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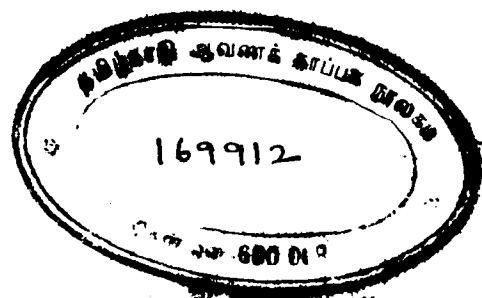
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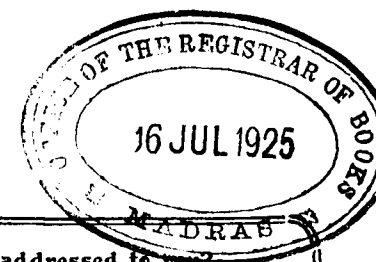
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FARMING IN CEYLON.

By A. M. RICHARDS.

The island of Ceylon contains vast stretches of uncultivated lands and possesses irrigation facilities, yet it depends almost entirely on Burma and India for its rice, so much so that when its export was stopped during the war, the people of this island were on the verge of starvation. The Jaffna Peninsula alone imports every year over two hundred thousand bags of paddy and an equal quantity of mill rice.

A few years ago the Government of Ceylon sold out forest lands under what is known as the Irrannamaddu Irrigation Scheme. Having tasted the bitter fruits of lean years many in Ceylon eagerly purchased several blocks so that they might introduce paddy and augment the supply. In a country where labour is very dear, it is expensive to convert within a short time a land, much less a forest, into an arable field fit for paddy growing. Even after one has expended a lot of energy and money in having the forest cleared, the lands banded, the plots fenced and channels cut, one is faced with the formidable obstacle of stumps. The most serious problem with the Ceylon

farmer is how to have the stumps and roots removed to make the land ploughable at a minimum cost. From reliable accounts maintained by settlers it is ascertained that in one representative case bunding and fencing two hundred acres of land cost Rs. 45,000. This was exclusive of the cost to be incurred in removing the stumps and of the price of the land paid to Government. Uprooting of stumps is an expensive operation in villages under this scheme, where labour is dear and coolies of the right type are not available. This will be evident from the fact that, though Irrannamuddu is situated within forty miles from Jaffna Peninsula and is connected by rail and a good road, the Irrigation Department had to depend on coolies from South India for the construction of the tank there.

Some wrongly imagine that if the lands are properly bunded and water is held in plenty the stumps will decay. This is not the case. If one walked along the Kilinochy tank bund, one would be struck by the number of dead trees, mostly *palus*, with their heavy branches standing aloft which by their appearance seem to have been there for the last twenty years or more. The preparation of fields contributes much towards the success of paddy cultivation. The Jaffna farmer is accustomed to cultivate paddy on lands which entirely depend on rain. The method of preparation of such rainfed lands is quite different from that for lands under tank irrigation. There are two ways of raising paddy in rainfed lands. One is known as 'Puluthy Vithaippu' where seed is sown broadcast after having reduced the soil into tilth. The other is known as 'Era Vithaippu' when the seed is sown on moist soil. Any failure of the second method results in poorness of the crop owing to the unavoidably late preparation of the soil.

When fields are under tank irrigation the preparation of the beds is known as 'Swamp or Puddle system'. For this operation of puddling the fields must be free from sharp stumps or spikes lest they should cause punctured wounds to men and beasts. After preparation of the fields either seedlings are transplanted or sprouted seeds sown broadcast.

Unlike the river water, the tank water that flows into the fields is free from silt, it having been deposited in the bottom of the tank. Easily available manures for a farmer are farmyard and green manures. The latter may either be collected from the nearer forests or grown in the field itself about two and a half months before the land is required for manuring. This practice is not yet common and needs to be popularised. Some friends of the farmer are labouring under the idea that cattle can be replaced by motor tractors in ploughing and other preparations; yet one thing is certain, tractors

cannot produce farm-yard manure and milk and we should keep cattle at least for milk and manure. The former is essential for the growth and vitality of man as it contains the necessary vitamins, the latter is the best plant food. Chemists like Pharaoh's magicians have tried and are trying several methods to convert the farm by-products into useful manure. McCarrison has shown that food has much to do with the growth and vitality of man and the crops raised by using farm yard manure give more nutritive food for man and beast than artificial manures. He has confirmed the results of the series of experiments conducted in this line by Dr. Norris till lately Chemist of the Coimbatore Research Institute on permanent manurial plots of the local College, the enzymes secreted by the digestive glands of cattle have the power of converting the bye-products of farm into suitable plant food. Cattle are thus indispensable for Ceylon.

There are suitable areas in Ceylon in the Northern Province for breeding cattle especially of the Indian Type. The point at issue is whether we should aim at a purely milk producing type or a purely draught type or a breed in which both qualities are combined. In European and American countries they have horses and machinery to do the draught work, the aim in cattle breeding there being to bring into existence a dual purpose breed fit for milk and meat. In this they have almost succeeded with their breed of Shorthorns. Extensive experiments are being carried on in this line in South America and in Java with Ongole cattle imported from India for this purpose. But a country like the little Island of Ceylon lying at the foot of the Mother Country, India, inhabited by people emigrated from there, with more or less the same religious sentiments, depending on her for all necessities except for luxuries, requires a breed fit for *work* and *milk*.

The need of a country can be found out from its demand. An agricultural country like the Northern Province imports every year at Katys a large number of Indian draught bullocks but less than two per cent of milk kine. Thus Jaffna definitely wants work cattle for cultivation more than milch cows. She is more in need of Kanji than milk.

It is interesting to learn that the Government of Ceylon is going to open a Dairy at Peradeniya this year. The point is whether they are going to import foreign breeds or going to build up a Dairy herd by selection from suitable local or Indian breeds. The latter is certainly a rather long and laborious process, but I do not think it is anything like as long as 30 or 40 years, as some imagine. Animals can be bred down to the fifth generation in the period of about two decades.

Some of the well-known Indian cattle breeders have cows which are equal to the best half-breds in yield of milk. By selection from such country cows it is possible to develop a dual purpose breed. The Pattagar of Palayakottai has a few such cows amongst his well known Kangayam breed.

When the Agricultural Department starts Dairy Farming or Cattle Breeding in the experimental station at Tinnevely, Jaffna, the farmers will expect the Department to select a breed whose bull calves will be useful for agricultural purposes and whose heifers are good milkers. From the point of view of Jaffna the former requisite is of far greater importance than the latter, as their statistics of cattle importation will clearly show.

I may be pardoned for saying right at the start that it will be a waste of time and money if attempts are made to breed half-breds. An animal is known as half-bred when its mother is a country animal and its sire a foreign breed like Ayrshire, British Frisian, Shorthorn, Jersey etc. The first generation of heifers invariably do well at the buckets, but the second generation is generally a failure and very rarely one in five among these may prove as good as the first. For Jaffna farmers the bull calves will not be of any use for agricultural purposes and they are without hump and they pant for breath in the sun even at Coimbatore which is at an altitude of 1400 ft. above sea level, and 12° N. latitude, and much more so in the tropical heat of Jaffna plains. Pure-bred foreign animals and these half-breds are more susceptible and vulnerable to contagious diseases than Indian cattle. Their upkeep costs are comparatively very high. There appear to be more cases of sterility and abortion amongst them. It is through foreign cattle that some diseases unknown in India have been introduced such as contagious abortion, pleuro-pneumonia contagiosa and tuberculosis.

There is a vast contrast as one travels in Ceylon and in India. In the former, nothing but thick jungles are seen on both sides of the railway line for miles and miles and in the latter country extensive plains either with dry or wet cultivation or pasture grounds lie stretched out. History tells us that Ceylon once had a vast area of paddy lands and that she was also exporting paddy even to Bengal. The very plains must have been converted into high forest by successive foreign invasions. It is not out of place to compare both the countries as to why paddy cultivation has not been pushed on in this little island when the inhabitants of it do require rice every day, it being their staple food. Great Britain having herself converted her wheat fields into hunting paths depends on other countries for food

for man and beast. England is quite different from Ceylon for she has power and command of a great fleet. Provincial Governments in India might stop the export of grains to Ceylon at any time. Unless Ceylon opens her eyes and produces articles of food herself, she is in danger of starvation.

It is over a century since Ceylon came under the British flag and there have been no wars and peace has prevailed uninterruptedly, yet the inhabitants do not appear to have made any effort to raise their own food grain and have even allowed the great part of the island to be overgrown with jungle or have their attention turned to commercial crops and coconut plantations. The progeny of planters invariably hunt after luxury and their sphere of usefulness is very limited to their country and people. It is high time that serious consideration is given to this problem.

In Ceylon:—

- (1) Only a rich man can attempt to cultivate in the forests.
- (2) The price of the land has to be paid in lump.
- (3) It will take some years to bring the lands into order.
- (4) Labour is very dear and the available coolies are incapable of standing any strain.
- (5) Malaria incapacitates coolies to do work.
- (6) It is very expensive to clear the forests, fence the area and watch the crops.
- (7) There are a number of enemies to the paddy crops, different kinds of insects invading from the surrounding forests not to speak of beasts and birds.
- (8) The branding ordinance not only ruins the hide trade of the island but has driven many a domesticated animal wild. It is by this branding system people allow their cattle to roam about in jungles to eke out their existence by their own efforts. Most of them when they grow fat retain their liberty in jungles and become a menace to cultivation. Numbers of bulls and cows can be seen even in day time in the jungle of Sankatharvial and a large herd of buffaloes roam about at night to graze the crops of Kilinochy.

Thus Ceylon is in a comparatively less advanced stage of farming than Southern India, but would with South India's help go forward as she is making strenuous efforts in this direction and her agricultural department has been reorganised though it is unfortunate that she lost the chance of having the Tropical College of Agriculture located within her limits.

EXTRACTS.

Land Tax & Transfer in the Chola-Pandya Times.

C. S. SRINIVASACHARI.

The taxes on landed property consisted of collections in kind and in coin. Custom invested the king with the right of collecting a large number of taxes and dues which fell either directly or indirectly upon land. "Whichever the king may lay his hands upon and enjoy," is the technical phrase that occurs in many inscriptions in giving away to a donee the full possession of a piece of land with all its rights and enjoyments. These consisted of a good number of items of service called *kudimai* (tenancy obligations), which appear to have been as strictly demanded and enforced as land revenue itself, i.e. *kadamai*. When grants of land were made to temples and Brahmins and for other charitable purposes, the original holders were divested of their rights of tenancy, evidently by some system of compensation. From this one may conclude that the tenants had an *a priori* right to the lands that they cultivated, subject only to their payment of *kadamai* and *kudimai*, or, as detailed in some inscriptions, "subject only to *kudimai*, which was tenable at the door of the tenant, and to the income by taxes (*varippadu*), which the village paid."

From a number of inscriptions we find that the total burden of taxation which fell on land, as could be computed in the most fertile portions of the Tanjore and the Trichinopoly districts, was about a hundred *kalams* of paddy per *veli* according to the *Adavalla* measure of Rajaraja I, which was the prevailing standard of measurement. Equal or identical measures were known by other names, like *Arumolidevan* and *Rajakesari* in other parts of the Chola dominions. Thus the land assessment (*kānikkadan*), as it existed about the beginning of the eleventh century, was about a hundred 100 *kalams* per *veli* (about six and two-thirds acres), equal to about¹ 80 *kalams* of the present time, each *kalam* being roughly about three maunds. In other regions of the kingdom, lands being generally less fertile paid less amounts, varying from 50 to 80 *kalams* per *veli*. According to Rai Bahadur V. Venkayya (see pp. 17 *et seq.* of the Introduction to Vol. II of *The South Indian Inscriptions*) paddy was sold at the rate of two *kalams* for each *kasu*, a small gold coin; while three ewes could be purchased for one *kasu*; and *dhal* exchanged with paddy in the ratio of 1 to 3. The burden of taxation per *veli* could be commuted into money payments varying from 4 to 9 *kalanju* of gold (one *kalanju* being equal to 20 *manjadi*).

¹ Vide S. K. AIYENGAR, *Ancient India*, pp. 176 and 182.

The village assembly collected the land revenue with some elasticity. When fresh clearings were made, and land was brought newly under cultivation, at first only a nominal revenue was demanded; and gradually it increased through a term of years its full nominal proportion. Usually in cases of flood, drought and other calamities a remission of taxes was expected, demanded, and granted. Occasionally, as in one instance on record in Vikrama Chola's reign, remissions were not granted in the case of a flood and some of the village holdings had to be put up to public auction by the assembly.

An inscription of the third year of Kulottunga I, found at Mulbagal, in the Kolar district of Mysore (No. 492 of Mulbagal, in Lewis Rice's *Epigraphia Carnatica*, Vol. X), gives in unmistakable terms the proportion of the assessment to the produce. It says: "For dry lands in which dry crops are raised, there shall be paid a *melvaram* (renter's share of the produce) of one-fifth. For lands under tank irrigation, (i.e. wet lands) there shall be paid a *melvaram* of one-third. Incidentally it may be mentioned that these proportions held good for a long time under succeeding governments also. In an inscription of the 33rd year of Rajadhiraj I, we have the information that *melvaram* in the case of wet lands was two-fifths of the produce; and for dry lands it was one-fourth. Yet another record says that for wet lands the ratio between *melvaram* and *kilvaram* (the cultivator's share is one to one and a half; and for dry lands it was one to three. As Mr. K. V. Subrahmania Iyer says (*vide* pp. 352-353 of his *Historical Sketches of Ancient Dekhan*), these proportions indicating the theoretical division of the produce between the renter and the lessee expresses simply "what existed between the king and the cultivators." He deduces the following significant points connected with the nature and incidence of land revenue in those days.

(1) The state received a payment which might be regarded as analogous to, if not actually identical with, the rent paid by the cultivators; and the use of the still current terms *melvaram* and *kilvaram* decisively goes to prove this character of the State demand.

(2) The proportions were fairly definitely fixed and could not be arbitrarily changed by any party, even by the king. Mr. K. V. S. Iyer thinks that the proportion was such that it could not have been considered as pressing hard on the cultivators; but in estimating the incidence the weight of other burdens that fell on the cultivator should also be taken into consideration.

(3) The payment of the revenue was generally made in kind; and there must have been large granaries in the various localities for the storing up of the grain payments.

(4) The State demand was only made on lands which were actually under cultivation and we read from a record that *kadamai* was paid for lands on which crops were actually raised (*Vilainda Nilattukku*).

(5) "The State realized rent from the cultivators of the soil at specified rates, which varied differently for the different classes of land, such as dry, wet, forest etc., and which were fixed with reference apparently to the advantages of irrigation, facilities for getting more yield, cost of cultivation, etc."

Two inscriptions, dated in the 14th year of Rajadhiraja II register a reduction in the rate of rents to be paid on *Varisaiparru* and *Varapparru* lands held under lease from the temple; and they record the quantity of diminished rents to be paid, the diminution being by about ten *kalams* in the case of the higher grades of land and by amounts ranging from two to five *kalams* in the case of the lower grades. For dry lands also a 15 per cent. deduction in assessment was made; and other reforms, in the way of diminution of rents, in the case of lands held in other tenures are also mentioned. There was general reduction of *kadamai* dues, and in realizing them the state officials were prohibited from entering any dwelling house or levying fines. They also declared that one cultivator should not be made liable for the dues of another (*vide* p. 97 of the *Epigraphist's Report* for 1918-1919).

The revenue collector for each village area was known as the *kaniyalan*, who was the intermediary between the king and the assembly on the one hand, and the cultivators on the other. He was responsible for collecting the king's share of the produce and for the upkeep of the efficiency of cultivation, and he controlled the eviction of defaulting tenants and the auction of lands on account of unpaid arrears of taxes.

In connection with the land tax, we have to note, the division of the additional taxes (*ayam*) into two classes: internal (*antaraya*) and external. The latter should have been generally of the character of tolls and octroi generally. The burden of the former class should have fallen chiefly on land, as handicraftsmen and other kinds of workers, who paid these taxes, were often remunerated in land for their services. An idea of the very large number of subsidiary taxes levied in Chola times can be got from an inscription of the 35th year of the Chola, Tribhuvana Chakravarthi Konerinmaikondan (*Kulottunga?*) (*vide* pp. 112-117 of Part I of Vol. II of *South Indian Inscriptions*). It says that the royal grant includes all kinds (*vargas*) of taxes

(*kadamai*) and rights (*kudumai*) . . . all kinds of revenue (*aya*) including the tax in money (*kasu-kadamai*); *odukkum padi*; *urai nari*; the share of the village watchman (? *padikaval*); the share of the *karanam*, who measures the paddy; the unripe fruit in *karttikai*; the tax on looms (*tari irai*); the tax on oil-mills (*sekk-irai*); the tax on trade (*sett-irai*); *tattoli*; the tax on goldsmiths (*tattar-pattam*); the dues on animals and tanks (*mavadai*; *kulavadai*); the tax on water-courses (*olukku-nir-pattam*); tolls (*variayam*); *inavari* (probably a tax on castes); the tax on weights (*idai-vari*); the fine for rotten goods (*alugal sarakku*); the tax on bazaars and stalls (*angadi-pattam*); the salt tax (*uppayam*), etc. Many other dues are also mentioned in this and other inscriptions, several of which have not yet been fully interpreted, like *panjupili*, *madhappadi nattuappadi anaikudam*, *kudiraippandi*, etc. (verses 10 and 11 of inscription No. 22, quoted above of Konerinmaikondan).

We also come to know of a large number of rights conferred on donees of land grants, who usually got the double right of rent from the tenants and other sources of income in the shape of tenancy obligations due from the land. Among the rights conferred on the donees are mentioned the following: fees for governing the village and the area (*nadatchi uratchi*), tax due by the potter (*kusakkanam*), marriage fee (*kannalakkanam*), tax on the washerman's stone (*vanna-rapparai*), tax on shepherds (*idaippattam*), tax for keeping watch (*nadukaval*), taxes on ferry-keepers and toll collectors, tax on toddy-drawers, share for the maintenance of village assemblies (*sabhaviniyogam*), tax on the profits of Brahmins, ghee-seller's fees, fee on cattle-sheds fee on new horses, settlement duties, tax on retainer of servants, tax on areca-nuts, tax on those for whom big drums are beaten, etc.

The above is "a long list of taxes, and would stand comparison with the list of seigniorial duties of Europe before the French Revolution." The list, such as is given here, is indeed formidable; the chief source of the royal income or that of the donees to whom landlord rights were transferred was land revenue; since the latter was not capable of any very large increase, there arose the necessity for devising so many petty and somewhat vexatious imposts which, "though not economical, form a chief source of increasing the revenue, and as such, less seen and understood."

Rai Bahadur V. Venkayya and Dr. S. K. Aiyangar try to calculate the incidence of taxes on land. The latter, basing his conclusion upon inscriptional evidence, says that the total demand upon land would have come up to four-fifteenths of the gross out-turn. As pointed out before, a *veli* of good land in the Kaveri delta paid 100

kalams by the *Adavallan* measure, equal to about 80 *kalams* (modern measure) of paddy, and the gross out-turn is estimated to be almost 300 *kalams*, perhaps an exaggerated one.

The Tanjore inscriptions of the great Rajaraja (Part I, p. 62, Vol. II, of *S. I. Inscriptions*) bear ample testimony to the accuracy of the revenue survey operations conducted by this king. Land as small in extent as $\frac{1}{52428800000}$ of a *veli* (2,000 *kuli*) was measured and assessed to revenue. An inscription at Tiruvisalur, in the Tanjore district, issued in the 24th year of Rajaraja, refers to a revenue survey carried out some time before; the chief survey officer was *Kuravan Ulagalandan*—a title which might have been given in recognition of his services in connection with the survey operations. In inscription No. 97 of 1900 (south prakara wall of the Vedapurisvara Temple at Tiruvottur, of the Chola Tribhuvana Chakravartin Vikrama Chola) there is information that there was a regular revenue survey prior to the sixth year of the reign when the grant was issued, and that the foot (*sripada*) of some royal personage was taken as the unit of survey. A Shiyali inscription of the ninth year of Kulottunga III, and a Tirunagesvaram inscription of Konerinmaikondan, both refer to the revenue survey undertaken in 1086 *i.e.* the sixteenth year of Kulottunga Chola I). The term *sripada* consequently refers to the foot of Kulottunga I, which was evidently taken as the unit (p. 9, *Epigraphist's Report* for 1899-1900).

In the course of the survey operations the total acreage and the extent of tax-free lands in each village, the extent of lands paying revenue or rent, the quantity of paddy or other grains due, and the amount of money to be paid to the State, were all ascertained and correctly noted in the registers. Even in times anterior to Rajaraja I, the approximate extent of cultivated lands in the villages was known to the authorities. Rajendra I seems to have ascertained the excess and deficiency in the measurements made prior to his time. Kulottunga's re-survey of 1086 was perhaps due to appreciable differences noted in the reign of Rajendra. Another re-survey was done in the 30th year of Kulottunga III, which is referred to in the records of his successors, Rajaraja III and Rajendra III.

Definite portions of the village land, which were indispensable for the life and growth of the village, were regarded as communal, and as such free from assessment. Thus the portions occupied by the artisans and the pariahs; the burning ground, the irrigation channels and temples; ponds in the middle of fields; flower gardens; streams; high roads; rivers; the burning ground and the water-ponds of the pariahs; cattle sheds and stables; the village threshing-floor; grazing ground for calves; wells and cisterns; the quarters of

toddy drawers and washermen cairns and cist-vaens; big trees marking boundaries; land washed by the river during floods; marshy places where fish is found; forest tracts where honey is gathered; and a host of other items were exempt. Thus in each village there was a definite record of its area, the extent of cultivated land in it, of cultivable waste, of uncultivated land set apart for special and communal purposes, and of land which was deemed unfit for cultivation. The principles of the settlement of land revenue depended upon the notion of rent realized by the state, and were applied with reference to the differential advantages of the different pieces of land, cost of cultivation, quantity of yield, facilities for irrigation, and other similar factors. Even footpaths and demarcation ridges between field and field were recorded, named and recognised, "so that the revenue officers, from a mere description of the boundaries and of the irrigation channel under which a particular plot was situated, and the name of the owner or owners, were able to spot out the field in question."

Numerous inscriptions register public and private sales of land. Note was already taken of the auctions of land for default of revenue made by the *sahba*. When land was granted, sold or exchanged, its boundaries were clearly defined, stones and the milk-bush plant were set up for demarcation purposes, and the bounds of roads, ridges, highways, footpaths and irrigation channels and water courses defined. Accounts of land transfers and revenue receipts were carefully preserved. Whether sold or leased out, exchanged or presented, all land transactions were very clearly worded, so as to be free from technical flaws and doubts. The seller's undisputed right over the property is made out and expressed in such phrases as "my tax-free land"; "in my own enjoyment"; "I give away in the manner that I have been enjoying it." Whether the land was acquired by public auction, by regular purchase, by donation, *stridhana*, or exchange, the fact was recorded in the document, together with all details connected with the previous transactions in the respective cases. The terms of a typical sale-deed are as follows: "The sale money agreed upon between us (parties) being received completely, I sell this, and declare twice and thrice that this document by itself shall be both the deed and the money receipt, and that no other documents besides this need be produced to establish the vendor's claim. . . . So long as the sun and the moon endure, the stone and the Kaveri exist and the grass and paddy grow on earth, the lands conveyed by the document shall be enjoyed by the purchasers, their sons, grandsons, and their successors, with the eight kinds of privileges, such as the use of water and trees, stones and treasures buried underground, *akshini* and *agami*, etc., together with the right to the wells sunk down and trees growing up, and all animals and birds attached to

the land and trees. The purchasers shall have this document inscribed on stone and copper." All land within the boundaries, including wet land, dry land, wells, ant-hills (?), mounds, fruit trees, such as the coco-nut, jack, mango, seedlings, (?), waste lands, low grounds and hollows, were deemed to be given away in the deed. The seller affixed his signature; and other signatures, generally of the chief citizens and arbitrators, followed.

In cases where the party was illiterate, another wrote for him and bore witness. Women had also power of independent sale in their own right, but they usually acted through an attorney (*Mudukān*). In public auctions of land notices had to be cried out at least thrice, the reason for the sale set forth, and the land knocked down to the highest bidder. The conveyance was drawn up and the selling price agreed upon before a concourse of people or the assembly convened for the purpose of registration of the sale. If the land sold formed the property of the village *sabha*, it was necessary that the assembly should order its sale, and some of the members were entrusted with the duty of seeing the transaction formally completed. The wording of all land conveyance deeds was very elaborate and careful; "every minute detail was set forth in unequivocal terms"; and generally the village or temple accountants and *madhyastas* (arbitrators) were chosen for the purpose of drawing up the deeds.

Most of the land transactions referred to in inscriptions are free donations to temples, Brahmins, and charitable institutions, either of the Hindu or of Jain persuasions. Sometimes the property which was thus given away was purchased, with all its "rights and enjoyments, in accordance with old custom in all land, high and low, where the iguana runs and the tortoise crawls." The sale amount was usually calculated in gold bullion of standard weight and fineness, or in terms of the current coinage. In the former case the gold intended to be paid was defined as "marked gold"; "red gold, brilliant as fire"; "gold passed by the king and weighed by the standard and stone of the village or of the treasury." The sale deeds were first drawn upon palm-leaf and then finally engraved on stone and copper.

All accounts of land transfers, revenue payments and disbursements, were entrusted to the department of *Thinaiikkalam*, which seems to have been meant exclusively for this object. The accountant of this office of rents, transfers, rates and taxes, maintained registers of charitable endowments and also careful accounts of money. Each endowment had its own book, where corresponding entries and deductions were made; the auditing of these accounts by special officers of the king was quite common. Sometimes special audit under imperial writ was organized, when the periodical audit

by the ordinary officials of the temple and other charities accounts, was found to be defective. For an illustration of this practice, we find that in his 25th year, Parantaka I issued such a writ for special audit to recheck the accounts of the temple of *Tiruneutthanam*, in the Tanjore district, and the accountants responsible for omissions and commissions were punished in the presence of the trade committee of the village (*Nagara Variakuttam*). Such accountants were rewarded for honesty with a bonus.

The free gifts of villages and lands, whether given to Brahmins (*Brahmadesas*), to Hindu temples (*devadanas*), to Jain shrines (*pallichchandas*), to the purpose of feeding Brahmins and others (*Salabhoga, murruttu*), or for imparting religious instruction and maintaining schools and expounders of Dharma and the scriptures, were not meant to be free from the payment of taxes and other obligations; but that such sources of income, which till then went to the king or the donor, ceased to go to him. These were also not to be enjoyed at the will and pleasure of the donees, but they were to be under certain liabilities and guarantees against deterioration. When a village was made tax-free by the king, the taxes went to the donee; when the donor was a private individual, he had to free the land from the obligation of paying taxes to the king; and this he did, either by paying to the king a lump sum down as compensation for abatement of land revenue, or by binding himself to pay the taxes instead of the donee. There are a few records known which illustrate this point. One of A. D. 1193, recording the gift of a village as *Devadana*, states that the grantor had agreed to pay the taxes to the State. Another record also informs us that the *Devadana* gift of land should be enjoyed by the donee tax-free, and that the donor should pay all items of taxes due. In some cases we know that the village *sabhas* collected from the individuals, making *Devadana*, and other gifts, a fixed sum of money, which they let out at interest and paid annually the income accruing as dues to the king. In the case of all grants, especially *Brahmadesa* and *Devadana*, the lands given became the property of the donees, subject to certain stringent conditions necessary for their efficient upkeep; and it was only under these conditions that they enjoyed the right of collecting the land tax from the cultivators and the supplementary dues.

Among the liabilities imposed upon the donees in case of charitable grants, we can note some peculiarly striking conditions preserving the rights and enjoyments of the old cultivators and other villagers. Thus the donees could not dispossess the old tenants, and had only the right to receive the usual payments due from them. Nor could they interfere with the rights of the various castes, washermen, goldsmiths, weavers, potters, etc., provided these paid their respective dues, of which, however, there were only too many and some of

which have been mentioned above. The right of dispossessing old tenants is not to be found in any of the numerous records of land transfer and gift hitherto obtained.

The following are a few of the important liabilities (pp. 341-342 of K. V. S. Iyer *Ancient Dekkan*) imposed upon the donees in all cases of charitable grants: (1) For drinking and irrigation purposes the donees shall cut out channels where water admits of easy flow, and receive the customary dues for such services. (2) They shall not allow water in the channels to be drained wastefully by under-channels and other means, nor permit water to be spoiled, imposing fines in cases of breach. (3) "They shall erect houses, mansions and other big structures with burnt bricks and tiles; they shall sink big wells; and they shall set up big oil-presses". (4) "They shall have the garden lands planted with fruit-bearing and useful trees of various descriptions, such as the coconut, palmyra, jack and mango, and shall cultivate sweet-scented creepers and flower plants, like *damanaka*, *maruvu*, *iruveli*, *senbagam* and *sengalunir*; they shall not allow the coconut and palmyra trees planted in the villages to be climbed by the toddy-drawers". The last condition is specially instructive to us, as showing the strength of opinion against drink and the encouragement of it in any form by *Brahmadesa* and *Devadana* grantees.

Irrigation received particular attention from the rulers. Kari-kala's embankment of both the banks of the Kaveri, to protect them against floods, is well known to us. Many of the present-day canals and branches of the Kaveri date back to pre-Chola times. The *Paiankaveri* and the *Kollidam* are mentioned in the hymns of Gnana Sambandar. *Vennar* and *Arasilaru* have been in existence for long. Parantaka I seems to have dug the canal called *Virasolan*; and other kings of the line are connected with the canals named after their titles, *Viramarthandan*, *Uyyakkondan* and *Mudikondan*, which were dug in the course of the tenth and eleventh centuries. In this respect the Cholas were only the continuators of the very good work that marked the Pallava rulers. Irrigation tanks and wells were scrupulously kept in proper repair; and "no natural source of water seems to have been allowed to run to waste". In each village there was a special committee of the *sabha*, which was entrusted with the work of tank supervision and control of irrigation as well. Inscriptions afford numerous references to channels water courses, sluices and embankments; and in almost every grant of land the conditions and methods of irrigation were very clearly laid down. The distribution of water was very carefully and systematically organized. All wet lands were classified for irrigation purposes and for the consequent assessment into several classes and grades, severally called *kinarru*

(well-irrigated), *sadiram*, *siragu sadukkam*, *padagai*, etc. One general rule observed in the supply of water was that fields, whatever their situation might be with reference to the main channels, were to take the water in the manner that it flowed, i.e. in its natural course, without causing any special obstructions or creating contrivances for preferential supply or prior utilisation. Such obstructions were punished, generally with a fine. Mr. K. V. S. Iyer refers to the Kuruvitturai inscriptions of the time of Jatavarman Srivallabha, a Pandya king of the latter half of the twelfth century, which refer to canals and water courses which existed at the time; one of them refers to the opening of a new channel, called *Parakrama Pandyan-kal*, which had to be closed owing to an objection raised that it was cut just above a main canal. Private individuals who benefited the community by cutting tanks and channels, got as reward gifts of tax-free lands and other concessions. "While some of these were undertaken to secure merit for the dead, others were taken up for the benefit of the public." A record of Hoskote tells us that all lands watered by a newly constructed tank were to be enjoyed as *sarvamanya* for the first two years, and then alone were to be made to pay taxes. A Hoysala inscription, of A. D. 1331, declares that the land watered by a private tank, just dug, should be enjoyed as permanent *sarvamanya*. Instances of this kind might be multiplied, to show that care for irrigation was operative even in the communal mind,—(From *The Young Men of India*, March 1925)".

(To be continued.)

Future of Subtropical Fruits.

R. W. HODGSON.

The list of fruits and nuts on the market during the year, from which the American housewife may select in accordance with the tastes and requirements of her family, is already a long and imposing one. Largest in numbers at least, as well as in extent of varieties, are the customary fruits of the temperate zones, the apple, pear, peach, plum, small fruits, berries and a host of others, according to season. But there are also ranged there before her in tempting array the inevitable fruits of the tropics to which she has long been accustomed, the pineapple, coconut, and the banana, practically always in season and decades ago established in the favor of the American consumer. The display would not be complete, however, without the orange, lemon, and grapefruit, the almond and walnut, and many others, contributions for her basket from the sub-tropics.

Of the fruits of the temperate zones, there are probably but few still to be exploited and made possible competitors for her favor. The

list bids fair to be greatly extended in the next half century, however, by additions from the tropical and subtropical fruits, the former furnished chiefly by Mexico and Central America, the latter to some extent by Florida and the Gulf Coast states, but principally by California and Arizona.

What Is a Subtropical Fruit?

On the basis of their climatic adaptations, all the fruits and nuts are grouped into three general classes: the tropical fruits, those of a subtropical character, and those of the temperate zones.

Among the common representatives of the tropical fruits are those already mentioned, the pineapple, coconut, and banana, although there are dozens more much less well known and appreciated. The tropical fruits normally occur in the tropics and are not able to withstand temperatures of below 40 degrees Fahrenheit at any time during the year. Obviously, tropical fruit culture in the United States is decidedly limited in extent, being in fact practically confined to the southern end of Florida.

The subtropical fruits are somewhat hardier than the truly tropical fruits although not sufficiently so to successfully withstand the rigors of the temperate zones. In general they may be said to thrive only where the temperature rarely if ever drops below 20 degrees Fahrenheit and some of them are severely injured at such temperatures. Among the better known of the subtropical fruits are those already mentioned, the citrus fruits, English walnut, almond, and many others of great importance, including the fig, olive, and date.

Fruits of Temperate Zone

The fruits of the temperate zones are so well known as not to require enumeration. They are much hardier than all other fruits and some of them when dormant commonly successfully survive temperatures many degrees below zero.

The subtropical fruits exhibit a much wider range of variations than the fruits of the temperate zones, not only the character of the fruit, and in hardiness but in other features as well. Some are evergreens, as the avocado, olive, loquat, and citrus fruits. Others are deciduous, and shed the leaves in the fall. Still others, like the cherimoya are partially deciduous but shed the leaves in the spring. On the basis of hardiness to low temperatures, in early spring or in late fall, the almond being one of the principal examples of the former, and the fig and walnut examples of the latter. Some of them require an unusual amount of summer heat in order to produce fruit although they may grow well in cooler localities.

Two outstanding representatives of this group are the date and the olive. A few, such as the loquat, bloom during the winter season and are therefore quite easily injured by low temperatures.

Most of the tropical fruits require relatively high atmospheric humidity for commercial fruit production as illustrated by the pineapple and banana. By far the greater part of the subtropical fruits, however, do especially well under arid conditions, providing irrigation is possible and temperature relations satisfactory.

Where the Subtropical Fruits are Grown.

This subtropical fruit belt of the United States begins in the Carolinas and extends along the Gulf coast from Florida to Texas, takes in northern Mexico and reappears in Arizona and Southern California, extending northward and ending in Southern Oregon. It is interesting to note that subtropical fruit culture is being conducted successfully in California at latitudes approximating those of Washington, D. C., and even farther north. This is due principally to the ameliorating effect of the so-called Japanese current, which passes up the California coast, and to the protection against the climatic conditions of the Rocky Mountain region afforded by the Sierra Nevada Mountains which, extending almost due north and south along the eastern border of California rather effectively shut out the cold storms from the east. The Gulf Coast belt is of a humid character, permitting the growth there in a small way of certain tropical fruits, including the pineapple and banana, which cannot be grown successfully in California. The absence of atmospheric humidity and an abundant supply of irrigation water however, makes possible here the production of a goodly number of subtropical fruits which cannot be successfully grown elsewhere in the United States, an advantage already recognized, but an opportunity not yet sufficiently realized.

What are the Subtropical Fruits?

The list of subtropical fruits is rather a long one and includes many not known to any great extent elsewhere in the United States. By far the most important members of the group are the much appreciated citrus fruits, the orange, lemon, and to a limited extent only, the grapefruit, these also being grown rather extensively in the Gulf Coast states, with the exception of the lemon, which is produced exclusively in California. The nutritious English or Persian walnut and the almond are two subtropical nuts grown here extensively and almost exclusively. Others of commercial importance are the healthful fig, the olive, the avocado or alligator pear, a salad fruit from the tropics, the thirst assuaging pomegranate, the date and the luscious Oriental or Japanese persimmon.

Subtropical fruits of minor importance grown in California include the sprightly loquat, sometimes known as the Japanese Medlar, the fragrant feijoa or pineapple guava, the true guavas, the expensive pistachio nut, the tuna or prickly pear, the attractive jujube or Chinese date, the delicate cherimoya or custard apple, the mango, the edible Passion fruit or grenadilla, the white sapote, and a host of others found only occasionally.

What Do the Subtropical Fruits Mean to California ?

At the present time there are more than 250,000 acres planted to the citrus fruits in California; 100,000 acres to the English walnut; 65,000 acres to the fig; 50,000 acres to the almond 40,000 acres to the olive; between 1500 and 2000 acres respectively to the avocado and pomegranate; 1000 to 1500 acres to the date, and 500 acres to the persimmon. The annual return from these crops is approximately \$100,000,000. The growing of these fruits and nuts constitutes a source of livelihood for more than 100,000 persons.

Of High Food Value

The subtropical fruits and nuts as a group contain the most delicious and nutritive fruits known in this respect far exceeding the fruits of the temperate zones. Thus in sugar content the date, fig and persimmon stand unequalled. The peculiar dietetic value of the citrus fruits is well known and constitutes an important reason for their extensive use in the dietary of the infant and adult as well. The avocado and the olive are higher in fat and oil content than any other fruits and consequently possess unusual nutritive values. The walnut and almond have long been recognized as among the most efficient meat substitutes known. In delicateness of flavour few fruits can compare with the pineapple and the cherimoya, by general consent regarded as two of the most delicious fruits in the world.

Thrilling Stories of Adventure.

The narrative of the search for the best varieties of these fruits and of their successful establishment in the United States constitutes a series of tales of thrilling adventure on the part of the intrepid plant explorers of the United States Department of Agriculture, excursions into the remote parts of the world, inaccessible tropical jungles and mountain heights fraught with constant dangers and hardships, not infrequently resulting in loss of life itself, all that the American consumer may have the best that the world affords in the way of fruits and nuts. The stories of the successful establishment of the date industry and of many others constitute thrilling epics of stoical devotion to the ideal of an American standard of living and eating second to none.

The Future.

With hundreds of thousands of acres of excellent soils, much of it either under irrigation or possible to develop water supplies for, and with climatic conditions unexcelled for the culture of a wide variety of subtropical fruits for which ample market demand can readily be created in the consuming centres of this country, and with little possibility of serious competition, the future for subtropical horticulture in California is assured. The progress of the past half century has been truly marvellous. When John Wolfskill in 1877 shipped the first carload of oranges from California to St. Louis he little dreamed that within fifty years it would be multiplied to an annual total of more than 50,000 cars of citrus fruits. And what has been done with the citrus fruits will undoubtedly be done in the future with walnut, fig, avocado and date, not to mention many others which will undoubtedly rapidly increase in importance. It appears likely that much of the acreage in California now planted to fruits of the temperate zones will gradually be replaced by subtropical fruits and nuts.

Incomes From Agriculture.

Taxation advocated. Giving evidence recently before the Indian Taxation Committee, Mr. J. P. Neogy, Lecturer in Economics, Calcutta University, urged that agricultural incomes in permanently settled areas should be made liable to income tax.

In the course of his evidence, Mr. Neogy said :—

"There does not seem to exist any economic justification for the exemption of agricultural incomes from the payment of income-tax in permanently settled areas. In these areas the land revenue, being a fixed charge on the rent, has long ceased to be a tax. For, the land revenue is taken into account by every intending purchaser and allowance is made for it in the purchase price. The land revenue has become completely amortized or capitalized, and with regard to this tax it may fittingly be said, that an old tax is no tax. Where lands have not changed hands by the process of sale and have passed only by inheritance, their capital value and income have increased. This increase may generally be attributed to the growth of population rise of prices or other causes unconnected with any deliberate or conscious effort on the part of the recipients of such income. The increased income from the lands in the permanently settled areas may be described as a 'surplus' in the sense that it is not required or considered essential to sustain any economic effort."

Referring to the above, the Maharaja of Burdwan and Sir Percy Thompson pointed out that in 1793 and subsequently, the Govern-

ment have virtually given an undertaking by deliberately excluding agricultural incomes from income-tax.

To this Mr. Neogy replied that conditions in those times warranted such a view to be taken by the Government, but he maintained that no fundamental undertaking was given. No class of persons, Mr. Neogy argued, including, Zemindars, had a right to claim exclusive security for their surplus income against successive legislation.

Continuing Mr. Neogy said that all persons who were described as rent receivers should come under the operation of the income-tax laws. For the purpose of assessing income-tax, the exemption limit for this kind of income should be lower than that fixed for "labour" incomes.

Exemption Limit. Mr. Neogy was inclined to exclude temporary settled areas from the operation of income-tax laws, because, in his opinion they stood on a different footing altogether. He was against a reduction in the existing exemption limit for the levy of income-tax. "To bring the exemption limit in India," he said, "with a view to bring it in a line with that in England without introducing the other features of the English income-tax law would lead to a glaring anomaly. In England men with income admittedly above the subsistence level often get exemption from the payment of income-tax on account of the operation of the law relating to allowances for children and dependents.

"In England a good deal of money is given back to the taxpayer in the form of socially beneficial expenditure, namely, old age pensions and unemployment insurance benefits. In India such forms of public expenditure are not yet existent. In asking the public to bear the burden of extra taxation, a Government should have in mind what services are provided out of taxes and are enjoyed by the several classes of the community. The beneficial forms of public expenditure referred to above, reduce the real as opposed to the apparent incidents of taxation.

"Wages and salaries," Mr. Neogy continued, "have a tendency to lag behind the price fluctuations. The salaried men have been hard hit in recent years on account of the inflation of currency which has taken place. Currency inflation is one form of taxation. Additional burden should not, therefore, be placed on the men with low salaries and wages. The cost of living has materially fallen since the time when the exemption limit was raised from Rs. 1,000 to Rs. 2,000 a year.

Mr. Neogy added that he was strongly of opinion that the anomalies of the present income-tax laws should be corrected before resorting to death duties.

(Indian Scientific Agriculturist.)

Environment and Disease in Plants.

Writing in the *American Journal of Botany*, December 1924 on "The relation of environment to Disease in Plants" L. R. Jones observes :—

For a generation past, pathologists have concentrated attention upon the parasite. Has not the germ theory of disease in its simplest conception—"germs" synonymous with disease—so filled the mind and satisfied the imagination of public and practitioner that it has been natural for even the investigator, who should see more deeply into his problem, to be influenced by the popular measure of his responsibilities? Has it not often been temptingly easier to find and name a new fungus than to probe patiently into the behaviour of one long known? When the potatoes show scab or scurf and the grower asks "why", have we not been too prone to ease our mind, and perhaps mislead him, by pronouncing some of our modern mystic words "Actinomyces" "Rhizoctonia"? When we so frequently must face the fact, with these and many other diseases, that, comparing field, and season with season, the loss following like initial infection may vary widely—perhaps even from nothing to total—then we must agree that naming the parasite is only a first step in explaining disease-occurrence.

Evidently, as basic for right thinking, we should accept the idea that soil environment—temperature, moisture and composition—has a controlling influence upon all soilborne parasites, whether of the obligate or of the facultative type; and further, that these environmental factors are the ultimate determinants, in the broader geographical distribution as well as in the local occurrence and seasonal severity of these diseases.

G. N. R.

Bacteria and Butyl Alcohol. One of Professor Edwin E. Slosson's stories in his admirable keeping up with Science (Cape London, 1924) has to do with Bacteria and Indian Corn. When the foreign supply of acetone, a substance of well-known importance in making cordite explosives, was cut off during the war, the fortunate discovery was made that a certain kind of Bacterium could produce acetone out of the starch of Indian corn, just as yeast produces alcohol. In a short time acetone was being turned out in large quantities in distilleries in Toronto and Terre Haute. But after the war the market for acetone slumped and the distillers were in a quandary. As has happened

so often, however, a way out has been found by utilising a by-product called butyl alcohol. This is similar to the "fusel oil" which is much used as a solvent in the manufacture of varnishes and lacquers. But "fusel oil" is a mixture and variable, whereas butyl alcohol is a pure substance with definite properties. Therefore it can be used in various industrial processes for which fusel oil is less suitable or not suitable at all. Thus it has come about that Bacteria are now being used to turn a million of bushels of Indian corn every year into butyl alcohol.

(From the Scottish Journal of Agriculture Vol. VIII No 1 of Jan. 25)

Arsenical Insecticides. Faure (Jean C). Sur L'importance croissante de L'arsenic dans la lutte contre les ennemis des plantes.—Prog. Agric Vitic, LXXXII No. 48 pp. 524-526. Montpellier, 30th Nov. 24.

Of a total world production of 10,000 tons of pure arsenic, France produces about half, but she could easily increase this amount and, by transforming the arsenic that is frequently considered a useless by-product of her metal industries into arsenical insecticides, could ensure an appreciable increase of revenue. Calcium arsenate is the preferred form. Statistics are quoted showing that, for insecticidal purposes, America has decidedly insufficient for her needs and must leave large tracts, such as the cotton-growing regions of the south, undefended. The loss in the United States in 1919 from insect depredations has been estimated at \$ 1,261,291,000.

(The Review of Applied Entomology. Vol. xiii. Ser. A. Pt 1. p. 40.)

Agriculture and the Laboratory. The agriculture of whole sections of our country, upon which the livelihood of many thousands of people depends, may be entirely changed by experiments in an attic laboratory, or by the work of a single man in his own back garden. The miles and miles of Marquis wheat-fields that one travels through when going west on the Canadian Pacific all owe their existence to a single head of cold and drought resisting wheat that Dr. Saunders, of Ottawa, discovered after years of patient, persistent work among hundreds of hybrids which he had made.

(Marian H. Bell Fairchild, in the Journal of Heredity)

The Function of Agricultural Science. The nineteenth century took the view that agricultural science was justified only in so far as it was useful. That view we now believe to be too narrow. The practical purpose is, of course, essential; the station must help the farmer in his daily difficulties—which necessitates co-operation between the practical grower and the scientific worker. But history has

shown that institutions and investigators that tie themselves down to purely practical problems do not get very far; all experience proves that the safest way of making advances, even for purely practical purposes, is to leave the investigator unfettered. Our declared aim at Rothamsted is "to discover the principles underlying the great facts of agriculture and to put the knowledge thus gained into a form in which it can be used by teachers, experts, and farmers for the upraising of country life and the improvement of the standard of farming."

(Sir John Ressel, Director of Rothamsted Experiment Station, in a recent address at Toronto, Canada.)

Essentials of Good Milking. The essentials of good milking (points out a publication of the English Ministry of Agriculture) are that it should be performed quietly (that is, with no discomfort to the cow), quickly (rapid milking appearing to increase the flow), and thoroughly—the last milk, being the richest, should always be withdrawn.

In the milker's contest held at the London Dairy Show, in which no competitor is allowed to milk his own or his employer's cows, the following are the points upon which competitors are judged:—(1) the manner of approaching the animal, and style of work, 20 points; (2) cleanliness, 10 points; (3) clean stripping, 10 points; total, 40 points.

Rat Control in Hawaii. Some years ago rats began to manifest themselves in something approaching plague numbers in Hawaiian cane fields and protected as they were by the forest of cane stems—they multiplied and rapidly and began to destroy considerable quantities of the cane itself and of certain fruits. With the failure of the mongoose, mechanical means of control have had to be resorted to on a large scale, while poison is often freely used. A method advocated is the use of barium carbonate baits, the procedure being first to set unpoisoned wheat (in five places to the acre) for a period of about two weeks until every rat and mouse knows where it is, and then to substitute poisoned baits. This is done three times a year with such success that the 1924 crop of cane harvested at Honokaa (an important plantation) showed practically no rat-bitten cane and the plantation got fully sixty thousand dollars worth of sugar which had hitherto gone to feed the rats. The total cost of the work here has been about five thousand dollars annually.

Another method of using the poison is to prepare a dough with one part barium carbonate to three of flour, rolling this thin, stamping it into tiny biscuits, and finally drying these and coating them with paraffin.

How Denmark became Prosperous. The Danes were once a seafaring, war-making, poverty-stricken people. Now they are agricultural peace-keeping, and prosperous. How did they do it?

During the Napoleonic wars they sided with the French. The English and Germans beat them. Their navy was sunk; they lost most of their colonies. Germany took all of the southern part of their country, which was by far the best part of it. By the latter part of the nineteenth century these defeated, poverty-stricken people were thrown back to make a living out of the poorest land in Europe.

Then what did they do? They did not emigrate to other lands; they did not submit themselves to be ruled by their aristocracy; they did not appeal to their government to help them. They did a very unusual thing—they helped themselves. They formed an association of neighbours to do things together; they pooled their intellectual power so that everybody in the pool should get the advantage of the best brains; and they settled down to work out their problems on the spot. (Southern Planter).

Dehorning of Dairy Cattle. The dehorning of calves is best accomplished by the application of caustic to the horn "buttons," the two small protuberances which can be felt when the animal is a few days old on either side of the poll where the horns emerge. The skin immediately surrounding each button should first be protected by smearing it with vaseline, and the button itself and then carefully rubbed with the caustic pencil. Should the caustic touch the skin severe burning will occur and areas of skin will slough off. For the same reason, the caustic must not be handled with the fingers, but slipped for use into some metal holder, such as an ordinary pencil-holder. Four applications are usually sufficient, when the buttons will peel off, this marking the completion of the treatment.

The operation is thus performed without any pain to the animal and the method is quite the most effective and humane. Adult cattle are sometimes dehorned by use of a special instrument, several kinds of which are on the market, but it is not a painful operation and is not recommended.

If cattle prove troublesome in the yard by horning others, much damage can be prevented by sawing off the ends of their horns, leaving them quite blunt. Care should be taken not to remove too much of the horn, and the sawn ends should be filed round.

Max Henry, Chief Veterinary Surgeon.

(Extract from the Agricultural Gazette of N. S. W. January 1. 1925).

Cotton Boll Weevil :—Several small lots of cotton seed of special varieties were admitted recently. Only four ounces of a kind were released and the seeds, after fumigation, were examined one by one to make sure no insect escaped detection. In one lot from America, covered by an official oversea inspection certificate and treated twice for the destruction of insect life before reaching South Africa, the picking over of the four ounces disclosed a specimen of the notorious Mexican boll weevil. The insect was dead, but its presence is significant of what might easily reach the country were drastic precautions not exercised. A little lot of cotton seed smuggled into the country might lead to the establishment of a new and formidable pest.

(Journal, Deptt. of Agri. United. S. Africa, Vol IX, No. 5 of Nov. 24).

Farm—Workers' Budget. Mr. A. W. Ashby, University College of Wales, Aberystwyth gives an account of his enquiries, on Farm Workers' Budget in Oxford. ("Journal of the Ministry of Agriculture, February 1925.") Particulars were collected from 83 families and are below :—

	Size.	Per family.
Adults over 14 years ...	199	2.397
Children ...	279	3.361
Total ...	478	5.758

5.758 persons were considered equal to 3.85 "men" for dietary purposes.

Weekly expenditure per family averaged, Rent S.2-2, Foodstuffs 20-9, Cleaning materials 1-1, Insurance club etc., 1-4, Fuel and light 4-10, Miscellaneous 0-9, and the average expenditure on food was thus 3-7½d., per head or a little over S.5-4½d. per "man."

These budgets were divided into two groups for analysis Group A related to families with more than three children and group B dealt with families with three or less than three children and the results arrived at are.—

Group A, families 40	Per family.
Adults over 14 years ...	100 2.50
Children ...	197 4.925
Total ...	297 7.425

Average weekly expenditure was rent s.0-10d, foodstuffs 22-4½, cleaning materials 1-0½, insurance 1-3½, fuel and light 4-0½, Miscellaneous 0-8½. Thus foodstuffs averaged 3s-0½d per head or about 5s-1d per "man."

Group B Families 43.			Per family.
Adults over 14 years	...	99	2.3
Children	...	82	1.91
Total ...			4.21

Average weekly expenditure was rent 2s-5½d, foodstuffs 19-3, cleaning materials 1-1½, insurance 1-5½, fuel and light 5sh. Miscellaneous 0-9d. Expenditure on food averaged 4s-7d per head or 6sh., 4½d. per "man"

Thus it is seen that families with more than three children suffered in the matter of diet to the extent of above 50 percent per head over families with three or less than three children.

We would invite our readers attention to a study of family budgets of workers families in Bombay, vide this Journal Volume No. A study of the family budgets amongst the several strata of workers in this country would be educative and reveal interesting facts.

A. N. I.

Ear-tick. The Spinose Ear-tick (*Ornithodoros Megnini Duges*). The ticks remain attached in the ear of animals, chiefly cattle, sheep and goats. They puncture the tender skins and suck the blood at the same time injecting an irritating fluid. The wounds thus caused often ulcerate, nervous and digestive disturbances arise resulting in low vitality of the animals which consequently fall off in condition. These ticks can be controlled by pouring or injecting a mixture at regular intervals for a few days. The mixture recommended should be such as contains ingredients which mix well together and flow freely. A mixture suggested in Natal and Transval (Journal of the Union of South Africa) is made of four parts by volume of thin tar, four parts of cotton seed oil and one of turpentine. Tar destroys ticks and prevents reinfestations. Cotton seed oil is a good solvent for ear wax and turpentine increases the destructive effect of tar. In India cotton seed oil can be replaced by groundnut, gingelly or safflower oil.

Height of Cotton plants and length of fibre. Working with the Pima variety of American Egyptian cotton, determinations were made of the length of fibre from bolls borne on fruiting branches at successive groups of nodes on the main stalk. The length of fibre was found to increase steadily from the lower to the next higher group of fruiting branches. On the other hand, no close correlation was found to exist between the length of fibre in a boll and date of anthesis of the flower from which the boll had developed—T. H. Kearney and Harrison in Journal of Agricultural Research.

G. N. R.

Freeing Animals from Ticks. Di Sangiustino, I describes a simple, cheap and speedy method adopted by the Arabs to free an animal from ticks. For 5 consecutive days, they give the tick-infested cattle pills made of barley pounded in a mortar, kitchen salt being added in the proportion of 200 grams per 2 Kilograms barley. The animals readily take the salted barley. In the treatment for adult cattle (1 Kg) 200 gm. per day are necessary, while 500 gm. (100 gm. per day) are enough for calves. From the first day, the dead or dying ticks begin to fall off, and on the fifth day the animal is quite free from the parasites. The sodium chloride is directly absorbed and passes into the blood, and poisons the ticks as they suck the blood.

(Inter. Rev. of the Sc. and Prac. of Agri. New series Vol. II. No. 4 October to Dec. 1924 p. 931-932).

B. V. N.

REVIEW.

Lt. Col. W. C. Ross and Dr. K. N. Bagchi of Bihar and Orissa in an article in recent number of the Journal of Indian Medical Research estimate that as a result of their observations at Patna in 1921 8.76 lbs. of nitric acid equivalent to 1.95 lbs. of nitrogen per acre is annually added to the soil. This figure appears to be too low. Dr. Leather investigated this problem as early as 1906 and as a result of 2 years' observations at Dehra Dun and Cawnpore estimated that about 3.5 lbs. of nitrogen are annually added to the soil. The disparity in the two figures is apparently due to the fact that Messrs. Ross and Bagchi based their estimate on the nitrogen present as nitrates only; while Dr. Leather estimated the ammoniacal nitrogen as well.

The recent investigation is of interest because it seeks to explain the causes for the variation in the reaction of the waters of the Ganges and the Sone.

Messrs. Ross and Bagchi started an investigation in 1917 on the relationship between the reaction of the waters and the use of alum preparations in their sedimentation. They have found that the waters of these rivers were alkaline in reaction for 6 to 8 months between October and May and acid in reaction for 4 to 6 months between May and October. These results were quite unexpected and on further investigation they found that the calcium bicarbonate present in the river waters was converted into calcium nitrate. The liberation of free carbonic acid gas by nitric acid in the rain has been stated to be the reason for the acid reaction,

B. V. N.

Think on these things in 1925.

Benjamin Franklin in the Eighteenth Century said:—The Taxes are indeed very heavy, and if those laid on by the Government were the only ones we had to pay, we might more easily discharge them; but we have many others, and much more grievous to some of us. We are taxed twice as much by our idleness, three times as much by our pride, and four times as much by our Folly; and from these Taxes the Commissioners cannot ease or deliver us by allowing an Abatement. However let us hearken to good Advice, and something may be done for us; God helps them that help themselves, as Poor Richard says in his Almanack of 1733.

Sloth, like rust, consumes faster than Labour wears: while the used Key is always bright. But dost thou love life, then do not squander Time, for that's the stuff Life is made of.

The Sleeping Fox catches no Poultry. There will be sleeping enough in the Grave.

If Time be of all Things the most precious, wasting Time must be the greatest Prodigality; Lost time is never found again, and what we call Time enough, always proves little enough. Sloth makes all Things difficult, but Industry all easy, and He that riseth late must trot all Day, and shall scarce overtake his business at night; while Laziness travels so slowly, that Poverty soon overtakes him, Drive thy Business, let not that drive thee; and Early to Bed and early to rise makes a man healthy, wealthy and wise. Industry need not wish,

and he that lives upon Hope will die fasting. There are no Gains without pains; then Help Hands, for I have no Lands. At the working Man's House Hunger looks in, but dares not enter. Industry pays Debts, while Despair increaseth them. A Legacy, Diligence is the Mother of Good-luck. God gives all Things to Industry. Then plough deep, while Sluggards sleep, and you shall have Corn to sell and to keep. One To-day is worth two To-morrows. Have you somewhat to do To-morrow, do it To-day. Be ashamed to catch yourself idle.

Theodore Roosevelt in the Twentieth Century Said. I extend pity to no man because he has to work. If he is worth his salt he will work. I envy the man who has a work worth doing and does it well. There never has been devised, and there never will be devised, any law which will enable a man to succeed save by the exercise of those qualities which have always been the prerequisites of success, the qualities of hard work, of keen intelligence, of unflinching will.

(The Philippine Agriculturist, Vol. XIII, No. 8, January 1925).

UNIVERSITY OF MADRAS.

B. Sc. Ag. Degree Examination, 1925.

PART I

AGRICULTURAL ENGINEERING

TUESDAY, 24TH MARCH. 7-10 A. M.

[NOTE.—THREE questions are to be answered in A and THREE questions in B. Questions 3 and 6 are compulsory].

A

1. A heap of earth is stacked for measurement with a trapezoidal section. The bottom of the heap is a rectangle, 25 feet by 10 feet. The slope on the four sides is 1 to 1. The depth is uniformly 3 feet. Calculate the volume.

2. (a) State what you understand by the theorem known as the 'triangle of forces'.

(b) Two hinges on a wall lie on the same vertical line, and are 6 feet apart. Iron rods attached to the hinges are 8 feet and 10 feet long, and their other ends are joined at a point from which a weight of 120 lb is hung. Find the forces in the rods.

3. It is proposed to build a vegetable market, 50 feet long and 12 feet broad, with roof of corrugated sheets carried by iron trusses (or wooden trusses), to be fixed to pillars of old rails. Briefly describe the design you would adopt, and make a dimensioned sketch of the cross section.

4. What should be the discharge of a centrifugal pump if it is to cover half an acre with 1 inch of water in one hour?

Calculate the size of a masonry rectangular channel whose width is twice the depth, and whose gradient is 1 in 625, to discharge one cubic foot per second when running full. Take the coefficient as 100.

5. (a) With a wheel-plough, how are the depth and width of furrow adjusted?

(b) What kinds of iron are employed for making farm implements? Give examples, with reasons, for using particular kinds of iron.

6. (a) Describe how a two-cycle oil engine differs from a four-cycle engine.

(b) Explain how you would start a four-stroke oil engine of less than 10 H. P.

(c) Point out what the causes may be if the engine fails to start.

7. A kerosene oil engine is to be installed for driving a centrifugal pump, but it is proposed to run the engine on crude oil. Find the size of the engine that has to be purchased, given the following data :—

Discharge of pump, 300 gallons per minute.

Total lift, 66 feet.

Efficiency of pump, 40 per cent.

Loss of power when running on crude oil, 15 per cent.

8. Describe, with sketches, one of the following :—a winnowing machine, a bone disintegrator, or a cup-feed seed drill,

ANIMAL HYGIENE.

TUESDAY, 24TH MARCH. 1—4 P. M.

[NOTE—THREE questions are to be answered in A and THREE questions in B. Questions 1 and 5 are compulsory].

A

1. (a) Describe briefly the anatomical situation, the relative position, and the structure of the uterus in the cow.

(b) What are the essential appendages associated with foetal life, and what purpose do they serve?

2. How will you deal with an outbreak of—(a) Malignant sore throat, (b) Black quarter, and (c) Scale in sheep?

3. What are the signs of health in cattle? Describe the clinical symptoms of catarrh in a calf. How would you treat a case?

4. What do you understand by active and passive immunity, and how is each applied in dealing with rinderpest?

B

5. (a) Describe the general circulation of blood.

(b) Illustrate, by a diagram, the heart of an ox, showing the different cavities.

6. What are the causes and symptoms of the following :—

(a) Choking, (b) Hoven, (c) Impaction of rumen in cattle, and (d) Gid in sheep?

7. (a) Give the causes of abortion in the cow.

(b) Describe how you would deal with such a case in a herd.

8. (a) What are the points of a Leghorn, a Light Sussex, a Rhode Island Red, and an Australop?

(b) Describe the merits of different breeds in selecting a pen for a farm.

CHEMISTRY

THURSDAY, 26TH MARCH. 7-10 A. M.

[NOTE—THREE questions are to be answered in A and THREE questions in B. Questions 3 and 6 are compulsory].

A.

1. What is the 'Periodic Law'? Explain fully the relationship that exists between carbon and silicon in the periodic classification of elements.
2. Write the constitutional formulae of glucose, laevulose, and sucrose. How can they be distinguished? Explain the reasons for the differences in their reactions?
3. What is indigo? Explain the reactions involved in the manufacture of indigo synthetically and from the indigo plant. State what happens when indigo is oxidized, reduced, and distilled respectively.
4. Explain the reactions of the following reagents in the study of organic compounds:—(a) acetic anhydride, (b) nitrous acid, (c) sodium ethylate, (d) hydrogen cyanide, (e) phenyl hydrazine, (f) hydriodic acid, (g) alcoholic potash, and (h) Fehling's solution.

B.

5. Write short notes on—polymerism, isomerism, metamerism, and stereo-isomerism. Illustrate by examples.
6. What do you know of the absorptive powers of soils for nitrates, ammonia, phosphates, and potassium salts? Explain the nature of the phenomena, and point out their importance in practical agriculture.
7. Is there any relation between the fertility of a soil and the activities of micro-organisms in it? Explain, with reasons.
8. Discuss the utility of the chemical analysis of a soil in determining its fertility and selecting a manure to increase the same.

AGRICULTURAL ZOOLOGY

THURSDAY, 26TH MARCH. 1—4 P.M.

[N.B.—THREE questions are to be answered in A and THREE questions in B. Questions 4 and 5 are compulsory].

A

1. Explain briefly, with the help of diagrams, the main points in the comparative morphology of *Paramaecium*, Cockroach, and Fowl.
2. Describe the peculiarities in the life-histories of a tape-worm, the horse bot, a potter wasp, and a house mosquito.
3. Write what you know of the insect friends of the farmer, pointing out in what manner they are helpful to him and how he can utilize such help with advantage to himself.
4. Point out briefly the defects in the existing methods of Sericulture in South India, with your suggestions, if any, to improve the status of the industry.

B

5. State what you know of the life-history of the Red Hairy Caterpillar (*Amsacta albistriga*) of South India, and indicate what measures you would adopt to bring the pest under control. Mention two other Hairy Caterpillars that you know of, and briefly state wherein they differ from the above pest as regards their life-history.
6. What are the aims of the Madras Diseases and Pests Act? State under what conditions and against which pests the Act can, in your opinion, be advantageously enforced in South India.
7. Describe three of the more serious pests of oil-seeds in the province of Madras, and indicate the measures that you would recommend to bring them under control.
8. Write short notes on the following:—a. Hyperparasite, b. Fumigation, c. Bee-keeping in India, and d. Repellants.

BOTANY I,

27TH MARCH 1925, 7—10 A. M.

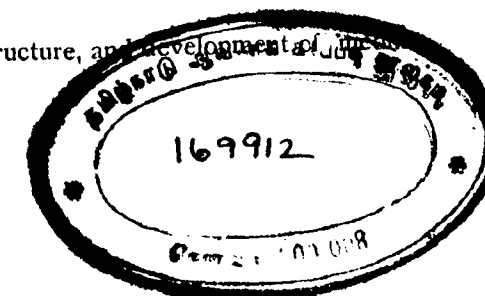
[Only FIVE questions are to be answered. All Candidates must answer Questions 1 and 2 and are expected to give examples and sketches wherever necessary].

1. Describe the position, structure, and development of the lary rays.

5

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J. G. M. 21113



2. Give an account of the characteristics of Malvaceae and Solanaceae, and mention some plants of these families that are of economic importance.

3. What is meant by prefoliation or ptyxis? Give an account of the various forms, with examples.

4. Describe clearly the variations that you have observed in the gynaeceum of flowers.

5. Explain the morphological nature of the tendrils in the following plants, giving in each case your reasons:—*Vitis vinifera*, *Cardiospermum Halicacabum*, *Bauhinia anguina*, *Pisum sativum*, *Gloriosa superba*, and *Bignonia unguis-cati*.

6. Explain the following terms:—chalaza, vacuole, raphides, tyloses, cladode, androgynous, tetradynamous, pyxis, cyathium, and strophiole.

BOTANY II.

27TH MARCH 1925, 1—4 P. M.

(N. B.—You are to answer Questions 1, 2, and 4 and any two of the remaining questions. You are expected to give examples and sketches wherever necessary).

1. Give an account of the reproductive process in Ferns, and compare it with the same process in Angiosperms.

2. Describe the thallus of the gametophyte of any liverwort that you have studied, pointing out its adaptation to its mode of life.

3. Mention the fungi that attack seeds during germination, and give an account of the life-history of any one of them.

4. Describe fully the method by which you would determine the species of fungus causing any particular disease in any higher plant.

5. Compare the mode of nutrition in a fungus with that in an alga.

6. Name the fungi which affect the cholam (*Andropogon sorghum*), and explain, in the case of any one fungus, its mode of entrance and development in the host and the methods you would adopt to prevent the attack.

AGRICULTURE. I

SATURDAY, 28TH MARCH. 7-10 A. M.

[Only six questions are to be answered. All Candidates must attempt Questions 1 and 2.]

1. Describe the composition of any igneous rock, the result of weathering actions upon it, and the character of the soil which is formed from it.

2. What are 'weather' charts? How are they useful to the ryot?

3. Describe the suitable rotation of crops for heavy land and explain briefly the principles on which it is based.

4. Describe the disc-harrow and explain for what purposes it is useful.

5. What is meant by tillage? Explain its objects. What are the useful tillage implements in use on the Central Farm and discuss their uses.

6. Write short notes on—porosity, air space, surface tension, capillarity, subsoiling, mulching, wrapping and hilling in soil.

7. Compare the economy of nitrogen manuring between the following manures:—(a) Nitrate of Soda, (b) Sulphate of Ammonia, (c) Nitrolim, (d) Cake feeding, (e) Growing daincha for green manure, and (f) applying wild indigo leaf.

8. A ryot owns a good well with plenty of water in it and there are two single mholes working. Explain the ways or method by which maximum area can be commanded by working the two mholes.

AGRICULTURE II.

SATURDAY, 28TH MARCH. 1—4 P. M.

1. A reserve forest is being deforested. State briefly the points you would consider in selecting such field for a mixed agricultural farm.

2. A level clay loam field measuring 5 chaus by 3 chains is waterlogged and requires underground drainage. Draw a plan of your proposed drainage system. Enumerate, but do not discuss, the points you would observe in preparing the plan. Calculate the cost of drainage if tiles cost 5 annas per rood, labour for cutting 4 annas, and labour for filling one anna per rood for furrow drains, and 30 per cent. extra for main drains. [1 rood=5½ yards].

3. *Either*, Describe a mechanical winnowing machine. Explain how it can be adjusted to clean different classes of grain. Illustrate your answers by sketches.

Or, Describe a disk plough. State the various adjustments and their effect on the working of plough. Discuss the utility of (a) the disk plough and (b) the share plough, in ploughing black cotton soil in the hot season.

4. Virgin lands are always fertile. Examine this statement and give your own views as to its accuracy. Enumerate any exceptions you are acquainted with.

5. *Either*, An agent offers a compound fertilizer with a guaranteed analysis of 5 to 8 per cent nitrogen, 20 per cent. soluble phosphates, 5 per cent insoluble phosphates and 5 per cent potash. What method would you adopt in valuing this fertilizer? Would you consider the above analysis sufficient for your valuation.

6. *Or*, Field No. 20 in the Central Farm is intended for tobacco. Describe the preliminary cultivation you would consider necessary (a) after ragi harvested in September and (b) fallow from March. What fertilizer would you use. State the rate and method of application.

PART II.

BOTANY. I.

MONDAY, 30TH MARCH. 7—10 A. M.

(NOTE.—*You are to answer questions 1 and 2 and any three of the remaining questions. You are expected to give examples and sketches wherever necessary.*)

1. Describe the arrangements existing in Angiosperms to facilitate the passage of gases.

2. Give a botanical account of Pani Varagu (*Panicum miliaceum*), with special reference to its habit, root system, structure of inflorescence and flower, and state how you would distinguish it from Samai (*P. miliare*).

3. Explain the importance of pruning fruit trees. What points should be determined before commencing the operation in any particular variety.

4. Describe the process of fertilization in flowering plants and the structure of the ovule when it is ready for fertilization.

5. What parts of the following plants are of economic importance, and to what uses are they applied:—*Crotalaria juncea*, *Nicotiana Tabacum*, *Manihot utilissima*, *Ricinus communis*, *Arachis hypogaea*, *Cocos nucifera*, *Allium cepa*, *Carum Copticum*, and *Amarantus gangeticus*?

6. Describe the means adopted by plants for the prevention of excessive loss of water.

BOTANY II

MONDAY, 30TH MARCH 1—4 P. M.

(NOTE.—*You are to answer questions 1, 2, and 3 and any two of the remaining questions. You are expected to give examples and sketches wherever necessary.*)

1. Give an account of reduction division of the nucleus, and explain its bearing on heredity.

2. Explain the means, other than carbon assimilation, adopted by plants to obtain energy for performing their vital functions.

3. Explain clearly the characteristics of the seeds in F₁ and F₂ generations when crossing is effected between a pea plant producing wrinkled seeds with yellow cotyledons and another having round seeds with green cotyledons, the character round and yellow being dominant.

4. Discuss in detail the general principles to be observed in the selection of seed for crop production.

5. Give an account of how green plants dispose of the food materials they manufacture.

6. What considerations would guide you in deciding whether 'selection' or 'hybridization' would be the more suitable method to be followed in the improvement of any crop?

CHEMISTRY. I.

TUESDAY, 31ST MARCH, 7—10 A. M.

(NOTE :—*Only six questions are to be answered. Questions 4 and 8 are compulsory.*)

What do you know of the lime requirements of South Indian soils? Explain the effect of lime on different soil types of the Presidency.

2. State clearly what is meant by enzyme action. Explain how a knowledge of enzyme action is essential for the proper understanding of several changes taking place in plants and animals and also in many industrial processes. Illustrate your answer with two examples of each kind.

3. What are the materials suitable for making composts and what precautions are necessary in making them? Explain the changes which take place during composting and state what you know of the manurial values of different kinds of composts.

4. (a) What factors will you take into account in the purchase, valuation, and use of the following manures :—(i) bonemeal, (ii) basic slag, (iii) flour phosphate, (iv) concentrated superphosphate, and (v) reduced superphosphate?

(b) What will be the content of phosphoric acid in good samples of each of the above?

5. What is meant by 'protein consumption'? Explain the effect of lean meat, lard, and starch, when fed alone or in combination, on the protein consumption of an animal. How would you determine the gain or loss of flesh in an animal during a digestion experiment?

6. Starting with fresh milk, explain, with reactions, how a good cheese of the Cheddar variety can be prepared. If cows' milk and buffaloes, milk are both available, state, with reasons, which milk you would prefer and what would be the difference in the cheese made. Discuss the possibility of making Cheddar cheese at Coimbatore.

7. Write short notes on—(a) available plantfood, (b) minimum cropping value, (c) nutritive ratio, (d) rancidity of butter, (e) absolute water capacity of soils, (f) crude fibre, (g) radiobacter, and (h) limiting factor.

8. Write a short account of the phenomenon of colloidal solutions, as compared to true solutions, as they exist in plant tissue. Bring out the significance of the term, 'two-phase system', as applied to colloidal solutions, in the translocation of dissolved material in the plant tissue. Explain how a living plant containing 90 per cent. of water maintains a rigid structure.

CHEMISTRY. II.

TUESDAY, 31st MARCH, 1—4 P. M.

[NOTE.—only six questions are to be answered. Questions 2 and 7 are compulsory].

1. Describe the nature of the changes going on during the opening of seeds in general and their germination later on.

2. Explain the term 'water requirements of crops'. If it in any way influences by manures? Explain, with reasons.

3. What happens when the same crop is grown on a field continuously without any manure for a number of years? Explain, with reasons.

4. Describe the changes going on in farmyard manure during storage, and state the precautions necessary to make good manure.

5. Explain what happens when ordinary acid superphosphate is used as a manure in (a) red soils, (b) heavy paddy soils, and (c) black cotton soils.

6. Discuss the relative merits of straw, hay or silage, and oil-cakes as cattle foods.

7. What are the general principles involved in compounding and fixing rations for growing young stock, working animals, and dairy cattle?

8. What do you know about the composition of cows' milk, and how are its quality and quantity influenced?

AGRICULTURE I.

WEDNESDAY 1st APRIL 7-10 A. M.

[NOTE.—Only six questions are to be answered. All candidates must attempt Questions 1 & 2.]

1. Explain the factors which determine the seed rate of the various crops. State how much seed is required per acre for the following. Wet paddy, dry cholam, tenai, ragi, gingelly, tobacco, turmeric and chillies.

2. Compare and contrast cane cultivation in the Circars with that in the Coimbatore District.

3. Describe the working of the threshing machine, illustrating it with a diagram, and state what labour is required for threshing and cleaning 1000 lb. of grain of:—ragi, cholam, tenai and bengal gram.

4. Discuss the several points that govern the cost of producing (a) 100 lb. of milk, and (b) one ton of farm yard manure.

5. Work out the cost of a day's cattle labour on the central Farm allowing 250 working days in a year.

6. How are non-credit co-operative societies more useful to the agriculturists than credit societies? Explain how such societies are organised and worked.

7. Trace the relationship between agricultural wages and prices and examine the factors which determine them.

8. Explain briefly the important points that are to be taken into consideration in selecting a site for an experimental farm.

AGRICULTURE, II.

WEDNESDAY 1ST APRIL 1—4 P. M.

[NOTE.—Only six questions are to be answered. All candidates must attempt questions 1 and 2.]

1. What are the various methods by which a race of plants can be improved? Describe the methods adopted in detail. Mention the lines along which work of this nature is being done in this country.

2. Explain the laws of "demand and supply." What are the causes that tend to their fall or rise? Explain what is immediate effect of such changes would be?

3. Under what conditions is the practice of green manuring successful? Quote some instances where this practice is unsuccessful. What will be the advantage to a cultivator who uses green manure systematically compared with another who uses only green leaf?

4. You are asked to introduce sugar-cane in a new tract. What points will you consider before you set on your venture? What are the working expenses of a farmer who takes your advice and plants over an area of two acres and what would be his gross and net returns? What advice would you give him generally in the cultivation of the crop?

5. Enumerate the various breeds of cattle, in the Presidency stating the localities in which they are found. Describe in detail the characteristics of a breed noted for (a) draft and (b) milk purposes.

6. Draw the ground plan and elevation and give internal dimensions, of a byre for 50 buffaloes in the Coimbatore district. What would be the approximate returns per annum if the milk is utilized under the following conditions.

(a) When sold as such, four miles from the farm;

(b) When converted into butter;

and (c) When converted into ghee?

How will you utilize the waste products, and how would you propose to maintain the same quantity of milk throughout the year.

7. Two blocks of light loamy soil containing 12 acres of dry and 3 acres of garden land under a well are situated 4 and 20 miles respectively from an agricultural station. It is intended to take either of them on a seven years' lease for groundnut experimental purposes. The lease is the same in both cases. State how you would stock the farms and run them. What would be the running capital required in each case during the first year of experimental work. What buildings would be necessary in each case? How would you lay them out for experimental purposes, and what precautions would you take in doing so?

AGRICULTURAL ESSAY.

THURSDAY 2ND APRIL 7-10 A. M.

Write an essay on one of the following subjects:—

Either

The need and scope for an economic inquiry among the agricultural classes of the Presidency.

Or

The improvement of indigenous cattle by imported bulls.

BOTANY, PRACTICAL.

PAPER I.

15TH APRIL 1925.

1. Describe with necessary sketches A and B and refer to their families giving reasons.
2. Write critical notes on C, D, E, F and G.
3. Identify the weeds H, I and J and explain how they are troublesome.
4. Viva-Voce- Physiological experiments.

Specimens given.

1. (a) Andropogon sorghum Infl.
(b) Medicago sativa branches with flowers and fruits.
2. (c) Tubers of Gloriosa.
(d) Lippia geminiflora Infl.
(e) Cestrum aurantiacum Infl.
(f) Cladodes of Casuarina and cones.
(g) Duranta fruits.
3. (h) Leucas verticillifolia.
(i) Alternanthera echinata.
(j) Commelina bengalensis.

PART II.

16TH APRIL, 1925.

1. Cut sections of the material A and explain with sketches of the various parts.
2. Identify B, C, D and E stating any special features that you notice
3. Dissect and label the parts of F, G and H and state their functions wherever possible.
4. Viva Voce-Respiration. Callus formation and cutting with roots.

Specimens given.

1. (a) Root of cotton plant.
2. (b) Sandal haustorium.
(c) Gomphrena spike with seedlings.
(d) Ochva fruits.
(e) Section of cucurbita ovary.
3. (f) Castor seedling.
(g) Wheat seedling.
(h) Carthamus heads.

AGRICULTURAL CHEMISTRY.

1ST PRACTICAL.

20TH APRIL 1925.

1. Estimate the percentage of phosphoric acid retained by given soil with the solution of phosphate provided.
2. Estimate the percentage of Crude Fibre in sample of Rice bran.
3. Estimate the amount of ammonia present in sample of Rain-water, in parts per 10000.

NOTE.—Unfinished work to be left over and completed next day.

IInd PRACTICAL.

1. Continuation of previous day's unfinished work.
2. Report on sample of Manure Mixture.
3. Identify the carbohydrate in stoppered bottle and prepare its osazone for microscopic examination.
4. Oral Examination.

AGRICULTURE 1ST PRACTICAL

17TH AND 18TH APRIL 1925 FORENOON.

1. Prepare butter from the quantity of cream supplied to you.
2. Record the details of your work on a sheet of paper provided.
3. Oral Examination.

IInd PRACTICAL.

(WHOLE DAY) 17TH AND 18TH APRIL 1925, AFTERNOON

1. Adjust the Monsoon plough to suit the cattle pair No. take it to field No. 37 and split in the plot assigned to you.
2. Award marks to the method of ploughing as found in the following field Nos. 52 B, 58, 60 B and C, 61 and 62, taking 100 as the maximum. Give reasons for your awards.
3. The field in front of you is sown to Chitrai cholam and covered. Prepare one bed of normal size for irrigation and form an irrigation channel 5 yards long.
4. Assemble the various parts of the improved plough placed before you.
5. A ryot to the east of Farm Wetlands owns 25 acres of paddy fields. He cultivated in 1924-25 five acres with G. E. B. 24, 10 acres with Tulukkasamba, 10 acres with Sinnasamba. Prepare :—
(a) A cultivation sheet for seed bed for G. E. B. 24.
(b) A cultivation sheet for a field of 2 acres of Tulukkasamba
(c) Balance sheet for 25 acres.
6. Orals.

BOTANY, PRACTICAL.

PART I.

FRIDAY, 3RD APRIL.

1. Describe fully the specimen *a* and refer it to the Family.
2. Write full morphological notes on *b, c, d, e, f, g, h, and i*.
3. Identify the slides *j, k, and l*.
4. Make preparation of the specimen *m* and identify it.
5. Describe and determine the diseases in *n, o* and *p*.

Specimens given.

1. (a) A branch of *Hamelia Patens* with flowers and fruits.
2. (b) Solid bulb of *Polianthis*
(c) Fascicles of flowers of *Polyalthia*
(d) Inflorescence of *Antigonon* with tendrils.
(e) Inflorescence of *Dardalacanthus*
(f) Fruits (dehiscing) of *Bignonia* and *Holoptelea*.
(g) Inflorescence of *Alyssum*.
(h) Leaf tendril of *Bignonia*.
(i) *Russelia* shoots.
3. (j) Section of dicot leaf (*Datura*)
(k) " the thallus of *raichantia*
(l) " spores of the Fungus, Oospores of *phytophthorus*.
4. (m) Stem of *Datura*.
5. (n) *Aecidia* of " on *ocium*.
(o) *Ephelia* on paddy,
(p) *Scolorogpora graminicola* on *Pennisetum typhoides* ear heads.

CHEMISTRY, PART I.

7TH APRIL 1925.

1. Estimate the percentage of sand and phosphoric acid in sample of bone ash (bottle)
2. Estimate the percentage of chlorine volumetrically in sample of chloride (weighing bottle)
3. Make a qualitative examination of solid (test tube)
4. Oral Examination,

AGRICULTURE, PRACTICAL PART I.

4TH APRIL 1925.

1. Assembling and adjusting a Monsoon plough.
2. Yoking bullocks and taking plough to the Field.
3. Ploughing as per direction.
4. Orals.

ENGINEERING, PRACTICAL.

(WHOLE DAY) 8TH APRIL 1925.

1. Oral Examination on Civil and Mechanical Engineering with reference to buildings and machinery in the College.

1. *Chain Survey*. A, B and C are bannerols. Chain along these sides and fix up the front four corners of the students pavilion and also 2 bannerols marked X and Y and also calculate the area A B C.

2. *Levelling*. Start at the Northwest corner of the bottom step of the Union building marked in pencil. Proceed taking level round the New College and close on the masonry water tub Southwest corner marked in tar. On your way touch the top of a wooden peg driven in the ground at the Southwest recess of the New College.

3. *Workshops*. Out of the wooden piece given to you, make a piece of rectangular section of desired dimensions.

ANIMAL HYGIENE.

PRACTICAL, PART. 1.

WHOLE DAY 6TH APRIL 1925.

1. Identification of drugs and their uses and doses.
2. Handling of cattle and sheep.
3. Dissection.
4. Identification of surgical instruments and their uses.
5. Drenching, bandaging, throwing and securing of cattle.
6. Detection of *laurence* in cattle.
7. Determining the age of cattle.
8. Oral examination on prevention of contagious diseases including simultaneous inoculation etc.

AGRICULTURAL ZOOLOGY.

PRACTICAL. PART II.

1. Dissect out the alimentary canal of the specimen provided. (Cockroach) and make a diagram to show the different parts.
2. (a) Identify the specimens provided.
(b) Pick out insects of economic importance from the box of specimens provided.
3. Examination of collection boxes of each candidate and oral.

CORRESPONDENCE.

From
T. Sambandham Pillai,
Murungapalayam Street
VILLUPURAM.
Dated 4th March 1925.
The Editor, Madras Agricultural,
Students' Union Journal.

Mr. R. D. Anstead Director of Agriculture, Madras and Mr. D. Sundha Rao, Deputy Director of Agriculture, IV Circle, paid a visit to Arasamangalam, a village in Villupuram Taluk on the 3rd morning. They saw about 10 acres of Cambodia cotton and sugar-cane (standing crops) introduced by the department in the village. The landlord who conducted the departmental improvements in his field gave one appreciation letter to the Director of Agriculture. A letter was read to the other villagers for their understanding of the benefits of the improved method. I request you to publish the same in your valuable Journal so that other ryots may be benefited by the experience of the mirasdar at Arasamangalam.

Yours sincerely,
T. Sambandham Pillay.

From
M. R. Ry. K. Srinivasa Chariar Avl.,
Mirasdar, Arasamangalam.
Arasamangalam,
3—3—1925.
To
The Director of Agriculture,
Madras.

Sir
The Agricultural Demonstrator, Villupuram, selected two plots of equal area (83 cents) to demonstrate the use of the paddy seed drill. One was used as a check plot and the other as demonstration plot.

Vadan Samba was cultivated in both the plots. 18 M. M. of seeds were sown in the demonstration plot and in the check plot respectively. Thus 6 M. Ms. of seeds were saved or in value Rs. 1-8-0. The customary practice here is to sow 30 to 36 M. M. per acre (for broadcasting). The seeds all germinated well since they were sown at a uniform depth by the seed drill.

There was a heavy rain some days after the sowing. So I could not weed properly. Later there was no rain and it rained heavily upon the yield of the crop.

Rs. 17—1—6 were spent for the broadcasted plot and Rs. 13-9-5 were spent for the demonstration plot. A net gain of Rs. 3—8—1 was saved per acre. The produce from the demonstration plot was 28—1—2 and 24—1—2 kalams for the check plot. If calculated at the present market rate the gain is Rs. 20. There was a net gain of Rs. 23—8—1 per acre from the demonstration plot.

The following are the impressions and advantages of the drill cultivation which I happened to notice during the short year of the new method in my plot.

1. Economy of the seed rate.
2. Germination is easily assured since all seeds fall at a required depth.
3. Free aeration is possible since the crops are in lines.
4. Covering of the seed with the country plough is necessary in the broadcasting method but here the covering is done with Guntaka. So less expenses.
5. Weeding and harvesting expense are less.
6. A decided increase in yield.

Considering from all points of view, drill cultivation is better than broadcasting method.

About 200 acres are generally cultivated under Vadansamba in this village every year. It is better if landlords realise this and do the cultivation with a seed drill of their own or I would suggest the local Co-operative society to purchase one and lend it to the members at least. There is every certainty that drilled paddy will give a gain of Rs. 10 at least per acre. So, there is scope for an annual net profit of Rs. (200 x 10) Rs. 2000 if all the expected areas are grown by the drill method. If the Co-operative Society make it a point to induce their members to do this cultivation and benefit thereby, I think there is a great scope for easy spreading of these implements among the ryot population.

In wet lands, two plots were selected for demonstration purpose in my land. One plot was cultivated according to the departmental method and the other under ordinary method. The ordinary method plot was manured with green leaf manure. Economic planting was done. Garudansamba was grown.

The demonstration plot was ploughed with Konkan plough. The green leaf manure and Super-phosphate (1 cwt.) per acre and 5000 lbs. of green leaf were applied. Economic planting was also done in this plot. Aduturai No. 1 paddy was cultivated in the demonstration plot. Green leaf manure was applied equally in both the plots.

Expenditure and income are shown below :—

Name.	Expenses.	Grain yield.	Value.	Straw yield.	Value.	Grain total.	Remarks
	Rs.	lbs.	Rs.	cwt	Rs.		
Check plot	... 35	1800	100	40	13		
Demonstration	— 38	2160	132	48	16	34	

NOTE.—The season was very unfavourable this year and the absence of rain during the later period told heavily upon the general yield of both the plots.

Now it is time for us to take to departmental methods and try for one or two years or three years in a small plot of land, and if it is found to be successful we must cast aside our old methods and choose the newer and more scientific ones. Herein lies a good method of solving the problem of agricultural indebtedness. We must clear our minds of age long shyness.

In some other lands of mine, I adopted some of the improvements suggested by the agricultural department. 6 acres were sown with the seed drill. 25 kalams were realised on an average per acre. 18 kalams were realised on an average from the broadcasted field per acre. (1 kalam: 36 M. M. : 90 lbs.) 1.16 cents were sown with sunhemp. Owing to the insect and flood damage the crop failed. However, it gave green manure for an acre. 5 acres of the dry land was ploughed with monsoon plough. Varagu grown in the area yielded well. Superphosphate was applied with green leaf manure to some other plots. Poombalai was grown in 16 cents of land. It gave 34 kalams per acre or 34 x 90: 3,060 lbs. I did not maintain any correct account for this. But I am sure that there is gain in each improvement suggested by the department.

I am extremely glad to take this opportunity of permitting you to let other peasants and mirasdars benefit fully by my experience.

I beg to remain,

Sir,

Your most obedient servant,

(Sd) K. SRINIVASACHARIAR.

EDITORIAL NOTES.

Rice finds elbow room:—Paddy Breeding was for over 12 years confined to a small area of land adjoining the Coimbatore Farm wet lands. The singling out of a promising strain which was christened G. E. B 24 led to systematic efforts being made to grow it under diverse conditions before it could be put out into the districts on a huge scale. This brought into existence the Aduturai farm in the Cauvery delta two years ago. Appreciation of the work on paddy encouraged the opening of a third station in Marteru in the Godavari delta this year. Release of 126 lakhs of rupees from the local contribution to the Central Revenues has occasioned the earmarking of 4 lakhs for the Development department and opportunity has been taken to make arrangements for establishing a Rice Breeding Station this time in South Malabar. Ganjam alone of all the chief rice growing tracts is thus without a station. She has been asking for a farm for nearly 20 years now. We hope that it will be her turn next. For we need not labour the point, that in regard to area under paddy and the number of varieties grown she stands almost second in the presidency. That

Ganjam has not yet been provided with a farm is, we believe, more due to lack of persistent effort and enthusiasm on her part, though she was one of the earliest districts to evince interest in agricultural activities. The latest Season and Crop report shows that in 1923-24 the acreage under paddy in the chief rice districts was as follows:—

Vizagapatam 1,147,800 acres, Ganjam 1,136,000 acres, Tanjore 1,124,300 acres, Kistna 1,137,000 acres, Malabar 873,400 acres.

Thick canes assert themselves :—It is common knowledge that vast stretches of land growing sugar-cane in India lie within the sub-tropical tracts, in Agra and Oudh, Punjab and the North-West Frontier Province. This region is characterised by its thin canes. Thick canes do not find a congenial home here, but hold sway in the warmer regions of this country. When the question of breeding sugarcane attracted attention in 1912, it was considered imperative that thin canes should be taken up first and the Sugarcane breeding station which was established at Coimbatore was made to evolve types of canes suitable to Upper India. We now understand that thick canes are no longer to be neglected and their breeding will be undertaken in a farm to be opened in the neighbourhood of Coimbatore immediately under a second Research Officer. We hope that the Deccan ryot will have better opportunities of profiting by the lessons on the latter station which will materially contribute to his success.

Severance of a limb :—The importance of sugarcane as an All-India question necessitated a breeding station being opened at Coimbatore in 1912 as the place best adapted for production of seedlings by pollination of flowers which phenomenon does not occur in Upper India owing to its climate. The Sugarcane Expert and the Breeding station were kept under the administrative control of the Madras Government which was however financed by the Central Government. With effect from 1st April this year this arrangement came to an end and the Government of India have assumed direct control of the staff and the station. This would, we hope, give scope for more intimate touch of the Experts at Pusa with Coimbatore to the benefit of both.

Agricultural Development Trust. The thoughts of the world have since the close of the War been turned towards Agriculture. More production, less wastage, better distribution, economic consumption, co-operation, efficiency are ideas which reverberate with great resonance in political, commercial and social circles. This is all for the good but there seems to be no real grasp of the means to be adopted. A well meaning Indian Pro-

fessor advises from America that mass co-operation in agriculture is the only way to regenerate India. A socialist suggests communism a loyalist advocates peace and order, a theoretical economist urges a layman advocates peace and order, a businessman wishes endless expenditure on marriages and obsequies, a capitalist emphasises efficiency of labour, a trade unionist insists on less hours and more leisure for workers, a statesman pleads for precedents and expediency, and the beggar cries for food at no cost. Thus owing to the interaction of several forces the state of agriculture in India which is by all acknowledged as an agricultural country, is anything but satisfactory. An improvement in any direction implies expenditure of money and a well laid out programme which should secure the assent of all parties and is beyond cavil and criticism. When the programme has been laid out spread over a number of years, it would be advantageous to have a fund from which required amounts can be drawn without anyone being subjected to impersonal pressure not to allow grants to lapse. The creation of such a fund is urgent in the cause of agricultural development as no schemes that are taken up can possibly be completed within a year, and their extension beyond the customary official year would under the present circumstances, entail either abandonment of the schemes or their being rushed through with feverish haste, undue waste of money and deplorable loss of efficiency. This suggestion is nothing original but requires courage, knowledge and patience on the part of responsible authorities, for the success. We hope, now that this department has been in active existence for about 20 years, it should think of creating such a fund for working out its programme; and the time is opportune as any slice that may be snatched from the remission of provincial contribution may very well form a sound nucleus.

Inter-University lectures :—Our readers are aware that in May last year a conference of representatives in India was held at Simla under the Chairmanship of Minister for Education and one of the resolutions that were passed was for the creation of facilities for exchange of Professors of eminence, so that correct knowledge may be diffused and the standard of teaching raised in University Colleges. No action seems to have been taken by any University so far. It would be best that this step is begun with applied sciences like agriculture, the subsidiary branches of which require deep knowledge, intimate contact with details, and authoritative expression of views, to ensure its progress. Now that Coimbatore, Poona and Lyallpur Agricultural Colleges are affiliated to the Universities it should be easy to arrange for such exchange or deputation of Specialists for varying periods, as was contemplated in the resolution referred to.

DEPARTMENTAL NOTIFICATIONS.

Appointment transfers etc.—

1. Mr. S. Subbuswami Ayyar B. A., appointed Special Officer for control of expenditure from 1st March 1925 on 500—30—800 grade
2. Mr. B. Kamaraju appointed to officiate as an Upper subordinate V grade from 15th April 1925 during the absence of Mr. V. Muthuswami Ayyar on leave.
3. Mr. K. P. Sankuhni Menon, Lower Subordinate, V grade restored to the Upper subordinate service V grade with effect from 1st April 1925.
4. Mr. A. K. Ganesha Ayyar, Assistant Farm Manager, Millets specialist section transferred to VI Circle on the expiry of his leave.

Leave:—

1. Mr P. H. Rama Reddi, Dy, Director of Agriculture, Bellary, study leave for 12 months and leave on average pay for 6 months from or after 15th June.
2. „ V. Muthuswami Ayyar, Teaching Assistant leave on average pay for 16 days from 15th April with permission to prefix easter holidays.
3. „ K. M. Thomas, Assistant in Mycology, leave on average pay for 20 days from 21st April
4. D. Marudarajan, Assistant in Mycology, leave on average pay for one month from 1st April.
5. Mr. O. Krishnan Nair, Assistant in Mycology leave on average pay for 15 days from 23rd April.
6. „ T. K. Balaji Rao, Assistant in Economic Botany, leave on average pay for two months from 20th April.
7. „ K. L. Ramakrishna Rao, Cotton Assistant, Hagari, leave on average pay for 15 days from or after 27th April.
8. „ S. Suryanarayana, Technical Assistant, Agricultural Middle school, Anadapalli, leave on average pay for 15 days commencing from 15th April with permission to prefix Easter holidays from 9th to 14th.
9. „ T. R. Venkaswami Rao, Special Agricultural Demonstrator, Tiruvalur, leave on average pay for one month from 4th May.
10. „ P. Abishekanatham Pillai, Agricultural Demonstrator, VIII Circle, leave on average pay for 4 months from or after 1st May.
11. „ A. Gopalan Nair, Agricultural Demonstrator, VII Circle, leave on average pay for 2 months from the date of relief.
12. „ Silthapathi Rao, Assistant Agricultural Demonstrator, Nellore, leave on average pay for 18 days from 15th April with permission to prefix Easter holidays.
13. „ M. Raman, Farm Manager, Chintaldevi, leave on average pay for 15 days and on half average pay for 15 days in continuation from 7th April.
14. „ L. Narasimha Achari, Farm Manager, Nandyal, leave on average pay for one month from or after 20-4-1925.
15. „ N. Subrahmanya Ayyar, Farm Manager, Paddy Breeding Station, Adutural, leave on average pay for 1½ months from or after 1st May.
16. „ T. V. Krishnaaswami Rao, Farm Manager, Hosur, leave on average pay for 13 days in continuation thereof, from 20th March.
17. „ U. L. Srinivasa Rao, Sub Assistant, Millets Specialist's section, leave on average pay for one month from 15-4-1925, with permission to prefix Easter holidays.
18. „ V. D. Kenchiah, Sub Assistant in Mycology, leave on average pay for 10 days from 18-4-1925.
19. „ G. J. Balraj, Assistant Agricultural Demonstrator, VI Circle, Melur, leave on average pay for one month from 15-4-1925 with permission to prefix Easter holidays.
20. „ P. L. Narasimham, Assistant Agricultural Demonstrator, Bobbili, leave on average pay for one month from 19-4-1925

(v)

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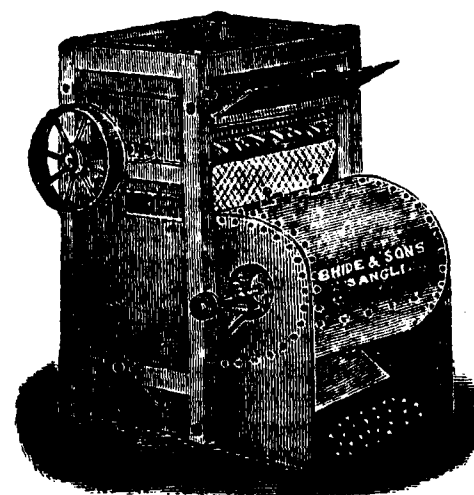
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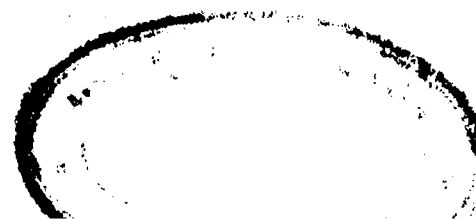
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(viii)

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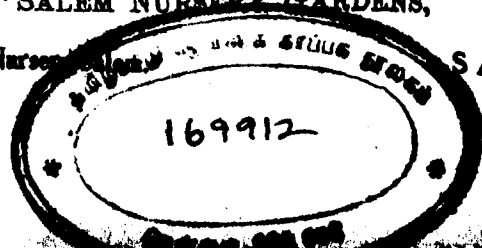
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