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THE JOURNAL

OF

The Madras Agricultural Students' Union.

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A NOTE ON THE EFFECT OF DELAY IN TRANSPLANTATION OF PADDY.

By

K. Venkataraman, B. A. (Hons.)

Assistant Paddy Specialist, Aduturai.

It is a matter of common knowledge that the majority of holdings in the Tanjore-delta are fragmentary and scattered. In paddy areas there is often a common nursery for several small holders, and the planting fields are at varying distances from the nursery. The system of raising seedlings in seed-beds, and subsequent transplantation, being extensively in vogue, ryots often find it impossible to transplant the seedlings immediately after they are pulled out from seed-beds. The distance to be carried, time, and availability of labour, are factors to be reckoned with; and the issue involved has a direct economic bearing on the problem of 'transport of seedlings' and 'delay in transplantation'.

A preliminary experiment was undertaken at the Government Paddy Breeding Station, Aduturai, to ascertain the length of time for which seedlings pulled out of seed-beds can be kept prior

Paper read at the M. A. S. U. Conference in July 1927.

to transplanting without detriment to their cropping-power. The present paper embodies the details and results of the preliminary investigation.

Paddy seeds of Aduturai strain No. 2 (White Sirumani) were sown on 1-8-1926. The seedlings were all pulled out from the nursery on 13-9-1926, and the pulled-out seedlings were kept together in the nursery. Some of the seedlings were planted out in a field-plot on the same day in six rows, spaced 6 inches apart between plants in the row, and 1 foot apart between rows. The six rows were scattered in various positions to minimise errors due to variation in soil-fertility. This formed the first day's planting. The rest of the seedlings were planted out in batches on five succeeding days, there being again six rows in each day's planting.

Detailed observations with regard to the establishment, growth, flowering period etc. of the different sets of planted seedlings were recorded and the salient points are enumerated below.—

(a) *Establishment of planted seedlings.*—

Normally, transplanted seedlings produce fresh roots, establish themselves in new soil, and manifest signs of growth in a week after transplanting. The percentage of well-established plants to the total number of seedlings transplanted in the six different sets will, other things being equal, afford a reliable measure of the effects of progressive delay on the establishment of seedlings after transplantation. Table No. I gives the percentages of establishment for the six different plantings, and it will be seen that up to a limit of 3 days after being pulled out of seed-beds, the establishing capacity of seedlings is not impaired to any considerable extent.

TABLE I.

Manner of planting.	Total No. of seedlings planted.	No. that died out.	Percentage of establishment.
Planted 1st day	1181	54	95%
„ 2nd „	1188	54	95%
„ 3rd „	1188	79	93%
„ 4th „	1188	112	91%
„ 5th „	1188	176	85%
„ 6th „	1188	613	88%

(b) *Growth.*—

The maximum growth is often attained before the commencement of the reproductive phase in the life-cycle of the plant. With a view to get data for comparing the growth in the six different day's plantings, tiller-counts for 60 plants in each of the six different sets were carefully taken after maximal growth had been attained, and Table No. II gives the results of such counts. It will be observed that there is not very much variation in the tillering-capacity of the different sets, and this is in conformity with the natural expectation, that once a transplanted seedling gets established in the soil, its further vegetative development will take a normal course.

TABLE II.

How planted.	Average tillering-capacity of a plant (average of 60 plants.)
Planted 1st day ...	11.8
„ 2nd day ...	10.8
„ 3rd day ...	10.8
„ 4th day ...	10.5
„ 5th day ...	10.8
„ 6th day ...	9.3

(c) *Flowering.*—

It was also necessary to determine whether the flowering period is likely to be affected by the delay in transplanting pulled-out seedlings. All the six batches of seedlings planted on six consecutive days were carefully flower-marked, and Table III contains a brief statement of the results. The table discloses that the 'flowering-period' is not affected by the progressive delay of one to five days to which the pulled-out seedlings were subjected. The day of the maximum flush in flowering for all the six batches is almost the same (18th December).

TABLE III.

How planted.	Number of plants that flowered on.									
	12th Dec.		14th Dec.		16th Dec.		18th Dec.		20th Dec.	
	actual	%	actual	%	actual	%	actual	%	actual	%
Planted 1st day	156	13.8	208	18.3	232	20.5	447	39.4	76	6.7
„ 2nd day	166	14.6	224	19.8	253	22.3	431	38.0	48	4.2
„ 3rd day	169	15.2	188	17.0	228	20.6	462	41.7	58	5.2
„ 4th day	121	11.2	195	18.1	285	26.5	385	35.8	66	6.1
„ 5th day	83	8.2	167	16.5	204	20.2	459	45.4	101	10.0
„ 6th day	16	2.8	41	7.1	88	15.3	231	40.2	186	32.2
Totai ...	711	...	1023	...	1290	...	2415	...	535	...

(d) *Yield.*

At harvest-time the plants in the rows relating to the six different batches of plantings were carefully counted. Any plant that had a blank on either side was discarded. The rest were all carefully harvested, threshed, and the produce weighed separately. The yield of 100 plants for each batch was then calculated, and Table IV gives the yield figures. An examination of the table makes it clear that up to the 6th day, the average yielding-capacity of surviving plants is in no way affected.

TABLE IV.

How planted.	Total No. of plants in 6 rows.	Total yield in Decagrams.	Yield of 100 plants in Decagrams.
Planted on 1st day	999	1408	141
„ 2nd day	1017	1562	145
„ 3rd day	945	1363	144
„ 4th day	879	1281	145
„ 5th day	738	1131	153
„ 6th day	211	270	129

Discussion of results.

A scrutiny of all the recorded observations regarding paddy-seedlings pulled out on a particular day, and planted in six consecutive daily batches, points to the conclusion that the establishing-capacity of seedlings is seriously impaired, if pulled-out seedlings should be kept for more than three days prior to transplanting. It is noteworthy that the vegetative growth of the surviving seedlings (as evidenced by tillering and flowering characters) does not appear to be affected adversely by the delay up to 6 days in planting. However, since the yield of a paddy-field may be mathematically expressed as the product of the number of the standing plants in the field and the average yield per plant, the diminution in the 'percentage of establishment' after transplantation will naturally involve a decrease in the output of grain. Hence, it does not seem advisable to delay the planting of seedlings pulled out from nurseries by more than three days.

BOTANY OF SOME USEFUL PLANTS—I.

By

S. N. Chandrasekharan M. A. and T. S. Ramakrishnan M. A.

The family Leguminosae (the family of the pulses, grams and beans) is of very great economic importance. It occurs both in the tropics and in the temperate regions and has a worldwide distribution. The family comprises herbs, shrubs and trees. The leaves are alternate, stipulate and mostly compound. The flowers are nearly always arranged racemosely and are hermaphrodite or polygamous, irregular or regular. The fruit is a legume. The seeds are exendospermous, the cotyledons being thick and rich in food materials. They are noted for their longevity.

The members of this family are comparatively rich in proteins and hence tend to balance the food ration of man and domestic animals. The protein is present all through the plant being concentrated in the seeds. Agriculturally, the family is of great value as a green manure. They leave a considerable quantity of avttone geiafter harvesting and thus add plenty of organic material

to the soil. The roots bear a number of small swollen structures called nodules on them. These are full of a bacterium called *Pseudomonas radicicola* which is capable of fixing free atmospheric nitrogen. This is partly utilized by the growing plant and when the roots decay the rest is left in the soil in the form of nitrates which add to the nitrogenous fertility of the soil. On account of this leguminous crops are regularly employed as rotation crops with cereals and root crops, and as cover crops.

The family is divided into three suborders :—Papilionaceæ, Cæsalpineae and Mimoseæ.

Suborder—Papilionaceae.

The flowers are characterised by the papilionaceous corolla consisting of a posterior large showy petal known as the standard or vexillum, the two lateral or wing petals (alae) and the two anterior petals mostly fused to form a boatshaped structure called the keel or the karina. The keel encloses the androœcium which consists of ten mona or diadelphous stamens and the gynoecium which lies inside the staminal tube.

Cyamopsis tetragonoloba.

(formerly known as *C. Psoralioides.*)

The cluster bean (Tam: Koth-Avarai) is cultivated almost throughout India. It is believed to be an introduced plant as it has never been found growing wild in India. It is mostly grown as a mixed crop or as a hedge or shade plant. In Northern India it is a field crop, while in Southern India it is grown only in gardens ; two forms are often met with in the South which are differentiated by the size and color of the pods. The seeds are sown with the rains and the plants come into bearing in about 3 months.

It is a robust, erect, bushy annual growing to a height of 2 to 3 feet, while some varieties grow up to 10 feet. The stem is ribbed, fibrous, hollow and covered with adpressed mid—fixed hairs. The leaves are alternate pinnately trifostlate, stipulate, stipules being linear and petiolate, the petiole being grooved on the upper surface. The stipels are absent. The leaflets are ovate or elliptic with an irregularly toothed margin, acute pinnate—reticulate and hairy with midfixed hairs.

The flowers are arranged in axillary condensed racemes. These are purplish and bracteate with small caducous bracts, the bracteoles being absent.

The calyx is gamosepalous, very hairy, persistent with 5 unequal linear teeth, the anterior ones being larger.

The corolla is purple with the standard orbicular and short-clawed. Wing petals are oblong and nearly as long as the standard and half as broad: the keel petals are as long and as broad as the wing petals, free at the bottom and connate at the tip.

The stamens are 10 in number, monadelphous with uniform oblong anthers which are distinctly apiculate. The ovary is superior, hairy, sessile, one carpelled and one celled with five to seven ovules. The style is bent at the tip and the stigma is capitate.

The fruit is a legume elongated and tapering to a point at the apex, obscurely foursided and with light constrictions between the seeds. The latter vary in number from five to seven and are oblong, exendospermous, rich in protein and varying in colour.

The young pods are used as a fresh vegetable or dried, salted and preserved for use when it is not possible to get fresh pods. The old pods are very fibrous and hence not used. The whole plant forms an excellent cattle fodder for which purpose it is sown as a dry crop in Northern India. On account of the large amount of nitrogenous matter the plant contains and its being comparatively free from fibre when young it is very useful as a green manure.

Sesbania grandiflora.

The Agathi (as it is commonly known) is cultivated in and around betel-vine gardens while isolated plants are found round many of the Hindu houses. It is supposed to be not indigenous. It is a small erect quickly growing soft wooded tree reaching 20 to 30 ft. high. Younger parts of the stem are covered with a dense coating of short hairs (tomentose).

The leaves are paripinnately compound, alternate and pulvinate with deciduous stipules. The upper surface of the petiole is slightly grooved. Leaflets are either opposite or alternate, stipellate with short cushioned stalks, oblong in shape, entire, obtuse with a sub-mucronate tip and pubescent.

The flowers are in axillary racemes. These are yellowish white, or red in colour, very large being 10 c. m. long from the joint of the pedicel, bracteate and bracteolate, (both deciduous) with the petals slightly fleshy.

The calyx is gamosepalous, bell-shaped and broadly two-lipped, the upper formed of two connate lobes and the lower of three.

The standard is clawed, greenish yellow outside with pink colour mixed with yellow inside with a green spot at the bottom and rounded, wings are as long as the standard, clawed and yellowish white in colour. Keels are fused throughout excepting at the apex and the base, as broad and long as the wings yellowish white, with apex turned up.

The stamens are 10 in number, diadelphous (9 and 1) of unequal heights; filaments are fused to very near the tip; anthers basifixed, elongated, with longitudinal dehiscence. There is a prominent disc of green glands round the ovary.

The ovary is one-called, sessile, and very much elongated with a short style and blunt stigma. The pods are pendulous, elongated and slender with many reddish brown seeds.

The leaves, flowers and young pods form favourite articles of food being prepared into curries. Orthodox Hindus make it a point of using the leaves of this plant particularly on the Dwadasi day (12th day after the full or new moon). The leaves form an excellent fodder for cattle especially for milch cows. In betel gardens the stem is used as a support for the vines. The leaves are used as green manure. Some medicinal properties are attributed to this plant. The leaves form a good laxative and are also recommended for ulcers in the mouth.

Arachis hypogaea.

This is commonly known as groundnut or peanut (and in Tamil as Nilakkadalai or Manilakottai). It is a native of Brazil and was introduced into India about 150 years ago Though cultivated in small areas in many parts of India, it is grown on a commercial scale in the provinces of Madras and Bombay. In Madras the chief centres of production are South Arcot and Coimbatore districts. This is generally a 5 to 7 months crop extending from June-July to October-January. A number of

varieties are present, some being low and prostrate and others upright and differing from one another in the number of seeds in the pods.

This is a spreading herbaceous annual branching profusely all round, growing up to 1 foot high and spreading with a diameter of 2 to 3 feet.

There is a tap root 8 to 10 inches long with few lateral roots with a number of bacterial nodules in them. Adventitious roots develop from the basal portions of the stem which are covered with soil. Root hairs develop very rarely. The branching of the stem commences from the axils of the cotyledons.

The stem is round at the base and angular in the young parts and is densely hairy—long hairs (hoary). The leaves are alternate with two pairs of leaflets, stipulate, stipules very long and adnate to the base of the petiole for nearly half the length, 30-35 m. m. long, linear-lanceolate. The petiole is pulvinate the pulvinus is formed just above the junction of the petiole and stipule grooved on the upper surface and hairy. Stipels are absent. Leaflets are provided with short cushioned stalks, elliptic-obovate, entire, shortly mucronate and margins fringed with hairs. They are leathery pinnate-reticulate and glabrous.

The flowers are axillary, either occurring singly or in pairs and sessile. There are two bracteoles each being two lobed. The corolla is orange colored and the flowers in the upper axils do not develop generally.

The calyx is gamosepalous developing into a long narrow tube expanding at the top into two portions (1) the posterior broad with 4 teeth and (2) 1 lobe developed anteriorly or to a side, green and hairy.

The corolla is much exserted and carried on the calyx tube; the standard is orbicular orange colored with a short claw: wings as long as the standard, yellow in colour; keel petals united and narrow, yellowish white and with a slight twist.

The stamens are monadelphous; usually 8 stamens develop. They are dimorphic, of unequal lengths, the longer ones with rounded anthers and the shorter ones with oblong and larger anthers; stamens are borne on the tip of the calyx tube.

The superior ovary is situated at the bottom of the calyx tube, sessile at first, with a long filiform style which is bent with a

bearded stigma. After fertilization the torus elongates into a very long stalk and pushes the developing ovary into the soil. This stalk responds to positive geotropic stimulus and thus enables the development of the pod in the soil.

The fruit is a legume with a corrugated pericarp or shell, almost cylindrical with the number of seeds varying from 1 to 4 in different varieties. The shell is slightly constricted between the seeds.

The kernels when roasted form an excellent food and are used as an ingredient in many sweets. An oil is extracted from the kernel, the percentage of oil being about 45 to 50. This oil is used in various ways, as a salad oil, for adulteration with ghee and gingelly oil and in the manufacture of several kinds of soap. The cake left after the expression of the oil forms an excellent stock feed and a valuable manure.

Cicer arietinum.

The common Bengalgram (known in Tamil as Kadalai) or chickpea is grown extensively all over India. It is a native of South West Asia and has been cultivated in India from remote times. It is largely grown in Agra and Oudh. "A line drawn from Bombay to Patna would approximately divide India into two sections the northern being the great gram area while the southern is that in which it is a very subordinate crop." In Madras about 150,000 acres are under this crop chiefly in North Arcot and Coimbatore districts. It is sown about the month of October and harvested in February-March. It thrives well in soil suited for wheat and linseed. It has a tendency to smother weeds in the fields. Several fairly distinct forms exist varying in the color and size of the flowers and seeds.

It is a small spreading herbaceous annual growing to a height of 1 to 1½ feet branching profusely the branches being divaricate from the base. There is a taproot 6 inches to 12 inches long with generally 4 rows of lateral roots. Bacterial nodules are present the number of which varies according to the nature of the soil.

The main stem is rounded while the branches are four-sided, ribbed, green and densely clothed with glandular hairs. The stalks of the glandular hairs are formed of a row of cells, the gland itself being the terminal cell which is pretty large, oval and hyaline.

The leaves are oddpinate, alternate, with the number of leaflets varying from 11 to 18, stipulate, stipules leafy and serrate and petiolate, petioles being furrowed on the upper surface. The leaflets are alternate or subopposite, six millimetres long and 4 millimetres broad, ovate, serrate, acute, covered with glandular hairs and hence somewhat sticky, pinnate reticulate and without stipels. The dew collected over the leaves has an acid taste due to the secretion of the glands.

Solitary flowers are formed in the axils of the leaves and are stalked, bracteate and bracteolate, bracteoles larger than the bract. The flower stalk is articulated.

The calyx is gamosepalous densely clothed with glandular hairs, persistent, with one anterior lobe, two lateral and the 2 posterior subconnate, lobes sublanceolate.

The corolla varies in color; the standard is obovate with a number of colored forking veins proceeding from the centre to top; the wing petals are nearly half as broad as the standard, clawed and spurred; the keel petals are nearly half as broad as the wing and as long as the standard, clawed and free.

There are 10 stamens which are diadelphous (9-1); anthers are two celled, orange colored and basifixed.

The ovary is superior, sessile, oval, with a terminal slightly bent style and blunt stigma. The fruit is an inflated legume with usually two seeds attached to the ventral suture. The seeds are beaked with wrinkled testa and are exalbuminous.

The seed is considered to be of high nutritive value and forms an important part of the Indian food. The flour prepared from this seed is very largely used in the preparation of various Indian sweets. It forms an excellent food for horses and cattle. The young tops of the plant are used as a potherb. The stem, leaves and husk are valued as an important cattle food especially for milch cows. The acid liquid collected over the plant is called vinegar and is used medicinally.

DISEASES ON BETEL VINE IN POONAMALEE, CHINGLEPUT DISTRICT.

By

S. Sundararaman.

Important Betel-vine growing villages lie to the east of Poonamalee. They are Managadupattu, Kattupakkam, Koovur, and Sennerikuppam.

Cultivation.—The land in these villages is chiefly owned by rich absentee landlords. It is leased out to middlemen who sublet to actual cultivators. No one individual undertakes to cultivate more than a third of an acre with betel-vine, and usually each tenant owns three strips in three distinct stages. Betel-vine is followed by betel-vine without any intermediate crop or by a long fallow. This system of cropping has resulted from two causes :— 1. the enormous profit this crop brings to the cultivator and 2. the application of organic manure which prevents to some extent the depletion of soil fertility and renders the necessity for rotation less obvious. A single crop of paddy may sometimes be sown between the ridges after betel vine is removed. Considerable attention is paid to its cultivation from beginning to end. The land is thrown into ridges three to three and a half feet wide and three feet high. This ensures perfect drainage. On the ridges agathi seeds are dibbled and occupy four lines. Sowing is done in January or July there being two seasons for planting this crop. *Thagarai* seeds are also sometimes sown with agathi. When the agathi crop is four months old the betel-vine is planted. The vine cuttings which are the topmost nodes of the third year plants are planted under the agathis, the first nodes being pressed into the soil and covered with wet earth. The agathi plants which are now about four feet tall are bent and tied together so as to form an arch over the ridges.

Irrigation and Drainage.—The crop is not directly irrigated but water is splashed on it from the trenches with the aid of wooden scoops. Watering is done thrice a day during the first three months and once a day thereafter. Drainage is satisfactory as trenches are usually deep. In dry weather wells supply water for irrigation and during the rains, tanks.

Manures. —Manuring is done on three occasions, first when the crop is three to six months old, a second time after another half year, and the last time in the beginning of the third year. The manure applied is powdered well-rotten horse dung, except on the second occasion when tannery refuse is also added on.

Coiling.—When the plantation is nine months old the free ends of vines are taken down, wound up in a coil and covered over with wet earth. This serves as a sort of layering and new shoots come up.

Harvesting.—Leaves are plucked once a month from the beginning of the second year, and the yield gradually increases from month to month till it reaches a maximum until the rains of the north east monsoon cease, after which it again goes down. The profits from this year's harvest enable the cultivator to pay his rent and meet cultivation expenses, besides furnishing him with means of subsistence from day to day. The third year's harvest generally counts for his margin of profit.

Diseases.—The vines are attacked in this locality by two kinds of diseases, both of fungal origin. 1. *Phytophthora* 2. *Sclerotium rolfsii.*

1. *Phytophthora.*—Local enquiries show that this disease made its appearance only three years ago and, has gradually spread until this season it is seen in all villages and is more or less firmly established. It has caused much loss. Whole gardens have been laid bare and the cultivation is being abandoned. The disease attacks the crop in all stages of growth. Once in a garden it spreads rapidly increasing in virulence and intensity after a spell of rainy weather. The first symptoms are shown by the sudden drooping of the tender upper shoots. The leaves lose their turgidity, become flaccid, droop and gradually turn yellow. The whole plant rapidly wilts, first turning yellow and later brown. Near the soil at the base of the vine, that is, at the region of the collar are sometimes seen dark water soaked spots which get softened. The whole region rots and becomes completely shredded. In most plants however, the roots, long before the rot sets in, become completely deteriorated and the plant dies.

2. *Sclerotium rolfsii.*—This disease is of equal if not of greater virulence. This is not apparently a new disease as the ryots seem to have been familiar with it. It is locally called "Purnam" by the cultivators. On the basal portion of the vines especially in the coiled portion is seen a growth of thick weft of longitudinous white—fibre likethings which spread and completely cover the whole base. The portion affected rapidly rots. The connection between the roots and the stem is severed and the plant dies. This disease is confined to moist portions chiefly the coiled portion attacking them just before they strike root. The loss due to this disease is also considerable.

Remedial measures.—Since in both cases infection spreads from the ground and the fungi presumably live in the soil, treatment of the soil is indicated as a remedial measure. Since the attack begins and in most cases ends in the collar region a protective fungicidal coating in this region also seems necessary. A trial has been made this season to find out if spraying would be useful. Bordeaux mixture (1 in 2 strength), along with resin and soda, fish oil soap and chestnut compound (or a mixture of copper sulphate and ammonium carbonate) have been sprayed. The results will be watched. Ryots in this locality have also been advised to adopt the following methods :—

1. Liming the soil 2. Judicious rotation 3. Lopping of agathi branches to admit more of sunlight.

(As this crop is grown in all parts of this Presidency though in small areas and as these diseases may escape the notice of the ryots in the initial stages it is presumed they will carefully note the symptoms mentioned above and communicate with the Government Mycologist, Coimbatore for advice—(Editor).

THE USES OF FUNGI.

By

T. S. Ramakrishnan.

Fungi are primitive plants devoid of the green colour (chlorophyll) and hence dependent for the supply of their organic food substances on dead or live animals and plants. To a layman the name fungus conjures up the vision of an unwanted organism capable of doing harm only and causing enormous economic loss. Its loathsome presence is felt all round us. In the field it is responsible for a variety of diseases in a number of economic plants either bringing about their destruction or resulting in much reduced yields. In homes it thrives in the preserved food materials and stored food grains, fruits and pickles and causes them to rot or turn 'mouldy' and become unfit for consumption. Leather goods such as shoes and suitcases and even clothing form favourable media for the growth of moulds during humid or rainy weather and if the articles are not carefully attended to every now and then, they perish quickly.

The ways in which fungi are capable of causing damage are numerous. Yet they also often become useful to mankind. They do not form a group of organisms capable of inflicting injury alone. There is a better side to this picture. Fungi are useful to man in a number of ways and in this article are described some of the uses to which fungi are put.

To begin with a number of them form delicious articles of diet. Mushrooms and morels, truffles and puffballs are the fungi that are largely used as food. These are found in plenty both in the open country and in the forests all over the world and are consumed by all the races both barbaric and civilized. In many countries the people are dependent for the supply of these on Nature, being collected in large quantities from the forests. In India the common mushroom which is found near the cattle sheds or manure pits soon after the rains, is relished very much and consumed in numbers. Other forms of mushrooms, truffles and morels are collected from the forests. On the Nilgiris these are brought regularly to the markets during the season. In Kashmir the morels are collected and dried in the sun in April and exported.

In many of the European countries the mushrooms are cultivated. France takes the lead in intensive mushroom farming. The cultivation is carried on underground, in disused quarries or abandoned mines. Provision is made for ventilation and abundant supply of water. The soil is specially prepared by the addition of large quantities of stable manure and leaf mould and made up into beds or ridges. These are then sown with the 'spawns' of the fungus which are only lumps of manure with a large quantity of the mycelium of the fungus. By keeping the soil moist the mushrooms come up in 3 to 4 weeks and the beds remain in bearing for 6 to 8 months. These are gathered in the young stage-in what are known as large button stage-, since they are not palatable or digestible if fully expanded and hence have no sale. The important points to be considered in this farming are the presence of a large quantity of moisture and manure with plenty of air and the absence of light, for the mushrooms come up better and earlier in darkness. Before the war, Paris alone produced 750,000 francs, worth of mushrooms every month.

Besides mushrooms and morels some other kinds of fungi are also cultivated but the former are by far the commonest forms. These are generally cooked when fresh and then consumed. In China and Japan they are often dried and preserved, when they are said to develop a particular aroma and hence valued in the preparation of soups. Mushrooms are believed by some to be equivalent to meat food on account of the flavour which is developed when cooked. Others are of opinion that fungi are of little real food value and can only be used as accessory food and not as substitutes for meat or vegetables. But yeast is believed to have considerable food value and in the dried and purified state is used for this purpose. The collection and cultivation of fungi afford employment and form a means of livelihood to many. In this connection it must be mentioned that there are several mushrooms which are very poisonous and resemble the edible species. Hence great care must be exercised in the collection of the edible fungi and one must acquaint himself with the chief characters and peculiarities of the fungi that are used as food.

Besides forming a direct source of food many fungi are employed to set up fermentation in the processes of breadmaking and the manufacture of wine and other liquors. In the preparation of bread a little 'yeast' is added to the dough which sets up fermentation followed by the evolution of carbon-di-oxide. This gas raises the dough and increases the porosity and softness of the bread and thus its digestibility. Again yeast plays the most important part in the manufacture of wine. beer, brandy, whisky and other intoxicating beverages. The spores of the yeast fungus are present in the air. These settle on the fruits of the grapevine and are largely responsible for the 'bloom' found on the fruits. Wine is prepared by pressing the juice out of the grapes and allowing it to stand, when fermentation is started by the yeast and the sugar is transformed into alcohol and carbon-di-oxide. The latter gas is responsible for the frothing up. The liquid is removed and stored up when the requisite amount of fermentation has progressed (and named as different grades in commerce). Beer is the product of fermentation set up by yeast in barley malt extract. Toddy is the fermented sap of coconut, palmyra or date palm and here again the fermentation is carried on by yeast. In addition to yeast other fungi are also utilized in the manufacture of fermented liquors. *Mucor oryzae* is employed for the preparation of arrack. The Japanese liquor 'sake' is prepared by using *Aspergillus oryzae*. Alcohol is obtained by the process of fermentation brought about by fungi in potato, rice, barley and other starchy materials. The increased use of alcohol for various purposes must necessarily make this aspect of the use of fungi the most important. Vinegar which is largely used as an accessory food and also in the preservation of certain articles of consumption is prepared by the acetous fermentation of a mixture of malted and unmalted grain or oxidation of wine through the agency of a fungus called *Mycoderma aceti*. Thus fungi are extensively used in industrial concerns.

Another way in which fungi become useful to man is in the entomogenous nature of some and in the consequent suppression or control of insect pests. The scale insects which are known to infect a number of plants including fruit trees have been in numerous instances kept under effective check by the growth of some insectivorous fungi which destroy them. The 'Florida' experiments for the control of whitefly with fungus cultures form a classic example of the benefits derived from fungi in this direction. Grasshoppers in Africa and cockchafers in France have been kept down by fungal parasities. The housefly which is the carrier of numerous diseases is in certain seasons killed in large numbers by *Empusa musci*. In the coffee estates in South India the greenbug

Lecanium viridis is in many cases kept under control by two fungi *Empusa lecanii* and *Cephalosporium lecanii.* Mealy bugs on Anona have also been found to be destroyed by *Cladosporium sp.* Numerous other instances are available where fungi form a limiting factor in the spread of insect pests.

Medicinal uses of fungi are also common. Folklore attributes various medicinal properties to several fungi. Though not used as universally and in such large numbers as of old yet a few fungi are still widely employed in modern pharmacopia. The 'extractum ergotiae' or Tincture of Ergot is prepared from the ergot which is the name given to the sclerotia of the fungus *Claviceps purpurea* formed in the ovaries of rye. This is used on occasions when active muscular contractions are to be induced especially in the uterus. In addition to ergot of rye, ergots of wheat and oat are also sometimes used. The sori or fruit bodies of *Ustilago maydis* which causes the smut of maize are in some instances used for the same purpose as ergot. *Saccharomyces cerevisiae* is another fungus used in medicine as an antiseptic in poultices applied to ulcers. Internally also it is administered in varying doses for diabetes, typhoid erysipylas and a number of other complaints. *Polyporus officinalis* in a powdered state forms a powerful purgative.

Many fungi act as cleaners and scavengers of the earth helping in the conversion of dead and decaying animal and plant remains into innocuous simpler substances. In this direction the service rendered by fungi in conjunction with bacteria cannot be overestimated. The organic manures applied to the soil are also rendered into a state which can be made use of by crops by these organisms. Fungi also play a very prominent part in the decomposition and disintegration of the waste materials used in making synthetic farm yard manure which is coming into great prominence owing to the limited supplies of cattle manure and the necessity for a bulky substitute.

Besides these there are other minor ways in which fungi are put to use. The fructifications of *Polyporus hispidus, Fomes ignarius* and *Hexagonia moria* have been used in Italy for the extraction of various dyes. These are used to colour cotton, woollen and silk fabrics and are also employed by leather dressers and cabinet makers. Several species of *Polyporus* and *Fomes* are used as razor strop, in the preparation of bottle corks, caps, aprons and other articles of dress, chest protectors, picture frames and

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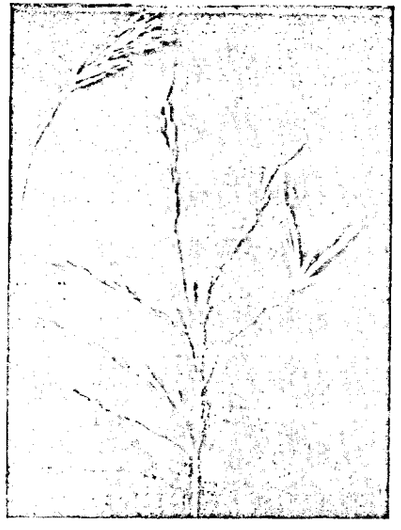

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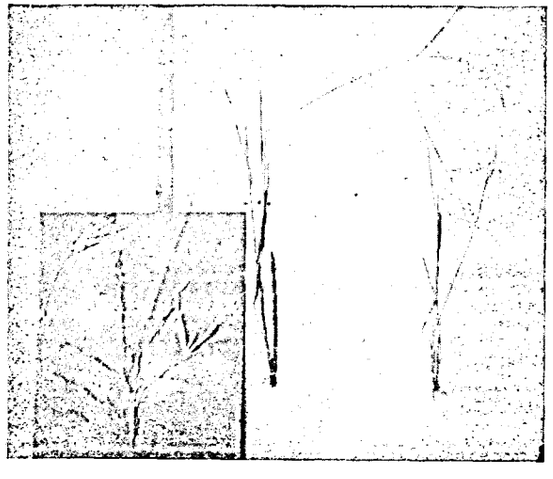

ornaments. In the dried form they are sometimes used as an ingredient of snuff. The soft bit used by entomologists for the mounting of insects is also dervied from a *Polyporus*. In ancient times dried pieces of *Fomes fomentarius* were used as tinder but with the advent of the cheap match boxes they have gone out of use.

The above are in the main some of the uses of fungi. As scavengers, entomophagicytes and articles of food they are very beneficial to mankind not to speak of their extensive use in industrial and medicinal spheres. To a small extent they are put to domestic and personal uses.

AGRICULTURAL CO-OPERATION WITH SPECIAL REFERENCE† TO WEST COAST.

By

K. Unnikrishna Menon,

Asst. Director of Agriculture, Tellicherry.

The word co-operation means working to-gether. When it concerns agriculture as a business, it should plainly enough mean the working together of farmers. The necessity for the same arises out of the one fact that the large majority of farmers in this country manage small areas. The absence of sufficient capital to work even these small holdings places the farmer within the clutches of an usurious money or grain lender. Thus even if the crops are moderately paying the farmer's resources remain encumbered as he cannot meet the unusually high demand on them. The pitiable condition in which the farmer is placed reaches its climax when the cultivation methods adopted, seeds used and manures applied are poor. Of these, the last item of cultivation expenses largely determines the yield. The inadequate capital which is mostly the result of want of confidence in the business invariably reduces the quantity and quality of the manure applied with the result that the yields are always poor. Under such circumstance the loans taken by him through co-operative societies to finance this unprofitable method of cultivation fail to make him richer. This again becomes aggravated by the fact that the money obtained as loans for agricultural purposes is partly wasted in other unprofitable ways. And the oft-repeated question of overdues haunt him and his society like a night-mare.

†Paper Read at the M. A. S. U. Conference July 1927.

2. It is therefore high time that we should strive our best to improve the situation and as such let us examine in detail and find out whether the conditions necessary for agricultural co-operation exist in our country as it is at present and see whether we are in a position to take advantage of them and improve the welfare of the farmers.

(a) A knowledge of the agricultural condition of the country is the first perquisite.

(b) A knowledge of the needs of the farmers is highly necessary.

(c) The masses must have a certain amount of co-operative training.

(d) A knowledge of the markets is very essential.

(a) Segelcke one of the pioneer workers of co-operation in Denmark first spent a year at Rothamsted before he went straight from there, to take up his work in co-operative methods of business and production which have since dominated Danish agriculture. I quote the Danes as an example as they stand pioneers in agricultural co-operation in the whole world. The work so far done by the Agricultural Department has enabled us to obtain an insight into the agricultural conditions of the country with some knowledge as to the ways and means of making cultivation more profitable. In several cases we have been able to make the crops especially paddy pay more, spending less than what they ordinarily do on its cultivation. I hold back actual figures as they may become an infliction upon you and am prepared to give them to those who want them after the conference.

(b) The needs of the farmer as regards capital, seed and manure etc., supply have been studied to some extent by the workers in the fields of both co-operation and agriculture. As a result of it we have got the co-operative bone crushing works at Nidamangalam, Manure and Implement Society at Pattambi, etc., with many seed unions in this Presidency.

(c) Thanks to the work so far done by the Co-operative Department and the honorary workers thereof in educating the masses in co-operative ideas, we have a very large number of co-operative credit societies working. The enthusiasm evinced by the members thereof and the large army of honorary workers in the field show that the incentive for co-operative work has come to stay. Co-operative credit work to finance an unprofitable business

like the present grain-production of the West Coast especially in Malabar must perplex the workers to some extent. Even the Danes who are the ideal co-operators have experienced failure. Failures have given us very valuable lessons to open our eyes and widen our outlook. They force us to examine the purpose for which the loans are taken and it falls to the lot of the workers to teach the farmer how he should use his capital on cultivation to make the business economical. It is here that we find the need for mass education and to combine the non-credit agricultural work with the credit movement to make them both successful. The need for more propaganda work is brought to the lime-light by a number of resolutions in the various co-operative conferences. Professor Baswani, in his inaugural address at the Co-operative Institute, Karachi, has recently urged the need for peasant schools where farming and weaving are to be taught to encourage co-operative work. These authorities evidently support my view that agricultural propaganda should remain organically connected with rural credit work in this country. On this aspect of the question I had drawn the pointed attention of this conference in my paper on "the place of agricultural improvements in co-operation" in 1924. Later on last year Rao Sahib Mr. V. K. Menon a reputed worker in co-operation, very ably emphasised the point by the way supporting my paper.

(d) Efforts have been made to study the fourth necessary condition for agricultural co-operation, viz., a knowledge of the markets, which is being acquired directly. We may have to enlist the sympathy of the bigger traders in our movement or to commence business ourselves and eliminate the unnecessary number of profit-sharing middlemen as far as possible. A few pieces of business have to be actually done through supply and sale societies before we become better fitted to do the work. We in the West Coast know very well how we could successfully carry on co-operative supply when co-operation and agriculture combined in selling chemicals for spraying against "Mahali." (arecanut disease). This has extended the activities of co-operative work and established an unquestionable faith in spraying against "Mahali" in the mind of the arecanut grower who no more fears the once dreaded "Mahali" disease.

3. Now it is left for us to consider as to how to combine these necessary elements of agriculture and co-operation at every step in one and the same movement and benefit the rural popula-

tion. The idea that co-operation means only credit work must be corrected and the outlook of the village co-operator must be broadened. Sir E. G. Russel of the Rothamsted experimental station says "Science may do much in giving new methods, but in agriculture the determining factors are human and experience shows that history alone gives the key to the human factor. If we know what many have done before in given circumstances and how they did it we know what they can do again." Therefore comparing our present conditions with those existed in other countries before they made considerable progress in agricultural co-operation, we find that we are situated almost similar to what they were in the German district of Neuweid area before the year 1862. It has been described by A. Wuttig in the following terms—"The district is not very fertile and the inhabitants are mostly small peasant proprietors some with sufficient land to graze a single ox or cow. An owner of 10 acres is a rich man. Before the year 1862 the village of (Anhausen) presented a sorry aspect: rickety buildings, untidy yards, in rainy weather running with filth, never a sight of a decently piled manure heap. . . . . houses and oxen belonged with few exceptions to Jewish dealers. Agricultural implements were scanty and dilapidated and badly worked fields brought in poor returns. The villagers had lost confidence and hope. They were the serfs of dealers and usurers." Raefeisen's work till about 1888 revolutionised their condition and converted them into a set of happy and prosperous farmers.

4. The masses have been to a large extent taught co-operation, the application of which to agricultural production is the question on hand. Many have told me that we have to copy the Denmark methods of co-operation to advance our co-operative activity especially in agricultural co-operation. But I fear that the incentive or natural instinct for co-operative work which the Danes possess is absent anywhere else. As in other countries we require some driving force from outside to successfully work our societies. Therefore I prefer to shape my scheme on German lines modified by the lessons of the French and Italian methods to suit our conditions. I mean to suggest Dr. Haas' model of Provincial Verbande and its affiliated societies especially as regards the relationship of the societies with the central union. The object of our unions must be identical with those detailed about the French co-operative syndicates. Probably Italian methods of

working have to be adopted to allow the societies and unions to have free scope to do business according to the needs of the farmer members. In Denmark, France, Ireland and other places dairy farming, vine production, poultry farming and the like guided the movement, as these branches of agricultural work had greater facilities there. We have to adopt the Neuwied Model of activities as we are mostly grain producers and our salvation consists chiefly in improving grain production through co-operative activities with certain side lines of farming as will be detailed hereafter.

5. In the first place we have to educate the co-operators in agricultural improvements basing their methods of cultivation on economic lines. The changes in their methods necessary for the purpose must be adopted by the members of a society which must commence to work on the lines of the German "Kasinos" societies with hardly any credit work to do to begin with. However we have even at the outset to shape them to serve as supply societies for the affiliated farmers which the "Kasinos" in later days became. Probably we would also require them to be affiliated to a central supply society. Thus we may be able to put together small farmers into bigger units as societies such that they derive all the advantages of the big farmer in studying new agricultural methods and procuring their supplies etc. Such societies remain related to one another through the union. The present credit societies and unions may function as such. Some of the present societies good enough for the purpose may be chosen to work like this or new societies may be formed with this object in view apart from credit work. The membership of the new society should be open to all farmers who undertake to manure their lands properly, to use selected seeds as much as possible and to dispose off their produce through the society or at its instance. We have to remember the one important fact that propagandists and the active office bearers who were very successful in credit work may not be successful in this line of activity. Therefore as in the Danish country, members of the one variety of society like the credit society may be allowed to become members of these agricultural societies or workers in the agricultural non-credit branch of a society must be chosen separately. As this new work involves a good deal of trouble and some expense, small monthly subscriptions may have to be raised to meet the incidental charges of a recurring nature and to pay the workers unless it be possible for the Government to depute officers to work them. Full—time

paid workers are necessary to run this pioneer sort of business. The workers must all be made responsible to a supervising Government control. Because what Raifeisen did in the Rhine colony has to be done by the Government in this country.

6. Probably the best place to start such a movement will be from one of the well—chosen centres with a Middle School in a purely rural area where credit work through co-operative means has made sufficient headway. The actual rural propagandist must be in charge of the School which can be imparting an ideal rural education with sufficient agricultural bias. It may also be continuation classes. The guardians of the pupils may off and on be invited to take interest in the rural work: even night schools may be started for adults of the labouring classes—thus adopting every means possible to concentrate work and make it affective.

7. These agricultural societies have also to function as sale societies in the disposal of the produce to the best advantage of the producer. The larger business that we have will be in grains. Grain societies requiring to store grains till the market becomes favourable find it necessary to have store houses involving considerable capital. When this is wanting, the small granary of the producer itself may serve as the storehouse of the society and on the security of the grains so stored money advances will bave to be made to the producer to keep him on till his grains are sold. Such advances, with any previous loans standing in his name, will have to be recouped when the grains are sold. Some penalty has to be imposed on the farmer who betrays the confidence placed in him. These societies have also to find more paying crops to grow and other productive lines of work like poultry, sheep and cattle rearing, dairying, flower and vegetable cultivation and such side lines of farming as are suitable to the locality and to the members thereof Mention has already been made of this in my paper on. "Side lines of farming" read in this hall in 1923. This will enable the farmer to find paying occupations during the slack season and also to find work for the ladies of the house-hold.

8. The aim of the movement must be to attach the rural population to their homes and to the soil by using every means in their power to restore the dignity of agriculture and make it more remunerative besides introducing profitable side lines of farming. Such an association of farmers guided by a rural worker may in course of time be able to establish among the members all kinds of co-operative societies and even provident societies and also

societies to improve the moral, intellectual and professional side of their lives and improve the material condition. One of the chief aspects of the supply work of such societies is to produce and distribute good seed to the members. A second item of work will be to prevent waste of the available manurial resources especially by adopting better methods of preserving cattle manure and supplement the supply of manure from outside sources or by production themselves. A third sphere of activity will be the introduction of improved implements.

9. I fear that I have been going too much into the details of the work of an ideal agricultural co-operative society. Further details can be found out when such societies are organised and worked. I do not at all suppose that it is a simple matter to start and work such societies, nor do I hold that useful agricultural co-operative societies to suit our needs cannot take any other form. What I have attempted to do in this paper is but to place before you some of my views on a subject of great importance to the farmers and of serious interest to both co-operators and agricultural propagandists. I wish that the discussion which my paper may arouse would enable us to throw more light on the subject bringing out more useful and practical suggestions for the prosperity of the country.

A SHORT NOTE ON A MONSTROSITY IN PADDY.

By

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The development of a paddy plant consists in a regular succession of processes which is the same for all the plants of the species to which paddy belongs. A paddy grain when sown germinates, produces roots and shoot, both of which grow. The shoot portion consists of stems and leaves which grow vegetatively till the activities are turned to a different manner in the production of earheads or panicles bearing spikelets (flowers), which, after fertilisation and ripening, become the seeds—the starting point for the next generation. This is the life cycle of a paddy plant. In the different stages of growth, certain deviations from the normal type may occur, due to some complex causes which are not definitely understood. Such deviations are known as 'Monstrosities.'

One such deviation from the typical form has been observed on the Paddy Breeding Station, Aduturai. In the panicle, which consists of spikelets, some of the spikelet or spikelets in a branch are compressed and become transformed into a bunch of leaves (vide photo No. 1). On observation it was noticed to be composed of a short compressed disclike stem, just as in the paddy seedling, with minute roots just starting from it. To know whether this will behave as a separate plant by itself, it was removed from the head in which it was noticed, and planted in a pot. It grew giving forth more leaves and finally produced an earhead. Photo No. 2 represents two plants grown from such monstrosities which were collected in a progeny of a natural cross in the Paddy Breeding Station, Aduturai. It is evidently a case resembling bulbil formation which has been observed in many monocotyledons.

EXTRACTS.

THE ECONOMICS OF THE CATTLE PROBLEM.

By

K. C. Ramakrishnan M. A.

India has the reputation of maintaining the largest number of cattle in the world, though in respect of the number of cattle per head of population she lags behind new countries like the United States, Canada and the Argentine, and old ones which have specialised in animal husbandry, like Denmark and Holland. In cattle, as in other things, India's superiority seems to lie in quantity and not in quality. The singing of the glories of a few fine breeds like the Amrit Mahal, Kankrej, Gir, Sindhi, Ongole and Kangayam—to maintain or improve whose quality as draught or milking animals little organised effort had been put forth until recently—cannot cover the sins of multitudes of miserable mongrels seen all over the country. Our average bullock is a poor draught animal, an impediment to the introduction of improved implements. Our average cow is a very poor milker, giving, according to an authoritative estimate made a few years ago in our Presidency, a net return of 4 pies per day.

It is not commonly recognised that for the available pasture far too many cattle are kept, and there are still some owners of large herds of cattle who seem to revel in mere numbers—reminiscent of the pastoral stage of rural economy when property was counted in terms of cattle. The shrinkage of pasture due to the growth of populations and the expansion of arable land is not peculiar to India; it has been the inevitable fate of all countries where population has multiplied without restriction, and other means of subsistence than agriculture have not kept pace with the increase of numbers. The Japanese and Chinese (to whom in particular the above statement applies) have been obliged to get on with next to no cattle, as there is little land to spare for these. Indeed in these countries the human population has crowded out the bovine. They cultivate their tiny holdings, not with ploughs, but with hand-spade and hoe, and, far from demanding milk and milk products for consumption, they are said to consider these 'ideal' foods positively disgusting, while they indulge in a large variety of animal dishes far less costly to produce.

The wisdom of restricting the number of cattle to the limits which pasture or available fodder or feeding stuff would permit is but very slowly dawning on India. There has not been much deliberate contraction of cattle, though epidemics and starvation have been acting as positive checks. Overstocking of the remnants of common pastures is the rule and the evil is not confined to under-feeding. We keep on so many decrepit and diseased old cattle which not only share the feed that should go entirely to the efficient ones, but offer a fertile field for the spread of epidemics and, if not sterilised, are agencies in the deterioration of breeds. In no other country would their existence be tolerated for a day. A drastic disposal of the diseased has for long been the rule in Western countries, as may, for instance, be evidenced by the rigour with which the Contagious Diseases Act is enforced in England.

Improvement of live-stock, unlike that of machinery where the old may be scrapped and the new substituted, is possible only by the selection of the best from among the existing animals and a ruthless elimination of the unfit. Our religious sentiment is outraged by the suggestion of the slaughter of the weak or inefficient, though a slow torture by continuous starvation on what are euphemistically called pasture grounds, though they are very often standing or starving grounds, is not so shocking. Near cities and towns having a large Muhammadan population it is not an uncommon thing to see in the Shandies old animals being sold away by Hindu ryots for less than Rs. 10 each. In the West, however, cattle are now seldom slaughtered because they are old or weak; they are in fact not allowed to live so long. In countries

like France and Holland, in parts of which bullocks are still used as draught animals, they are broken to work fairly young, worked for a few years and then fattened off for beef. The economic calculations by which cattle breeding and rearing are now guided in America and Germany appear indeed gruesome to a Hindu mind. Cattle of both sexes are considered as machines whose business it is to convert the cheap grains and the inedible products of the farm into consumable commodities, milk or beef. When they begin to yield diminishing returns, *i.e.*, when the additional quantities of feed that they necessarily require as they grow in years begin to result in proportionately smaller increase of milk yield or beef-laying-on, they are considered fit for the butcher's knife; and this accounts for the development of the 'baby-beef industry' in those countries.

This certainly cannot be an ideal for Hindu India. Apart from the staggering affront it would mean to our religion, it is doubtful if from the economic and dietetic points of view a densely populated tropical country like ours would be wise in taking to beef which is more costly to raise than many nutritious vegetable foods. Milk, however, is much cheaper to produce than meat and it ought to be a welcome addition to balance the diet of a predominantly vegetarian nation like ours. And we want, in this country of small fragmented holdings, bullocks for draught purposes, though their number might well be restricted in view of the existence of many tiny holdings and the scope that lies for the introduction of heavier machinery on the bigger farms.

Most of our famous breeds are noted either for milk or for draught and not for both purpose, thus rendering cattle rearing more uneconomic than it need be. The great majority of fine breeds are noted for draught and the cows of such breeds are kept by ryots not for milk but as breeders of draught bullocks. Milk has been practically bred out of them. The cow calves are usually neglected by ryots while the bull calves are pampered. The opposite is the case with buffaloes, kept much more for milk than for draught; the milking animals and heifers are well looked after and the males are deliberately neglected. The cultivators as a class do not sufficiently feed the cows which yield little or no milk, and the non-cultivating classes who keep cows for milk leave little for the calves of either sex which naturally get stunted and become poor breeders or milkers or workers. It is forgotton in all these cases that an animal is an organism that at no stage in its life should be starved or ill-cared for.

If cows could be made to yield more milk in addition to being breeders, and if male buffalos could be used for heavy draught of short lead, wherever power more than speed is required, as in the case of sugarcane crushing and carting timber from forests, far more gain would accrue from cattle rearing as all breeds would then serve dual purposes. From the point of view of pure economics, there is no gainsaying the fact that if these animals, after being used for the dual purposes of draught and milk, could at a certain stage be fattened off for beef as in France, the cattle business would be even more paying. The great wrong, however, that is done by the sacrifice of the cow at the prime of her productive period either for a religious purpose by the Muhammadans or as a method of disposal of an animal which is felt by the *goala* to be costly to maintain in her dry season, should be stopped. But if slaughter for any purpose at any stage is repugnant to the Hindu mind and to that extent we are prepared to sacrifice our economic interests, it is up to us, at any sate, to sterilise and segregate the old, the weak and the inefficient animals and to prevent them from breeding or even mixing with the better ones. In Western India a favourite form of charity is the maintenance of the inefficient in *Pinjrapoles*, though some of these are not well conducted. This is a compromise, though a costly one, which the rest of Hindu India should be prepared to adopt. Let us not in the name of humanity let loose the weak and the inefficient to graze along with the healthy and efficient ones, for all efforts at improvement of live stock may thereby be neutralised.

The truth that communal grazing leads to degenerate breeding has not been burnt into the minds of our cattle breeders and rearers. Breeding is done in a haphazard fashion in most tracts, while the facilities that some primitive professional breeders enjoyed are fast dwindling. Private enclosed pastures, the separation of the sexes and the weeding out of the unfit are rare exceptions. In our Presidency Kangayam is the only tract where these practices obtain and naturally the best draught animals come from that source. In the Nellore tract far less care is taken and the dedication of the Brahmini bulls is no longer a dependable factor in the breeding of cattle. It is the clear duty of the Government Livestock Department not only to evolve dual purpose animals but to supply a large number of breeding bulls to the ryots whom it believes it can persuade to adopt the best methods of animal husbandry. In the face of the reckless practices that prevail, improvement in the quality of our cattle can only be a very slow process.

Meanwhile the fodder scarcity is assuming alarming proportions. The area of pasture is not likely to expand in this country unless it be that more forest areas, not bearing or capable of bearing valuable timber and lying in the neighbourhood of villages, are handed over to Forest Panchayats which may be trusted to regulate grazing and limit the number of animals to the available pasture. It is also possible to raise fodder crops in a system of rotation with food or commercial crops. It is not easy to what extent the advice of Mr. Galletti, I. C. S., given in the columns of the *Statesman* in 1926, that Indian royts should imitate the Italian cultivators who devote a large proportion of their lands to leguminous fodder crops can be followed, as the compensation in the increased yield per acre of food crops as against the diminution in the area under food crops, is not yet a calculable factor. What is gain to the animals may be an unbearable loss to man in this densely-peopled land. But a good deal of fodder that is now wasted or ill-utilised on fields and in forests may be conserved by ensilage. Stall-feeding of superior dairy cows will have also to be resorted, to a much greater extent as in Denmark, Holland and Egypt which import large quantities of wheat bran, oilcakes etc., while such feeding stuffs are increasingly exported from this country, saddled, as it is with a large number of ill-nourished cattle.

The problem of the supply of milk and milk products in cities, and even in villages, is growing very serious. Good milk and butter are nearly as dear in our cities as in London and New York. Here is a statement of Mr. Smith, Imperial Dairy Expert: "The milk supply of India today is indescribably bad; it is filthy, expensive and scarce. No wonder the infant mortality in some of our large cities equals 666 per 1000 infants from birth to one year old." To take up the economic aspect alone, the supply of both milk and ghee is far short of the demand. But there is little demand for pure milk or ghee at a price which would attract the producer. Hence the futility of Adulteration Acts which seem to work more on paper than on milk or ghee. The undisguised watering of milk and the roaring trade in 'ghee mixtures' are bound to continue as long as the dairy industry is a bankrupt one —as it has been pronounced to be, by Mr. Carruth, in the city of Madras which imports the best milking breed of the Presidency. The fact is that the cow of even our best breed is a poor milk yielder compared to the cows of the West and is not worth the

keep at its present rate of yield in a densely peopled tract. Cross bred cows are better yielders but they are more susceptible to disease and the cross bred bulls are no good for draught.

The improvement of the breed of milch cattle by selective and cross breeding from among the best indigenous animals is the *sine qua non* of any satisfactory solution of the milk and the ghee problem though better feeding and housing would contribute their share. But such an improvement cannot hang by itself, if cattle breeding and rearing should be an profitable industry. The power of the draught animals should be improved along with the yield of milch cows. It is to the evolution of such dual purpose animals—cows rich in milk, and oxen strong in muscle—that all the efforts of live-stock experts should be devoted; and the fodder question should be tackled by the agricultural experts. Without a bold and comprehensive policy of breeding and rearing only finer cattle, and the gradual restriction of the number of cattle to the requirements of agriculture and the limits set by the extent of pasture available and the fodder that can be conserved and multiplied the cattle industry is bound to continue in its present unfortunate position. This has been aphoristically summed up by the late Sir Ganga Ram, a member of the Royal Commission on Agriculture in India, when he was examining Mr. Bruen, the Live-stock Expert of the Bombay Presidency:—

Sir Ganga Ram: In the cattle business cattle-lifting pays better than cattle breeding?

Mr. Bruen: That is so!

Sri Minakshi College Miscellany.

Differential response of Barley varieties to manuring.

By selection or hybridisation, varieties of any one plant can be produced which differ markedly in their yielding capacity. Although yielding capacity of plants is controllable by manuring, it is not known whether the increase in yield gained in this way is a function only of the manure added, or whether different varieties respond to varying extent to the manurial combinations given. Interesting results were obtained in the experiment with five varieties of barley. Eleven manurial combinations consisting of of different amounts of phosphate, nitrogen and potash were used. The experiments were done in pot culture using pure and sand solution of pure chemicals.

Varietal differences in response were apparent in all the types of manuring. The effect of immediate interest here is the differential varietal response with the different manures. It is seen that for any one pair of a varieties the relative magnitude of yield differs in an orderly way with the manuring; thus where a significant increase of the first variety over the second was obtained in the phosphate-deficient combinations, the order is reversed in the potash deficient sets and so on. Furthermore even when no significant differences are found with complete manures such differences show themselves in the partially deficient sets.

A difference in efficiency in the use of manures is established and it is further seen that for different varieties tested over the same range of manurial combinations, it is not always the same manurial constituent which in minimum has the most marked effect on relative yield. The agricultural bearings of the results obtained are twofold (1) varietial trials must be combined with manurial trials to be complete and (2) the lines along which to develop selection and breeding of varieties to meet the requirements of different soil types are indicated.

—(From " Nature " dated 28th January 1928.)

DESTRUCTIVE INSECTS AND PESTS ACT, 1927.

(of England.)

This Act, which received the Royal Assent on December 22, 1927, amends the earlier Acts of 1877 and 1907. This Act of 1877 which was passed at a time when the Colorado Beetle was sweeping across the North American Continent, enabled the Privy Council to make Orders for the prevention of the introduction of the Beetle, and its spread in Great Britain. It empowered the Privy Council to require Local Authorities to carry out any Orders issued by the Council, and to pay compensation for any crops destroyed under those Orders. The Act of 1907 extended the 1877 Act to include other insect and fungus pests.

The 1927 Act enables the Ministry's officers to take the urgent action which would be necessary if a new and dangerous pest were discovered, and extends the definition of "insect" in the original Act so as to include "bacteria and other vegetable or animal organisms and any agent causative of a transmissible crop disease." This provision will enable the Ministry to take action against "Virus" diseases, such as Mosaic and Leaf Roll of

potatoes, and diseases of bacterial origin. Power is given for the removal or destruction of any crop infected with a destructive insect introduced into Great Britain, and to take such steps as may be necessary to prevent the spread of the pest. Compensation may be paid by the Ministry for any crops which may be so removed or destroyed, but the amount of compensation and expenses so paid may not exceed £2,000 in any one year without the consent of the Treasury.

The Act also enables the Ministry to charge fees for certificates given after the inspection of crops (the expression "crop" includes seeds, plants or any parts thereof).

Following the precedent established by the Seeds (Amendment) Act of 1925, the time within which proceedings may be instituted for an offence in connection with the movement, sale and consignment or planting of potatoes is extended to twelve months from the day on which the offence was committed.

Under the previous Acts, the maximum penalty which could be imposed for offences against any Order was £10, and experience has shown that this penalty has not always been sufficient to prove a deterrant. Provision has, accordingly, been made in the new Act to increase to £50 the maximum penalty for a second or subsequent offence against an Order.

(The Journal of the Ministry of Agriculture Vol. XXXIV, No. 11, February 1928). Y. R. R.

RAYS AND BREEDING.

It is well known that X-rays in certain doses bring about in mammals a sterility which commences soon after treatment and may be subsequently recovered from in part at least. But while rats and mice are very useful subjects for experiment, being relatively near domesticated animals, the use of X-or radium rays is apt to cause permanent sterility. This fatal disadvantage can be readily avoided by working with such humble creatures as the fruit fly. Moreover, the fruit fly experiments are inexpensive and rapid, and the experimenters who have worked for many years on this particular type, know what to expect in the way of change apart from that induced by the special factor experimented with. Thus Prof. H. J. Muller of the University of Texas has spent eight years in the study of the "mutation rate" of one of the fruit flies, *Drosophila melanogaster*, and is therefore in a very

favourable position for studying the effects of X-ray treatment which may be regulated so as to avoid fatal effects. "It has been found quite conclusively that treatment of the sperm. with relatively heavy doses of X-rays induces the occurrence of true 'gene mutations', in a high proportion of the treated germ cells. Several hundred mutants have been obtained in this way in a short time, and considerably more than a hundred of the mutant genes have been followed through three, four, or more generations." We may recall that "gene" means a hereditary "factor" the germinal representative or initiative of a particular character. They are believed to lie in linear order, like beads on a string, in the nuclear bodies or chromosomes of the germ cells. Most biologists believe that the novelties that crop up in the course of generations in plants and animals are due to changes in the "genes" or hereditary factors, and Muller may be said to have proved this at least, that X-rays may artificially provoke heritable variations usually breeding true and mostly behaving in Mendelian fashion. More than this has been proved, but let us keep to the broad result. "The transmuting action of X-rays on the genes is not confined to the sperm cells, for treatment of the unfertilised females causes mutations about as readily as treatment of the males." The young stages of the eggs in the ovaries are definitely affected. It may be noted that the raying of the sperm cells may be effected in the males or after they have been transferred to the female receptacles. This success in artificially inducing mutations is sure to throw light on the nature and behaviour of the genes, and it also frees the investigator from the necessity of having to wait for mutations to turn up. "For the practical breeder it is hoped that the method will ultimately prove useful." But he had better practise first on a corpus vile like a white rat. The evolutionist should not hurriedly toss aside these and similar experiments as being far away from what may have occurred or may still occur in wild nature. For just as there are ultra-violet rays in sunlight so there is a small amount of gamma radiation present in nature. Whether there is enough to pull the trigger of a mutation will soon be determined experimentally.

Prof. J. A. THOMSON in Scottish, Jl. of Agri. Vol. XI D. G. I.

SOME ASPECTS OF THE PRESENT CATTLE SITUATION IN INDIA.

By

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There is much confusion in thought even among enlightened people in India concerning the cattle problem, though cattle generally enter into the life of the people to a much greater degree in India than in most countries, due largely to religious sentiment.

Compared with the productivity of the country there is a very large population of cattle, the majority of which are of an exceedingly low grade. The great mojority are of such quality that nowhere else in the world would they be allowed to exist. Cattle-rearing is largely divorced from agriculture, and this, along with the general uncertainty of rainfall, accounts for the low standard of fertility which is found over the greater part of India. There are sufficient exceptions to show what can be done with better feeding and better selection.

Probably some of the better types of cattle which still survive are the result of the breeding and feeding by itinerant graziers. Such breeds as the Red Karachi, the Sahiwal and the Gir have been evolved by tribes which were separated from other parts of the country by natural circumstances and promiscuous crossing was thus obviated.

Newspaper correspondents, public leaders etc., frequently have got a general idea that present conditions are hopelessly bad, and in this they are right, but they are generally far from right in their socalled facts and in their proposed methods of improving conditions.

Usually the Government is blamed for curtailing the grazing grounds. The Forest department is blamed for preventing the promiscuous trespass of village cattle through reserved jungle land. The Government is blamed for allowing the export of cattle and sometimes for permitting any cattle to be killed at all. It is perfectly correct to state that a number of ancient grazing tracts are now no longer available. Some of these areas have been turned into fertile agricultural centres by means of irrigation canals, but although the agricultural prosperity of the tract is increased, cattle rearing in many of the canal irrigation areas is very backward.

The average Indian village supports a large number of inferior types of cattle of all sizes and shapes. During the day these cattle are herded on the usually very restricted grazing grounds. Frequently the male animals of all conditions run with the herd and no castration is done. During the monsoon and for some months after, the grass grows rapidly and there is plenty of food; later on during the cold weather and during the dry hot weather, conditions get worse and worse until the cattle are emaciated. Some of the cows in millk get extra feed and so do also the bullocks which are used for carting and well work. Seldom are fodder crops grown, and the roughage if obtainable, consists of dried stalks of jowar (sorghum) etc., and rice straw. Under these conditions good animal cannot be produced and it is their inherited hardiness which enables them to survive.

An engineer with experience of India lecturing in England recently recommends the general introduction of small oil-engine plants for lifting water in wells for cultivation. He suggested that these plants would set free several million bullocks and their food. It is difficult to reconcile this opinion to existing facts. This mass of animals would simply be added to the existing hordes.

One of the greatest obstacles in the way of introduction of improved animal-draught agricultural implements into India is that implements, owing to the inferiority of the draught animals, have got to be cut down to so low a level that they cease to be economical.

A certain amount of improvement can be effected by slow public education in the use of leguminous fodder crops as catch crops for grazing between the staple crops. Where irrigation is available this is an immediate possibility of the greatest value, but in tracts where the monsoon is variable or generally deficient, this procedure has not the same possibilities.

Plate 14 (omitted) is a photograph of cattle found in a *pinjrapole* in North Bihar. This *pinjrapole* is supported by public charity; it is well run and is possibly more efficient than the usual *pinjrapole*. The contrast is brought out between cattle which are probably better fed than usual in India as against cattle which are properly fed and treated on the government farm at Pusa. At Pusa the cattle are fed from the proceeds of a self-contained area of land; no grain is brought from outside.

It is obvious that if religious sentiment requires the retension of a vast number of useless animals, then India has to pay a very heavy price for the privilege, and the price reacts on all sections of the community and is one of the factors which keeps the average cultivator but little above the starvation limit.

(From Journal of the Central Bureau for Animal Husbandry and Dairying in India for January 1928),

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SCIENCE AND LEADERSHIP.

Some instruction in science is now provided at most of the secondary schools in Great Britain. Such instruction, in the case of the boys schools, usually takes the form of an introduction to chemistry and physic while in girls' schools botany and chemistry are frequently the only branches of science taught. For various reasons, which have so often been the subject of reference in these colcums that they need not be repeated now, those pupils who show any aptitude for science are mostly led for the last two years at school to tread the path of specialisation on their journey to universities. They arrive at the universities embryo chemists, physicists, or botanists, where they are hatched out as full-fledged specialists destined to act as guides to others along the same narrow paths, or to apply their specialised knowledge to industry or in one or other of the public services. Only the comparatively few forsake the paths of specialisation and find scope in leadership and control for the exercise of the particular qualities of mind engendered by the study of science.

The demand for early specialisation in science is as vicious in principle and as harmful in its effects as the demand for any form of early vocational training for the children of the less favoured classes of the community. The revolt against the old fashioned classical education was successful because the teaching of the classics had become so socialised that the main object of the study was obscured. It encouraged the worst forms of pedantry; it was de-humanised. There is abundant evidence that the teaching of science is suffering from the same disease. The spirit of science, the systematic observation of facts, the conception of hypotheses, to be discarded if they cannot be verified over a complete range of observations, or enunciated as universal if they stand such test constant challenge to established precedents and authority, is apt to be obscured by a mass of technical trivialities which passes for

scholarship. The influence of scientific discovery upon man's outlook and activities is too often ignored by teachers of science. They incline to look at their several subjects from the inside, and thus not only lose sight of the unity of purpose of the whole range of scientific study, but also fail to appreciate the important impacts of this study upon our common stock of ideas.

At the recent meeting of the Science Masters' Association, Prof. W. A Bone opened a discussion on "Industrial Openings in Scientific Technology:"

. . . . . The teaching of science in schools and most universities is vitiated by over-specialisation, with the resulting tendency to produce experts in the narrowest sense of the term. What is most needed at the present time is an appeal to the science masters in our schools to break with a bad tradition, and by broadening the basis of instruction in science, particularly by the inclusion of biological studies, to extend the mental horizon of their pupils. University teachers will then be the better enabled to equip science students for the responsibilities attaching to the most coveted positions, not only in industry and finance but also in the spheres of higher administration in the State and local government services, the various services and even the judiciary.

Most of us will subscribe to the view that no person can be considered well educated who lacks the equipment to discern the principal forces which are operating to mould our environment. Undoubtedly some knowledge of science and some training in scientific method are essential for such discernment. For the control and direction of affairs, more than this general training is and should be required. It is doubtful whether any one who lacks the capacity for independent and prespicacious inquiry should be entrusted with the cares of leadership. The field of research is sufficiently extensive to provide abundant opportunity for testing such capacity. It behoves us to follow some such precedure in choosing our leaders, rather than continue to leave it to chance circumstance to produce them.

To prevent misunderstanding, let us state definitely that it is not contended that the creative research workers of any country should be hampered by administrative duties. Such research workers are suficiently rare to be given every form of encouragement to extent the bound of knowledge. Their requirements are met by giving them all the facilities they need for their work, the

greatest amount of freedom from external control, and freedem from pecuniary worries. It does not follow that we agree with the often repeated assertion that such men are unfit for administrative control. The success of Newton as Master of the Royal Mint is by no means the exception which proves the accepted rule. Our view is that no country can afford the luxury of diverting them from the pursuit of new knowledge and its dissemination. Their gift of vision is the world's greatest asset: their function is leadership in a supreme degree. Happy the community that is intellectually equipped to appreciate their genius and possesses the will to follow them.

It is the other type of research workers for whom we consider more varied and abundant opportunities should be given for the exercise of their talents. They may be concerned with the critical examination of discoveries being made in a particular field of knowledge with the view of their application or they may be engaged on what is embraced by the term "development work" But because of the existing prejudice in Great Britain against the so-called experts, they are rarely placed in a position to accept full responsibility for the execution of their ideas. Possibly this prejudice is more ingrained in the heirarchy of the Civil service than elsewhere. Cases are on record where administrative officers have come to decisions on technical questions without even consulting the technical advisers of the department. It is repeatedly asserted in administrative circles that a man with intensive knowledge of a particular subject is incapable of unbiased judgment on any matter within its scope upon which there may be difference of opinion. Consequently, when a Royal Commission was appointed to inquire into the state of the coal industry, its members included no scientific authority. It is true that the Commission was assisted by a scientific assessor but on actual member of the commission was competent to examine the scientific experts who gave evidence before it. We are assuming, of course, that finance and economics cannot be regarded as exact sciences.

Obviously there are historic reasons for the prejudice against the expert in the State service. The prejudice, however, should be attributed to the expert's virtues rather than to his vices. The State machine is activated by bias—the bias of one or other of the political parites. The scientific expert who is faithful to his training must deal with facts objectively and not subjectively.

Like the lawyer, it is his function to weigh evidence but unlike the lawyer it is not his function to select only those facts which support his preconcieved hypotheses. If the weight of evidence is against his hypotheses, he must find others. It is only natural that the politician and the administrative head of a department who has to serve him often to the extent of writing a memorandum demolishing all the arguments in a memorandum on the same subject which he had prepared a few months before under a different regime should display a preference for the legalistically minded adviser. The scientific expert cannot be expected to be so accomodating.

Ethical considerations apart, let us assume that the present machinery of government is such that it demands for the smooth working of certain of its parts a type of administrative officer whose function is to serve as a buffer to lessen the shock of impact of impartial judgment on the political heads of the State machine. It does not follow that every part of that machine must be subject to the same control. The State has made itself progressively responsible for providing certain services, the efficient administration of which is entirely dependent upon the way our available resources of technical skill and scientific knowledge are utilized. It is farcial to pretend that they can best be utilized by those who are ignorant of those resources any more than it is safe to assume that the ignorant will seek impartial advice or be unbiased in their judgements. We suggest that the present machinery of government is in need of overhaul. An attempt should be made to differentiate clearly between those departments whose principal functions are political, and those whose activities are governed solely by financial considerations. It is not denied that successful administration depends upon a knowledge of the administrative system, but we fail to understand why this knowledge cannot be acquired by those who have had the advantage of the broad training we suggest in the methods and principles of science.

As we have already said many desirable changes in the teaching of science would be effected if the choice of career of science students were not so limited. Their predetermination to specialisation is bad for them and worse for the country which has built up the tradition. In the continental countries there is no tradition. Men trained in science occupy the highest positions in the State and industry. This may account for the rapidity with which the scientific discoveries of our countrymen are applied to industry in

Germany, and possibly afford an explanation for the slow development of our tropical possessions of Great Britain in comparsion with the rapid development of those of Dutch.

It is high time a survey were made of the positions for which candidates in addition to that ill-defined quality–personality—should possess a sound knowledge of science. We can think of none where this knowledge would not be an advantage. It would lend reality to finance, to the direction of industry, to the administrative services, and even to politics. It would increase our respect for the law if the judges in the special courts dealing with technical matters were themselves able to differentiate between what is and what is not science. It would be worth while trying the experiment of appointing scientifically trained men as governors of our non-self-governing dependencies, instead of distinguished soldiers, or politicians. But it is unlikely that any such survey will be made until there are far more members of the House of Commons who have a knowledge of and abiding interest in science and faith in its methods. It would hasten the day if more teachers of science appreciated the social implications of their studies and led their students to realize that mordern statecraft must be based upon a comprehensive study of the sciences.

(From "Nature" dated 18th February 1928.

MADRAS FORECASTS. (1927-28.)

Paddy. Second Report.

The area sown with paddy up to the end of November is estimated at 9,783,000 acres or a decrease of 2.5 %. The reduction occurs in most districts out-side the Circars and chiefly in Cuddapah and Chingleput. The first crop has been harvested everywhere. Heavy rains in November have reduced the yield in West Godavari and Kistna. The crop has suffered from drought to some extent in Chingleput, South-Arcot, Chittoor, North Arcot, Salem and Tanjore. Most other districts report normal or slightly above normal yields. The seasonal factor works out at 100 % of the average.

Paddy. Final Report.

The area sown in 1927–28 is estimated at 10,889,000 acres. 1,106,000 acres have been sown since the second report, mainly in the Godavaris, Anantapur, Chingleput, South Arcot, Chittoor, North Arcot Ramnad and Tinnevelly. The harvest of the main crop has been finished in most districts. It has been affected by drought in Chingleput, South Arcot, Central districts except Coimbatore and the South except Madura. South Arcot and North Arcot were specially affected. Yields in other districts are normal or slightly above normal. The seasonal factor works out at 98% and the yield at 100,057,000 Cwt. of cleaned rice.

Sugarcane. Final Report.

The area planted with sugarcane upto the end of December is estimated at 105,350 acres or a decrease of about 8.5%. The harvest has commenced in most districts. South Arcot, the Central districts except Chittoor and the South suffered from drought somewhat. Normal or slightly above normal, yields are expected in other districts. The seasonal factor works out at 98%, the yield is estimated at 294,690 tons of jaggery.

Gingelly. Third Report.

The area sown up to the end of December is estimated at 629,900 acres, an increase of about 39%. The increase is due to timely sowing rains and occurs in most districts. The greatest area is found in West Godavari, Chingleput, South Arcot, North Arcot Salem and Coimbatore. The main crop has been harvested except in the South. The yield was below normal especially in West Godavari, Bellary, North Arcot and in others normal. The seasonal factor works out at 98% and the yield is estimated at 82,500 tons.

Groundnut. Final Report.

The area sown in 1927 is estimated at 3,260,100 acres or an increase over last year of 22%. The increase is due to good sowing rains and remunarative prices. It is grown on all soils. It is replacing cotton especially in Kurnool. The harvest of summer and early crop was finished by the beginning of October and that of main crop is proceeding. Chingleput, North Arcot, and South-Arcot, Salem, Trichinopoly, Tanjore and Madura suffered from drought. In other districts yields are expected to be normal. The

seasonal factor for this year's crops works out at 97% and the yield is estimated at 15,85,000 tons of unshelled nuts, the highest reported.

Castor. The area is estimated at 342,800 acres that is a decrease of 6·5% chiefly in Guntur, Kurnool, Bellary, Nellore. Normal yields are reported except from Bellary and South Arcot. The seasonal factor works out at 100% and the yield estimated is 34,400 tons.

Indigo. Second Report.

The area shown up to November is 32,900 acres a decrease of 40% due to small demand for the dye.

Cotton. Third Report.

The area sown with cotton up to the end of November is estimated at 16,50,200 acres a decrease of 13·15% due to reduction especially in "Northerns" and "Westerns" areas. The area under irrigated Cambodia is estimated at 1,18,400 acres, a decrease of 13%. In Ganjam, Vizag, Godavari the crops suffered from heavy rains. The seasonal factor works out at 100% and an yield of 3,37,400 bales of 400 lbs., lint is estimated.

Cotton. Fourth Report.

The area sown up to the end of January is 1,946,500 acres. Picking of early sown crop is in progress the, yield is normal The seasonal factor works out at 95% and the number of bales estimated at is 391,000.

DEPARTMENT'S WORK. SEPTEMBER 1927.

Weather. The rainfall was up to or above the average in all districts except Ganjam, Vizag and Godavari (East and West) owing to the good rains received in the second fortnight of the month. These rains revived the standing crops and brought partial supplies to many of the rainfed tanks. Good rains were received in the first week of the month in Chingleput, South Arcot the Central districts and Madura.

Irrigation supplies were generally sufficient for standing crops in the Circars (Guntur excepted), Kurnool, Cuddapah, Nellore, Coimbatore. Trichinopoly, Tanjore and the Periyar area of Madura and on the West Coast and inadequate in parts of other districts.

Standing crops were good in parts and fair in others.

Waltair Circle. On land in the Bodokimidi estate under the Court of Wards, this department is demonstrating the cultivation of sugarcane and the value of green manuring. At Anakapalle station, canes 6½ months old were cut and planted in the nursery. Sulphate of ammonia applied forced the growth of the canes. At Yellamnchali 550 acres of paddy were under economic planting. At Anakapalle and at Samalkota crops of J. 247 cane left without irrigation were doing well and were not inferior to irrigated ones.

Guntur Circle. The ridge system of planting turmeric was introduced and the method of curing it in a big rectangular iron pan over a sindewahe furnace was becoming popular. The District staff visited 104 villages.

Bellary Circle. H. 25 cotton introduced in Kurnool suits local conditions of soil and rainfall and N. 14 cotton is better fitted to Nandikotkur where the soils are lighter and the rainfall heavier. The practice of economic planting of paddy is spreading. The *Hingari* rains were later in this circle, by three or four weeks and the crops suffered in consequence. Good rains were received in the second week and the cotton sowings were over.

Madras Circle. Palakuppam received good rains; in result insect pests in groundnut disappeared and its flowering began. Cumbu crop began an average of 500 lbs. per acre per year. There was rain throughout this circle but was unevenly distributed 218 villages were visited by the staff and 55 iron ploughs were sold besides quantities of paddy and green manure seeds. The Industrial school at Ikkadu (Trivellore) set up a small exhibition of cheap iron ploughs. The district officers demonstrated the usefulness of treating bleeding diseases on ccoaunts in Mutupet, Jambuvanodai Uppar and Alangad.

Trichinopoly circle. The bunch variety of groundnut has been introduced here and improvements on cotton culture advocated. 116 villages were visited. The effects of demonstration farms on ryots in the neighbour-hood of Tanjore and Mulangudi were visible.

Madura Circle :—Demonstration work was continued. Periamanjal cholam was introduced as a fodder crop in dry tracts in place of Irungu cholam. There was fair rain throughout this circle.

West Coast Circle :—Unusually heavy rains were experienced towards the end of the month, which interfered with the harvest of paddy and caused some damage. The midduration strains of Tavalakannan and Kayama were increasing in popularity. The officers visited 204 villages.

Coimbatore-Salem circle :—Seed farms introduced in different villages fro Cambodia and Karunganni cotton were proving very useful and popular, and a start was made with the help of the Co-operative Department to convert the seed farms into co-operative societies and federate these into ginning and sales societies. To distribute cotton seed 35 depots were opened and sufficient Cambodia and Karunganni seeds to sow 11,260 acres were distributed. The rainfall in this circle was low and cotton was therefore dibbled in the ragi stubble – a practice to be deprecated.

Cattle Farms :—Good rains were received at Hosur and a good season was ensured. A number of varieties of grass seed was sown. Welcome rains were received on other cattle farms also and grazing was obtainable. 38 cows and 14 buffaloes were covered by stud bulls and the conditions under which government assistance could be given for the manitenance of breeding bulls in suitable localities were revised and published for general information.

JANUARY RAINFALL IN MADRAS.

No. of Stations	Districts	First Half.	Second Half.	Mean average month.	No. of rainy days.	Mean average rainy days.
16	CIRCARS—Ganjam (Littoral.)	...	...	0·26	...	0·5
17	Vizagpatam (Do.)	...	..	0·28	...	0·5
14	East Godavari Plains ...	...	...	0·22	...	0·3
8	West Godavari ...	...	...	0·16	...	0·3
13	Kistna ...	...	...	0·42	...	0·5
16	Guntur ...	...	...	0·35	...	0·5
15	DECCAN—Kurnool ...	...	...	0·18	...	0·4
11	Bellary ...	...	...	0·06	...	0·1
14	Anantapur ...	...	...	0·13	...	0·3
11	Cuddapah ...	...	...	0·44	...	0·5
16	CARNATIC—Nellore ...	0·04	0·01	1·03	0·1	1·0
14	Chingleput ...	0·53	0·03	1·17	1·1	1·4
1	Madras ...	1·14	...	1·14	1·0	1·4
17	South Arcot ...	1·31	0·01	1·12	2·6	1·4
13	CENTRAL—Chittoor ...	...	0·11	0·88	0·4	1·0
16	North Arcot ...	...	0·22	0·76	0·3	1·0
21	Salem ...	...	0·08	0·43	0·2	0·8
21	Coimbatore ...	0·03	0·09	0·50	0·3	0·8
1	Kollegal ...	...	...	0·14	...	0·3
16	Trichinopoly ...	0·41	0·05	0·79	1·3	1·1
11	Pudukota ...	0·90	...	0·82	2·3	1·2
26	SOUTH—Tanjore ...	4·66	0·06	1·37	4·4	1·9
15	Madura ...	0·22	0·09	0·79	1·0	1·3
21	Ramnad ...	0·93	0·05	1·15	1·9	1·6
21	Tinnevelly ...	1·12	0·27	1·75	3·1	2·3
6	HILLS—Ganjam Agency ...	...	...	0·30	...	0·6
11	Vizag Agency ...	...	...	0·16	...	0·4
5	East Godavari Agency.	...	...	0·26	...	0·4
1	Kodaikanal ...	1·54	1·87	1·89	4·	2·6
1	Yercaud ...	0·19	0·55	0·78	2·	1·0
11	The Nilgiris ...	0·39	1·16	1·29	2·5	1·7
1	Anamalais ...	0·20	0·11	0·20	2·	...
10	WEST COAST—Coorg ...	0·12	0·10	0·19	0·9	0·38
11	South Kanara ...	0·21	...	0·14	0·1	0·2
25	Malabar ...	0·06	0·03	0·31	0·2	0·5
6	Cochin ...	...	0·26	0·39	0·3	0·5
9	Devikulam ...	0·52	0·19	1·42	2·1	2·3
14	Kottayam ...	0·13	0·44	0·77	1·0	1·0
21	Quilon ...	0·94	0·34	1·37	2·7	1·7
31	Trivandrum ...	0.41	0·25	1·43	1·8	2·1

AGRICULTURAL COLLEGE, COIMBATORE,

METEROLOGICAL OBSERVATIONS.

January 1928.

Date.	Barometric pressure reduced to 32° F inches.	Wind Velocity per hour (Miles)	Maximum shade temperature	Minimum shade temperature.	Rainfall in inches.
1	28·639	2·9	86·8	58·5	Nil.
2	28·621	2·4	89·0	57·0	Nil.
3	28·631	2·7	87·0	64·5	Nil.
4	28·633	2·0	87·5	64·8	Nil.
5	28·628	2·8	84.0	69·5	Drizzle.
6	28·640	3·7	82·0	70·0	Drizzle.
7	28·630	4·2	83 0	70·5	Nil.
8	28·648	3·8	86·0	70·0	Drizzle.
9	28·636	4·1	88·5	69·0	Nil.
10	28·626	3 7	88·3	64·1	Nil.
11	28·628	3·4	87·0	66·0	Nil.
12	28·622	3·1	86·0	67·8	Nil.
13	28·630	3·4	86·5	65·5	Nil.
14	28·682	4·1	85·0	67·8	Nil.
15	28·680	4·1	87·0	61·0	Nil.
16	28·676	3·8	84·0	58·5	Nil.
17	28·647	3·1	86·5	66·0	Nil.
18	28·658	3·0	85·0	64·0	Nil.
19	28·662	3·5	88·0	66·0	Nil.
20	28·658	3·4	85·2	60·2	Nil.
21	28·638	5·3	86·0	61·0	Nil.
22	28·620	3·4	87·5	68·5	Nil.
23	28·516	4·3	89·5	69·0	Nil.
24	28·576	3·3	90·0	68·5	Nil.
25	28·55	2·7	90·0	69·0	Nil.
26	28·541	3·5	91·0	71·0	Nil.
27	28·565	5·9	91·5	77·5	Nil.
28	28·575	3·9	90·2	69·0	Nil.
29	28·599	3·9	91·0	67·5	Nil.
30	28·579	3·7	91·0	70·0	Nil.
31	28·611	3·6	92·0	71·0	Nil.

AGRICULTURAL COLLEGE, COIMBATORE.

METEOROLOGICAL OBSERVATIONS.

February 1928.

Date.	Barometric pressure reduced to 32° F inches.	Wind velocity per hour (Miles.)	Maximum shade temperature.	Minimum shade temperature	Rainfall in inches.
1	28·625	3·2	93·0	64·5	
2	28·583	5·1	90·2	72·0	Nil.
3	28·586	5·3	87·0	71·5	Nil.
4	28·572	2·8	87·5	70·5	Nil.
5	28·554	2·3	83·6	71·1	0·58
6	28·544	2.5	81·3	71·7	Drizzle.
7	28·571	3.7	86·8	71·2	0·07
8	28·609	3.7	86·8	72·9	0·04
9	28·595	3·3	87·7	72·1	0·02
10	28·597	2·7	91·1	67·7	Nil.
11	28·614	4·4	91·8	66·4	Nil.
12	28·677	4·7	90·3	64·3	Nil.
13	28·670	3·6	89·4	64·5	Nil.
14	28·607	3·2	92·4	59·7	Nil.
15	28·607	2·4	90·3	60·2	Nil.
16	28·598	3·7	91·6	63·2	Nil.
17	28·559	2·5	91·3	62·3	Nil.
18	28·575	3·4	93·9	66·3	Nil.
19	28·665	3·5	93·7	64·5	Nil.
20	28·657	3·5	91·6	65·6	Nil.
21	28·645	3·6	92·6	65·3	Nil.
22	28·621	3·0	92·6	63·1	Nil.
23	28·647	5·7	92·8	66·6	Nil.
24	28·631	2·4	91·6	65·4	Nil.
25	23·597	2·8	92·2	64·5	Nil.
26	28·568	3·1	93·5	68·7	Nil.
27	28·582	2·6	94·1	71·2	Nil.
28	28·628	3·9	93·9	67·2	Nil.
29	28·590	3·2	91·4	63·8	Nil.

NOTES.

Farming on the Film-Educational Enterprise. The office of the Motion Pictures, Department of Agriculture, U. S. A. is concerned with the production and distribution of educational films dealing with the problems of agriculture and farm and home economics. A wide variety of the important activities of the U. S. A. Department of Agriculture has been covered by the films. Those now in circulation include the following:—

Beef-cattle, Dairy cattle, dairy products, diseases of cattle, parasites of cattle, horses, sheep industry, swine husbandry, poultry production wild game and bird protection, cereal crop production, diseases and insects, cotton production and insect control, fruit production, home gardening. miscellaneous crops, farm engineering, types of road construction, food inspection, forest fire prevention, marketing of farm products, co-operative marketing, rural organisation, agricultural extension work, rural sociology, weather forecasting and various other subjects.

(From Queensland Agricultural Journal, January 1928.)

S. V. D.

Students' Tours :—Class III and Class II assembled at the Exhibition grounds during the Congress Session in Madras; spending a day more there, they dispersed, the former to Hosur and the latter to South.

Class III spent a few days at Bangalore during which period they had the very rare opportunity of visiting the excellent Ganganahalli Estate of Mr. Mac Isaac about 20 miles from Bangalore. This gentleman is reported to have reclaimed the estate from a mere scrub jungle, converted it into a beautiful garden, growing at present pears, apples, apricots and other fruits of excellent quality and in considerable quantities. The subsoil irrigation for fruit trees and the subsoil drainage he has introduced were an object lesson never to be forgotton by those present. Enjoying his hospitality, the party returned to Coimbatore on the 14th in time for the Pongal holidays. This party was in charge of the Vice-Principal M. R. Ry. D. Balakrishnamurthi Garu. Assistant Lecturer in Botany M. R. Ry. P. S. Jivanna Rao Avl : also accompanied the party. At Bangalore, the students visited the Imperial Institute of Dairying and other important institutions besides paying a visit to the Hebbal farm.

Class II visited important places in South Arcot, Tanjore, spent two days at Palayakottai and returned. They also visited the magnificient irrigation anicuts near Trichy. This party was in charge of M. R. Ry. T. V. Rajagopalachariar Avl; Lecturer in Agriculture. The Lecturer in Engineering, and the assistant lecturers in Entomology and Botany were with the party. The engineering works in the Golden Rocks were of very great interest and were instructive.

Animal Nutrition. A few experiments conducted at the Central Farm, Coimbatore, at the instance of the Physiological Chemist about four years ago and the collaboration that has been made possible between this officer and the officers of this department hastened the starting of animal nutrition experiments at Coimbatore. Mr. P. Venkataramayya, M A., B. Sc., who had some training at the Bangalore Institute has been put in charge of this work. Buildings are almost getting compeleted and experiments will begin about the beginning of April. The new line of research has great potentialities for opening up problems connected with the fodder question in this presidency. We hope this section will devote itself not only to the pressing practical problems of the hour but will also take up fundamental problems in its own way.

We offer our *congratulations* to our members Rao Sahib Mr. T. S. Venkataraman and Mr. D. Ananda Rao on the Rao Bahadurship that has been conferred upon them. Mr. T.S. Venkataraman won his Rao Sahibship in 1920 and has done considerable work in the cane line. His selections at Coimbatore have spread in most provinces in India and a few have won golden opinions in a far off noted cane country like Cuba. Mr. D. Ananda Rao is the senior Deputy Director. His work both at the College as Assistant Principal and in the District as a circle officer has been uniformally good and the title bestowed on him was long overdue. We wish our friends will earn much bigger titles in due course.

We are glad to learn that *Rao Bahadur M. R. Ramasami Sivan* our retired Principal has not left grass to grow under his feet but is as active as ever. He has gone to Benares at the instance of Pandit Manamohan Malavaya-the Vice-Chancellor, to organise an agricultural section at the Hindu University. We hope Mr. Sivan's Work in this connexion will be of a lasting character and bring credit to this province.

Interrugnum :— We are gratified to learn that Mr. Anstead who went on a short holiday to Upper India with effect from 23rd December returned to duty in the third week of January. We are sure this trip of his which he seemd to have long contemplated has brought him renewed health and increased his acquaintance with instructive and important places. During the interval Mr. G. R. Hilson, Cotton Specialist was officiating.

A special feature of this year's *Work, at the College* was the delivery of lectures on different aspects of agriculture to the class of co-operators that was instituted at Coimbatore at the instance of the Registrar. It is well that such lectures are given but we wonder whether a practical subject—agriculture—can impress itself on the class of students selected for the co-operators class. It would be well that agriculturists get much more training-in co-operation than co-operators can in agriculture. Because at any rate in this country and much more in this province, co-operators' work lie mainly in the village and in reference to land the cultivating classes with whom however, an agriculturist is in a better position to deal.

North-East Monsoon rains have not been favourable this year. They have been in defect in some places and failed altogether in some others. So some anxiety is excusable on the part of the cultivator to tide over the next season, i.e., until at least he is in a position to gather a decent harvest next.

A new cotton harvester. A new cotton fibre gathering machine will shortly be put on the market in U. S. A. capable of doing work of 100 handworkers. The machine possesses working parts provided with steel "fingers" which automatically remove the cotton fibres from the ripe or open individual bolls. It has two vertical drums, each fitted with 500 fingers which rotate at a high speed as the machine moves forward each of them gathering fibres from one side only. As the machine proceeds, the gathered fibres are wound round a reel and when the reel is full, a special mechanism based on air suction comes into action, releasing the reel which holds the fibre and depositing the latter in sacks placed ready in the rear.

Working continuously for 24 hours, the machine can do the work of 100 men working the same number of hours and needs only two men to look after it one to drive and the other to put the sack in position and remove when full.

Such quick work obviates the serious difficulty, which exists in districts where labor is scarce, of the impossibility of immediately harvesting the ripe cotton which thus remains for some time on the plant and deteriorates.

(From Queensland Agricultural Journal January 1928.)

Australia's trade with India. Exports of Australian wheat to India during 1926-27 amounted to 40,400 tons as compared with 35,400 tons in 1925-26. There was also an increase in shipments of horses and wooden railway sleepers, whilst raw wool decreased from 632,000 lb. in 1925-26 to 365,000 lb. in 1926-27.

The principal imports from India to Australia in 1926-27 were: Gunny bags—86,000,000; Gunny cloth—26,500,000 yards and Tea 8,00,0,000 lb.

Imports of goats' skins, carpets and rugs showed an increase.

(From Queensland Agricultural Journal, January 1928).

S. V. D.

Prickly Pear Pest :—The Council for Scientific and Industrial Research of the Australian Commonwealth Government which is financed by a vote of £ 250,000 is investigating among other problems, the eradication of pests affecting agricultural developments. As an instance of the magnitude and gravity of the problems, the cause of prickly pear may be cited. This pest now covers 60,000,000 acres in New South Wales and Queensland, which is about three times the total cultivated area of Australia and is reported to be spreading at the rate of one million acres a year. Measures which would merely prevent its spread would result in the saving of £250,000 annually at the low valuation of 5s. per acre. Insects for destroying the prickly pear have been introduced and the results are encouraging.

(From Tropical Agriculture, February 1928). S. V. D.

Indian Labour in Malaya :—The prosperity of Malayan trade industry is dependent upon an adequate supply of labor. Fortunately we are situated geographically, sufficiently close to the main sources of supply, namely China and India.

The mining industry is more or less conducted with Chinese labor. On the rubber estates, the Indian laborer from Southern India predominates, but there are also a large number of Chinese employed on the various rubber plantations throughout the country. In the towns Chinese are almost universally employed in rubber,

saw and rice-mills and building trades; while Indians are employed as ordinary laborers in construction and maintenance of roads and public works. The Chinese again predominate as house servants. From time to time there have been undoubtedly considerable shortages of labor in the planting industry, but the excess of arrivals over departures in Malayan ports from non-Malayan, in 1924 was 100,000 and in 1926 it was no less than 300,000.

(From Tropical Agriculture, February 1928). S. V. D.

Chemical Industries in Southern India :—The utilization of limes and tamarinds was among the first problems to be investigated. Limes grown in the Kistna district contains only 3% of citric acid (compare 7% for West Indian limes) consequently, it was found unremunerative to use them for manufacturing citric acid. The supply of limes is inadequate and the cost of reagents and plant is high. The greatest hope of success lies in the production of calcium citrate from South Indian limes. It is also unremunerative to manufacture tartaric acid from tamarinds, although calcium tartrate may perhaps he manufactured with profit. If the sugars of the tamarind could feasibly be converted into alcohol, the industry might be made to pay.

Investigations into the possibility of manufacturing malted foods from cholam indicated that this was quite practicable but that it would need adequate finance to render it commercially successful.

The most useful research, however, has proved to be that on coir production. The conditions for satisfactory retting have been carefully examined and the bacteriology of the process has been studied. It was found that contrary to established belief, brackish water is not essential to good retting and that coconut husks themselves contain the necessary bacterial flora. During retting the material that bind together the coir fibres is decomposed. It is made up chiefly of mucilaginous or gummy substances. Attempts to soften the husk by the use of chemical reagents yielded very inferior coir. The best procedure for retting was found to consist in a preliminary soaking process (whereby suitable bacterial growth was established) followed by crushing between rollers and finally returning the crushed husks to the soaking vats. By this means the time of retting was considerably reduced and good quality fibre could be obtained in less than two months.

(From Tropical Agriculture, February 1928.) S. V. D

REVIEWS.

Madras Bulletin. This bulletin which extends over 16 pages, condenses in a small compass the history of a certain crops grown in the Presidency from 'sowing' to 'harvest' and describes the vicissitudes they suffer under certain seasonal conditions. The information is tabulated month by month and under each month brief notes are added regarding the normal weather and the prices of the crop and agricultural operations carried on during the month. Any student of agriculture can by reference to this bulletin obtain correct ideas as to the crops sown in a month, the stage of the crops including their growth and maturity. This bulletin designed for Madras is well conceived and worked out and replaces an earlier similar but incomplete publication of the Government of India. We congratulare the statistical section of the local Agricultural Department on the very useful information contained herein which must have taken considerable time and ingenuity in disentangling particulars from the generally incoherent and incomplete crop reports that are being received from the Taluk offices.

Agricultural Journal of India. January 1928. This number of the journal contains very informing articles and the selections are equally useful. Dr. D. Clouston's concise notice of the late Dr. James Mollison and Dr. Burna an Appreciation of Dr. Harold H. Mann are personal notes which touch the tenderest chord in every Indian who has had some contact with these two great men or who has gained some knowledge of their work on this country. Mr. M. L. Darling continues his articles on economic holding or the Family Farm and in this number discribes about France and Belgium and compares with conditions in Punjab.

Mr. P. H. Carpenter's article on Tea in North East India brings information on this useful plantion product up to date with sufficient details and statistics.

A contribution on Coimbatore seedling canes by Rao Bahadur T. S. Venkataraman and Mr. U. Vittal Rao gaves brief descriptions of the most popular of them viz., Cos 205, 210, 213, 214 and 223. It is hardly necessary to speak about the excellence of these seedlings and readers have already been made familiar in a former issue with the golden opinions which some of these have earned in Cuba. The technique of raising seedling canes in Java culled from the "International Sugar Journal" is well worth perusal.

Tom Lewis in his article on 'Co-operative Societies' and some of their difficulties (reprinted here) goes to the root of the matter and sufficiently points out certain defects common not only to Britian, especially Wales, but to this country also.

Studies in Rural Economics. By P. R. Venkatasubramaniam. This is one of the few books on rural studies under taken in India. The author with an insight into the rural life of a typical village Vazhamangalam in the land locked state of Pudduk-kotah has brought out in detail, the economic condition of the village. A description of the physical features of the village, the incidence of revenue levied on various classes of land and especially details about the cultivation of individul crops and systems of rotation adopted, form a special feature of this little book. From a detailed analysis of the figures the author comes to the conclusion that there is a deficiency per family of rupees seven in an average year. One could therefore fancy what this really means in a lean year or a successions of lean years characteristic of this tract. We congratulate the author as he has struck a new line and would welcome many more contributions from his incisive pen. The book is moderately priced at rupee one and should be found not only with students of economics but those who follow current economic problems carefully.

QUESTIONNARIE ON AGRICULTURAL MARKETING.

Crops for Sale.

1. What are the important crops in your locality and the conditions favouring their production ?

2. Estimate the costs of production of the crop in question. Quote any farm accounts maintained.

3. Of the produce harvested, what are the proportions (*i*) available for immediate sale, (*ii*) stored for consumption and stored for sale at top prices later on ?

4. How much of the produce is sold in the village to dealers? How much is taken to markets?

Transport.

5. Give the distance between producing, marketing and consuming centres by land or water.

6. What is the conditions of the roads in and out of the village up to the market? Is there any traffic by moter lorries?

7. Is there any river or canal or coastal traffic? If so, what are the limitations?

8. How far is the village from the railway routing to market centres inconvenient?

9. Sum up the complaints re inadequate supplies of vans, absence of special vans for perishables, mishandling, delay, misappropriation, annoyance and corruption.

10. How do the rates for carriage of produce by the several agencies mentioned above compare?

11. How are the rates determined as far as you can see? Are unfair preferences and concessions shown?

12. Is any special attention paid to the packing of perishable goods? Is any other precaution taken?

Warehousing.

13. Are there any warehousing facilities at railway, shipping and market centre?

14. Are advances on produce stored in godowns of banks given to producers and traders?

Market Charges.

15. Estimate the time and money spent by producers in going to market and returning in selling at market or hawking outside?

16. What is the amount of money spent in boarding, lodging and indulgence if any in market centres?

17. Give an account of the market charges by producers and dealers on items such as: gate fee, stall fee, fees for cleaning, bagging, weighing, measuring and loading, religious and charitable cesses authorised and unauthorised, payments for the police, market servants, beggars etc.

Weights and Measures.

18. Mention the variety of weights and measures used in and around the market. Are different ones used for buying and for selling?

19. Are weights and measures used? Is any precaution taken by police or other authorities?

Adulteration.

20. Are there complaints of mixing and damping by producers or middlemen? How far is adulteration due to carelessness and how far is it deliberate? Describe the existing methods of adulteration.

21. Are any standards recognised in markets and premiums offered, or is there any other encouragement shown by the trade for superior qualities? Do consumers show a distinct preference for better goods?

The Middlemen.

22. Give an idea of the number and series of middlemen between producers and consumers and the services they render.

23. Are the middlemen brokers, commission agents or paid servants of merchants?

24. What are the castes and general occupations of middlemen—their principal and subsidiary ones?

25. For how long are they in the trade? What do they do the rest of the year?

26. What are the rates of remuneration or profits received by each one of them roughly? Quote actual cases, if possible.

27. Sketch the organisation of big firms manufacturing or exporting agricultural produce and employing agents.

28. How far are cultivators financed by merchants and smaller dealers and by others unconnected with trade?

29. Distinguish between advances made for cultivation expenses, for sustenance of the family and other expenditure.

30. What are the rates of interest? Are there any other stipulations? Is the produce pledged?

31. Are forward sales effected? If so, on what terms? What are the penalties attaching to non-fulfilment.

32. What is the stage at which advances are solicited or given and forward sales effected?

33. Are there other reasons than financial needs that force sale immediately after harvest?

Prices.

34. Note and account for the degree of difference in prices between those of free and pledged produce, village and bazaar, wholesale and retail and harvest and top prices.

35. How far can you discover the working of price-fixing factors and agencies in your market? How far does the producer understand this and utilise any such knowledge?

Market News.

36. Do ryots, at least the bigger ones get any information re crop forecasts and returns, state of markets of the country and of the world and complaints about produce? Do they take any action on that?

37. Do merchants and traders make any use of crop forecast and returns and telegrams of prices in markets at home and aboard?

38. Is there any trade association which organises the supply of information concerning markets which is not supplied by the Government?

Co-operative Sale.

39. Has any co-operative sale society been started in or near your place? Or has the credit society undertaken to help sell produce directly or indirectly through a union?

40. In either case ascertain the volume of transactions the regularity of sales and the benefits confered by joint sale.

41. If the attempt has been successful is there any scope for the enlargement of the enterprise? What are the limitation to expansion?

42. If co-operative sale has been a failure point out the causes of failure, cutting facts and figures.

43. Apart from difficulties common to all agricultural marketing, how far is failure of co-operative marketing due to paucity of members, lack of loyalty, wrangling over quality, lack of business ability on the part of management, dishonesty, struggle with organised middlemen, want of financial resources?

44. Has there been any linking of producers' sale societies with consumers' stores? If any such effort has failed, why has it? Where and how do the stores generally purchase their requirements?

45. Has co-operative production or conversion of produce helped sale? What are the prospects of societies of this type in your area?

46. Have central banks refused any help in finance reasonably sought? Has the Imperial Bank helped?

47. Is any help rendered by the Government to sale societies through its agricultural department—by way of distribution of improved seeds for members, demonstration, inspection and certification of produce?

48. Does the Government help by way of loans and grants for building of granaries and for purchase and installation of machinery or otherwise? Has Government help been solicited and refused at any time?

49. Do big manufacturing and exporting firms show any special favour to sale societies or exhibit any prejudice against them under the influence of the organised middlemen?

50. Do railways show any marked concession to the societies?

Suggestions of future points for investigation and enquiries as to elucidation of any of the above points may be made to undersigned:—

K. C. Ramakrishnan,

University Lecturer in Economics, Senate House, Triplicane, Madras.

Please State:—

Village or town studied.....

Market centre.....

Taluk and District.....

Name of the investigator.....

Occupation & Address.....

Duration of the investigation.....

DEPARTMENTAL NOTIFICATIONS.

Mr. M. Mangesha Rao, Assistant Director, 8th Circle to be in charge of current duties, 8th Circle during the absence of Mr. D. G. Munro, on deputation to the Agency.

Mr. H. Shiva Rao, Lecturer in Chemistry, leave on average pay for three weeks from 4th January 1928.

Mr. K. Gopalakrishna Raju Assistant Director, on relief by Mr. Y. G. Krishna Rao to be Assistant Director, 8th Circle reverting Mr. M. Mangesha Rao.

NON-GAZETTED: PROMOTIONS, TRANSFERS ETC:

Lower Subordinates Messrs K. Sitarama Ayyar, U. S. Ayyaswami Ayyar, P. V. Sambasiva Rao, T. Seshachalam and S. Suryanarayana are promoted to the Upper division V grade from 10th January 1928. Mr. Bhairy Siva Rao, Demonstrator, Tirutani is transferred to Madanapalle.

LEAVE ETC:—*First circle*: A. Kondayya Sarma Assistant Demonstrator Nidadavole, leave on average pay from 3rd January to 31st January in continuation of the Xmas and New Year holidays. Mr. Nheelamani Bakta, Assistant Demonstrator, Vaddadi leave on average pay for 12 days from 24-1-28. Mr. P. V. Sambasiva Rao, Demonstrator, Yellamanchelli, extension of leave on average pay for three weeks.

Second circle:—Mr. V. V. S. Varadarajan Assistant Demonstrator, Gudivada leave on average pay for one month from 6 February.

Third circle:—Mr. K. Hanumantha Rao, Assistant Demonstrator, Kudligi leave on average pay for 15 days from 4th January. Mr. K. T. Bhandary, Demonstrator, Hospet, leave on average pay for 4 days from 4th January. Mr. K. Raghavacharya, Farm Manager, extension of leave on average pay for one week. Mr. N. Annaswami, Manager, Hagari, leave on average pay for one month and one day from 3rd January. Mr. P. Naghadar Nayadu, Assistant Demonstrator, Kurnool leave on average pay for three months and thirteen days from 4th January. Mr. A. Krishnaswami Ayyar Demonstrator, Tadpatri, leave on average pay for ten days from 2nd Febrary. Mr. S. Varada rajulu Nayadu, Assistant Manager, Nandyal leave on average pay for 17 days from 13th February.

Fourth circle:—Mr. Bhairy Shiva Rao, Demonstrator Tirutani, leave on average pay for 29 days from 1st February. Mr. N. C. Tirumalai, Manager Palur, extension of leave on medical certificate for one month and eighteen days from 4th January with permission to prefix the Xmas holidays. Mr. M. C. Krishnaswami Sarma, Assistant Manager, Palur, extension of leave on average pay for 17 days.

Sixth circle:—Mr. F. Rajagopal Mal, Demonstrator, Koilpatti, leave on average pay for three months in continuation of the Xmas and New Year holidays. Mr. V. Ayyaswami Ayyar, Demonstrator, Srivaikuntam, leave on average pay for two days in continuation of the Xmas and New Year holidays. Mr. K. Ramaswami Ayyar, Demonstrator, Sholavandan, extension of leave on a average pay one day in continuation of the Xmas holidays.

Seventh circle:—Mr. M.U. Vellodi, Manager, Nileshwar, leave on average pay for 9 days in continuation of the Xmas holidays.

Eighth circle:—Mr. P. Narayanan Nayar, Demonstrator Bhavani, leave on average pay for 10 days in continuation of the Xmas holidays. Mr. S. S. Katchapeswara Ayyar, Demonstrator, leave on medical certificate for one month and 24 days from 4th January. Mr. M. Mangesha Rao, Demonstrator leave on average pay for one month from date of reversion. Mr. C. S. Seshaghiri Ayyar, Demonstrator, Dharmapuri, leave on average pay for two months on medical certificate from date of relief.

Live Stock:—Mr. A. Gopalakrishnayya, Demonstrator, Podalakur, leave on average pay 27 days from 16th January.

Paddy Specialist section:—Mr. M. B. V. Narasinga Rao, Assistant Maruter, extension of leave on medial certificate for 25 days.

C. S's Section:—Mr. V. K. Subramanya Mudaliyar, Assistant leave on average pay for 18 days from 4th January in continuation of the Xmas holidays. Mr. G. Seshadri Ayyangar, Herbaceum Assistant, leave on average pay for 7 days from 4th January in continuation of the Xmas holidays.

G.A.C's section:—Mr. K. Govindan Nayar Assistant, leave on average pay for one month in continuation of the Xmas holidays. Mr. M. Suryanaraya Assistant leave on average pay for one month in continuation of the Xmas holidays. Mr. M. Sanyasi Raju, Assistant, leave on average pay for 9 days from 27th February.

Principal's section:—Mr. V. Muthuswami Ayyar, assistant lecturer, leave on average pay for one month from 22nd February.

EDITORIAL.

Rural reconstruction:—There are 700,000 villages in this country. For several centuries successive waves of invasion spread over the land but left the village life un-affected. The on rush of the mighty and brilliant Western Civilization swept before it the village life and its institutions so that now its original state has become a fit subject of enquiry and research which eludes even analytical thinkers. Modern means of communication, cheapness of articles which are of great utility, the social, political and economic ferments inoculated with the introduction of western methods of ideas, all make it difficult to go back to old conditions. Any attempt at rural reconstruction therefore should have for its aim not the rehabilitation of old and defunct institutions but to give to rural life a vigour and rejuvenation to stand this strain of modern life. Different groups of men are trying to solve this question in different ways, nevertheless real Rural Reconstruction must proceed on the basis of real economic freedom and village solidarity. This would imply village autonomy secured for the benefit of the whole village but guided and controlled by a central authority. Each village should have a council, all members of which should be elected by the village as a whole and not from any literate or monied section or caste. Any member should be liable for removal by the central authority for reasons of moral turpitude, incurable infectious diseases, heavy indebtedness or criminality. This council must derive all its authority from the village. One such council in each village would look after the interests of the whole body and would become alive to its rights and privileges, duties and responsibilities. The council in one village where water is scarce will try to sink wells. Another in a second village where cattle lifting is common will arrange police duties amongst themselves. A third council may in times of famine arrange to get provisions and distribute them to whomsoever is needy and thus prevent exodus of poor and needy members. A fourth may arrange to connect their village with the main road at a very much less cost than what has become a normal rate now. A fifth by self-restraint and self discipline may keep out a virulent disease like rinderpest or cholera. A sixth may by collecting the whole produce sell at a dear market and gain more profit. A number of vexatious suits instituted and brought to courts through the instrumentality of lawtouts could be very quickly and more economically settled in the village itself. Centralised institutions like hospitals

and courts however perfect, cannot exert a wholesome influence on the distant villages because they are far too remote from them and they cannot be established in every village. We are aware that several public men and public bodies have adumbrated several schemes of rural reconstruction. The bedrock on which they rest either has been forgotten or not paid attention to. Introducing a few hand looms, opening night schools for adults and labourers or banks and loan societies cannot solve the problem. Something real, something tangible, something in which every villager can take part and feel a pride in ought to be introduced if rural life is to be reconstructed. In an autonomous village it is easy to introduce agricultural improvements, new manures, new implements and new methods of culture if not also new crops ; for then the touchstone of such introduction will be the real need and real source of profit to the village in which each and every villager will take an abiding interest. Agricultural improvements when lustily taken up by one village will be copied by another. A studbull maintained in one will be sought after by a number, a crop which has grown luxuriantly and has yielded the highest profits will be described and talked about in the most distant village, requisitions for seed will fly in much beyond one's expectation and the countryside will be filled with much more corn and milk. With more food to eat and more milk to drink the villager will have more leisure and greater opportunities for bettering himself and trying to solve his social, economic, educational, sanitary and other problems with the unerring judgment which always characterises him, unwarped as he is by confusing issues. Once the villager is happy, the townsman also will be happy and thus they mutually help each other and advance themselves. Without an improvement in the status of the villager and without a real lasting improvement of the whole village as a unit no partial illdirected attempts at reconstruction will avail. They must prove colossal failures with the concurrent wastage of large sums of money and bright intellects.

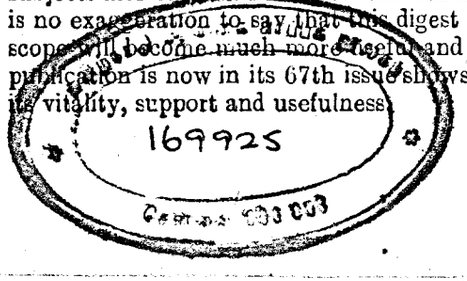
Sugar from air :—We have been accustomed to look to the cane, the beet, the palm, and a few other plants of the vegetable kingdom for our sugar. Of these cane and beet are giving us at present 21,000,000 tons of sugar and the growers of these two sources of sugar in Cuba, Java, India, Germany, France and few other countries have depended solely upon them. Now comes the astounding news that the ever ingenious German is trying to

produce sugar from the air direct. Will this revolutionise sugar cultivation and sugar industry and send the millions to starvation as the same German monopoly of aniline dyes tended enormously to reduce the cultivation of indigo in India?

Indian cattle problem :—We would invite the attention of our readers to two extracts on this question published elsewhere in this issue. One is from the pen of Mr. G. B. Henderson, the Imperial Agriculturist and the other is from Mr. K. C. Ramakrishnan, Reader in Economics, Madras University. The points they have both raised are of profound economic importance to India at present and we should request our readers and the public to digest their views, open up discussions and try to influence the villager in the best manner they can. Any contributions to the columns of this journal will always be welcome.

A new feature :—In this issue appears the first of a series of articles on the, Botany of some Useful Plants, by two of our members Messrs. S. N. Chandrasekar M.A. and T. S. Ramakrishnan M.A. We are sure this series which describes plants and gives their economic importance will prove useful to the laymen and students of Natural Science.

The Madras Digest :—Provincial Agricultural Departments in India have since their reorganisation two decades ago exerted all their strength in demonstrating to the villager the usefulness and the economy of new methods of culture, new crops, new manures and the treatment for pests and diseases for his animals and plants. This they have tried to do in several ways. One such is through free distribution of hundreds and thousands of leaf-lets and bulletins and other publications but the special characteristic of the Local Agricultural Department in this line is the publication month by month of what is known as a digest. This gives for each month under notice the work done by the members of the department at the College, on Farms and in the Districts and also describes the general features of rainfall with the nature of the standing crops, etc. Further, recently, the collaboration of the heads of Departments of Co-operative Societies and Veterinary Service has enabled matters concerned with these two subjects also to be included for the benefit of the Agriculturist. It is no exaggeration to say that this digest with its present enlarged scope will become much more useful and be sought after. That this publication is now in its 67th issue shows its popularity, certainly, its vitality, support and usefulness.



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The Ramasastrulu-Munagala Prize 1928.

1. The Prize will be awarded in July this year.

2. The Prize will be in the form of a Medal and will be awarded to the member of the Union who submits the best account, of original research or enquiry, carried out by him on any agricultural subject.

3. The subject matter shall not exceed in length twelve foolscap pages type-written on one side

4. Intending competitors should notify the Secretary of the Madras Agricultural Students' Union not later than the 1st June the subject of the paper which they propose to submit and the paper should be sent in so as to reach the Secretary, Madras Agricultural Students' Union not later than the 15th June 1928, with a covering letter showing full name and address of the sender. The author's name should not be shown on the paper which should be entered under a *nom-de-plume.*

5. Four type written copies of the essays should be sent in.

6. The name of the successful competitor will be announced and the prize awarded at the time of the Conference.

7. The Union reserves to itself the right of publishing all or any of the papers.

8. All references in the paper to published books, reports or papers by other workers must be acknowledged.

9. Papers submitted will become the property of the Union.

Any further particulars may be obtained from the Secretary, Madras Agricultural Students' Union, Lawley Rd. P. O. Coimbatore.

Secretary,
M. A. S. Union.

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