Journal of the Madras Agricultural Students Union.

V 13. No. 10. October 1925

Vol. XIII

THE JOURNAL OF THE MADRAS AGRICULTURAL STUDENTS' UNION

No. 10

REGD No - M 1155

OCTOBER 1925

Rs. 4.

Sinlge copy As 6.

PATRONS.

V. Arumugam Pillai, Sundaikamuthur, Coimbatore District.
Dewan Bahadur C. Arunachala Mudaliar, Zamindar of Chunampet, Chingleput District.
Lodd Govindoss, Madras.
Khan Bahadur Haji Abdulla Haji Kasim Sahib Bahadur, Udipi, S. Kanara District.
A. M. Kalinga Rayar, Kumara Zamindar of Uttukuli, Coimbatore Dt.
Raja Sree Krishnachandra Gajapati Narayan Deo Garu, Raja of Parlakimidi Ganjam Distict.
Raja Sri Madana Mohana Simha Deo Garu Zamindar of Dharakota.
R. Madhava Rajah, Kollengode, Malabar District.
N. R. Malayandi Chettiar, Udamalpet, Coimbatore.
Rao Bahadur Sir A. P. Patro, Madras.
Raja Rajeswara Sethupathi alias Muthuramalinga Sethupathi. Rajah of Ramnad, Ramnad District.
Dewan Bahadur V. Ramabhadra Nayudu Garu, Zamindar of Doddappanaickanur, Madura, District.
Rao Bahadur, T. A. Ramalingam Chettiar, Coimbatore.
Sir C. P. Ramaswami Ayyar, Madras.
Rao Bahadur C. S. Rathnasabapathy Mudaliar.
M. Sambandam Mudaliar, Coimbatore.
Reerarayan Thirumalpad, Nilambur, Malabar District.
V. C. Vellingiri Gounder, Coimbatore.
Venganad Rajah Sir Vasudeva Rajah, Kollengode, Malabar District.
C. R. Venkataramana Ayyangar, Coimbatore

BENEFACTORS

Kochu Kunjunni Achan, Cochin.

ASSOCIATES

A. Devappa Punja, Mangalore, S. Kanara District.

The Golden Jubilee

OF THE

MADRAS COLLEGE OF AGRICULTURE

the first institution in India

OPENED IN 1876

WILL BE

celebrated by the

MADRAS AGRICULTURAL STUDENTS' UNION

IN JULY 1926

along with the usual

Annual College Day and Conference

The Co-operation of all members of the UNION

AND OF

other gentlemen who take an abiding interest in Agriculture is very earnestly solicited.

THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. XIII]. OCTOBER. [No. 10

CONTENTS.

Farming will never be a success unless the farmer had more voice in the disposal of his produce—P. Morrel.

THE JOURNAL

OF

The Madras Agricultural Students' Union.

Vol. XIII.] OCTOBER 1925. [No 10.

"THRIPS".

An Insect group little known in India.*

T. V. RAMAKRISHNA AYYAR,

Agricultural College, Coimbatore.

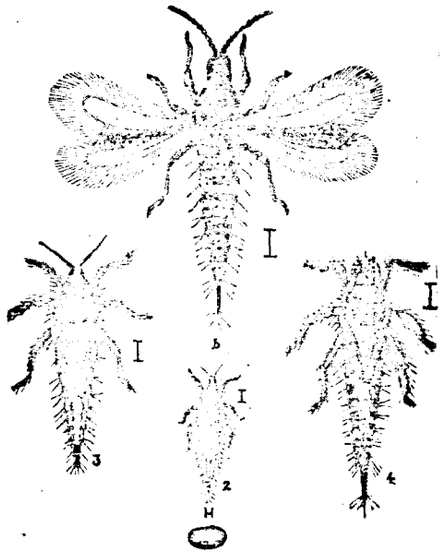
The group Thysanoptera (Thrips) forms one of the major sub-divisions into which the great class-Insects-is divided ; in spite of this fact our knowledge of these insects, compared with the recorded information available on the other orders of Insects, is remarkably meagre, or almost nothing, and this is all the more so with regard to the species of the group inhabiting India. The paucity of our knowledge or the apparent neglect of this group on the part of entomologists is certainly not because these insects are in any way rare or difficult to obtain, since they are abundant all over the country, but it appears to be chiefly due to the minute size, the unattractive coloration, and the hiding habits of these creatures—characters which make them quite inconspicuous, unlike many large and gorgeously coloured butterflies, beetles or grasshoppers which easily attract attention. The writer has been paying some attention to the study of these insects for some time past and in 1919 published a small preliminary note (a) on this subject. In this paper a brief account is given of the biology and

*A paper read at the Indian Science Congress meeting at Benares in 1925.

(a) A note on our present knowledge of Indian Thysanoptera and their economic importance. pp. 618-20. Report of the 3rd Entomological Meeting, Pusa, 1919.

systematics of these little known insects with special reference to South Indian forms just to indicate what has been done to add to our knowledge of these insects so far in this direction since then, and if possible invite the attention, criticisms and co-operation of entomologists that may be working in this line in different parts of the country.

General organisation, lifehistory and habits. The insects included under this order, which are popularly known in different places as "Thrips", 'Fringe-wings,' "Black-fly" etc., are small creatures, most of the forms being miscroscopic, whilst the giants among them do not measure more then $\frac{1}{3}$ to $\frac{1}{2}$ an inch in length. Among the South Indian forms the size varies from $\frac{1}{2}$ mm in some species (b) to 8 mm in a recently described species; (c) some of the largest known forms inhabit Australia (d). Some of the species are short and flat while others have a long and cylindrical body. The head is vertical and moderately movable. It is usually of a broadly conical or triangular shape broadly attached to the thorax. In some, (e) the head is short, hemispherical and very broad; and in some the vertex of the head is drawn forwards like some weevils as in the new form mentioned above which has the head remarkably elongated, the anterior tip carrying the two antennae far forwards. The antennae are moderately long and contain from six to nine joints; these latter possess sensory organs of different patterns. The variations in the structural details of the antennae form very important features in the classification of the group into families, genera and species. The two large compound eyes and three ocelli are invariably present though in some the latter are absent; while



"THRIPS"
Full grown and young ones.

(b) Helio-thrips and Sc[illegible]othrips (c) Kleothrips (d) one being Idolothrips spectrum Hal (e) as in Aust[illegible]ips cochinchinensis, K.

the lateral sides of the head behind the eyes are in many forms armed with bristles and spines of different kinds, they are unarmed and smooth in others. The prothorax is an important region, generally broad, bigger than the head and movable. This is also adorned with setae and bristles in different species. Some forms possess the usual two pairs of wings while others are apterous or short winged. The wings, which are very narrow and delicate, are fringed with long cilia like hairs on one or both the margins; due to this peculiar feature these insects are called *Thysanoptera* or Fringe-wings. The structure of the wings and the arrangement of the cilia show variations which are also of taxonomical importance. Of the six legs the structure of the anterior pair exhibits remarkable variations in different forms as in some South Indian species. (f) The tips of the tarsi which are one or two jointed are modified into a structure with a characteristic rounded vescicular shape, and this feature has given rise to the name *Physopoda*, or bladder-footed insects, applied to the group. The Thysanoptera are mostly *plant feeders* and the *feeding mechanism* in these insects *presents very peculiar features. The mouth parts form a combination of scraping and sucking apparatus* consisting of a tubular cone-shaped beak of varying shapes provided with jaw-like structures on each side; the whole structure is known as the mouth cone. With this apparatus *the insects open* and *irritate* the plant *tissue* in various ways *and suck the sap.* The abdomen is usually the longest region of the body and is ten segmented; the last segment exhibits remarkable variations in structure. In some a distinct ovipositor is found while in others this is absent. The lateral and tail regions of the abdomen are also provided with ciliae and bristles in many species *In* the matter of *development Thysanoptera do not pass through any definite metamorphosis; the young ones hatching out of eggs resemble the parent and assume the adult stage after the periodical moults,* though in some forms a quiescent pre-adult pupa-like stage is noted before assuming the adult condition. As in many Plant Lice and Scales we find parthenogenesis occurring in this group also. So far, no natural enemies of any importance have been noted to destroy Thrips on any appreciable scale, but on two or three occasions in Coimbatore a dark brown species of a bug (g) has been noted sucking thrips in *Ficus* leaf-galls (h) and in leaf galls of *Mimusops elengi* (i). *Thriposoma* and *Thripoctenus* are two parasitic hymenoptera recorded as parasites on some species outside India. *Thrips are found inside various kinds of flowers and they also infest the tender shoots and leaves of many plants. Some are found under tree bark* and some *in plant galls* often made by the insects themselves. *Some*

(f) Mesothrips, Androthrips, Arrhenothrips and Kleothrips. (g) Anthocorid (*Triphleps*). (h) Gynaikothrips uzcli-z. (i) Arrhenothrips Ramakrishnae.

are known to *live on fungi*, though none has been noted from India so far. In South India a very interesting gall-making thrips (j) has been recently discovered, which makes large ball shaped galls in a climbing shrub (k) commonly found all along the Western Ghats. South Indian species of Gynaikothrips, Mesothrips, and Arrhenothrips have also been found to produce leaf-galls on *spp.* of *Ficus*, *Pothos scandens*, *Mimusops* elengi (மகிழம்), etc.

Economic importance. As to the economic importance of the group there are *some very well known Thrips pests* in different parts of the world known to *cause considerable damage to different cultivated crops*; the more prominent of them are the *Pear Thrips*, *Wheat* thrips, *Tobacco* Thrips etc. of European and American countries. Though in India we have not as yet come across many such serious forms, so far as we know, there are a few species which cause some appreciable damage to growing crops. In S. India the *Paddy* Thrips (Thrips oryzae, W.) which attacks paddy seedlings in different parts is the most important of these. *Others* which now and then cause more or less damage *are* the different *forms* noted on *turmeric* and *arrow root*, *onions*, *chillies*, *croton* and *rose leaves*, *groundnut*, *grapevine* and *tea*. Apart from this aspect of their economic importance it is not unlikely that many species of flower inhabiting Thrips interfere with their pollination and fructification-perhaps beneficially in some cases: this is an aspect very little known and worth investigating.

Classification. The order Thysanoptera is divided into two sub orders, one (l) in which the females are provided with an external ovipositor and second (m) where the abdominal end is tubular in both sexes and without any ovipositor. Each of these is sub-divided into many families, sub-familes and genera. The *economic species* noted *from S. India* till now are *all small forms* and belong to the first sub-order. The giants of the order and the various gall makers mostly belong to the second sub-order. The classification of the order has been worked out chiefly by the famous specialists Bagnall, Karny and Hood; the tabular synopsis of the main groups, genera and species by Karny will be found particularly useful.

Previous records from India. The first record of Thysanoptera from India is by Newman (n) of the two species, (o) collected by Hamilton on a species of *Anacardium* in Mysore in 1855. We have no further records until we come to the year 1912 when

(j) Austothrips cochinchinensis (k) Calycopteris floribundum, (l) Terebrantia (m) Tubulifera (n) pp 265-66 Transactions of the Entomological Society of London 1856. (o) Idolothrips halidayi and Phlœothrips anacardii.

the eminent English specialist Bagnall described an interesting species (p) collected in Madras as attacking turmeric and forwarded by the Madras Board of Revnue to the Indian Museum in 1889. From 1913 onwards Bagnall has been publishing several papers on Indian Thysanoptera, but until the year 1919, all species recorded were N. Indian forms only. In 1915 Williams described (r) the paddy Thrips, Thrips oryzae from material collected at Chingleput, S. India. In 1919 J. D. Hood, the American Thysanopterist published a paper (s) on a small consignment of South Indian material. From 1919 onwards Bagnall has been describing new species on and off from the S. Indian material submitted to him. During the last two years a good portion of further material mostly collected by the writer was forwarded to the famous Austrian Thysanopterist Karny working on Asiatic forms in Java, and his paper on the same is expected to be published at an early date. A paper on two new species from S. India has recently been submitted by the present writer for publication in the Bombay Natural History Society's Journal. It may be interesting to note in this connection that while in 1912 there were only three species of Thrips recorded from S. India, there are at present over twenty recorded species, (t) not to speak of the numerous new forms already found in the material collected, and the novelties that still await discovery in the different tracts of the Province.

Hints for Collection and Preservation. Thrips are very commonly found inside many flowers: as such the flowers may be collected and kept in paper envelopes until they are pickled. They are also got by beating bushes with fine butterfly net. Many species are secured from plant galls of various kinds and some from under bark of trees. Soon after collection it is better to drop the insects into rectified or methylated alcohol and they can be preserved for a long time in that condition. For a study of the details of structure it will be found necessary to make microscopic slides of most of the species. For this, fresh specimens or material pickled as above should be dehydrated by passing through 90, 95 p. c. alcohol and then in absolute alcohol for two or three hours; from the latter they may be transferred for clearing into clove oil, xylol, or cedar oil. After this each specimen may be mounted separately in Canada balsam and the slide properly labelled with the usual data: locality, host, etc. In some cases where the insects are dark coloured or opaque it might be found necessary to treat them in potash solution before dehydrating and clearing, to clearly study the chaetotaxy.

(p) p. 257, Records of the Indian Museum, XII. 1912. Panchaetothrips indicus (r) p. 353. Bulletin of Entomological Research. 1915. (s) pp. 90-103 Inse cutor Inscitiae Menstruus, VII. 1919. (t) for list see at the end of the paper.

List of "Thrips" recorded from South India.

Sub-order—Terebrantia.

FAMILY—THRIPIDAE.

Scirtothrips dorsalis, Hood p. 90, Ins. Insc. Menst. 1919. (a) A small yellowish brown species found in numbers in the tender shoots and flowers of castor and chillies. Coimbatore, Guntur. With *plant-lice* this species contributes its share in the leaf curling of chillies.

**Dendrothrips indicus*, Bagnall. p. 261, A M. N. H. IV. ‡ 1919. found on the tender leaves of arrow root plants. Taliparamba. Malabar. Found in company with *Panchaetothrips indicus* B.

**D. bispinosus*, Bagnall p. 455. Bull. Ent. Res. † XIV. 1924. On tea leaves. Nilgiris.

**Rhipiphorothrips cruentatus*, Hood. p. 94. Ins. Insc. Menst. VII. 1919. Found doing some damage to the tender foliage of grape and rose leaves, *Terminalia catappa*, in Coimbatore, Malabar, etc.,

**Heliothrips indicus*, Bagnall p. 291. A. M. N. H. XII. 1913. On onions in Chicacole, Ganjam, and on blades of ragi and grasses in Coimbatore; it is recorded on onions, brinjal, and indigo in Bengal and Bombay.

**Euthrips citricinctus*, Bagnall. p. 270. A M. N. H. IV. 1919; on arrow root leaves. Taliparamba N. Malabar.

Physothrips minor, Bagnall. p. 393. A. M. N. H. VII. 1921; in distal shoots and tender foliage of the common creeper *Ipomoea staphylina*, Coimbatore and Mysore.

**Thrips oryzae*, Williams p. 353. Bull. Ent Res. 1915; sometimes a serious pest of young paddy in different parts of S. India.

Dendrothripoides ipomoea, Bagnall p. 625. A. M. N. H. XII. 1923 in tender foliage of the creeper *Ipomoea staphylina*, Maddur, Mysore.

**Bregmatothrips Ramakrishnae*, Bagnall p. 265 A. M. N. H. XII 1923 rolling tips of Sugar cane leaves. Palur, S Arcot.

(a) Insecutor Inscitiae Menstruus—America.

‡ Annals and Magazine of Natural History—London.

† Bulletin of Entomological Research—London.

* Species marked thus are economically important.

FAMILY—PANCHAETOTHRIPIDAE.

**Panchaetothrips indicus*, Bagnall. p. 257 Rec. Ind. Mus. (a) VII 1912; in tender foliage of Turmeric Madras 1889. It has recently been found on arrow root leaves in Taliparamba and also on turmeric in Coimbatore. Sometimes causes damage to the crop.

Sub order—Tubulifera.

FAMILY—PHLOEOTHRIPIDAE.

Phloeothrips anacardii, Newmann. p.266. Tr. Ent. Socy. (b) 1855 On *Anacardium sp.* Mysore. This is one of the two species of the earliest record of "Thrips" from India.

**Liothrips ordinarius*, Hood. p. 101 Ins. Insc. Menst. VII. 1919. In shoots of *Sesbania grandiflora*. Coimbatore.

Dolichothrips varipes, Bagnall. p. 359 A. M. N. H. VII. 1921 a reddish brown species found in swarms on a wildbush, Coimbatore.

**Haplothrips pictipes*, Bagnall. p. 273. A. M. N. H. IV. 1919; inside diseased pepper berries. Taliparamba. N. Malabar

Neoheegeria indica, Hood. p. 96. Ins. Insc. Menst. VII. 1919. on shoots of *Ailanthus excelsa*. Coimbatore.

Austrothrips cochinchinensis, Karny. p. 113. Jour. Siam, Socy. XVI. 1923; in large galls of the plant *Calycopteris floribunda*, Western ghats.

Cecidothrips bursarum, Kieffer. p. 165. 'Marcellia' VII. 1909; from unknown plant galls, Trichinopoly.

**Gynaikothrips uzeli*, Zim. p. 12. Bull. Inst. Bot. Buitenzorg. (c) 1912; originally described from Java-noted in leaf galls of *Ficus retusa* Kollegal, Coimbatore.

**Arrhenothrips Ramakrishnae*, Hood. p. 99 Ins. Insc. Menst. VII. 1919. causing leaf galls in Mimusops elengi. Coimbatore, sometimes damages the foliage appreciably.

FAMILY-IDOLOTHRIPIDAE.

Idolothrips halidayi, Newman. p. 265. Tr. Ent. Socy. 1855; on Anacardium *sp.* Mysore.

As stated at the beginning the object of this paper is mainly to point out the extensive field open for work in this unexplored group of insects, and if this paper contributes even to a small extent in stimulating entomological work in this direction, the writer will feel amply repaid.

(a) Records of the Indian Museum—Calcutta.

(b) Transactions of the Entomological Society—London.

(c) Bulletin of Botanical Institute, Buitenzorg—Java.

A Short Note on Sericulture.

P. S. Sambasiva Rao.

Sericulture is a home industry and rarely practised on a large scale in this direction. There are possibilities however for a development. For example recently in Peddapur in East Godavari and in Etikoppaka, in Vizagapatam district this is run on a fairly large scale.

Climate. Climate is of great importance in the successful development in any country and no less in India, as without it, it is not possible to rear silk worms. From this point of view the two governing points are temperature and humidity. A temperature of 75° to 80° F. is quite suitable and a humidity 50 to 70 per cent. Silk worms will not thrive in any region in which the temperature is below 50° and above 100°F and humidity above 75 per cent.

Some erroneously hold that coastal areas are unsuited to rear silk worms. These are perhaps less favoured than-interior areas but the climate and humidity will suit fairly well, which are the main points in its favour.

Food of the Silk-worm. The food of the domesticated silk worm known as *Bombyxmori*, is the mulberry leaf. There are many varieties of mulberry, the chief among which is the white mulberry *Morus Alba.* This grows wild or is cultivated, in the latter state as a bush and as a tree.

Soils suitable for mulberry cultivation. The nature of the soil does not play a prominent part in the cultivation of mulberry. It grows equally well in all varieties of well drained soils. It can satisfactorily grow in red sandy loams, black cotton soils as also in shallow soils, the root system of the plant not going very deep.

Bush cultivation. The bush is propagated by cuttings. The land selected is prepared for planting during the summer months and planting is done soon after the first rains. The preliminary operations consist in ploughing the land 6 to 8 times at intervals and at the last ploughing in applying manure and incorporating with the soil. The manure generally used is cattle manure or village refuse and the quantity applied ranges from 10 to 15 cart loads per acre.

Method of planting. After the land is prepared for planting, furrows are made at a distance of 2½ feet apart. On irrigated lands, the distance may be a little less. Holes are made in the furrows at an interval of 2½ feet. The stalks are cut up into pieces 8 to 9 inches

long and two or three of them are planted in each hole. In some places the cuttings are laid flat on the ground just as in the case of sugarcane and covered over with the soil. But where there are irrigation facilities the cuttings may be planted in a slanting manner, allowing 2 inches to project above ground. In Kollegal mulberry is planted in dry lands as a rain-fed crop but if rains should fail soon after planting, pot watering is done.

Shoots appear in the second month after planting. Then land is cleared of the weeds either by hand or with bullock hoes. Picking of the leaves is begun generally after five or six months by which time the plant will have grown 3 ft. high. This may be early or late depending on the fertility of the soil. In a year 4 to 5 ploughings or harrowings are given to keep weeds under check. Every year either before or soon after first rains the plants are pruned flush with the level of the ground. After pruning the soil is raked up either by a hoe or a plough while a handful of manure is applied to each clump.

Cattle, goats and sheep eat mulberry leaves and hence the plantation should be kept well fenced.

Mulberry once planted keeps from 10 to 12 years; then the land is cleared of mulberry, a crop like ragi or cholam is raised for one year and mulberry is planted again.

Cost of cultivation:—

Preparing cuttings and planting,	Rs.	5
Hoeing or ploughing,	,,	8
Manure 15 cartloads,	,,	15
Weeding ,,	,,	4
Pruning ,,	,,	3
Total	Rs.	35

Income from an acre. Each picking gives on an average enough leaves to feed worms producing 50 lb. of cocoons. There are 6 to 8 such pickings during the year. Taking 6 pickings as the minimum, 300 lb. of cocoons are got from an acre. These fetch Rs. 300 at one rupee per lb. In irrigated lands the pickings are made no less than 8 times a year and each picking is enough to feed worms producing 75 lb. of cccoons. Thus in one year 600 lb. of cocoons are obtained and an income of Rs. 600 realised.

Diseases of Mulberry. There are two diseases of this crop, which are caused by minute insects at the back of the tender leaves, causing them them to shrivel. The ordinary treatment in such cases seems to be to allow the sheep to browse or to graze away the leaves. After these are grazed the leaves that sprout afresh are free from it.

Silk Worms. The silk worm belongs to the family of insects known as Lepidoptera. This family consists of (1) Bombycidae which feeds on mulberry (2) Saturniadae which feeds on other leaves.

The worms are of two classes viz.,

(1) Univoltine.

(2) Multivoltine.

Univoltine. Univoltine worms are those that have one generation in the year and give one crop of cocoons.

Multivoltine. Multivoltine or Polyvoltine are those that pass through a number of generations through the year.

The silk worm that gives the greatest quantity of silk is the Univoltine worm, It cannot be fed on mulberry bush, because of its less nutritive qualities Multivoltine worms cannot be fed on tree mulberry leaves because of their over nutrition.

Multivoltine worm is chiefly reared in India, in Bengal and Mysore.

Life History. The silk moth lays on an average 250 to 400 eggs. The egg is very minute in size, oval in shape and looks like a seed. Across the long axis it measures 1½ m. m. and across the short axis it is 1 m. m. There is a gentle depression on the upper surface. The eggs are cream to yellowish white when laid. But before hatching into worms they get a bluish black colour. It is due to the dark embryo seen through the transparent egg shell. It generally takes ten days for multivoltine eggs to hatch, but this varies according to the temperature of the place. In higher temperatures it will be earlier and in lower, takes longer time to hatch. They do not hatch all at once or at a particular part of the day, though the bulk of the eggs hatch between 9 to 10 a. m. These eggs finish off hatching in two days. The colour of the worm that comes out of the egg is dark brown.

The body contains two glands called silk glands, which open into seripositor. When the larva approaches maturity these glands are filled with a clear viscous fluid, which is thrown out through the seripositor. When this fluid comes in contact with the air, it solidifies and forms the silk. The thread so formed really consists of two filaments one from each gland which have been agglutinated. The length of the fibre each vomits is from 300 to 1,000 yards. The colour of the thread is that of the colour of the legs of the worms.

The transformation takes place inside the cocoon, from the worm into a chrysalid and then into a moth. And the moth comes out by cutting through the cocoon. It will be cream white in colour. The male moth is smaller then the female moth. The former will atleast be 15 m. m. and the latter 20 m.m. Both have wings but they never fly being domesticated. As soon as they emerge out each male moth pairs off with a female. After some hours' copulation the female moth is separated from the male moth and kept in a separate bamboo tray for laying eggs. Each moth lays 250 to 400 eggs and they are covered with a viscous fluid and stick to the laying surface. Within three days the eggs are all laid.

In ten days after laying the eggs hatch out and Larvae emerge. They are gently brushed with a feather into another tray, when they are fed with tender mulberry leaves chopped fine. Fresh leaves should be used for each feeding.

The hatching takes place in two days and the worms of each day are kept separate. The life cycle from hatching to spinning of cocoons is about 30 days in summer and more during the cold weather. The worms moult four times during this cycle, the period of activity may be said to be five.

Table giving intervals of each period, number of feeds and quality of leaves given.

Period.	Number of days.	No. of feeds in 24 hrs.	Moulting hours.	Quality of leaves given.
1	7	8	36	Tender leaves finely chopped.
2	4	7	24	Tender and half mature leaves chopped a little broader.
3	5	6	24	Half mature leaves chopped a little broader,
4	6	5	36	75% mature leaves into 3 pieces
5	8	4	Spinning.	Entire leaves.

This is the country, the irrigated Lombard plain, from whose experience I would answer the Statesman's question. We irrigate the meadow there as well as the paddy-field. We still keep there bullocks strong to the plough and cows that yield 1,000 seers of milk a month. We sow fodder-crops for them by the hand. We devote half our land by rotation to pasture for them.

When paddy was first introduced and grown year after year in the same fields, the cattle had to be driven away to the hills in the summer, which is our season there for the growing of paddy. But sowing paddy year after year in the same fields had been given up long ago. "Rotation paddy fields are far more productive than the stable paddy-fields," says an Italian text book "and their productive capacity is great in proportion to their freshness." Numerous varieties of rotation are given in the text-books, varying from three to ten years. Half or less than half the years will be paddy years and even for those years you are advised to vary the kind of paddy and not grow the same every year. In 1921 I visited the Italian Government's great experimental paddy station at Vercelli and the head of it gave me the following as common and ideal rotations:—

Common (1) 3 years paddy. I year dry cultivation with wheat or oats; meadow sown in the cereal while it is growing and then it remains meadow for a year or two; after the meadow sometimes maize. (2) for heavy soils, 1 year dry cereal-2 years meadow.

Advantages of Rotation.

If paddy is only grown one year in three or two years in five you divide up your paddy land into three parts or five parts and each year are using two-thirds or three-fifths of your land for other crops; mostly grass, trefoil, lucerne which cattle eat, or oats, which are also only animal food in Italy. The greater part of your paddy land will accordingly be producing all the time food for your cattle and it is no wonder that the Lombard ploughing-bullock is a sleek well-fed animal four times the weight of the little starved abortion used in India, and the average Lombard cow-yields I am afraid to say how many times as much milk, of better quality, than the Indian. When I went over the paddy-farm of Cav. Stabilini near Milan not long ago it was his cows that he was most anxious to show me and he told me that he made much more by them than by his paddy. He sends his milk, his butter, his cream, his cheese into Milan. The paddy-farmer of Bengal has no milk or cream or butter or ghee to send into the great markets of Calcutta, which would so willingly pay him high prices for pure products of the cow. Cav. Stabilini's

cows not only have beautiful meadows and lucerne and clover hay made for them and corn but palatial stables and all the latest appliances for cleaning and milking. Where the cow is a valuable possession she is tended with care and love, and crops are grown for her and palaces are built for her. Where she is merely an object of veneration she is left to stand and starve in the public standing and starving grounds which are miscalled grazing-grounds in India. India should abolish these places of torture and breeding-grounds of disease and abortion and every Indian should devote three-fifths or two-thirds of his land to growing grass and fodder for his cattle.

I assure him that he will not be a loser. Apart from the fact that the milk-crop, at any rate near large centres of population, is more valuable than the paddy-crop and better food, rotated and manured paddy will yield him two or three times as much as unrotated and unmanured. I do not think the soil or climate of Lombardy are superior or even equal to those of the Deltas of the Ganges, the Godavari, the Kistna or the Cauvery for paddy-growing. The season in Lombardy when it is hot enough is so short that it is with difficulty they can scramble out one crop a year. But what are the figures for the yield?. The official figure of the average yield in North Italy is 45 quintals a hectare or 4½ tons; nearly two tons per acre. The official figure for most parts of India is well below 1,500 lbs an acre. In my own district of Ganjam, where one million acres are cultivated and there is nothing to be seen but paddy, the yield is about 1,200 lbs. If we reduce the acreage to 400,000 acres taken in rotation and manured properly and weeded properly, as they do in Italy, and got a yield of 4,000 lbs an acre instead of 1,200 the 400,000 acres would yield one third more paddy than the million acres do now and we should have in hand 600,000 acres on which to raise crops of grass and fodder for the cattle or wheat or maize and other crops for men.

The official estimates of 45 quintals a hectare for Italy is only the average. The standing crop I say in 1921 on the farm of one Signor Rossi near Milan was estimated at 60 quintals; and 70 and 80 quintals are sometimes obtained.

It need not be supposed that irrigable land is not fit for meadow. In Lombardy they use the same land in rotation for paddy and meadow. They irrigate the meadow once in 20 days, or so

In the Italian estates some land is usually reserved for permanent meadow. It is irrigated summer and winter and the ice that forms on the surface is broken by alternately withdrawing and adding water. These permanent meadows are arranged on a slope so

that water passes from one to another; each plot is further sloped from the centre and water falls into side channels, which carry it to other plots. Cav. Stabilini showed me his permanent meadows (*marcite*) and said that labour being now so dear, it would never pay now to form the meadows and plots, but it was all done long ago.

But such ere the extraordinary efforts made in Italy to provide pasture when the season is least propitious.

(From The Indian Scientific Agriculturist.)

The Improvement of the Cotton Crop.

By G. R. Hilson.

This article embodies a survey, in some detail, of the problem of the improvement in yield and quality of the cotton crop. This survey was prepared with special reference to conditions in India, but as in its broader aspects it is of more general application, it may be of interest to others outside that country.

Analysis of the Problem. Beginning at the point in which the grower is most interested and which it is the final aim of research work to influence favourably—viz, the value of the crop per acre—and working backwards, the following analysis of the problem was arrived at.

Value of the crop. The value of the crop per acre depends upon the yield per acre and the price, which, in the main, depends upon the quality of the produce (lint)

Yield per acre. This depends upon the number of plants per acre and the yield per plant. Each of these factors in turn depends upon the interplay of hereditary characters and environmental factors.

Quality. The quality of the produce similarly depends upon the interplay of hereditary characters and environmental factors.

Hereditary characters. 1. Those which affect the yield per plant are:—

(a) The number of bolls per plant. (b) The number of loculi per boll. (c) The number of seeds per loculus. (d) The weight per seed. (e) The weight of lint per seed.

(a) The number of bolls per plant depends upon the habit of the plant, the length of the term, and the vigour of the plant.

The Habit of the Plant :—Under this head are included the height of the plant, the number of vegetative branches developed from the axillary buds on the main stem and from the accessory buds if such develop, the number of fruiting branches borne on the main stem and on the vegetative branches, the number of nodes on the fruiting branches, the length of the internodes, the angle at which the branches are carried in relation to the main stem and the toughness of the wood. The last three characters affect the ability of the plant to carry its crop to harvest without breaking down before the bolls mature and burst The others determine the number of flower buds produced.

The length of the Term:—This is affected by the habit of the plant (a plant which produces its first flowering branch low down the main stem will flower earlier than one which does so high up the stem), but also depends upon the rate of growth of the main stem, the vegetative branches, and the fruiting branches ; the interval between the appearance of the bud and the opening of the flower and the interval between the opening of the flower and the bursting of the boll.

The Vigor of the Plant. By this general term may be described the constitutional ability of the plant to withstand excess or defect of moisture, to resist the attack of pests and diseases, and to mature a high proportion of bolls to buds produced. In this connexion the rooting system of the plant and the development of the anthers are probably factors of importance. The presence or absence of hairs on the leaves is certainly of importance in relation to the attack of the Jassid (Empoasca devastans).

(c) The Number of Seeds per Loculus:—This is affected by the number of loculi per boll, and may depend on the number of ovules per loculus and on the size of the loculus.

(e) The Weight of the Lint per seed:—This depends upon the length, cross-section and specific gravity, characters of importance affecting the quality of the lint.

2. Characters which affect the number of plants per acre are the habit of the plant, which determines the amount of space required by the plant in order to develop fully; length of term, which affects the amount of space desirable to allow the plant under given condisions; and vigour, which affects the ability of the plant to survive.

3. Characters which affect the quality of the lint. The most important of these, from the point of view of the producer of raw cotton are: length, strength, colour, lustre, and uniformity in each of these. The other characters, such as porosity, extensibility etc., are not such as are simple of determination, and are better dealt with in a technological laboratory.

4. Other characters. Besides the above mentioned characters, there are others such as the colour and size of the flower, the size and the shape of the leaf, the presence or absence of nectaries etc., which may or may not have any connexion with the yield of the plant or the quality of the lint, but which are useful identification marks, and enable the worker to judge easily whether mixture is taking place either in the breeding plots or in the cultivators' fields.

Environmental factors.—These affect the yield per plant, the number of plants per acre, and the quality of the lint. They are: (a) Climatic conditions. (b) Pests. (c) Diseases (d) Water. (e) Soil. (f) Manure. (g) Methods of cultivation.

(a) Climatic conditions. Under this head are included rainfall, temperature, humidity, sunshine, cloud, and wind.

(b) Pests. The chief pests are: The pink and the spotted boll worms, the stem weevil, the stem borer, jassids, aphis, the dusky and red cotton bugs, and certain other sucking insects which are probably instrumental in spreading fungoid and bacterial diseases.

(c) Diseases. These are fungoid-e. g. wilt (Rhizoctonia); bacterial-e. g. black arm (B. Malvacearum); and physiological-e g.; red leaf disease.

(d) Water. The effect of irrigation on a cotton crop depends on the amount of water given, the time and method of application and on the composition of water.

(e) Soil. The fertility of a soil depends on its texture, depth and composition, which last term covers the whole soil complex, organic and inorganic ingredients, and living organisms.

(f) Manure. The effect of manure on a cotton crop depends on the kind and the quantity applied, and on the time and method of application.

(g) Methods of cultivation. Under this term are included the various methods of preparing the land for the crop, sowing the seed, cultivating the crop after the seed has germinated, and the various rotations of which the cotton crop forms a constituent.

From the foregoing it is evident that a complete scheme of agricultural research, aiming at the improvement of the cotton crop in regard to yield and quality of produce, may be divided into two main divisions. In the one will be included matters concerning the heritable characters of the plant, and their mode of inheritance, and in the other matters concerned with the environment.

Before proceeding to discuss in detail these two divisions, it is well to draw attention to two important considerations. First, in the case of the heritable characters while their expression in the plant is affected by the environment and while as characters they cannot be altered by human agency, yet they can be manipulated and made to combine in a manner which will result in some degree in the improvement aimed at. Secondly, in the case of environment though some of the factors are within human control and can be varied so as to bring about the desired improvement, others are not. In their case however, a knowledge of the effect of variations in them is of importance in estimating the effect of variations made in those under control. This knowledge is also necessary to prepare a forecast of the time at which a crop will come to harvest, the yield it is likely to give, and the quality of the produce which will be marketed. The more exact this information is, the more likely is the forecast to be correct.

Turning now to a consideration of these two main divisions, heredity and environment, matters concerned with the former will be taken first.

Heredity. In a study of the inheritance of the cotton plant, there are three processes to be gone through;

1. The recognition of the heritable characters and their definition or method of measurement. 2. The isolation of pure strains in which the heritable characters are combined in various ways. 3. The manipulation of these characters by crossing strains with the object of forming new combinations of characters, and the study of the results obtained.

Items 1 and 2 are carried out simultaneously, and together form the foundation of all plant breeding work on cottou. Item 3 is carried

out by making crossess between strains of the same or of different species and applying ordinary plant breeding methods. The more important heritable characters having an obvious bearing on the economic position and upon which research should be first directed are: *Lint*—Length, strength, fineness, colour, lustre, uniformity, in each of these and weight per seed. *Seed*—Weight, size, presence or absence of fuzz, number per loculus. *Boll.*—Number of loculi, size, shape, manner of opening. *Leaf.*—Presence or absence of hairs. *Plant.*—Habit, length of term, vigour. Other characters, such as colour of flower, type of leaf, presence or absence of nectaries, colour of the fuzz on the seed, etc., are in the light of the present knowledgte of less importance. Many of them can be studied while dealing wih the other important characters.

The chief defects from which Indian cotton suffers are that the staple is short, the average yield per acre is low, and there is frequently too high a percentage of leaf present in the sample. A considerable improvement in the last named detail could be brought about if the size of the boll were increased and the sectors of the capsule opened more widely. Work on the the inheritance of characters should therefore aim at the removal of these defects.

(From the Empress Cotton Growing Research Vol. II No. 3).

(To be continued).

Farming with a Test Tube.

How They Solve Mysteries at Rothamstead—"Wet-bobs," and a Subtle Business With Skim Milk.

Agriculture is fast becoming almost as scientific and technical a profession as medicine or chemistry, and it seems as if soon the popular idea of a farmer's boy being a straw-sucking rustic with hayseed in his hair will be replaced by that of a be-spectacled, learned-looking youth, armed with a microscope in one hand and a test tube in the other.

At least, that is the impression which I gained after spending an hour in the Rothamsted Experimental Station at Harpenden, where for years past research has been going on in connection with problems affecting agriculture, the soil and the growth of plants.

The Ladybird's Food. During the last few years the centre has grown considerably, and at the present time there are over 100 workers engaged in the laboratories carrying out investigations in relation to chemistry, botany, proto-zoology, allogamy, plant-pathology, and similar subjects.

Thousands of people visit the station in the course of the year, and although you may not be particularly interested in some of the causes which compel the British farmer year after year with almost monotonous regularity to complain "It's the worst season we have ever had," you can spend quite a fascinating time wandering through the laboratories.

You will learn all sorts of things you never knew before. How many people, for instance, are aware that the lady-bird—that scarlet and black bizarre-looking little beetle—is the friend of the farmer and the natural enemy of the black bean aphis, a pest which has been very trying this season?

This particular aphis, I was told, is one of the lady bird's favourite items of diet. It has been suggested that, in order to deal with the pest, battalions of ladybirds might be drafted into the bean fields; but, unfortunately, this method—although offering sporting possibilities—is not regarded as economically practicable!

Potato "Wet-Bobs." Then there are the "wet-bobs" who are responsible for spreading potato blight during a wet season. This blight appears first as a brown patch on the leaves of the potato, and examination in the early stages shows that surrounding these patches is a powder-white mould, eventually producing small tailed spores, which are able to swim!

Thus in wet weather these spores—striking out like Channel swimmers—swim all over the field, spreading the disease.

It is with the extermination of pests of this kind that the researchers are particularly interested, and investigations are constantly being made to discover effective measures for dealing with them

Attached to the station is a large area of land, where different varieties of the crops are grown and their [illegible] watched and studied. Grass, crops and plants of different kinds are also cultivated in greenhouses for experimental purposes.

In one of these glasshouses are many large pots of lucerne, a green plant, which are undergoing some highly technical process involving inoculation with some mysterious bug. This inoculation process is a subtle business, which takes a lot of grasping, but I did gather that skim milk plays an important part in the operation.

Weighing Barley Grains. Three solemn, scientific-looking men poring over an ear of barley in a corner of one of the laboratories attracted my attention. One man held the ear of barley as tenderly as if it were the rarest and most delicate flower, and gently nipped off each grain in turn. After each had been weighed, it was carefully deposited in a test tube, and the results recorded on a sheet of paper, which, covered in figures, resembled a chartered accountant's idea of a nightmare.

"They are investigating," my guide explained, "that subtle thing *quality*. Records of the barley are taken week by week, and the results show the development of the crop during the season. It is a delicate business, and in addition to this counting and weighing process, the experts have to go out into the fields and measure the crop and collect samples.

"Recently there has been developed at the station a method of measuring the tractive resistance of soils. By fastening a specially-designed dynamometer between the implement and the tractor, the resistance of cutting through the soil is recorded on a chart. This shows the sharp variations which occur even in small areas of cultivated land.

"Even in fields that are perfectly well known, and have been under cultivation for several centuries," my guide told me "there remain differences in the soil which have not yet been investigated, and which are sufficient to account for very wide variations of the yield of the crops.

"In the course of the year many inquiries are sent by farmers to the station from all parts of the world."

"Do you ever get asked silly questions?" I inquired.

"Farmers," replied my guide, "rarely ask silly questions. You see, they are all the time dealing with Nature, and she is never silly."

(Evening News August 25). J. Y.

The World's Cereal Harvest.

Information communicated by the various countries interested to the International Institute of Agriculture, and published in the October issue of its Bulletin of Statistics, shows that the 1925 output of wheat, rye, barley, and oats was: million centals (1 cental=100 lb) :—

	Without U. S. S. R.	Including U. S. S. R.
Wheat ...	1,727·6	2,124·4
Rye ...	538·1	997·3
Barley ...	559·0	690·8
Oats ...	1,147·5	1,372·2

These aggregates cover 98 per cent of the entire wheat and rye production in the northern hemisphere, 90 per cent of that of barley, 95 per cent of the oats, and reflect almost completely the total results of the agricultural season.

As compared with those of 1924, 1923 and the pre-war five years' average, the results during the current year are expressed by the following percentages :—

Percentages of production in 1925 as compared with those of :—

		1924	1923	Average 1909—913
		per cent	per cent	per cent
Wheat.	without the Soviet Union ...	108·7	95·6	107·0
	including the Soviet Union ...	116·8	—	104·9
Rye	without the Soviet Union ...	139·0	110·4	97·8
	including the Soviet Union ...	128·8	—	103·6
Barley	without the Soviet Union ...	115·9	105·3	105·1
	including the Soviet Union ...	122·0	—	96·2
Oats.	without the Soviet Union ...	105·4	101·6	109·7
	including the Soviet Union ...	109·6	—	102·9

All these index numbers tend to demonstrate the specially plentiful outturns of 1925 as compared with 1924, indicating increases varying from a minimum of 5 per cent for oats to a maximum of 30 per cent for rye.

Again, when compared with the 1923 data, the new crops come out favourably, and the reduction of about 5 per cent in wheat should be considered along with the fact that the 1923 crop was exceptionally prolific in all parts of the world, and was harvested from an area of about 2 million acres more than that sown for the current yield. Compared with the pre-war period lastly, most of the index numbers indicate general improvement in the situation ; the exception in the case of rye must be attributed chiefly to the large decrease in area under this crop in Germany, compared with the 1909—1913 average. As regards Russia, brought into the table somewheat incompletely owing to the absence of any aggregate data for the whole territory in 1923, it should be noted that the estimates of 1925 are those of August, since when unfortunately somewhat serious injury has occurred to all the Russian crops owing to bad weather. The damage is estimated at about 75 million centals, spread over the different cereal yields.

At the present juncture particular importance is attached to the outlook for the southern hemisphere crops, to be harvested towards the close of the year Reports to hand concerning the crops in Argentina are of a promising tenor, and, what is more, the area sown is decidedly greater than last year's, and particularly so for wheat, as the increase as compared with 1924 is more than 1,200,000 acres. A slight decline in the Australian wheat area is however reported. In that country the September rainfall was deficient, and according to the most recent advices a plentiful downpour in October is a necessity

* * * *

The information to hand for the maize crops gives the following results: in million centals (1 cental = 100 lb.)

Europe (6 countries)	...	238·0
Canada and United States	...	1,640·0
Total	...	1,878·0
U. S. S. R.	...	98·8
Grand Total (9 countries)	...	1,976·8

The ascertained maize data are only slighty less complete than those of the other cereals; in fact, they refer to a group of countries which last year produced about 88 per cent of the total maize crops in the northern hemisphere.

The estimate for the Serb-Croat-Slovene State is not yet to hand, and those of a few other minor producing countries are also absent; these reached nearly 200 million centals in 1924.

Percentages of the Production of Maize in 1925 as against those of:—

	1924	1923	Average. 1909—1913
	per cent	per cent	per cent
Europe ...	113·9	129·7	97·9
Canada and United States ...	119·6	95·5	107·3
Total ..	118·9	98·8	106·0
Soviet Union ...	187·1	—	320·2
Grand Total ...	121·1	—	109·7

The European maize harvest, estimated from the data already received and from the generally good accounts of the crops in those countries which have not yet communicated their production figures, may be regarded as the best of recent years, and this without taking account of the great development in the output of the Soviet territories. In the United States, the latest returns show a slight improvement. The crop, although notably surperior to last year's, is still about 5 per cent below that of 1923, and is just equivalent to the average of the five-yearly period 1919—1923.

(International Institute of Agriculture.)

Circular Bureau of General Statistics.

True Devotion and not Budget Grants Advance Science.

Prominent specialists from all parts of the world have from time to time dropped off in passing Manila to visit Los Banos and look over the work being done on Malaya-Philippine entomology and mycology and the collections accumulating therefrom. Only a few days ago it was Dr. Silvestri. We hope he will be followed by many others.

Dr. Silvestri expressed great surprise to find that all this work was purely a private undertaking, carried by one ordinary salaried man and without support to the extent of a centavo from any public institution. He expressed great surprise to find the collections and work housed in a native bamboo structure, with the immense reference collections therein dry, without mould, and as well kept as is possible in the humid tropics-better than in many institutional laboratories, although here granted not even safe housing. He expressed still greater surprise that all the great undertaking of mounting hundreds of thousands of specimens, labelling, curating, packing and shipping to specialists, was done at night by one pair of hands-where the same work in almost any institution would be accorded a staff. He expressed still greater surprise that the work could be supported and kept under vigorous development from one moderate salary. Though he had opportunity to see that if one lives as simply and rigorously as a Trappist monk-many things become possible. He had occasion to see that living equipment serving personal needs had for fourteen years been but little more than served Edmond Dantes for equivalent period in the Chateaud' If ! Great knowledge, may however, be purchased at this price.

However I wish to place to the right credit, the moving force back of the work being done here and which is not always apparent to one who inspects the operations at this end. To a very large extent this force originates in the moral support of the large number of specialists (more than 100 now) scattered over the world, who are actively engaged on this material and whose fine results thereon, as exemplified in the extensive series of papers already published, have been a constant stimulus, acting to invigorate and push onward the local work. The enthusiastic and vital interest of a specialist in any group is practically certain to be reflected in the local activities towards accumulating and getting into his hands for study, the entomological and mycological riches of these vast and varied archipelagoes. And conversely, when his interest wanes and his activity abates, to the same extent the work here, on the group which he represents, slows down and even stops.

In other words we have no interest in the mere accumulation of study materials to pile up on the shelves of some museum or fill the cases of some private collection. Our immediate interest is first to see this great fauna *made known as rapidly as possible, in form for use by students everywhere*, and in the accomplishing of this, to place ourselves wholly at the service of the most active specialists of the world, who have the ability and energy to push students on this material through to publication. Only in this way can be built the necessary foundation for future economic work.

We therefore consider the working specialist *the most important factor* in the whole matter. *From him flows the stimulus* that excites activity in this remote field. Material support is assuredly a great desideratum though one that may never be realised—the lack of it we might be able to survive. But without the moral support of our cooperating specialists the work would, in large part, cease. We therefore desire to express the liveliest appreciation and obligation to all the specialists concerned and to hope that their active co-operation may continue. Also to hope that more of them will emulate Dr. Silvestri and others and some day visit the Philippines, where they will find a warm welcome, and an incomparably rich field for investigation.

College of Agriculture,
Los Banos, 4—9—1925.

C. F. BAKER,
DEAN.

REVIEW.

The Agricultural Journal of India (July).

In the first of the series of articles in the Agricultural Journal of India (July 1925) J. T. Edwards and S. K. Sen begin a summary of information available on some recent advances in the protection of cattle and other animals against diseases.

C M. Hutchinson in his article on " The control of the biological factor in soil fertility by irrigation " emphasises the need of research into the biological conditions obtaining in the soil from a real investigation into methods of irrigation for crop production. For he says " Not only is it of great importance to know how best to secure nitrification of organic nitrogen present in the soil but the actual increase in the amount of the latter by natural fixation processes may be of equal consequence, especially in India." Such processes whether-symbiotic or asymbiotic depend largely upon proper water conditions being maintained in the soil and in his opinion the amount of nitrogen fixed by a soil is determined, *coeteris paribus* not so much by the amount of water in the soil as by its continuous movement therein. For instance, in the conversion of buried organic matters such as green manure, oilcake etc., into available plantfood a high moisture percentage conduces to completeness of this action during the earliest stages when it is intended to break down the cell walls of the vegetable tissues; later, ammonification is promoted by a smaller amount of soil water and lastly nitrification of ammoniam amino acids is secured by a still further reduction of water supply.

G. S. Honderson in his article "Some aspects of the utilization of the under-ground water of India" controverts the statement made by Sir. Alfred Chatterton that 6,000,000 cattle maintained to lift water from the wells with the help of which 16,000,000 acres are annually raised to crops are an economic drain and can be replaced by small oil engines and argues contra that at present cattle are largely fed on by products as cotton seeds, oilcake and rice from mills and are an agricultural necessity in turning the production of the land into manure for which no artificial manure can be wholly substituted and any form of steam engine is far essential and simpler to handle than an oil-engine, with inexpert labour, but that the Indian Boiler Inspection Act is the only bar to its introduction. This can and we think should be amended for reasons stated by the author that in Egypt, steam engines are not inspected and they are very widely used for pumping on canals and that in the case of a factory an explosion of stem engine might mean loss of life to workers while in the case of an engine used for an agricultural purpose and not housed it would only affect a single man-the driver who could suffer from an explosion only by criminal carelessness.

Sea-borne trade of the Madras Presidency during 1924—25.

Imports during the first four months did not show much variation as compared with the corresponding period of the previous year. But there was a steady increase from August especially under piece goods brought about by a larger crop and reduced prices of American cotton coupled with a high rate of exchange. Large arrivals of cheap Japanese yarn and Java sugar also contributed to the increased import trade. The export trade showed a remarkable expansion. The monsoon on the West coast on the whole was favourable in spite of floods in July causing damage to tea on the West coast and to rice in the southern districts. The crops were good and this was followed by a rise of price in most of the Indian produce owing to larger demand from the consuming countries as a result of their improved economic conditions. Sterling exchange which was below 1s. 5d. up to July 1924 began to appreciate and T. T., touched at 1s. 6'5-16 (top rate) about the 9th of October and exchange has been steady round 1s. 6d. until the close of the year.

A.—Private. 1. foreign Trade. Imports merchandise, 2003 lakhs. Gold 74 lakhs. Silver 4 laksh. Total 2081 lakhs. Exports. Re-exports 39 lakhs. Indian produce 4027 lakhs. Gold, 1 lakh Silver, 41 lakhs. Total 4108 lakhs. Total foreign trade, 6190 lakhs. Increase over last year 10.55 p c. II Coasting trade. Imports Indian produce, 1917 lakhs. Foreign trade 246 lakhs. Exports Indian produce 1087 lakhs foreign merchandise 33 lakhs. Total coasting trade 3283 lakhs.

B.—Government Transactions 67 lakhs.

Total Trade 9,539 lakhs Prices of important articles over 1898—1901 were as follows. Kerosene oil, 194 p. c. Sugar, 153 p c. Grain and pulse, rice in husk 25 p. c Rice not in husk 207 p. c. Manures 325 p. c. Coconut oils 197 p. c. oil cakes 184 p. c.

Madras Legislative Council.

AUGUST. (*Continued from previous issue*).

Demands for supplementary grants were put and carried and grants were made for the following :—

Agriculture. Rs. 1,27,625-to be made up of 5 items (a) Rs. 7,600 for additional demonstrators (b) 4,325 for installation of ice plant, (c) 21,200 for acquisition of lands for the Paddy Breeding Station in Kistna, (d) 81,000 for opening of a Paddy station in South Malabar, (e) 6,500 for opening of an agricultural middle school at Kalahasti:— Rs. 40,200 for improvement of cattle breeding in. Hosur and the installation of the dairy plant.

Rs. 27,740-as grants to local bodies towards the cost of construction of elementary school buildings. Rs. 6,25,000 for grants to local boards for improvement of water supply in rural areas and Rs. 8,61,030 for roads and bridges.

Communications to the Council :—

(1) G. O. Mis. I dated 23-4-25—authorizing an expenditure of Rs. 4 lakhs during the current year in the Kattalai Right Bank Canal Scheme—Trichinopoly District.

(2) G. O. Mis. No. 186 I. dated 27-4-25, authorizing an expenditure of Rs. 1 lakh for constructing during the current year locks and regulators across the Ellore and Bandar canals in the Godavari district.

(3) A copy of the note that the question of the restoration of the Periapalayam anicut across the Noyyal in the Coimbatore district was under consideration.

(4) G. O's Mis. 843, 915, 963, and 983 Revenue, authorising an expenditure of Rs. 5,000. Rs. 5,000, Rs. 30,000, and Rs. 2,000 respectively for free supply of housing materials to the poor whose houses were damaged or destroyed by the cyclone in Kistna and Guntur districts.

(5) A copy of Mr. S. Forbes, report on the Hydro-electric power supply in the Madras Presidency which along with recommendations in the interests of the general tax-payer detailed the water-power re-sources, described the schemes and furnished estimates of receipts and expenditure.

The sites for development in the several divisions were stated to be.

Southern Division.—(1) The Periyar Project (2) The Papanasam Project (3) The Parappar Project (4) The Pinjikavi Project.

Madras—Nilgiri Division.—(1) The Pykara project (2) The Cholatipuzha project (3) The Upper Bhavani project and (4) The Silent Valley project.

Northern Division.—The Kolab project and the Ananthagiri project.

West-Coast Division.—The Chalakadi project in Cochin State.

Resolutions. (1) That the council approves the notification and the rules proposed to issue under Sections 3 and 7 of the Cotton Transport Act 1923. (2) That the scheme of colonizing Andaman Islands with Moppillas and all propaganda in support of that scheme be immediately stopped and a committee of non-official members of the House including Moppilla representatives be sent to enquire and report on conditions and until then no free men and women be sent.

GLEANINGS.

Sugar. Java maintains her leadership in cane sugar production in the Far East. She has been the beacon light of hope for various countries situated in the eastern hemisphere. The land has been the great vantage ground of the Holland-Indian possessions from whence have radiated remarkable influences.

Java has a record of over two hundred years of activity in sugar manufacture. As early as 1710, Batavia alone had 130 sugar mills. For fear there would be an overproduction each mill was held to an annual output of 18 tons and because of this stringent regulation the number of mills in 1745 was reduced to 65. But Holland's persistency to maintain the industry ran the number in Batavia up to 82 in 1752 which number again fell to 55 in 1779. Of these mills 24

were then in the hands of Europeans and annually produced 100,000 piculs of sugar. The Chinese originally manufactured the sugar and delivered it to a Dutch Company and this corporation for years engineered the industry. When it was dissolved the Government of Holland took control of the mills. It is the irrigation waters that insure Javanese success and it has been estimated that every kilogram of sugar needs 1,000 liters of water to bring about its consummation. Originally the period of rental of cane plantations was $3\frac{1}{2}$ years, but as this did not give a long period of guarantee to the manufacturers who wanted a steady flow of cane, the Government raised this to $21\frac{1}{2}$ years.

Should Java lose her sugar industry the 200,000,000 florin profit would mean a loss of 175,000,000 florin to the native Javanese. The rest of the profits go to Holland and Chinese factory owners. The sugar factories employ 4,000 Europeans, and 50,000 Javanese and during the campaign from 700,000 to 800,000 laborers find employment in the fields and factories.

(The Planter and Sugar Manufacturer)

Agricultural Schlarships in Scotland:-These are awarded annually.

Class I. Allowance not exceeding 35 s. per week for short course of from four to ten weeks' duration in agriculture, horticulture dairying, poultry keeping etc.

Class II. Scholarships, each not exceeding £ 30 in value, for courses of instruction, during one session of about twenty weeks, in agriculture, horticulture, dairying, poultry keeping etc.

Class III. Scholarships, each not exceeding £ 120 in value, or £ 40 per session, for three sessions of about twenty weeks each, for courses of instruction for diplomas awarded by Agricultural Colleges in Scotland.

Class IV. Scholarships, each not exceeding £ 360 in value or £ 120 in any one year, tenable for courses of instruction for the degree of B. Sc. (Agriculture) of a Scottish University during three academic years or thereby, or for the qualification of M. R. C. V. S. at the EDINBURGH or GLASGOW Veterinary College.

In addition to the allowances described above, class fees are paid in respect of all scholarships awarded. Travelling expenses may be paid either in addition to, or wholly or partly in place of the allowances.

The Scheme is administered by the Board of Agriculture with the assistance of the Scottish Education Department, Education Authorities, Colleges of Agriculture and the Scottish Farm Servants' Union.

Benefits under the scheme are confined to:—

(a) The sons and daughters of agricultural workers;

(b) The sons and daughters of other rural workers, including smallholders, whose financial circumstances are comparable to those of agricultural workmen.

(c) Persons who are themselves bonafide workers in agriculture or its allied pursuits, whose financial circumstances are comparable to those of agricultural workmen.

Research and Post-graduate Scholarships. These are intended to provide training for research work for graduates who show distinct promise of capacity for advanced study and research in some one of the sciences bearing on agriculture. The scholarships are of two classes:—

(1) Scholarships of the value of £ 200 per annum, tenable for a period of three years, open to graduates with honours in science (or equivalent qualifications) of a British University. In the case of Veterinary Research Scholarships, applicants must have obtained the Diploma of the Royal College of Veterinary Surgeons or have shown evidence of proficiency in medicine or some other related branch of science.

(2) Scholarships of the value of £ 120 for one year, with a possibility of extension in exceptional cases for a second year, When the scholarship is tenable at Oxford or some other centre where the cost of living is unusually high an increased award may be made.

Applicants must be graduates of a British University.

Nine Scholarships are awarded annually, provided a sufficient number of suitably qualified applicants is forthcoming.

Scholarships for students intending to become Agricultural organisers, lecturers, etc.—This scheme, is intended to further the education of selected agricultural students who propose to take up posts as agricultural organisers, teachers or lecturers in agriculture. *Candidates* must be *British born* and should be *graduates* of a University but exceptional candidates otherwise qualified who have not had an opportunity of graduating, are regarded as eligible.

These scholarships of which five are available for award annually are of a maximum value of £ 200 per annum and are tenable for a period of two years, the second year being spent abroad, when special additional allowances to meet travelling and other expenses will be granted.

Travelling Research Fellowships.—This scheme enables members of the Agricultural Research and Advisory Staffs to visit foreign countries in order to gain a first-hand knowledge of the progress being made elsewhere in their special subjects. These fellowships are available for short periods up to about six months, and the amounts of the awards are fixed by the Advisory Committee on Agricultural Science, by whom the successful candidates are selected.

(From the Scottish Journal ofAgriculture Vol. VIII. No. 4). Y. R. R.

Statistics.

PROVINCIAL LOANS AND ADVANCS : MADRAS, 1924—25.

Balances at the close of the year.		Rs.
Advance to cultivators	...	60,89,630
Agriculturists' Loans Act	...	59,61,932
Loans for Pumping installations and agricultural implements	...	196,433
Loans to sufferers from Moppilla rebellion	...	897,401
Loans under Co-operative Societies Act	...	5
Total	...	1,31,45,392
Loans under State aid to Industries	...	4,59,600
Loans to landholders and other notabilities :—		
Zamindar of Punganur	...	38,333
Uralan of Tirukaliyur Devasam	...	5,835
Zamindar of Kangundi	...	8,484
Sivaganga Estate	...	300,00
Loans to local boards for Railway construction	...	18,54,250

(From the Fort Saint George Gazette, 13th October 1925).

RECEIPTS AND DISBURSMENTS of the Madras Government for 5 months ending 31-8-25.

RECEIPTS.	ACTUALS.	BUDGET FOR 1925—26.
Land Revenue	2,00,51,218	7,50,67,000
Forest	18,75,070	54,86,500
Irrigation (a)	—13,15,763	—28,65,200
,, (b)	32,730	1,.3,000
Ports and Pilotage.	21	100
Education.	2,56,275	5,94,200
Agriculture.	1,14,987	2,74,800
Industries.	2,67,021	10,000,100
Total Revenue.	5,50,51,652	16,51,79,100
Famine Insurance Fund.		6,26,551
Loans & Advances Provincial Government.	18,31,216	30,05,500
Loans between Central & Provincial Govt.		1,01,20,800
Total Receipts.	578,33,058	18,18,76,451
Opening balance.	53,24,062	14,12,739
Total.	6,31,57,120	18,32,89,190

Disbursments	In India	In England	Total	Budget
Land Revenue	16,19,800	20,770	16,40,570	42,20,400
Forest	16,16,869	61,730	16,78,599	51,65,500
Irrigation works				1,08,600
Agriculture	10,63,203	31,160	10,94,363	29,69,000
Industries	5,84,765	64,790	6,49,555	17,96,500
Ports and Pilotage.	10,406		10,406	50,800
Famine Relief & Insurances	611	...	611	6,61,000
Superannuation allowances and pensions	19,95,256	1,69,370	21,64,626	61,39,700
Total expenditure charged to revenue.	46594512	1295590	47890102	162229800
Irrigation works			64,776	38,500
Industrial development			1,90,429	1,57,900
Loans etc. by Provincial Govt.			17,40,605	83,68,900
Loans between Provincial & Central Govt.			9,50,000	29,44,500
Total Disbursments.	5,01,43.809	12,95,590	5,14,39,399	17,82,91,600
Add, Closing balance			1,17,17,721	49,97,590
Total			6,31,57,120	18,32,89,190

N. B.—Figures in rupees.

Rainfall in the Madras Presidency for 1924.

DISTRICT.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Total.
Ganjam-Plains	.. 0'67	0'57	,,	0'59	3'84	1'55	5'69	7'91	10'95	7'33	13'28	...	52'38
,, Agency	... 1'01	0'03	0'03	0'80	4'41	2'93	7'29	12'74	10'27	8'18	9'62	...	57'31
Vizagapatam Plains	... 0'26	0'41	,,	0'41	2'83	2'44	2'87	7'95	15'65	5'54	7'82	...	46'18
,, Agency	... 0'32	0'14	0'07	1'63	3'35	2'89	8'11	13'29	11'69	4'90	6'57	0'01	52'97
Godavari-Plains	... 0'08	,,	,,	0'16	1'85	2'66	6'18	7'18	15'31	6'28	16'80	...	56'50
,, Agency	... 0'20	,,	,,	0'83	1'55	2'38	10'63	9'31	11'29	6'09	5'78	...	48'06
Kistna	... ,,	0'04	0'03	0'13	1'04	2'05	7'04	7'08	12'97	3'63	7'70	...	41'71
Guntur	... 0'02	,,	0'04	0'15	2'04	2'05	3'22	4'55	8'75	3'29	7'50	...	31'61
Nellore	... 0'78	,,	0'03	0'09	0'93	1'69	3'47	2'59	8'36	2'32	17'29	0'03	37'58
Madras	... 2'37	,,	0'13	,,	,,	3'45	5'63	2'57	9'67	4'80	16'12	0'88	45'62
Chingleput	... 1'13	,,	0'08	0'01	0'73	1'60	3'64	2'69	9'85	4'19	14'12	0'83	38'87
Chittoor	... 0'65	,,	0'09	0'70	1'86	2'95	3'18	3'33	8'08	2'57	8'62	0'02	32'05
North Arcot	... 0'76	0'01	0'21	0'45	2'44	1'94	2'99	4'22	10'53	3'48	6'14	0'26	33'43
South Arcot	... 3'31	,,	0'94	0'10	1'42	0'76	2'57	5'08	10'27	5'02	7'84	2'19	39'50
Tanjore	... 1'73	0'02	3.13	0'16	1'08	0'64	1'42	2'81	6'51	4'37	7'45	3'41	32'73
Trichinopoly	... 1'54	,,	0'66	1'14	3'34	1'02	1'73	4'71	6'97	2'92	6'15	0'46	30'64
Pudukkottai	... 1'66	,,	1'85	0'23	1'90	2'18	2'80	6'50	7'38	3'55	3'93	1'00	32'98
Madura	... 1'25	0'07	1'17	1'42	2'61	1'33	3'77	2'12	5'57	2'27	5'51	0'49	27'58
Kodaikanal	... 2'63	0'20	1'72	2'21	5'93	5'03	12.57	10'62	10'75	2'97	6'43	4'23	65'29
Ramnad	... 1'43	...	2'84	0'85	1'40	0'78	1'39	2'80	4'50	4'64	7'28	1'90	29'81
Tinnevelly	... 1'80	0'05	2'05	1'06	1'20	1'32	4'33	0'58	3'16	7'49	6'04	3'41	32'49
Travancore State	...												
Devikulam Division	... 1'31	0'04	2'92	2'60	5'09	28'80	71'04	17'18	13'74	10'20	7'96	3'21	164'09
Kottayam ,,	... 0'73	0'34	3'57	5'40	10'01	48'19	54'05	28'27	12.54	7'99	7'22	2.53	180'14
Quilon ,,	... 1'31	0'09	3'83	4'85	8'00	31'08	36'40	16'48	11'96	8'16	7'47	4'02	133'65
Trivandram ,,	... 0'55	0'89	2'67	4'57	4'20	17.72	18'10	5 18	9'14	9'67	5'75	3'74	82'18
Cochin State	... 0'46	0'31	1'94	4'92	9'31	45'82	50'83	28'12	10'29	5'11	8'73	1'12	166'33
Malabar	... 0'30	0'02	1'90	4'24	6'99	43'59	69'44	27'86	9'60	5'80	6'21	0'87	176'82

South Kanara	...	...	1.22	2.38	3.48	42.30	66.87	32.86	13.48	4.31	1.53	0.16	168.59
Salem	0.31	0.01	0.50	1.17	6.14	1.64	1.98	4.14	6.93	2.89	3.49	0.02	29.22
Yercaud	1.00	0.12	0.72	3.40	2.96	3.39	11.96	6.70	7.75	4.69	4.82	0.20	47.71
Coimbatore	0.28	,,	0.98	2.34	4.24	2.61	5.67	1.67	3.81	4.06	5.62	0.48	31.76
Kollegal	,,	,,	0.30	3.25	6.35	3.34	4.05	4.26	3.63	2.29	2.68	...	30.15
The Nilgiris	2.63	,,	2.66	2.86	5.04	13.44	44.20	10.13	8.03	5.67	6.77	2.93	104.36
Coorg	0.17	0.06	0.82	3.32	4.11	21.05	91.28	17.17	10.95	5.19	3.81	0.62	157.92
Cuddapah	0.26	,,	0.02	0.23	1.30	1.12	2.93	2.14	1.63	1.26	6.54	...	24.73
Anantapur	,,	,,	,,	0.70	2.32	1.83	2.02	3.21	7.14	1.33	2.63	...	21.18
Bellary	0.10	,,	0.11	0.87	1.62	1.66	2.71	4.42	6.70	2.08	0.39	...	20.93
Kurnool	0.00	,,	0.02	0.40	0.90	1.23	4.05	4.32	7.01	1.13	3.21	...	22.27
Amindivi	1.54	,,	0.02	0.13	5.85	32.90	14.51	13.19	8.65	2.37	0.67	0.01	79.85

July 1925—Rainfall.

Ganjam Littoral	2.40	3.64	N. Arcot	0.10	2.53	Malabar	12.71	19.43
Do Agency	8.51	6.51	S. Arcot	0.02	1.96	South Kanara	17.35	35.34
Vizagapatam Littoral	1.35	4.15	Tanjore	0.03	0.58	Salem	0.03	1.16
Do agency	5.35	7.86	Trichinopoly	0.01	0.75	Yercaud	0.16	1.69
E. Godaveri plains	0.59	11.90	Pudukotah	0.13	1.15	Coimbatore	0.29	0.45
Do Agency	13.08	14.99	Madura	0.03	0.89	Kollegal	0.27	0.42
W. Godaveri	1.37	9.69	Ramnad	0.02	0.76	Nilgris	4.13	5.99
Kistna	0.95	8.61	Tinnevelly	0.25	0.08	Coorg	22.06	15.03
Guntur	4.57	5.02	Devikolam	0.96	5.67	Cudappah	0.52	4.60
Nellore	0.28	2.41	Kottayam	6.84	9.47	Anantapur	0.52	1.20
Madras	0.76	3.06	Quilon	5.93	4.88	Bellary	0.54	1.02
Chigleput	0.40	3.10	Trivandrum	1.93	1.65	Kurnool	0.58	3.81
Chittore	0.40	2.94	Cochin	7.70	12.45	Kodaikanal	0.32	1.51

N. B.—Figures in inches.

Areas in acres cultivated in Madras. Up to the end of September Paddy 7,042,000; Groundnut 2,013,900; Gingelly 5,21,200; Sugarcane 1,05,800.

Vital statistics (Madras).

	July 1925.		August 1925.	
	Births.	Deaths.	Births.	Deaths.
For 81 municipal towns ...	9,688	74,02	10,446	7,678
For 82 rural towns ...	3,750	2,217	4,051	2,153
52,198 villages ...	1,12,775	65,762	1,12,544	60,018

Rate of exchange for calculating ad valorem duty:—Government of India Notification Finance Department 18th September 1925.

British £ 1 sterling—Rs. 13-5-4; French 1 Franc—Re. 0-2-3; German 1 renten Re. 0-10-9; U.S.A. or Canadian 1 dollar—Rs. 2-12-0; Chinese (Shangai) 1 tael—2-2-6; Straits (Bri. As. Possessions) 1 dollar 1-8-0; Hongkong 1 dollar—1-9-6; Mexican 1 dollar—Re. 1-9-6; Japanese 1 yen—Re. 1-2-6; Persian 1 kran—Re. 0-5-0.

Notes.

An *Agricultural Middle School* has been proposed to be started at Kalahasti. The. Hon. the Raja of Panagal has offered free of cost 8 acres of wet land and 7 acres dry to be attached to the school. He has also undertaken to finance the construction of the school building and an office and museum costing Rs. 2800 and Rs. 3050. An initial expenditure not exceeding Rs. 31900 has been sanctioned for the school and a sum of Rs 6500 for the layout this year.

Benefaction to Universities. A very large number of the gifts and bequests received by the American Universities come from their alumni and not only are these more numerous than the alumni of the British Universities, but a much larger proportion make their career in commerce and industry.

A characteristic of British as compared with American benefactors is the greater particularity with which benefactors specify the purposes to which they desire their money to be applied.

During 1875-1905 the benefactions for the higher education rose from 3 to 20 million dollars. Nature, May 2, 1925.

The *Birhors* are a tribe that dwell in the jungles that infringe the eastern margin of the central plateau of Chota Nagpur which is 2000 feet high. They eke out a livelihood by burning patches of jungle and raising crops of maize and beans. Their normal mode of life is nomadic. The fauna and flora of the jungle supply them with food and with the *chop* fibre (*Bauhinia Scandens*) which they make into rope and barter for such clothing, condiment, salt and other things they cannot produce themselves:—says Rai Bahadur Sarat Chandra Roy.

On 30th June, the factories in New South Wales produced 115,000,000 lbs. *butter* for the 12 months This with 5,000,000 lbs. made on farms and sold as dairy butter made a total of 120 millions.

The provisions of the Madras *Cattle Disease act*, 1886, are put in force in Nandyal and Nandikotkur taluks for a further preriod of three years

Coconuts in Laccadives. General satisfaction will be felt at the recommendation made by Mr. I. M. Fraser, who inspected these islands along with the Government Mycologist and a Farm manager that an agricultural officer should be deputed to these islands to introduce better cultivation, as coconut growing is in a very bad state and as the life of these islands depends upon coconut.

In the Malayan Agricultural Journal for September 1925, H. W. Jack and J. H. Dennett write that nuts from untapped *coconut* palms contain 8'5 per cent more dry meat or copra and the meat contains 14.2 per cent more oil than *nuts* from palms which had been tapped for toddy for two years prior to the time of collection of fruit.

Cotton Industry in Argentine. The increased production of cotton has led to the installation of ginning machines mostly American, and a few weaving factories are installing spinning machinery which has led to an agitation for increased duties on yarn. (Journal of Royal Society of Arts. September, 4).

Cotton picking. According to the density of the cotton crop, 40 to 50lbs. of seatoland cotton constitutes a fair day's picking in Queensland when the weather is fine.

A Madras Government (Development department) press Communique dated September 21, says The Cotton Transport Act is brought into force in the Madras presidency and made applicable to the three protected areas as follows,

(1) The Northerns and Westerns area consisting of Anantapur, Bellary, Cuddapah and Kurnool districts.

(2) The Tiruppur-Combodia area consisting of the district of Coimbatore, the Karur, Musiri and Kulittalai taluks of the Trichinopoly district, the Namakkal, Tiruchengodu and Rasipur taluks in Salem and the portion of the districts of Ramnad and Madura lying to the north and west of the Vaigai river.

(3) The Tinnevelly area-consisting of the district of Tinnevelly and that portion of the districts of Ramnad and Madura lying to the east and south of the Vaigai river.

It is understood that the staff on *cotton work* in Madras will be augmented by the addition of a botanist with experience in both plant physiology and genetics, a biochemist and entomological assistants for detail insect work. The Indian Central Cotton Committee have offered an annual grant of Rs. 55,000 for five years and the local Government have accepted the offer.

Fifty students are undergoing training in the Imperial *Dairy* Institute at Bangalore. (Madras Mail—September 22).

A cinematograph film illustrating the work of the Imperial Dairy Institute was shown on Saturday 19th September at Bangalore' Lectures were give by Mr. Smith and several reels of the extensive dairying operations up-to-date in America were shown.

Journal of Agriculture Victoria : August :--From W. C. Rugg's quotation of a letter by Professor Edward Brown we gather that England's consumption of *eggs and poultry* for 1924 was worth 40 million pounds made up as follows. Eggs. Home produced £ 14,238,000, imports including those from Ireland 20,231,000. Poultry :—Home produced £ 2,883,000, imports including those from Ireland 2,532,000. We also understand that New Zealand is exporting large quantities and Victoria is making arrangements to do so.

Honorary Assistant *Registrars* of Co-operative Societies appointed in 1924-25 were 33 in the Andhra districts, 48 in Tamil districts and 5 in the West Coast.

Journal of the Royal Society of Arts (Sept. 1925) observes that the influence of the *motorship* on export trade is enormous. The first small seagoing motorship was constructed in 1910 and the first large one in 1902 and today more than one-third of the ships under construction in the world are equipped with Diesel engines. Although a motorship costs 25 per cent more than a steamer of a similar size, it can carry goods from 10 to 30 per cent cheaper, because a Diesel engine requires less space than a steam plant, less fuel, a smaller crew, and no coal passers or trimmers. How this will affect the coaling stations and collieries is a matter of concern.

Sheep scab is a condition of the skin due to infestation by certain parasites which, while living and breeding on the skin puncture it to obtain their nourishment from the lymph and blood. Sheep infested with the parasite may become by unthrity and emaciated. They even perish if neglected.

The affected animals rub themselves against fixed objects, nibble at the itchy parts and the wool becomes broken and detached.

ESTATE NEWS.

It is understood that the subordinate staff of the Cane expert's section have memoralised the Government of India about their salaries and prospects and disadvantages they are likely to suffer from by denying to them the Pusa scales of pay but by continuing the Madras scales without the attendant conveniences.

Mr. A. K. Menon of the Bacteriological Laboratory Muktesar, was on a tour of inspection in the Presidency including Bangalore. He visited the Agricultural College Dairy and investigated the incidence of Johne's disease amongst the cross breds and other cows at Coimbatore.

STUDENTS' CORNER.

B. Sc. Ag. Degree.Changes in Regulations.

The first examination for the B. Sc. Ag Degree was conducted in April 1923 and experience during the past 3 years necessitated some changes, which at the initiative of the Board of studies and at the instance of the Academic Council were made by the Senate at its meeting held on 22nd October 1925. These will come into effect immediately and will apply to the examinations that will be held in April 1926.

Part I. Up to the present there were 6 subject minima This number has now been reduced to 5. Animal hygiene ceases to exist as a separate subject but will merge into agriculture. Instead of 8 papers there will in future be only 6 papers. (1) Engineering (2) Botany. (3) Chemistry. (4) Zoology. (5) Agriculture (6) Agriculture (animal hygiene). Each paper will carry 50 marks. There will be 6 practicals To each are assigned 50 marks except to agriculture proper which gets 100. Thus the total number of marks for theory is 300, and for practical 350. The subject minima will continue to be 33 per cent but a pass requires a total minimum of 40 per cent, while for the first class is still retained 66 per cent.

Part II. As heretofore there will be 3 subject minima (a) Botany, (b) Chemistry, and (c) Agriculture. The first two will have two papers each and in agriculture there will be 3 papers. Botany and Chemistry get 200 marks each, while with the third paper which will be an essay, and carries only 50 marks agriculture gets 250 marks. 50 marks are assigned to each of two practicals in Botany and Chemistry, while they are raised to 100 in the case of agriculture, so that 650 and 400 marks are allotted for theory and practical respectively. The subject minima and the total minimum for a first class continue to remain at 33 per cent and 66 per cent respectively, though the total minimum for a pass has been reduced to 45 percent.

The Mycological portion of Botany in Part I and the Physiology and Ecology portion in Part II change places; and so also in agriculture, manures and manuring in Part I and animal husbandry in Part II.

No marks are allotted for laboratory and field note-books which will however be perused by examiners in connexion with oral examinations.

Names of successful candidates will be published in the order of proficiency as determined by the total number of marks obtained.

Holders of the B. Sc. Ag. Degree are now eligible for University studentships which will be awarded on the recommendations of the Board of Studies, for post-graduate study in particular branches of agricultural science.

B. Sc. Ag. has been declared to be a Professionol examination like Engineering or medicine.

Waste of manure in India.

(K. AMBIKACHARAN. B. Sc. I.)

That water and manure are the chief wants of the ryot is the honest opinion of many an agriculturist in India. Yes, it is true; and in most cases manure is the more important requirement. The chief source of manure in India is from the excreta of the cattle. Cow-dung is the best available manure. It is a closed book to many of the agriculturists in India that the urine of domesticated animals is more important than the dung, because it is richer in nitrogen and in some salts which are as valuable as any manure. If dung and urine are preserved for a sufficient period and used as manure, there is no doubt as to the maintenance of the fertility of a land in the most economical manner possible, We are well aware of the fact that urine, which weight for weight is as valuable a fertilizer as dung is in many districts in India absolutely wasted. Its economic value as manure is not comprehended nor fully appreciated by the ryots. The dung is used as fuel on a very large scale. In cities and tows its value as fuel is greater than manure. This kind of wastage is most deplorable. In many important centres, large number of work cattle, milk cows, buffaloes and horses are stabled. These domestic animals are fed with richer food than cattle in the country, and naturally their dung and urine contain the essentials of the good manure in a greater degree. If these excreta are preserved with care as manure, it would be much better than that produced by an ordinaty ryot in the country. The solid excreta, as we behold, are worked up as cakes and dried and used as fuel. The liquid excreta which is the urine dries away.

It is somewhat encouraging to note that in some towns and villagse the night soil and sweepings are preserved as manure. We also see that in very many places vast sources of manure supply are neglected for want of knowledge and in some cases mere prejudice induces the ryots not to care for them. In places where poudrette is preserved and used, its value is very well understood for the very reason that its use as manure for irrigated crops is very effective. Bones are considered as a very valuable manure by many countries. On account of the economical value of the bones, they are exported on a very large scale to Europe from India. It is believed that during the past few years about 50,000 tons of bones per annum were exported. Oil cakes are very much used as manure for irrigated crops and garden lands. These cakes are used as food for cattle in many districts. They are sufficient indications to show that the ryot in India thinks that he is in need of new sources of manure supply. There are many sources of manure supply which have not been exploited viz, refuse from factories, tanneries, slaughter houses etc.

Such wastage of manure should be avoided by the ryots. Our country is very rich in manures, The pity is, the ryot does not consider the economic value of various kinds of refuse and what he thinks insignificant is indirectly and indisputably indispensible to him. He should at all times think that if the fertility of a land has to be maintained the land should be liber ally manured with the preserved dung and urine.

Books 1925 up to 30-9-25.

RECEIVED IN THE COLLEGE.

Bentham. G. Revised by Rendle. A. E. Hand book of British Flora 1924. Pethe Bridge. F. R. Fungoid and Insects pests of the Farm. Wolfe. T. K. and Hut Cheson. T. B. Production of field crops 1923 Bailey. L. H. A manual of cultivated plants 1924. Copeland E. B. Rice 1924. Ely R. T. and Morehouse Elements of land economics. 1924. Finlay. G. F. Recent devolopments in cattle breeding 1924. Howard. A. Crop production in India 1924. Jean. F. C. and Weaver. J. E. Root behaviour and crop yield under irrigation. 1924. MacBride. E. W. An introduction to the study of heredity 1924. Marsh. E. L. Where the buffalo roamed 1923. Watherhouse. G. A and Lyell. G. The butterflies of Australia 1914. Feldmen. W. M. Biomathematics 1923. Tookey W. A. British oil engines 1923. Yule. G. U. Function of statistical methods in scientific investigation 1924.

Miscellaneous Publications U. S. A. 1925 Departmental Bulletins. 1307 Absorption and retension of Hydrocyanic acid by fumigated food products. No. 1323. Citrus Pectin. Porto-Rico. Agricultural Notes:—No. 8:—Controlling coconut bud-rot. No. 16:—Some pine-apple problems. Egypt Ministry of Agri. Tech and Sci. Bull No. 48:—Effects of heat treatment of cotton seed on its germination and on the subsequent growth and devolopment of the plants. Bull. No. 47:—Cotton growing in relation to climate in Egypt and Sudan Ministry of Agri. and Fisheries (England) Leaflets:—No. 164 :—Potato leaf-roll. No. 125 Cultivation of Melons. No. 123:—Cultivation of cucumbers. University of California:—Circul No. 277:—Head Cane and Cordon pruning of Vines.; Michigan Exp. Station Circul No. 63 :—White Ants. Special Bull. 138. Rural highways. Extension Bull. No. 39 :—Orchard grafting. Wisconsin Agri. Exp. Station Research Bull. No. 60 :—Rural religious organization Bull No. 368 :—Contagious abortion in cattle. Circul 174. Bee-keeping in Wisconsin. Circul, 177. Control of round-worms and tapeworms in poultry Circul. 179. Farm accounts made easier. Circul. 182. Vegetable

Cookery. Philippine Bureau of Agri. Bull No. 40. Agricultural Credit Co-operative Associations. Arizona Agri. Exp. Station. Bull. 103. Dry farming in the Sulphur Spring Valley. Texas Agri. Exp. Station. Bull No. 320. Influence of individuality, age and season upon the weights of fleeces produced by Angora cattle under range conditions. Bombay Agri. Bull No. 118:—Land crabs as agricultural pests in Western Indian. South Australia Dept. of Agri. Bull No. 186. Smyrna fig culture. No. 190. Some diseases of wheat crops and their treatment. Board of Economic Enquiry Punjab. Rural Publication No. 4. Size aud distribution of agricultural holding. No. 5 An enquiry into the mortgages of agricultural land in the Kot-Kopura circle. Nebraska Expt. Station. Bull No. 205. Tenure and farm investments. Union of South Africa. Science Bull. No. 37. Comparative results of analysis of spirits and brandies. No. 39. Streak disease of sugarcane. Forest Bull. India. No. 61. Eucalyptus in the plain of North-West India. Madras Dept. of Industries. Bull. No. 1. Report ou the malting of large quantities of cholam.

News Jersey Expt. Station Bull: —No. 390 studies on the biology of sewage disposal. No. 400:—Making and use of Nicotine dust. No. 401. The stem rot of potatoes. No. 402:—Egg-production-Correlation Tables Report-Miscellaneous:—Paper on the milk supply of Lahore by Shiva Batta. Report on cultivation experiment with irrigated cotton in Iraq.

CORRESPONDENCE.

Agriculture in India and Italy.

One must not be struck with the very sensible contribution of Mr. Galletti Collector of Ganjam regarding practical agriculture in Italy and India. In Italy the systematic rest given to the paddy fields and the rotation of crops contribute to the increased fertility of the soil. Coupled with this the cultivation of fodder crops such as lucerne in paddy lands not only gives good food for cattle but also indirectly enriches the soil by the cattie voiding their urine and excreta in the soil when they graze. In India every inch of ground is cultivated year after year with the sanie kind of crop. We have heard old people say that a land which lay fallow will yield well. What does this mean except that land which was given rest will yield well? In India due to the increased demand for milk and milk products on account of the ever increasing coffee—and tea —shops, good milk has become rare and what could be had for two annas ten years ago could not be had even for 4 annas. The

cattle wealth of India is decreasing gradually partly by constant export and partly by neglect. It is true that Ongole cattle have been prohibited export. There are however other good breeds which are being largely exported and which in course of years will become rare. Free mixture of all kinds of breed in grazing ground and the covering by immature animals produce an inferior kind of cattle fit neither for milking well nor for draught purposes.

Supposing the owner of paddy fields sets apart a certain acreage for rest and indirectly for pasturage by growing fodder crops or cereals for the benefit of his cattle, will Government remit the assessment if previous intimation is given by the owner of his intention not to cultivate paddy but to leave it uncultivated for use of his cattle? In Indian village where the holdings are scattered and where the ryots do not combine and adopt any improved methods, it will be difficult to adopt improved methods. If I allow my land to be grown with fodder for cattle, will it be possible to prevent my neighbours' cattle from grazing on my land. These and other matters deserve the consideration of the Agricultural Department and the Development Department of Government.

Rao Bahadur K. S. Venkatramier.

[Mr. Ayyar's suggestion is well worthy of consideration. In the district of Coimbatore it was the custom not long ago to levy a concessional rate of assessment on lands cropped with fodder cropsor put down to grass. This has fallen into disuse and the causes for the disappearance of this system are fit questions for serious study by interested persons—Editor].

EDITORIAL NOTES.

B. Sc. Ag. Examinations.

Elsewhere In this issue are published certain changes which the University have considered neeessary to make in the regulations governing the conduct of the B. Sc, Ag. Examinations. These changes are really a step forward and all will welcome them so far as they go. They are agreeable in this respect viz., that the number of subject minima has been reduced in Part I and marks and portions of the syllabus readjusted, so as to relieve the strain on the students. Perhaps later experience may show that further readjustments are

necessary and this is desirable and would be natural, seeing that our experience in regard to the University course in Agriculture in this Presidency is short and the last word has not been said on the subject. It may be that Part I is still over-weighted and may lead some letting out of pressure. Even now an opinion is held that all problems connected with Zoology and Mycology might usefully be pieced together and treated under a new subject which may be designated Plant pathology so as to follow a natural division in the treatment of the subjects concerned.

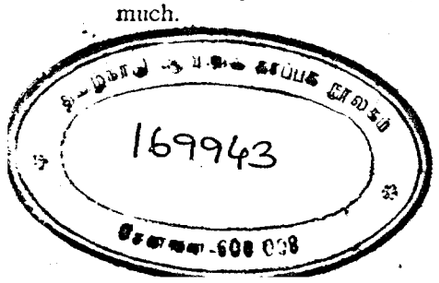
Further, as no one subject which is now honoured with a distinct place in the curriculum can be treated by itself, without the aid of and reference to other subjects and fairly a full knowledge of all subjects is essential for a correct answer, portions of subjects as soils and manures, plant and animal nutrition taught by different teachers from different standpoints may be rightly correlated. so that students may be equipped with full knowledge in each subject during a particular period, without having to wait until the end.

We appreciate the decision of the Senate that the minima for pass should be reduced to 40 per cent in Part I and 45 per cent in Part II seeing that all University examinations are to be conducted on the same equitable standards of correction. This, we feel sure, does not imply that the standard of examination has been lowered but that students will have to be prepared for stiffer questions and more rigid valuation.

We are glad that within such a short time it has been possible to effect desirable changes in the examination largely on account of the intiamate touch of the authorities of the College with the University and of the presence of our representatives in the academic council and in the Senate.

What helps Science.

With great pleasure we publish elsewhere a circular letter which a scientist of eminence Dean. C. F. Baker, Los Banos, addressed to a member of this department. From a perusal of it, it would be evident that spacious halls and gilded pageantry are not the sinequa non for advancement of science. But even in the modern days of materialism, undaunted spirit of research, regardless of surroundings, can achieve much.



Departmental Notification.

Promotions and Transfers:—

The following three lower subordinates are promoted from the V to VI grade. Mr. A. Kondayya Sarma from 29th April 1925 and Messrs. P. Janakirama Ayyar and R. Sitharama Ayyar from 1st October 1925.

Mr. S. V. Doraswami Ayyar is posted to Koilpatti to work under the Farm Manager.

Mr. P. N. Krishna Ayyar, Assistant IV grade, promoted provisionally to III grade, from 12th July 1925.

From 1st November, 1925, Mr. P. S. Venguswami Ayyar, Assistant demonstrator, is posted to Maduranthakam and Mr. S R. Srinivasa Ayyangar to Saint Thomas Mount.

Mr. T. S. Venkatarama Ayyar, Agricultural demonstrator, posted to Koilpatti to work under the orders of the Farm Manager.

LEAVE, ETC.

Second Circle.

Mr. K. Ramanath Ayyar, Agricultural demonstrator, Bapatla, leave on average pay for one month from 14th October 1925 afternoon.

Mr. S. Sithapathi Rao, Assistant Agricultural demonstrator, Nellore, leave on average pay for 10 days from 26th October 1925.

Mr. G. Sitharama Sastri, Agricultural demonstrator is granted extension of leave for one month and fifteen days.

Third Circle:—

Mr. L. Narasimhachari, Agricultural demonstrator Tadpatri, leave on average pay for 15 days from or after 15th October 1925.

Mr. B. Venkataramana, Assistant Farm Manager, Hagari, leave on average pay for 15 days from or after 6th November 1925.

Mr. A. Venkobachar, Assistant Agricultural demonstrator, extension of leave for two months.

Fourth Circle:—

Mr. S. Rama Rao Assistant Agricultural demonstrator, Chittoor, leave on average pay for 15 days from 6th October 1925.

Mr. K. T. Bhandary, Farm Manager, Palur, leave on average pay from 3rd to12th August 1925.

Sixth Circle:—

Mr. P. Kannappah Pillai, Assistant Agricultural demonstrator, leave on average pay from 10th to 30th September 1925.

Seventh Circle:—

Mr. M. U. Vellodi, Farm Manager, extension of leave for 2 months and 25 days with permission to suffix the Christmas holidays.

Mr. K. Krishna Hegde, Assistant Farm Manager, leave on average pay for one month and fifteen days from or after 24th October 1925

Eighth Circle:—

Mr. D. S. Subramaniya Ayyar, Assistant demonstrator, Pollachi, leave for one month from date of relief.

Live-stock Section :—

Mr. M. Krishnaswami Ayyangar, Assistant Farm Manager, extension of leave for three months.

Mr. V. Suryanarayana, Farm Manager, leave on average pay for one month from 6th October 1925.

Cotton Expert's Section:—

Mr. R. Chockalingam Pillai, Herbaceum Botanist Indian Central Cotton Committee, leave on average pay far one month from 20th October 1925.

Mr. S.N. Venkataramanan, Assistant, leave on average pay for one month and eight days from 16th November 1925 with permission to suffix Christmas and New Year holidays.

G. M's. Section:—

Mr. S. Rajaratnam, Sub-assistant leave on average pay for 20 days from 26th October 1925.

G. A. C. Section:—

Mr. T. S. Ramasubramaniya Ayyar, Assistant leave on average pay for 20 days from or after 26th October 1925.

G. E. B. Section:—

Mr. Samuel Jobitharaj, Assistant, extension of leave for 10days.

Central Farm:—

Ma. V. T. Subbayya Mudaliar, Farm Manager, extension of leave for one month.

The Journal of

THE

Mysore Agricultural & Experimental Union

BANGALORE.

A Quarterly Journal published for the Union by an Expert Board of Editors.

Chief Editor—Dr. B. Narasimha Iyengar, B.A., Ph. D.,

Agricultural Chemist in Mysore.

Subscription Rs. 3 per annum.

OFFICE-BEARERS FOR 1925—26.

The Council (25 Members.)

PRESIDENT (Ex-officio).		Principal.—R. C. Broadfoot.
VICE-PESIDENTS (4)—	*Resident:*	C. Tadulinga Mudaliar.
,,	*Mofussil:*	D. Ananda Rao, St. Thomas Mount.
,,	,,	P. H. Rama Reddi, Bellary.
,,	,,	R. Swami Rao. Cuddapah.
MEMBERS (20)	*Resident:*	U. Vittal Rao, *Secretary.*
,,	,,	D. Srinivasa Rao, *Treasurer.*
,,	,,	T. V. Rajagopalacharya, *Editor.*
,,	,,	P. S. Jivanna Rao, *Sub-Editor.*
,,	,,	V. Muthuswami Ayyar, *Manager.*
,,	,,	M. C. Cherian, *Member Ed. Board.*
,,	,,	Y. Ramachandra Rao, *Member, Ed. Board.*
,,	,,	M. R. Ramaswami Sivan, *Member, Ed. Board.*
,,	,,	S. N. Venkataramanan, *Member, Ed. Board.*
,,	,,	S. N. Chandra Sekharan.
,,	*Mofussil:*	K. T. Alwa, Guntur.
,,	,,	K. Avadainayagam Pillai, Coimbatore.
,,	,,	K. T. Bhandary, Palur.
,,	,,	T. Budhavidheya Rao, Hosur.
,,	,,	G. Jogi Raju, Samalkota.
,,	,,	N. S. Kulandaswami Pillai, Trichinopoly.
,,	,,	A. V. Tirumuruganatham Pillai, Madura.
,,	,,	K. Raghavachari, Bellary.
,,	,,	K. Unnikrishna Menon, Tellicherry
,,	,,	G. Rajagopala Nayudu, Periapalayam via Ponneri.

Working Committee (14 Members.)

The resident Vice-President and the ten resident members with the following student members form the Working Committee.

Student-Members (3) K. C. Kumaraswami Chetty, B.Sc I.
U. Achyutha Wariyar, B. Sc. II.
K. Varadachary, B. Sc. III.

Editorial Board (7),—as indicated above.

AUDITORS.—K. Krishnamurti Rao,
T. S. Ramasubrahmanyam.

THE JOURNAL
OF
THE MADRAS AGRICULTURAL STUDENTS' UNION.

PUBLISHED MONTHLY.

A Journal in English devoted to the study of improved agriculture. Contains articles of scientific as well as of general interest. Extracts and reviews from various Journals both Indian and Foreign a special feature.

Widely circulated and therefore an excellent medium for advertisement.

RATES

Subscription :— ANNUAL.

For members, new associates and Patrons of the Union.		Free.
For others—	(India) ...	Rs. 4-0-0
Do.	(Foreign) ...	Rs. 4-8-0

Advertisement :—

	Single insertion.	Per annum.
	Rs.	Rs.
For full page ...	5	20
For half page ...	3	12
For quarter page ...	2	8

The rates of Advertisement of Trade, other than Agricultural subjects, will be one and a half times the above. Preparation of blocks, unless supplied by firms, extra.

N. B.—All advertisements are subject to the approval of the M. A. S. U. Working Committee before insertion, and the charges are payable in advance.

All business communications should be addressed to :—

The Manager, M. A. S. U. Journal.
Agricultural College, Lawley Road P. O., Coimbatore.

Printed at the Electric Printing Works, Tower Building, Coimbatore.