a Co-operative sugar factory in which the cane growers will be enrolled as members, was taken up at a meeting of the Board of Directors of the Union and important cane growers. The Registrar of Co-operative Societies, Madras, The President of the District Urban Bank and the Deputy Registrar of Co-operative Societies were present at the meeting. The proposal of establishing a sugar factory was discussed in full and the following decisions were arrived at.

- (1) That a Co-operative sugar factory consisting of cane growers should be started.
- (2) That ryots should take up 3000 shares of Rs. 250 each.
- (3) The share amount may be paid in full in cash. In the alternative a share holder may pay Rs. 100 in cash, furnishing a security of unencumbered immovable property for the balance of Rs. 150.
- (4) that every ryot should undertake to cultivate and supply to the factory for each share held by him, canes grown over an acre of land for being crushed in the factory.
- (5) When 1500 shares have been subscribed for, by the ryots, a separate society will be registered to run the factory. So far 850 shares have been subscribed and earnest attempts are being made to reach the goal.

The starting of this sugar factory will be the signal for launching other schemes to help sugar-cane growers in other areas. It is under contemplation to start co-operative societies for sugarcane growers at Unjalur and Udumalpet to ensure steady supply of canes to the factory from the feeder

societies. The issue of loans on produce, and the marketing thereof will be left with the Sugarcane Growers' Union, to which these societies will be affiliated in due course.

The necessary finance for the enterprise is to be derived from the shareholders and the financing bank, but the co-operation of the Department of Agriculture and Industries are essential for launching the scheme and working it successfully. Sugar factories in S. India are few in number and those, excepting one, are joint stock concerns. The example of the Vuyyur Co-operative factory has demonstrated the possibilities of a Co-operative factory even under difficult circumstances. With much more favourable conditions, a co-operative sugar factory in Coimbatore is bound to thrive well.

ABSTRACTS.

The application of genetics to plant breeding. J. B. Hutchinson *Jou. Gen.* 40. 271.

There can be no response to selection unless the material is genetically variable. The relation of variability to rate of change under selection and the effect of selection in reducing variability are therefore fundamental factors in breeding theory. The examination of unselected crop populations has provided information on the equilibrium between selection and variability that is established in nature and it appears that variability persists at a high level. It follows that natural selection does not naturally result in uniformity and the stability of such mixtures must be due to selection and not to genetic uniformity.

The records of breeding projects with sea island cotton show that it is in practice impossible to achieve genetic uniformity, even when it is deliberately sought. Variance may be greatly reduced, but it persists in some measure even in the most closely bred strains. If the stability of unselected populations is due to selection and not to genetic uniformity the breeder may regard purity as a secondary consideration, and a new approach to his problem is possible.

The problems involved in the choice of material for selection have been better studied than most others that face the breeder. For most crops the areas of high variability are known. Now that it is recognised that hybridisation is only a means of increasing variability and is a preliminary to selection and not a substitute for it, breeding programmes are better planned. No one nowadays wastes his time creating variability when it exists in his neighbour's fields. Where hybridisation is necessary genetic investigations have marked off the dangerous areas where cytological abnormalities and inter-specific breakdown require special treatment, and in some cases, as in cotton sound guidance can be given and the order of its magnitude likely to be found in hybrids of any given type.

Studies of the rate and magnitude of change that can be induced by selection have an obvious bearing on breeding policy, but little information is available beyond Students' analysis of Winter's selection experiments, Harland's account of the Mount Serrat Sea Island cotton and Hutchinson and Kubersingh's analysis of the effect of selection on Malvi cotton. A preliminary enquiry into another aspect of the problem of the mass action of genes is Anderson's recent calculation of the limiting effect of linkage on gene assortment in distant hybrids. This has an interesting bearing on the rate of re-establishment of the species balance in Harland's back crossing method of exploiting interspecific hybrids. S. V. P.

Genes: Atoms of Heredity. B. P. Pal. *Indian Farming* 1:6. The degree to which individuals resemble their parents is spoken of as "heredity" and the degree to which they differ is said to be due to variation in this heredity. How these resemblances are perpetuated from parent to progeny and how new differences arise are the subject matter of the comparatively recent science of genetics.

Within the nucleus there are a number of more or less rod shaped bodies called chromosomes. The number of chromosomes is the same in every nucleus of any one plant or animal and is also constant for each race or species. Thus tomato has 24, gram 16 and man 48 chromosomes.

Furthermore, in these cases the chromosome complement is composed of two similar sets, each chromosome being represented twice in each cell. The chromosomes contain a large number of living particles known as the genes which control the development of all the inherited characters of an organism.

Unlike the division of the nucleus in the body cells where each chromosome divides longitudinally and gives rise to daughter cells with the same number of chromosomes as the parent cell, the nucleus undergoes a different division, in the reproductive cells. In these special cells, the similar chromosomes come together in pairs and separate out to daughter cells without undergoing a longitudinal division, so that after each division each cell contains only half the number of chromosomes as the parent cell. In the act of fertilization the original double number of chromosomes is restored and further divisions of fertilised egg results in cells containing the original double number of chromosomes.

Life is perpetuated by the passage of living material from parent to offspring and this living material is the nucleus with its chromosomes carrying the genes which are the units of heredity.

The genes are extraordinarily stable and pass from one generation to another unchanged. Occasionally, however, changes do occur in individual genes producing visible effects on the organisms. These changes are called "mutations" and are perpetuated in succeeding generations.

Instead of two sets of chromosomes usually present in any organism of a species, three or more sets are sometimes present. This condition known as "polyploids" is daily common in nature. The polyploids in nature are usually giants adapted to many adverse conditions of growth.

In some instances all the chromosomes of a set are not duplicated but only one or more are present as extras. This kind of change which occurs in nature is termed "heteroploidy" and may be responsible for evolutionary changes.

Mutations, polyploidy, and heteroploidy are being artificially speeded up by applications of X-rays, temperature and chemicals to plants with a view to getting germinal variations which may eventually prove of economic value.

It has been recently discovered in America that a substance "colchicine" when applied in weak solutions to growing plant cells produces polyploids.

EXTRACTS

Pyrethrum cultivation in Kashmir. Pyrethrum constitutes a genus of Chrysanthemum in Compositae family and is said to constitute a hundred species, out of which some are toxic to insects. The principal species, commercially important is *Pyrethrum cinerariaefolium*. The plant ordinarily resembles the field daisy, particularly the flower which is apparently similar to the daisy, in size, shape and colour. The plant is perennial and grows 18 to 20 inches high.

The dried crushed flowers have a pleasant, characteristic odour due to the presence of essential oil which is pronounced in the freshly prepared material. It has acrid, bitter taste and causes numbing sensation to the tongue and lips which is due to the active principle present in the plant. The active principle is called pyrethrin, which is said to exist in two forms. Both these forms are mineral oil soluble.

The use of pyrethrum flowers in powdered forms and its extraction is known since earlier days. At present very large quantities of the flowers are utilised in U. S. A. and other occidental countries.

The plant is cultivated on a commercial scale in Dalmatia (Yugoslavia), Japan, Kenya, some parts of Italy, United Kingdom and Russia. Japan and Kenya are the two principal producing countries.

Since last several years the use of this insecticide has been found practicable as a control against mosquitoes. The adults readily succumb when the pyrethrum extract is sprayed on them, as is evident by the so-called commercial 'Flit'. Flit is mineral oil extract of pyrethrum.

India has been importing flowers from Kenya in considerable quantities.

The Imperial Council of Agricultural Research having recognised the possibilities of its local demand, took necessary steps for the introduction of pyrethrum cultivation in India. Seeds in small quantities were imported and distributed to various provinces and the constituent States in the year 1937.

The Department of Agriculture (Kashmir) started its cultivation under the auspices of the Imperial Council of Agricultural Research. This is the third year of the plantation. From the present harvest which has been just completed we have more than half a maund of seed, besides some quantity of dried flowers for experimentation. The last two years' experiments have shown:—

1. Seeds sown in well-prepared nursery beds in spring, early summer and autumn germinated well, although the early summer percentage was 50 per cent., less than that of spring and autumn.
2. From 1 lb. of seed we obtained about 15,000 seedlings.
3. The seedlings were transplanted after 4 or 5 weeks one and a half foot apart either way. Seedlings can be planted both in spring and autumn.
4. Very little irrigation is needed. In fact too much irrigation or plenty of rain damages the plant.
5. The crop could be multiplied by subdividing the one year or two year old plants and the area as such could easily be multiplied 4 to 6 times.
6. The flowers are ready for harvesting in the beginning of June. The flowers ripen for seed production sometime in the middle of July.
7. In the first year of plantation, very few flower heads are produced second and third year gives increased yields. In the second year we obtained as much as 300 lb. of flowers per acre and some of the individual bushes did yield 500 flower heads.
8. The flowers were sent for trial purposes to the Malarial Institute of India, which has found the specimen equivalent to the Kenya ones in biological test. It is said to have contained about 1 per cent pyrethrin.
9. The vitality of the seed has not been affected by storage for one complete year so far.

Other cultural experiments including manuring under irrigated and unirrigated conditions in different classes of soils have been started at about a dozen centres. It is expected that the cultivation of pyrethrum will be started on a very large scale during the coming season.

The Forest Department had taken up the cultivation earlier and this year they had brought an area of about 200 acres under this crop.

Small samples of five other varieties namely *P. roseum*, *P. parihani*, *P. cina*, *P. varia*, *P. carnaum*, *P. lencopiloides* have also been received from the Imperial Council of Agricultural Research. Out of these only two i.e., *P. roseum* and *P. parihani* succeeded well. As a plant, none of these can compare well with *P. cinerarioefolium*. Samples of flowers are collected and will be sent for biological test. (Pyrethrum cultivation in Kashmir by M. R. Fotidar. *Current Science*, 9: No. 8, August 1940. pp. 360-361) K. R.)

Timber Protection—New Swedish method.

Many attempts have been made to find suitable means of protecting timber against rot and insects. Painting is, of course, the most common but, being only a surface preparation, it does not prevent the body of the timber from taking up moisture, and therefore rot gradually appears even in painted wood. The effective components of a new Swedish impregnation method are certain arsenic compounds. The method has been developed by the Boliden Mining Company, in Stockholm, which obtains large quantities of arsenic as a by-product in the smelting of copper ore from its mines in northern Sweden. The impregnation liquid used consists of a solution of various salts, including arsenic. After these salts have entered the timber, a chemical process takes place, with the co-operation of certain easily oxidized substances in the wood itself. The final result of this chemical process is the production of zinc arsenate and chromic arsenate, which become inseparably fixed in the wood, and constitute the effective elements against attacks of decay or insects. Arsenic-impregnated timber is said to retain its mechanical qualities. It takes on a soft green color with a slight shade of brown, which is sufficiently strong to render painting unnecessary if the timber is used in buildings. Another advantage is that the timber does not catch fire as easily and burns less quickly than unimpregnated boards, thus contributing to damage reduction in case of fire. The new method is said to compare very favourably in cost with other methods. In the Scandinavian countries, arsenic-impregnated timber at present is being used increasingly for various kinds of out-door purposes, including quay and other under-water constructions. Twelve impregnation plants in various parts of Sweden are employing the method, in addition to some in Norway and Denmark. (*Sci. Amer.* 163: (1940): 210-211).

Foods—their Value.		
Foodstuff.	Work.	Sources.
1. Protein.	(a) to build and repair all tissues.	Meat, fish, eggs, milk, cheese, cereals, pulses, nuts.
	(b) to give heat and energy. (of secondary importance as it is an expensive source)	
2. Carbohydrates. (starches and sugars)	to give heat and energy.	Sugar, fruit, honey, milk, cereals, pulses, vegetables.
3. Fat.	(a) to give heat and energy.	Cream, butter, fat of meat, milk, cheese.
	(b) to protect delicate organs.	Eggs, vegetable oils, cereals, nuts.
4. Mineral salts.	(a) to make bones and teeth.	Milk, green vegetables, fruit, eggs, cheese, fish.

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|---------------------|--|--|
| | (b) to keep blood in good condition. | |
| | (c) to aid growth. | |
| 5. <i>Water.</i> | (a) to keep temperature even. | Water, milk, fruit, vegetables, beverages, etc. |
| | (b) to remove waste matter. | |
| | (c) to make the body fluids. | |
| | (d) to dissolve and carry food to all parts. | |
| 6. <i>Vitamins.</i> | (a) to help growth. | Vegetables, fruit, liver. |
| | (b) to maintain health. | Milk, animal fats. |
| | (c) to prevent or cure certain diseases. | Eggs, cereals, and most common foods, particularly uncooked fruits and salads. |
| 7. <i>Roughage.</i> | (a) to prevent constipation. | Fibrous parts of fruit and vegetables, cereals. |
| | (b) to regulate the bowels. | |

N. B.—The sources are placed as much as possible in order of importance.

- | | Kind of diet. | Result. |
|---|---------------|---|
| 1. Inadequate in quantity, otherwise satisfactory. | | Malnutrition. |
| 2. Over adequate. | | Obesity and may result in certain diseases developing owing to organs overworking. |
| 3. Adequate as regards heat producing substance but deficient in certain essential constituents. (Cheap diet of too much starch). | | War or nutritional oedema or certain deficiency diseases from lack of minerals and vitamins. |
| 4. All constituents present but badly balanced. | | Too much fat habitually produces kelosis and acidosis Too much calcium upsets absorption of phosphorus. |
| 5. Unsuitable with regard to too little or too much roughage. | | Indigestion, constipation or diarrhoea may develop. |
| 6. Food contains poisonous substances through contamination. | | Definite poison symptoms. |
| 7. Certain agents lacking. | | (a) Determines resistance or response to disease (particularly in children e. g. dental decay, rickets).
(b) Pernicious anaemia and numerous other diseases. |
| 8. Diet sometimes satisfactory for ordinary individual, but quite unsuitable for the exception. | | Certain people cannot eat straw berries, apricots, etc. |
| 9. Dietary deficiencies. | | These link up with endocrine disorders e. g. goitre. |

(The Rhodesia Agricultural Journal, page 581, Oct. '40.)

Fire Proofing of Thatch.

A. J. Taylor, of the College of Agriculture, Cedara, in the Union Weekly Press Service, gives the following hints for the fire-proofing of thatch:—

One of the drawbacks of thatch in farm buildings is the risk of fire. This danger can be largely eliminated, however, if the thatch is treated before use with a suitable protective material.

Ordinary alum is one of the best and cheapest of such chemicals, whilst ammonium phosphate, sometimes applied as a fertiliser, can also be used.

The bundles of thatch grass should be loosened and then well soaked in a solution of alum, about 4 to 8 ozs. per gallon of water. When thoroughly saturated, they should be removed from the solution and the surplus liquid allowed to drain back into the tank or vessel used for treating the thatch. Standing the loosened bundles on end on a sheet of corrugated iron leading into the tank will ensure good drainage and so save any surplus alum solution. The bundles should then be spread out to dry, standing them on end against a wall or suitable rack so as to ensure a good circulation of air around and through them. It is important that the thatch be thoroughly dry before it is put on the roof. Damp thatching material employed in constructing a roof is very liable to become mouldy and to rot.

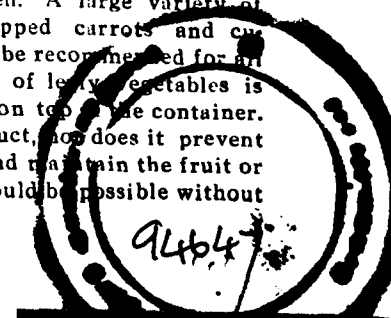
The thatch grass should be treated with the alum before it is used. It is less satisfactory to spray a thatch roof already built, since the grass does not become properly impregnated with alum, especially the inner layers to which the solution does not penetrate.

Thatch thus treated will be found to smoulder but not to burn freely. The alum which coats the grass fuses and so forms a protective glaze on the thatch which prevents access of air to the material and so makes it difficult to ignite. Sparks falling on such treated thatch will not set it alight.

The use of alum has a further advantage in that it makes the thatch less liable to harbour insects. [The Rhodesia Agricultural Journal p. 697, Oct '40]

Gleanings.

Preservation of vegetables by waxing. It has long been known that a film of natural or artificial wax on the surface of plant tissue is effective in reducing its rate of waterloss and commercial processes have been developed particularly in the citrus industry, which take advantage of this fact. More than 75 per cent of the oranges grown in California and Florida are now being treated in this way. The possibility of extending the process to include vegetables which have to be stored for some time before sale, is now being investigated and useful results are described by H. Plantenius (Cornell Univ. Agric. Expt. stn. N. York, Bull. 723) The method which appears to be the most promising is the dipping process, which can be carried out by hand or mechanical equipment. The vegetables are first washed, and without drying are dipped momentarily into a cold wax emulsion at room temperature and then dried thoroughly, the average thickness of the resulting dry film varying from one to two microns. The chemical nature of these emulsions is very simple. Essentially they consist of colloidal suspensions of one or several kinds of waxes in water, the minute particles being kept in the disperse phase by means of a soap. One of the waxes used contained benzonitres in addition to paraffin and soap. Proprietary articles were used in their experiments, and their names, together with those of their manufacturers and partial compositions, are given. A large variety of vegetables were tested. The result, obtained with topped carrots and cucumbers were outstandingly good, and in general can be recommended for all root crops with the exception of parsnip. The waxing of leafy vegetables is not advised, nor for those which are shipped with ice on top of the container. Waxing does not improve the quality of an inferior product, nor does it prevent the progress of disease but it does reduce shrinking and maintain the fruit or vegetable in a fresh condition for a longer period than would be possible without treatment.



Synthetic Rubber. The newest of the synthetic rubbers, Chemigum, has just been announced by Goodyear as a result of several years' research. A new plant having an initial capacity of 10,000 pounds per day is being installed at Akron. Chemigum is derived from petroleum through a cracking process, and tyres made of it are said to give superior performance to those made of German Buna. In fact, the manufacturer claims that such tyres are equal to those of natural rubber. Like other artificial rubber, however, Chemigum at present costs more than natural crude rubber. Nevertheless, its increased tensile strength; resistance to ageing, abrasion, and oils, and the fact that it may be processed more easily than Buna, make it important industrially. It also has possibilities for blending with natural rubber, so that it might help in an emergency to make out slender supplies of the natural product. (*Sgt. Amer.* 163: (1940) 218-219) •

Sulphur dioxide tablets. The National Fruit Research Station in England has perfected a method for the preparation of exact quantities of sulphur dioxide in tablet form. These sulphur dioxide tablets, when dissolved in water, form a solution in which fruit as picked or purchased from shops will keep indefinitely.

The British Ministry of Agriculture, as a war-time measure has appealed to the public to preserve as much fruit as possible. It is stated that the sulphur dioxide tablets are already available and that six pence worth will preserve 20 lb. of fruit. Manufacturers are to use the commercial sulphur dioxide process to preserve surpluses, which will be released as required for jam-making.

Agricultural Findings.

Early varieties of Ragi and the performance of strain E. C. 3517.

To shorten the duration of a crop with an increase in yield will mean a double benefit to the ryot.

For some years, E. C. 593 has been the departmental strain of ragi which has stood the test, maintaining a high standard of yield, but the strain takes a slightly longer time to mature. In the trials with the early varieties of ragi, the Millets Specialist, has brought out a promising strain, labelled as E. C. 3517. This was tried at the Millets Breeding Station in six series of yield trials both in the early and late season along with strains about 110 days in duration during the past three years. An average increase of about 24% in yield was secured by this strain. In comparing it with E. C. 593, it gave as much yield as E. C. 593 even though E. C. 3517 is ten days earlier in duration. This would mean saving of irrigation charges to that extent. In district trials it has proved superior to local varieties of similar duration in Coimbatore, Karur, Musiri, Kalahasti, Arkonam, Conjeevaram, Chingleput and Saidapet Taluks. The increase in yield in all these cases varied from 11% to as much as 35%.

It must however be borne in mind that evolution of a good strain does not end the problem there. The highest response a good strain gives to the best treatment afforded to it is the test of its popularity. This statement has been amply proved by the performance of this strain on the Central Farm, Coimbatore, during the ragi season this year. Transplanted at the proper time, in a well prepared soil and favoured with irrigations at the proper stages, the crop showed vigorous growth. The ultimate yield from an area of 1.24 acres broke all records for ragi on the Central Farm, giving a rare yield of 4,075 lb. grain per acre. The highest yield obtained so far on the Central Farm was 3,660 lb. of grain from E. C. 593 in 1934-1935 and this year E. C. 593 has raised its own record to 3,734 lb. From the figures recorded outside the Central Farm, 3,882 lb. is the highest figure noticed and this is from Gudiyattam.

E. C. 3517 is a selection from *Mutti Ragi* of Udamalpet taken at the Millets Breeding Station in 1935. The plants are unpigmented and have fist-like ear-heads. This shape of earhead is liked by the ryots.

(From the Director of Agriculture.)

Provincial Marketing Board. The second meeting of the Provincial Marketing Board was held on the 19th November 1940. The Director of Agriculture (Chairman), the Director of Industries and Commerce, the Registrar of Co-operative Societies, Diwan Bahadur M. Balasundaram Naidu, C. I. E., Rao Sahib G. Rajagopala Pillai, Rao Sahib V. Krishna Menon, Messrs. Vellingiri Gounder, Guduthur Thimmappa, and the Provincial Marketing Officer (Secretary) were present. Mr. T. A. Ramalingam Chettiar attended by special invitation to discuss the present position of the Provincial Marketing Society, Madras.

There were 14 subjects on the agenda. Among the important subjects discussed at the meeting may be mentioned the organization of paddy and rice marketing in the Presidency; the expansion of the oil crushing industry in groundnut; the present position of grading of agricultural commodities and the standardization of weights for rice and paddy in local and export trade. A proposal to publish a co-operative Directory and a proposal to enlarge the weekly price list now published by the Director of Industries and Commerce was also discussed. Four subjects were adjourned for the next meeting.

The Board resolved to advise Government that immediate steps be taken to start oil crushing factories in a few important production or market centres with Government assistance, if necessary. It recommended that transactions in rice and paddy marketing should be by weight only and that packages (gunny bags) in the export trade should be standardized. It was suggested that research should be done on the qualitative demand of the various rice consuming centres to ascertain how much demand can be met by adjusting production in adjacent rice producing areas. It was decided to expand grading of commodities under Agmark on a wider front. Grading in the Madras Presidency has now reached a total of over 13½ lakhs of rupees worth of produce handled, the bulk of the produce handled being rice in Nellore and Tanjore Districts and fruits (oranges and mangoes) from Koduru and Chittoor respectively. New grading stations were approved for rice, mangoes, oranges, plantains, grapes, jaggery and hides and skins in other important producing areas. When the Tanjore and Kumbakonam Marketing Societies begin to function, rice grading will be done by them also in addition to grading now in progress by rice grading unions of mill owners in that district. A suggestion to make the grading staff direct employees of the Department was also endorsed by the Board. As regards the work of the Provincial Marketing Society, Madras, the Board came to the conclusion that while it held hopeful signs of advance as a fruit sale society, it was considered that the marketing of other commodities would be best developed through creation of commodity sale societies with subsequent organization in local federations.

The next meeting of the Board will be held in February 1941.

(From the Director of Agriculture.)

Crop & Trade Reports

Sugarcane—Intermediate condition report. The condition of the sugarcane crop is generally satisfactory and the yield is expected to be normal in all districts.

The wholesale price of jaggery per imperial maund of 82 2/7 lb. (equivalent to 3,200 tolas) as reported from important markets on 9th December 1940 was Rs. 5-2-0 in Erode, Rs. 4-7-0 in Mangalore, Rs. 4-4-0 in Rajahmundry,

Rs. 4-3-0 in Cuddalore, Rs. 4-2-0 in Cocanada, and Adoni, Rs. 3-15-0 in Salem and Chittoor, Rs. 3-14-0 in Vizianagaram, Rs. 3-5-0 in Vellore, Rs. 3-4-0 in Trichinopoly, Rs. 2-14-0 in Bellary, Rs. 2-6-0 in Coimbatore. When compared with the prices published in the last report, i. e., those which prevailed on 4th November 1940, these prices reveal a rise of approximately five per cent in Cocanada and a fall of approximately 15 per cent in Vellore, 13 per cent in Mangalore, nine per cent in Cuddalore, eight per cent in Rajahmundry, five per cent in Chittoor, two per cent in Bellary and one per cent in Erode, the prices remaining stationary in Vizianagaram, Adoni, Salem and Coimbatore. [From the Director of Industries & Commerce.]

Cotton Raw, in Madras Presidency. The receipts of loose cotton at presses and spinning mills in the Madras Presidency from 1st February to 6th December 1940 amounted to 498,728 bales of 400 lb. lint as against an estimate of 366,800 bales of the total crop of 1939-40. The receipts in the corresponding period of the previous year were 467,345 bales. 5,05,621 bales mainly of pressed cotton were received at spinning mills and 122,786 bales were exported by sea while 135,214 bales were imported by sea mainly from Karachi and Bombay.

(From the Director of Agriculture).

Paddy—1940-41 Second Report. The average of the areas under Paddy in the Madras Province during the five years ending 1938-39 has represented 13.2 per cent of the total area under Paddy in India.

The area sown with paddy up to 25th November 1940 is estimated at 8,928,000 acres. When compared with the area of 8,486,000 acres estimated for the corresponding period of the previous year it reveals an increase of 5.2 per cent.

The area is the same as that of last year in Guntur and the Nilgiris. A decrease in area is estimated in Kurnool, Anantapur and Tanjore and an increase in area in the rest of the Province, especially in Vizagapatam (plus 90,000 acres), East Godavari (plus 25,000 acres), West Godavari (plus 65,000 acres), South Arcot (plus 25,000 acres), North Arcot (plus 45,000 acres), Salem (plus 50,000 acres), Trichinopoly (plus 25,000 acres), and Madura (plus 50,000 acres). The increase in area is attributed to timely sowing rains.

The first crop of paddy has been generally harvested throughout the Province. Yields slightly below normal have been reported from Vizagapatam, Chingelput, South Arcot, Chittoor, North Arcot and Tanjore. The yield is expected to be normal in the other districts. The crop has been affected to some extent by the heavy and continuous rains of November 1940 in parts of the Tanjore district and by insect pests in parts of Vizagapatam.

The seasonal factor for the Province as a whole works out to 99 per cent of the average as against 97 per cent in the corresponding period of the previous year.

The wholesale price of paddy, second sort, per imperial maund of 82 2/7 lb. equivalent to 3,200 tolas as reported from important markets on 9th December 1940 was Rs. 3-12-0 in Masulipatam, Rs. 3-9-0 in Ellore, Rs. 3-8-0 in Rajahmundry, Bezwada and Guntur, Rs. 3-7-0 in Cocanada, Rs. 3-5-0 in Trichinopoly, Rs. 3-3-0 in Tinnevely, Rs. 3-2-0 in Vellore and Virudhunagar, Rs. 3-0-0 in Vizianagaram and Chittoor, Rs. 2-14-0 in Hindupur and Kumbakonam, Rs. 3-13-0 in Nagapatam, Rs. 2-9-0 in Cuddalore and Mangalore, Rs. 2-5-0 in Anantapur and Rs. 2-1-0 in Conjeevaram. When compared with the prices published in the last report, i. e., those which prevailed on 4th November 1940, the prices reveal a fall of approximately eight per cent in Conjeevaram, and a rise of approximately ten per cent in Nagapatam, eight per cent in

Cuddalore, seven per cent in Masulipatam, six per cent in Ellore and Trichinopoly, four per cent in Bezwada and Chittoor, two per cent in Cocanada, Rajahmundry, Guntur, Hindupur and Kumbakonam, the prices remaining stationary in Vizianagaram, Vellore, Virudhunagar and Tinnevely.

(From the Director of Industries and Commerce).

College News and Notes.

Students' Corner :- Students' Club: Under the auspices of the Students' club Sri. N. Krishnaswami Iyengar, B. A., B. L., Sub-judge, Coimbatore, delivered a lecture on "Advise to the students" on 4-12-40, with Rao Bahadur G. N. Rangaswami Iyengar, Principal in the chair. The lecturer deplored the utter lack of self confidence, the courage of conviction and individuality of judgement that are essential for the development of a dynamic personality. He stressed upon enduring patience and unflinching perseverance for success in life. Plain living and high thinking along with sports-man spirit, should, in the opinion of the lecturer, radiate happiness. Finally the lecturer exhorted the students to develop the immense faculty of intelligence—a speciality of mankind.

Games. On account of the second terminal examinations students' activities have decreased considerably, in both indoor and out-door games.

Hockey. The Bangalore division final hockey match was played at Bangalore against the Ceded districts' College. Our college lost by one goal to nil. The reverse was not due to any superiority of the opponents but unfortunately, due to our players not rising up to their full form. The Vice-President Mr. H. Shiva Rao accompanied the party of players to Bangalore.

Foot-ball. In the inter-tutorial foot-ball match played between Sri. C. R. Srinivasa Iyengar's wards and Sri. C. Narasimha Iyengar's wards, the former won by one goal to nil.

Association of Economic Biologists. A meeting of the association was held on Thursday the 28th November when the following papers were presented:—

1. The probable nature of the clay complex responsible for base exchange phenomena in soils by Sri. C. Raghavendrachar, Assistant in chemistry, and
2. the problem of mixture in the cottons of the Tinnies area by Rao Bahadur V. Ramanatha Ayyar and Sri. V. Ramaswami Mudaliar. This was followed by interesting discussion on the papers.

Two public lectures were also arranged (i) Training in Agriculture by Rao Bahadur Sri. V. Ramanatha Ayyar on 3-12-40 and (ii) Agriculture in Uganda by A. S. Thomas Esq. Economic Botanist, Uganda on the 9th December 1940.

South Indian Branch of the Entomological Society of India. A meeting of the South Indian Branch of the Entomological Society of India was held on Tuesday the 10th December when Sri. T. V. Subramaniam gave an account of his trials with Malarial and Pyrocide 20 larvicide to test their relative merits as mosquito larvicides when used in the irrigation water in paddy fields, especially with regard to their effect on the crop. Sri. P. N. Krishna Ayyar read a paper on 'Host-selection by *Spathius citolans*, Nixon., a braconid parasite of *Pemphres affinis* in S. India in which he detailed the tropic response of the insect to sensory impressions awakened by the host relative to size, shape, etc., and the factors governing the incidence of super-parasitism and the general interactions of host parasite populations. A few interesting insect specimens were also exhibited at the meeting.

Personal. Intimation has been received that Mr. P. H. Rama Reddy, Director of Agriculture who was on leave for six months has rejoined duty at Madras on the 11th December.

Mr. A. R. C. Westlake, I. C. S., who was Director of Agriculture during the absence of Mr. Reddy has been posted as Collector of Coimbatore.

Mr. R. C. Broadfoot, Principal of the Agricultural College, who has been in indifferent health for some months has been granted an extension of leave from December 24, 1940 to 4th February 1942 preparatory to retirement.

Visitors. Dr. A. Subba Rao, Soil Physicist, Dry Farming Station, Hagari was on a short visit to the Research Institute.

Mr. A. S. Thomas, B.Sc., Economic Botanist, Uganda, visited the Agricultural College and research institute.

Mr. R. W. Littlewood, Livestock Development Officer, Madras, stayed on the College estate from 11th to 17th December.

A party of students and staff of the Board High School, Bhavani, the Govt. Training School, Coimbatore, and the Govt. Training School for Women, Palghat, visited the College and Research Institute and Central Farm.

OBITUARY

We record with deep regret the death of Sri. V. Panduranga Rao, Assistant in Plant Physiology, in the Bellary Dry Farming Scheme, on November 28, 1940.

Sri. V. Panduranga Rao was an M. A. of the Madras University and joined service in this Department as an Assistant to the Millets Specialist in 1926. In 1935 he was appointed as Assistant in Plant Physiology and posted to Hagari to work in the Dry Farming Scheme. He was deputed to America (Nebraska) to study plant physiology under Dr. J. E. Weaver. He stayed in America for about 14 months where he acquitted himself very creditably. During his stay he obtained the M. Sc. degree and was elected to the Honorary Scientific Society of Sigma Xi as an active member. He returned in 1937 and plunged into his work, specialising in root studies and control of soil erosion, till the time of his death at the age of 36. His researches were of a high order. He endeared himself to one and all of his colleagues and acquaintances by his genial manners. He leaves behind him his young wife and 3 children, his aged father who is a retired Assistant Secretary to the Board of Revenue, Madras and numerous relations and friends to mourn his untimely death.

Weather Review—NOVEMBER 1940.

RAINFALL DATA

Division	Station	Actual for month	Departure from normal @	Total since January 1st	Division	Station	Actual for month	Departure from normal @	Total since January 1st
Circars	Gopalpore	0.2	-3.8	72.1	South	Negapatam	43.1	+25.4	58.2
	Calingapatam	0.1	-3.8	45.9		Aduthurai *	21.5	+10.6	44.7
	Vizagapatam	1.9	-1.9	33.9		Madura	14.0	+9.0	42.7
	Anakapalli *	1.1	-2.9	40.7		Pamban	23.1	+11.1	44.3
	Samalkota *					Koilpatti *			
	Maruteru *	3.7	-0.1	40.6		Palamkottah	10.9	+3.5	25.8
	Cocanada	6.3	+0.9	45.0					
	Masulipatam	7.3	+1.6	41.0					
	Guntur *	3.3	+0.2	33.2					
					West Coast	Trivandrum	7.7	0.0	66.6
Ceded Dist.	Kurnool	0.2	-0.9	29.1		Cochin	10.2	+3.7	129.4
	Nandyal *	0.0	0.0	0.0		Calicut	7.5	+2.1	128.8
	Hagari *	0.9	-0.4	21.9		Pattambi *	6.1	+2.0	98.0
	Siruguppa *	1.2	-0.3	24.4		Taliparamba *	0.0	0.0	0.0
	Bellary	0.6	-1.6	22.0		Kasargode *	11.1	+7.7	151.8
	Anantapur	3.1	+0.3	27.3		Nileshwar *	6.1	+2.8	156.7
	Rentachintala	2.4		26.7		Mangalore	8.1	+5.0	149.7
	Cuddapah	6.1	+2.5	39.9					
	Anantharajupet *	23.7	+14.4	49.5					
					Mysore and Coorg	Chitaldrug	1.6	-0.7	33.9
Carnatic	Nellore	26.5	+15.3	53.6		Bangalore	6.4	+3.5	35.9
	Madras	22.5	+8.2	46.6		Mysore	13.0	+10.4	47.5
	Palur *	36.7	+24.0	59.5		Mercara	7.7	+4.5	142.4
	Tindivanam *	19.2	+8.7	43.8					
	Cuddalore	42.3	+27.2	69.5					
					Hills	Kodaikanal	23.3	+15.1	71.8
						Coonoor			
						Ootacamund *	12.7	+1.3	52.5
						Nanjanad *	11.1	+7.1	51.5
Central	Vellore	10.6	+3.6	35.8					
	Salem	3.2	-0.5	39.3					
	Coimbatore	13.3	+9.5	37.6					
	Coimbatore A. C. & R. I. *	12.8	+8.0	30.5					
	Trichinopoly	11.6	+6.0	34.3					

The weather over the Presidency was characterised by a great activity of the seasonal trough of low pressure over the south of the Bay, which was active throughout the month and occasioned almost continuous rains over the south east of the peninsula.

The month opened with unsettled weather in the south west of the Bay in the neighbourhood of Ceylon which moved into the south east Arabian sea and developed into a depression by the 3rd and into a storm on the 4th but weakened by the 6th and passed away by the 7th. On the 7th weather was again markedly unsettled to the west of Ceylon but the unsettled conditions disappeared by the 9th. Again on the 11th weather became unsettled in the south west of the Bay and developing into a depression and crossed inland and lay near Salem on the 12th morning, moved into the Arabian sea the next day, and intensifying into a storm on the 14th, weakened off the Kanara coast by the 15th.

On the 15th unsettled condition in the south of the Bay developed into a depression centred near latitude 13°N and Long 85°E and moving in a north easterly direction as a storm lay centred at Lat. 19°N and 89°E by the 18th but.

became unimportant by the 19th morning when a fresh depression formed in the Central Bay of Bengal and weakened and filled up off the Coromandel coast by the 24th. On the 27th conditions were unsettled in the North East and East Arabian sea but passed off by the 27th. Weather in the south of the peninsula was more settled from then till the end of the month. The almost continuous unsettled weather associated with the activity of the trough of low pressure and resulting in the formation and passage of depressions across the south of the peninsula, and in the Bay, occasioned very heavy rainfall in the south east of the peninsula.

Rainfall over the Presidency was in very large excess in the Carnatic, Central and Southern districts and in the adjoining areas in the Ceded districts and in Mysore, Coorg and Malabar being in some cases over 400% of the average rainfall. Rainfall was in large defect in the northern districts of the Circars, and in slight defect in the Ceded districts in the western parts.

The chief falls of rain reported were:

Nagapatam	... 10'4" (6th)
Nellore	... 6'4" (13th).
Pamban	... 5'4" (18th).
Madras	... 5'1" (12th).
Cuddalore	... 4'9" (2nd).
Vellore	... 4'3" (12th).
Coimbatore A. C. R. I.	... 4'46" (3rd).
Cochin	... 3'7" (14th).
Mysore	... 3'7" (24th).
Masulipatam	... 3'6" (10th).

Weather Report for the Agricultural College and Research Institute Observatory

Report No. 11/40.

Absolute maximum in shade	... 88'8°F
Absolute minimum in shade	... 66'3°F
Mean maximum in shade	... 83'1°F
Departure from normal	... -1'4°F
Mean minimum in shade	... 70'5°F
Departure from normal	... +2'0°F
Total rainfall for the month	... 12'77 inches.
Departure from normal	... +7'97 "
Heaviest fall in 24 hours	... 4'46 "
Total number of rainy days	... 11
Mean daily wind velocity	... 1'1 m. p. h
Departure from normal	... -1'13 "
Mean humidity at 8 hours	... 88'2%
Departure from normal	... +7'6%

Summary: The weather during the month was characterised by almost continuous rain, due to the disturbances originating in the Bay of Bengal. The rainfall was in very large excess, being 12'77 inches or 7'97 inches above the average. The heaviest fall in 24 hours was 4'46" recorded on the 3rd which constitutes a record for over 18 years of rainfall records at the institute.

Skies were in general heavily clouded and humidity in excess. Day temperatures were below normal and night temperatures above normal. Air movement was generally below normal.

P. V. R. & R. S.

Departmental Notifications

Gazette Notification.

Appointment.

Sri. M. Sanyasi Raju, Assistant in Bacteriology section, Coimbatore, appointed to officiate as Agricultural Bacteriologist, Coimbatore in category class I Madras Agricultural service with effect from 3rd January 1941 vice P. D. Karunakar granted leave.

Sri. T. V. Subrahmanya Ayyar, Assistant Entomologist, Coimbatore, to be in charge of the duties of Government Entomologist, in addition to his own during the absence of Mr. M. C. Cherian on leave for 9 days from January 1941 with permission to prefix Christmas and New year holidays and suffix the holidays from 12th to 14th January 1941.

Sti. L. Narasimha Acharya, Agricultural Demonstrator, Chittoor, appointed to officiate as Assistant Director of Agriculture, in category 6—class I Madras Agricultural service and is posted to Cuddalore.

Sri. V. N. Subbanna Acharya, Agricultural Demonstrator, Rayadrug, appointed to officiate as Assistant Director of Agriculture in category 6, class I, Madras Agricultural service and is posted to Cuddapah.

Transfers.

Name of officers.	From	To
Sri. K. Raghava Acharya,	Asst. D. A., Cuddapah	Asst. D. A., Madura.

Leave.

Name of officers.	period of leave.
Sri. M. U. Vellodi, Asst. D. A., Tellicherry.	L. a. p. for 3 moths from the date of relief
" M. Anandan, Asst. D. A. Cuddalore,	L. a. p. for 28 days from the 26—11—40
" Samuel Jobitha Raj, offg. Asst. D. A., Madura,	L. a. p. for 4 months from the date of relief.
" P. D. Karunakar, Agricultural Bacteriologist, Coimbatore.	L. a. p. for 1 month from 3—1—41.
Mr. R. C. Broadfoot, Principal, Agricultural College, Coimbatore.	Extension of leave from December 24, 1940 to February 4, 1942, preparatory to retirement.

Subordinate Services.

Transfers.

Name of officers.	From	To
Sri. I. Kurma Rao,	A. D., Repalli,	Special duty in the Vuyyuru Factory area.
" G. L. Narasimha Rao, A. D., Vuyyuru Factory area.	A. D., Repalli,	
" A. R. Krishnamurthy, A. D., Madura	A. D., Karur.	
" V. K. Appaji	A. D., Karur,	Special duty Sugarcane work Pugalut.
" V. Ratnaji Rao,	A. D., (on leave)	F. M., Kalahasti.
" N. V. Kalyanasundaram,	F. M., Kalahasti,	A. D., Kalahasti.

„ E. K. Govindan Nambiar	F. M., (on leave)	F. M., Taliparamba.
„ P. A. Narayanan	F. M., Taliparamba	A. D., Krishnagiri.
„ N. Srinivasa Rao,	A. D., Krishnagiri	A. D. Salem.
„ N. S. Rajagopal Iyer	A. D., Salem	A. D. Rasipuram.

Leave.

Name of officers.	Period of leave.
Sri. J. Suryanarayana, A. D., Gurzala.	Extension of l. a. p. on m. c. for 1 month and 5 days from 19-11-40.
„ B. N. Padmanabha Ayyar, A. D., Gingee.	Extension of l. a. p. on m. c. for 2 months from 1-12-40.
„ C. S. Namasivayam Pillai, A. A. D., Nanguneri.	Extension of l. a. p. for 2 months with m. c. from 19-11-40.
„ M. S. Kylasam, Asst. in Entomology Coimbatore.	L. a. p. for 28 days from 26-11-40.
„ E. Achuthan Nayar, Asst. A. D., Harur.	L. a. p. on m. c. for 4 months from 19-11-40.

Notice.

Members, and subscribers, whose subscription expires by 31st December 1940, are kindly requested to remit their subscription before the end of January. The M. O. form with particulars filled in is enclosed for their convenience.

K. Ramaswami,
Manager.



The Madras Agricultural Students' Union.

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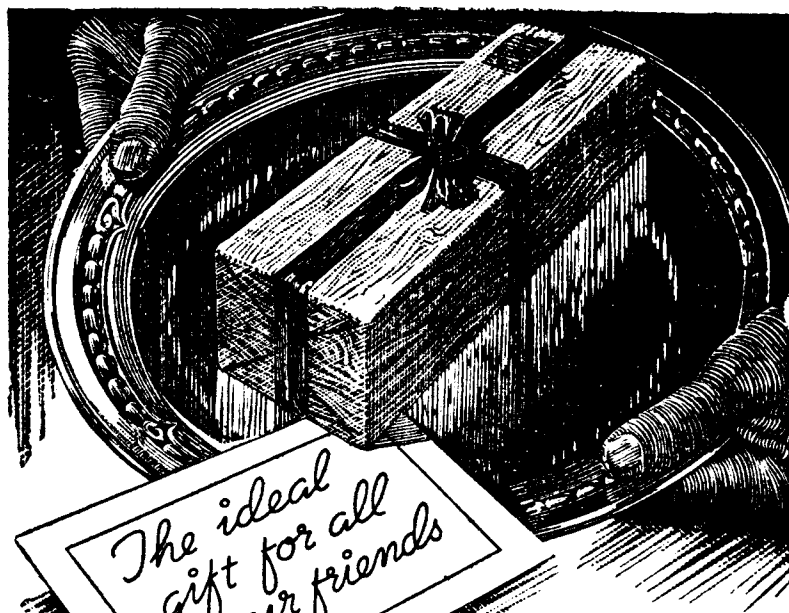
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*—this Christmas
and New Year*

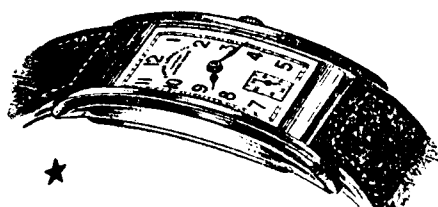
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