REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE,

MADRAS PRESIDENCY

FOR THE OFFICIAL YEAR

1905-1906.

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REPORT

ON THE

OPERATIONS OF THE DEPARTMENT OF AGRICULTURE

FOR

1905-1906.

I.—PREFATORY.

The post of Director of Agriculture was held throughout the year by the Hon'ble Mr. A. E. Castlestuart Stuart, I.C.S. During the same period, Mr. Benson, Major Gunn, Mr. Barber and Mr. Chatterton held the offices of Deputy Director, Superintendent of the Civil Veterinary Department, Government Botanist and Superintendent of Pumping Experiments, respectively.

2. The Director spent 106 days on tour, visiting all the districts of the Presidency except the Nilgiris, Cuddapah, North Arcot, Tanjore, Trichinopoly, Madura and South Canara, and inspected all the Agricultural stations at Samalkota, Bellary, Hagari, Attur, Palur, Koilpatti, Taliparamba and Hindupur. He opened the Agricultural Exhibition held at Bellary in May 1905, and the Cattle Shows held at Anakápalle and Ongole in February and March 1906, respectively, and further visited Coimbatore in July 1905 in company with Messrs. Shipley, Benson and Barber, Major Gunn and M.R.Ry. C. K. Subba Rao for the purpose of selecting a site for the new Technical School, Research Institute and Central Farm. The work of the Department of Agriculture in this Presidency is expanding so rapidly and its activities have so much increased during the past three years and must continue to increase still more in the near future, that the appointment of a whole-time Director under the control of the Board, as contemplated in the reorganization scheme, will soon become an absolute necessity. The present Director of Agriculture is also a Member of the Board of Revenue, Court of Wards and Legislative Council, Commissioner of Revenue Settlement and Director of Land Records and is practically the head of four public departments, viz., Settlement, Survey, Land Records and Agriculture, and has also to perform the functions of Famine Commissioner and to control the work of the Registrar of Co-operative Credit Societies and of the Special Officer employed to develop industries, *e.g.*, tanning and weaving, in addition to much other work connected with the revenue aspects of irrigation projects, minor irrigation, loans, suits, etc. The work in all these various branches is constantly increasing and in the best interests of the Agricultural Department, it is desirable that it should be provided with a whole-time Director at an early date.

II.—SCIENTIFIC AND NATIONAL ENQUIRY UNDER IMPERIAL DIRECTION.

3. ***Entomology.***—Specimens of the locusts which appeared in the Alur taluk of the Bellary district and at Patikonda in the Kurnool district were forwarded to the Imperial Entomologist who found that they belonged to the species of *Acridium Succinctum* (Linn) or the "Bombay locust." A few of the [illegible] plants at the

Koilpatti Agricultural station having been found to be affected by a disease which was characterised by an abnormal growth of whitish hairs in patches and in many cases also by a curling of the leaves, specimens of the diseased cotton were forwarded to the Imperial Entomologist, and it was ascertained that the cotton leaves were infested with a mite closely allied to the genus *Phytoptus*, that the microscopic mites generally lived on the surface of the leaf and that the velvety growth of hairs was always associated with them and was supposed to be due to the irritation they set up.

4. *Mycology.*—The outbreak of a serious disease among palmyra palms (*Borassus flabelliformis*) in certain taluks of the Gódávari district induced the Imperial Mycologist to visit the affected tracts. He traced the disease to a fungus of the genus *Pythium*—a species new to science. He has since the close of the year furnished an elaborate report regarding the disease and the remedial measures suggested to combat it. It may be noted that the disease has recently spread to both cocoanut and arecanut trees. The Government Botanist has been requested to report whether it will be practicable to adopt the measures suggested by the Imperial Mycologist during the next cold season.

5. *Imperial Institute.*—Specimens of about fifteen kinds of vegetable food used by the poorer classes of people in times of scarcity or famine and 6 lbs. of Tinnevelly cotton seed were forwarded to the Reporter on Economic Products, and at his instance steps were also taken to supply him with specimens of native pens made from Indian reeds sold in the bazaars.

6. Tobacco seed of the typical varieties grown in this Presidency was sent to the Imperial Agriculturist for experimental cultivation at the Pusa farm. Similarly, one pound of seed of the Bourbon variety of tree-cotton grown in the Coimbatore district and a parcel of lemon grass plants were forwarded to the Director of Land Records and Agriculture, Eastern Bengal and Assam, while half a pound of seed of the different types of Sunn hemp (*Crotalaria juncea*) cultivated in the Godavari district was supplied to the Superintendent, Royal Botanical Gardens, Calcutta. One pound of coffee seed from the Nilgiris was forwarded to the Inspector-General of Agriculture for cultivation in Australia; and arrangements were made for the supply to him of two pounds of Jadapratti (Kidney cotton) tree-cotton grown at the Bellary Agricultural station for experimental cultivation in West Africa as well as for the transmission of ten to twenty plants of bananas (*Musa sapientum*) from the Malabar coast to German East Africa for the same purpose. Samples of the lint of certain perennial tree-cottons were collected in this Presidency for Messrs. Shaw Wallace and Company, Calcutta, and were at their instance valued by Bombay trade experts. Thirty samples of wheat and some samples of leaf tobacco were also forwarded to Pusa for exhibition at the meeting of the Board of Agriculture held in January 1906. With a view to the despatch of a third consignment of lemon grass plants to the West Indies, a set of plants was obtained from the Conservator of Forests, Cochin, and established in the open at the Agri-horticultural Gardens, Madras, but they did not thrive owing to the unfavourable character of the season. A further set planted at the Taliparamba farm having also been found to be backward, a fresh collection of plants has been made since the close of the year, and steps are being taken to establish them in a Wardian case for transmission to the West Indies.

III.—SCIENTIFIC AND LOCAL ENQUIRY UNDER PROVINCIAL DIRECTION.

7. The Agricultural Probationer who had been receiving practical training at the farms of the Bombay Presidency returned in March 1905.

During the year under report the Agricultural stations at Samalkota and Palur were placed on a permanent footing. As stated in paragraph 7 of the report for 1904-05, a permanent station was opened at Taliparamba for the investigation of the pepper vine diseases prevailing in the Malabar district. Further, a pumping station was newly started on the banks of the Hagari in the Bellary district and near the town of Bellary for the purpose of investigating problems connected with the irrigation of paddy and cotton on black cotton soils such as are met with in the tracts commanded by the Tungabhadra Irrigation Project. The pumping station at Attur in

the Chingleput district, referred to in paragraph 24 of the report for 1904-05, was converted into an Agricultural station for the purpose of making a thorough trial of exotic and perennial cottons under irrigation and for conducting experiments in the growth of fodder crops and fruit trees and in the conservation and application of cattle manure. Steps were also taken to open a permanent farm at Nandyal in the Kurnool district to be devoted mainly to a thorough study of the "Northerns" variety of cottons and to remove, by the propagation of pure seed, the evils of admixture prevailing in the locality. The most important administrative change made during the year was the decision to close the Agricultural College at Saidapet and to institute in its stead an Agricultural College and Research Institute in conjunction with a Central Farm on the most approved modern principles. A suitable site was selected near Coimbatore and acquired during the year and steps were taken to bring the land into order and to equip the farm with live-stock and agricultural implements.

8. As stated in paragraph 8 of the report for 1904-05, the main problems to be solved at both the Bellary and Koilpatti stations were the extent to which "deeper tillage" would operate as a remedy for the evil effects of drought and the determination of the comparative value of the various methods of collecting and utilizing cattle manure. At the Bellary station, the series of tillage experiments in field No. 3 were continued though no further deep ploughing was done on any of the plots during the year. The outturns obtained presented considerable discrepancies but may, on the whole, be said to indicate a slight benefit from the previous deep tillage in the case of the grain crop while, in the case of the cotton crop, the superficial tillage with the country plough performed during the year gave slightly better results. At Koilpatti, experiments in "deeper tillage" were suspended during the year as the land set apart for the purpose could not be brought by Mr. Benson into proper condition with the ordinary cultivation of the locality. At the Bellary station, the experiments designed to test the three methods of conserving cattle manure (*viz.*, the box, the byre and the pit systems) were continued on the identical plots of field No. 2 manured in the previous year: for the collection of manure under the pit system, a new pit was made and provided with a shed which did not, however, serve to secure the satisfactory decomposition of the collections, and the manure thus conserved lost a most extraordinary amount of nitrogen and phosphoric acid whilst in the manure heaped in the open to which the urine of the cattle was not added, the proportion of nitrogen and potash was unduly high. The manures thus collected were applied to certain plots sown with korrapatti (Italian millet, two rows, and cotton, one row) and though, owing to unfavourable season, the results obtained during the year under report were inconclusive, it may be inferred from the outturns obtained by the application of manures during the past three seasons that the box manure gave the best results so far as the korra crop was concerned and the worst in the case of the cotton crop and that the best yield in the case of cotton was obtained from unmanured plots. At Koilpatti also, the analysis of the collections of manures under the three systems mentioned above disclosed discrepancies; and as to results, no conclusions can be arrived at until the outturns of the cotton crop to which the manures were applied are known.

A fresh series of experiments in the application of artificial manures was at the suggestion of the Inspector-General of Agriculture conducted at both the stations during the year in order to test their value on cotton grown in the ordinary local rotation and on cotton grown continuously. The analysis of the soils at the Bellary station having shown that their great defect was in phosphates and nitrogen, a scheme for supplying the want by applying to certain plots, which had received no manure previously, oil-cake at 1,000 lb. per acre or saltpetre or superphosphate at 300 lb. per acre was adopted, and the plots were sown with korrapatti [korra (*Setaria italica*) and cotton] in order to determine the effect of the manures on cotton grown in rotation; the result was that in the case of korra, the oil-cake gave better results than even the box manure, the saltpetre showed a material increase on the unmanured plot and the superphosphate had no effect at all; while, in the case of cotton, the saltpetre plot showed a small increase over the unmanured plot and the superphosphate and oil-cake plots showed the smallest yields. To the plots set apart for the continuous cultivation of cotton, several kinds of artificial manures (oil-cake, superphosphate, saltpetre and basic slag) were applied, either singly or jointly, and a plot was also left unmanured; but

owing to scanty rainfall, the results obtained were discrepant and indicated that none of the manures had any effect on the yield. The tests will, therefore, be continued. The results of the similar application of manures at the Koilpatti farm will only be known after the cotton crop is harvested though it may be observed that the past season was not favourable to obtaining any results of value.

9. At the Bellary station, sorghums of a number of varieties, local and foreign, were sown, in addition to cotton and korra grown on the experimental plots, either with a view to the selection of seed or in the ordinary course of farm management. Owing to the unfavourable character of the season, no results of practical value could be arrived at, but effort was concentrated on securing the best possible supply of seed for the next year. A small trial of Bombay fodder sorghums was made under irrigation, and it is reported that the "Nilwa" and "Sundhia" varieties maintained their reputation at Bellary and especially the former, though the latter is the quicker grower.

10. At Koilpatti also, the season was unfavourable, and the chief crops grown in addition to cotton, tobacco and foreign varieties of paddy were cumbu (*Pennisetum typhoideum*) of local and foreign sorts, sorghums (*Andropogon sorghum*) of certain local varieties, ragi (*Eleusine coracana*), sweet potatoes (*Ipomœa Batatas*) and chillies (*Capsicum frutescens*). Cumbu of the local sort was sown over about 3½ acres and yielded only 1,057 lbs. of grain, while the foreign varieties of cumbu yielded poorer outturns, and the chilly crop almost failed, under the seasonal conditions experienced. Fodder sorghum (chola-nattu) was grown as usual; but, owing to the bad state of the season, the experiment of cutting the crop at different stages in order to determine the best time for cutting the crop from a fodder point of view was not repeated. The growth of the Irungu sorghums was continued and sufficient seed propagated by "sorts" to allow of field tests of the varieties being made later on. In the case of ragi, a trial of the relative merits of the ridge-and-furrow and flat-bed systems of planting was continued but, though the conditions of the season were not favourable for satisfactory record, the advantage of adopting the former system was again proved. As regards sweet potatoes, an attempt was made to test the effect of lifting the vines to prevent their rooting, and the result shows that this practice was attended with some small advantage; the relative advantages of planting the vines in flat-beds and on ridges was also tried but, owing to unfavourable season and scanty water-supply, no conclusions of real value could be arrived at.

11. *Sugarcane.*—The Samalkota station having been placed on a permanent footing, a block of land measuring 30 acres was acquired and laid out, and most of the permanent works and improvements required were carried out. The whole cultivable land was divided into a series of blocks, the necessary paths and roads, drainage channels, jaggery store shed and cattle sheds were provided, the main irrigation channel was straightened and otherwise altered suitably, and three dams with revetments and aprons were made along the course of the channel. Finally, a bund along the Elleru river has been transferred by the Public Works Department to the farm, and it affords sites for buildings. The season was generally unfavourable for experimental work owing to scanty or unseasonable rainfall, and there was also a serious outbreak of disease which vitiated the results from many of the experimental plots. The experimental plots were further disturbed by the urgent need for the distribution of canes to various places, including the Palur Agricultural station and the pumping station at Melrosapuram; but this disturbance will, in future, be avoided owing to the steps taken to open a cane nursery at Melrosapuram. The experimental plots were, as usual, divided into three classes, namely, the varietals, the manurials and methods plots.

The *varietal plots* were slightly rearranged, some canes being transferred from class B to class A, as they seemed worthy of detailed study and extended cultivation. In the *methods plots*, experiments were conducted in the use of trash, in green-dressing, the parts of canes to be planted, the number of sets to be planted per acre, stool-planting, wide-planting, nursery seed-bed, bamboos for supports and planting in June and September, while the question of ratoons received special attention because of the spread of disease. In the *manurial plots*, cattle manure, castor cake, a mixture of the Pungam (*Pongamia glabra*) and Nim (*Melia azadirachta*) cakes obtainable locally and a "general cane manure" were applied to the canes, and the results recorded. The "disease plot" was continued; unsuccessful attempts were made to raise

seedling canes on the farm and in the greenhouse at Ootacamund; studies were made regarding early-maturing canes and the destruction of jackals, while canes were planted in June and September for sale at local festivals. A careful botanical study of the canes grown on the station was also made. Specimens of the Mauritius canes grown at the farm were sent with paintings, drawings, descriptions and measurements to the Director of the Government Plantation in the Mauritius for the determination of their right names. As in previous years, canes of good varieties were distributed to select cultivators in the Gódávari district. The reports of the officer deputed to inspect the plantations speak of the successful cultivation of farm canes by the ryots and the general replacement of the local varieties by the farm canes. The new canes have taken a firm foothold in the district and they are all retained or sold for planting.

Other crops grown in the wet area of the station were several varieties of paddy and the best local plantain. In the dry area, dry paddy and red gram (*Cajanus indicus*) were grown in rotation with sugarcane, while other such rotations were chillies (*Capsicum frutescens* and turmeric (*Curcuma longa*). Turmeric was especially successful, while chillies and red gram yielded an indifferent outturn owing to diseases caused by drought.

12. *Ground-nut.*—As stated in paragraph 12 of the previous year's report, the Agricultural station at Palur in the South Arcot district was started in view to (1) the study and improvement of the ground-nut crop in the same manner as sugarcane is studied at Samalkota, and (2) the introduction of superior varieties of sugarcane. It consisted of 16 acres of wet and dry land under irrigation from a channel and two wells respectively. The season during the year was in the main unfavourable, owing partly to deficient and partly to unseasonable rainfall. All the varieties of ground-nut available in other districts and in other Provinces and the Japan, American and African varieties were got together and grown at the station and as far as possible compared in regard to their growth and yield with the local varieties, while one cwt. of the Mauritius seed was also imported direct in order to test the relative values thereof and of the seed imported into the district ten years ago. On dry land there were two crops during the year, one rainfed and the other irrigated; and a small extent of wet land was also planted. The crops were, however, attacked with *Surul puchi* (*Anacampsis nararia*, Meyr.); this and other diseases of the crop were carefully examined during the year as opportunity offered. The various kinds of ground-nut grown were subjected to a careful botanical analysis and fifteen samples of pods were forwarded to the Imperial Agricultural Chemist for determining their oil content. The sugarcanes which were successfully grown at Samalkota were introduced into this station and planted partly on dry and partly on wet land. The canes grown on the dry land were analysed by the Chemist to Messrs. Parry & Co. at Nellikuppam, but those on wet lands had not matured sufficiently before the end of the year for analysis. Owing to difficulties in obtaining an adequate supply of water, the nursery system of planting was introduced, and this has been adopted by local cultivators. Indigo was grown at the station as a rotation crop, the other rotation crops being gingelly (*Sesamum indicum*, DC.), ragi (*Eleusine coracana*, Gaertn.) and paddy, while a few cotton plants were also grown. Guinea grass was also successfully introduced at the station. The Imperial Agricultural Chemist's report on the analysis of the soil having shown that it was "well supplied with mineral plant food and should prove very fertile if manured with ordinary farm manures," attention was paid to the improvement of manure. The station was towards the close of the year placed on a permanent footing and a block of land measuring acres 51·69 surrounding the present site was selected and acquired; of this area, 13 acres are wet and 38 acres are dry and fairly provided with wells.

13. *Pepper.*—With a view to improving the pepper industry in all its aspects including the raising of new and improved varieties and their wide distribution over the Malabar district, an extent of 84 acres in the village of Taliparamba, Chirakkal taluk, consisting of pepper gardens, hill paddy, wet land, scrub, pasture and forest was acquired during the year; and all the permanent improvements necessary were carried out. The site of the station has been divided roughly into 80 inspection plots of convenient size with paths between. The season of the year was abnormal. The study of pepper in all its branches was undertaken, the local practices were studied and compared with those of other parts, especially the Wynaad. Though touring in the district was not neglected the actual pepper at the station received most attention;

the 80 plots thereof were exhaustively studied and the harvest from each plot was kept separate. Among other lines of observation in the plots, the effect of shade and aspect, soil and moisture were being studied, and experiments in mulching, manuring, moulding and pruning were being carried out, while leaf pits were also dug as in the North Canara gardens. The botanical and vernacular names of the standards to which the pepper vines cling were determined and their relative popularity among the native pepper growers studied. Further, the sexual differences of the pepper varieties grown on the station were noted and several new kinds were introduced into it including, notably, the three best Wynaad kinds and cultivated pepper from Bombay and Burma. The diseases of the vines were carefully noted and certain areas marked and numbered as "disease spots" and will later on receive special attention. As a subsidiary study, the cultivation of the district was being investigated, the chief of the subjects of study being the growth of hill paddy with murukku (*Erythrina indica*, Lam.) standards, the wet paddy and the local grams and pulses. The other work carried on at the farm consisted in the introduction of guinea grass (*Panicum maximum*, Jacq.) for fodder purposes, the cultivation of long-stapled cotton, the establishment of a set of lemon grass (*Andropogon Nardus*, Linn.) plants from roots obtained from Ceylon and Cochin and the planting of rooted cuttings of rubber (*Ficus elastica*) obtained from Burma.

14. *Imperial grant of* 1½ *lakhs for the development of agriculture.*—In pursuance of the scheme for the development and expansion of the Agricultural department, the Government of India sanctioned, during the year, a perpetual subvention of Rs. 1½ lakhs for this Presidency which will, with the grant that may annually be made by the Local Government, go far towards helping the Department in making substantial progress in the improvement of agriculture. The grant was during the year utilized (1) in acquiring the site required for the establishment at Coimbatore of the new Agricultural College and Research Institute and Central Farm in the place of the existing College of Agriculture at Saidapet which is to be abolished and in making explorations for water in and equipping the farm and in purchasing materials for fencing and farm sheds, (2) in placing the Samalkota and Palur agricultural stations on a permanent footing, (3) in opening a cotton farm at Nandyal in the Kurnool district, and (4) in making improvements to the existing agricultural stations. The addition to the staff of two Agricultural officers, viz., a Principal of the combined College and Research Institute and an Agricultural Chemist, was also sanctioned; but these badly needed experts have not yet arrived.

15. *Cotton.*—At the Bellary agricultural station, the experiments in the improvement of indigenous cotton were conducted on two lines, namely, (1) the endeavour to improve the stock worked on in previous years by selection and crossing mainly *inter se* and (2) the experimental growth of good seed of cottons of different strains collected in the early part of 1905 in the tracts on which the trade depends for the sorts known as "Northerns" and "Westerns". Several strains of cotton raised and selected either at Bellary or Koilpatti for further trial as well as Badnehal seed, a cotton with a great local reputation, were sown with a view to further selection and crossing; some of these did fairly but not well on the whole. The seed of several varieties obtained by crossing in previous years was also sown again. In character of growth these came on true to type and, in some promising cases, showed astonishing vigour; and their yield was also, in a majority of cases, a decided improvement on that obtained from uncrossed strains, but it remains to be seen how the lint turns out. Professor Gammie, Economic Botanist, Bombay, visited the station during the year under report and expressed the opinion that the experiments were being conducted on the right lines by a rigid course of selection and crossing *inter se* with the best and most productive plants. He further hoped that some of the forms that might be developed at the station might prove commercially valuable when tried on a larger scale. As stated above, work was also done in the collection and growth of seed of different strains of the "Northerns" and "Westerns" varieties found in ryots' fields. The year under report being the first of their production, no opinion can be expressed on their relative merits. Government have, however, recently ordered the discontinuance of this line of work on the grounds that agricultural stations should be used for strictly comparative experiments and that arrangements can be made for the cultivation of the best local varieties by the agency of ryots under agreement, if necessary, far better than they can be grown on the stations.

The "Bombay cotton" referred to in paragraph 14 of the previous year's report flourished fairly, but the outturn was not quite satisfactory. The Peruvian cotton, mentioned in the same report, proved a failure, while the Caravonica cotton plants made no growth on the soil of the Agricultural station.

At the Koilpatti Agricultural station it was for the first time possible to sow a fair area with pure seed of the Uppam and Karanganni varieties separately, and a supply of a new stock of the former sort was also obtained and sown on a separate plot. The product of the crosses made in previous years was also sown after careful selection with a view to obtaining early yielding and prolific varieties. The Cambodia cotton, referred to in the previous report, was again sown, but neither in this nor in the case of the other experiments with the cotton crop would any purpose be served by further reference thereto as the crop is still standing.

At the new Agricultural station at Attur a start was made by the growth, under irrigation, of Caravonica, Sea Island and Egyptian tree cottons. The plants are in a very healthy state; but as no lint has yet been produced, it is too early to decide on their relative merits.

At the Taliparamba Agricultural station an attempt was made to plant cottons of long staple, but the seed was sown late and the growth was unsatisfactory. Further trials will be made.

As stated in the concluding clause of paragraph 14 of the previous report, arrangements were made during the year under report for the distribution of the pure seed of several varieties collected in the Kistna, Cuddapah, Anantapur, Bellary, Kurnool and Tinnevelly districts; but owing to the season for sowing having commenced unusually early, much of the seed was placed on the market rather late and the condition imposed on the ryot of paying for the seed in cash militated, to some extent, against its ready sale. It is, however, gratifying to note that in the Bellary and Tinnevelly districts, in which special enquiries about the results of the distribution were made, the crop grown with such seed as was sold yielded more than the ordinary seed and gave a higher percentage of lint than the ordinary cottons and that the advantages of sowing the selected seed were fully appreciated by the ryots.

With a view to working, through the growers of cotton crops themselves, towards the removal of the cardinal defect prevalent in the Nandyal valley, viz., the admixture of cottons, a premium of two annas per acre was offered for every acre of practically pure cotton that might be grown in the season of 1906 within the taluks of Nandyal, Sirvel and Koilkuntla in the Kurnool district and Jammalamadugu and Proddatur in the Cuddapah district. Claims for premia were preferred in respect of about 13,000 acres, of which about 2,400 acres were, on investigation, found eligible for the reward. The ryots have been strongly advised to keep the pure cotton seed for future cultivation and to take care not to allow it to get mixed again with impure varieties.

Several American varieties and Caravonica cotton were tried by a few private individuals in the Cuddapah district but they were all found to be liable to great damage by insect-pest except in a single case where the crop was grown under irrigation from a well.

During the year under report Mr. Fyson, Professor of Biology, Presidency College, conducted experiments in crossing cottons with a view to making a scientific study of the subject and was supplied with different varieties of seed and with the necessary funds. The result of his trials was embodied in a preliminary report which it was considered premature to publish. The experiments will be continued on a larger scale at the Attur Agricultural station during the current year.

16. *Tobacco.*—As stated in paragraph 15 of the previous year's report, good tobacco leaf grown in selected gardens near Dindigul was purchased and delivered to Messrs. Spencer & Co. for drying and curing with a view to secure a better class of "wrapper" leaf than is obtained under the ordinary practice of the centre. During was carried on both in shade and in the open as usual; and notwithstanding the scarcity of water-supply during the year and the consequent unsatisfactory quality of the leaf obtained, Messrs. Spencer & Co. secured a high quality of cured leaf by paying careful attention to detail in fermentation, and the leaf so cured was allowed to mature for more than the usual period with a view to determine whether any improvement in

flavour and burning quality could be obtained thereby. Samples of the cheroots made by Messrs. Spencer & Co. with the covering leaf thus cured by them were sent to a few leading firms dealing in tobacco, and their opinions, though not altogether favourable, were to the effect that the covering leaf was an improvement on the ordinary Indian wrapper tobacco obtainable and was well cured, but that no very satisfactory test as to the quality thereof could be arrived at in the absence of the unrolled leaf which had all been used up; the samples laid before the Board of Agriculture at its second meeting at Pusa in January 1906 attracted much favourable attention. Towards the close of the year under report, fresh arrangements were made with Messrs. Spencer & Co. for the purchase and curing of leaf by them on behalf of Government subject to the conditions that the cured leaf should be treated as the property of Government and that if success is attained a full account of the methods of curing adopted should be made available for the information of the public: the results of the experiments will be awaited, but it may be noted in this connection that the conditions of the season of 1906 were even more unfavourable for the conduct of experiments than those of 1905.

In order to encourage the introduction of superior foreign varieties of tobacco and the conduct of experiments to find out whether any, and if so, which of them, could be grown in this Presidency in such a way as to retain their distinguishing characteristics, *viz.*, a good smoking quality and a light coloured ash, Government granted a lease of 150 acres of lanka land in the Gódávari district to Mr. T. H. Barry for experimental cultivation for five years, free of rent, on the conditions mainly that he should personally conduct experiments in tobacco cultivation on the leased area with the aid of approved and up-to-date appliances and in consultation with and under the supervision of the officers of the Agricultural department and should furnish Government with all information, particulars and results of such experiments whenever called upon to do so. Seed of the Sumatra and several of the American varieties was obtained and supplied to Mr. Barry for experimental cultivation during the year, but tobacco being grown in lanka tracts without irrigation, no satisfactory results were attained owing mainly to the character of the season and in part to the late arrival of the seed. Fresh seed will be obtained from Pusa and supplied during the current year and the experiments continued. A small quantity of the seed of the American varieties obtained for Mr. Barry was sown at the Koilpatti Agricultural station, along with chillies, under irrigation; and of these, one sort, namely, Kentucky white burley, attracted a good deal of local attention on account of the size and weight of the leaf; it will be further tried.

17. *Aloe plantation.*—The agave plantation at Hindupur was maintained during the year; but the growth of the plants continued to be irregular. A number of suckers was collected into nurseries with a view to the extension of the plantation, but this work was deferred owing to other and more pressing calls on the staff available. The trial of the relative merits of certain methods of cultivating agaves, referred to in paragraph 16 of the previous year's report, were not carried out by Mr. Benson during the year. The reasons assigned were that, as the plantation did not need drainage, the method of draining could not be applied and that the respective growth of plants under shade and in the open could not be properly tested for want of shade; nor was it possible according to Mr. Benson to do anything effectual towards testing the comparative value of clearing only the large growing plants and thoroughly weeding them, as the whole place had previously been cleared out. A small portion of the plantation has, however, been since left to nature, and the relative values of this process and of clearing have yet to be determined. As regards the output, the matured leaves (4,579 in number) at the plantation were trimmed from 362 well-grown plants, and from the results of the extraction of fibre therefrom by hand and from the reports of Messrs. Chambers & Co., Madras, on the quality of the fibre, it appears that the leaf at the plantation contains a satisfactory percentage of fibre (3 per cent.) and that, with care, this fibre can be turned out in appearance and quality that will command more than £32–33 per ton in public sale in London but the cost of extraction proved excessive, having amounted to £28 per ton. Further and more conclusive trials will be made when a larger quantity of leaf is available.

Samples of muslin, napkins, rugs and door mats manufactured wholly or largely from fibre extracted from the Bastard aloe (*Agave vivipara*) were received from the Superintendent, Central Jail, Rajahmundry, and forwarded to the Reporter on

Economic Products who considered that the rugs indicated a new commercial outlet for the fibre; he retained the samples for exhibition in the Economic Court of the Indian Museum.

18. *Foreign varieties of paddy.*—Of the several extra-provincial varieties of paddy referred to in paragraph 17 of the previous year's report, trials were made with eight sorts on plots of adequate size at the farm attached to the Agricultural College, Saidapet; they were grown partly on the transplanting method under irrigation from the oil-engine and pump or from the Mylapore tank and partly on the broad-cast system under the tank. The crops, especially those under the tank, were affected by drought and yielded at rates ranging from 1,547 to 3,469 lbs. per acre under the system of transplantation and from 273 to 1,323 lbs. under the broad-cast system: the experiments were not, however, conclusive as to the comparative merits of the different varieties and will therefore be continued. At the Koilpatti Agricultural station, the propagation of seed of the Banko and Halki varieties was continued on small areas with results less favourable than in 1904–05 but not altogether unsatisfactory in the case of Banko paddy which, with 29 acre-inches of water, gave 1,700 lbs. of grain per acre. The Halki variety gave only 929 lbs. per acre with 33 acre-inches of water. The results of the trial of these varieties in the Shiyali taluk of the Tanjore district have not yet been reported. Seed of the Banko paddy grown at the Koilpatti farm was distributed in 1904–05 to 32 ryots scattered over all except two taluks in the Tinnevelly district; but the crop was grown successfully by only six ryots. The failure in the other cases is, however, ascribable to the insufficiency of water, to the saltish nature of the soil planted on and, above all, to want of care: seeing that fair results were obtained with care at the home farm attached to the Sivagiri estate, under the superintendence of the Court of Wards, there is no reason why equally good results could not have been obtained by ordinary ryots. A fresh supply of seed was distributed to ryots during the year under report and the results of the renewed trials are awaited.

19. *Indigo.*—Among the varieties of indigo which were grown as a rotation crop at the Palur Agricultural station referred to in paragraph 12 *supra* were the Java-Natal (*Indigofera arrecta*) and the newly rediscovered *Indigofera longeracemosa* of Travancore, but they did not flourish owing to the general drought in the South Arcot district. A set of cakes of locally prepared indigo was forwarded to the Indigo Expert to the Government of Bengal who analysed and compared them with the Bengal product.

20. *Saline soils.*—The experiments in the reclamation of saline soils under the Periyár project referred to in paragraph 20 of the previous report were continued under the supervision of the local officers of the Public Works Department. The inspections made by the late Deputy Director of Agriculture during the year under report and the recent analyses of the soils of the plots experimented on, show that their chief defect has for the most part been removed by the drainage and tillage which the plots have undergone and that what the plots now need is mainly good cultivation. Some of the plots yielded fairly during the last season, and arrangements are being made for the continuance of the experiments during the current year.

With the object of inducing ryots holding lands under the Periyar project to make attempts on their own account at reclamation of saline soils, Government offered to remit the full assessment on such lands for three years. Some of the ryots having agreed to conduct the experiments; the soils to be reclaimed were examined chemically, and the methods of reclamation to be applied in each case were determined by the late Deputy Director of Agriculture. Though attempts at reclamation were made in 22 cases, none of the ryots, except one, conducted the experiments in the manner suggested by the late Deputy Director of Agriculture, either because of their general indifference or of their unwillingness to incur the expense that the experiments would have entailed. The Periyar Special Deputy Collector and the Divisional-officers and Tahsildars have been instructed to persuade the ryots to conduct the suggested experiments in the current year, and the results will be awaited.

21. *Paspalum dilatatum.*—Several leading ryots and Agricultural Associations were supplied with the seed of this fodder grass in 1904–05 for experimental cultivation, but reports were received from only two Associations, and these were of

an unfavourable character. Nor did the grass flourish at the Bellary Agricultural station, the experiments there going to show that it cannot stand the long dry season without irrigation and that, even if it is watered from time to time, it is not equal to the sorghums in importance as a fodder plant. At Koilpatti, on the other hand, where a small plot of one-eighth of an acre in the red soil block was planted out with the grass and the sets were placed two feet apart in either direction, it struck well and stooled considerably and between April and October yielded 3,030 lbs. of green fodder in five cuttings. The stools were then planted over an extended area of 45 cents and in December yielded a further quantity of 864 lbs. Judging from the experience at this station, it is clear that the grass will not, on a light soil, withstand an ordinary hot weather but will yield fairly if tended with care and watered frequently. Further experience is needed before the plant can be pronounced to be suitable for ordinary cultivation as a fodder grass.

22. *Nitrogen-fixing bacteria.*—The nitrogen-fixing bacteria obtained from America and forwarded to the Curator, Government Botanic Gardens and Parks, the Nilgiris, in May 1905 for trial, were applied to the seed of five leguminous crops, viz., "Berseem" or Egyptian clover, lucerne, white or Dutch clover, red clover and common pea; and the seed so inoculated was sown in 5 plots of good alluvial soil in Sim's Park, Coonoor. The seed was, for the most part, washed away by an unusually high flood. Of the seedlings which escaped the inundation, the berseem grew fairly well but had no healthy appearance while the pea grew well at first but died before it produced pods. A few plants of the red clover survived and appeared to be in vigorous health but equally healthy plants are to be seen on the hills without similar treatment. Similar experiments with bacteria obtained direct from America were carried out at the Agri-Horticultural Gardens, Madras, upon various garden plants, but owing to the hot weather setting in earlier than usual, the experiments were not successful. A fresh consignment was obtained, and experimental plots of lucerne, peas and beans were put down and treated with this bacteria; the plants in the plots are said to look very healthy.

23. *Jute.*—As stated in paragraph 25 of the report for 1904–05, true jute was cultivated departmentally at the Samalkota Agricultural Station on a small scale with a view to seeing whether it could be successfully grown in the Gódávari and Kistna delta. Of the seed received from the Inspector-General of Agriculture 8 lbs. of four varieties of *Corchorus capsularis* and 3 lbs. of two varieties of *C. olitorius* were sown in separate plots measuring 90 and 40 cents, respectively; but owing to insufficient knowledge of the crop and the correct time of sowing it, only 150 and 17½ lbs. of fibre per acre valued at Rs. 7–8–0 and 1–0–0 respectively were obtained. Comparative experiments are being made again during the current year under the advice of Mr. Finlow, the Bengal Jute Expert, who visited the station and inspected the fibre produced. A small quantity of the jute seed was supplied to the Rev. Mr. Thomssen of the American Baptist Mission at Bápatla and sown by him in the Romperu swamp, Guntúr district, but the plants were killed by the rains and floods of August 1905, a result which seems to indicate that the conditions of the swamp are unfavourable for jute cultivation.

At the instance of Messrs. Wilson & Co., the Collectors of Ganjám, Vizagapatam and Gódávari were asked to send samples of the jute grown in their districts to the Government Botanist for examination; but the result has not yet been reported.

24. *Experiments in the irrigation of dry crops on black cotton soils.*—During the year under report, the ryots holding black-soil lands under the Ponnalur tank commenced the timely cultivation and irrigation of dry crops therein, but owing to paucity of hands, no agricultural subordinate could be deputed to record full particulars of irrigation and outturn or to help the ryots in the conduct of the experiment. As, however, the experiments made in 1904–05 have proved that light watering does no harm to black soils, it is hoped that the ryots will gradually avail themselves of the entire water-supply of the Ponnalur tank for the irrigation of dry crops.

25 *Lima beans.*—In 1903, a small quantity of white lima beans (*Phaseolus lunatus*) was supplied by Messrs. Praschkauer & Co. of London, for cultivation in this Presidency and they were sown at the Bellary and Koilpatti stations as a vegetable or garden crop under irrigation and tended with special care, and the beans were very much appreciated. A small quantity of seed of local growth was sent to the above firm at their

request. The article having met with their approval, it was left to them to make their own arrangements with local exporting firms for the cultivation of the bean in this Presidency. The seed raised at the Agricultural stations was also supplied to the Tanjore Agricultural and Industrial Institution and to other Societies desirous of trying it; but the results of the trial are not yet known. In view of the remarks made in the Government of India Agricultural Ledger No. 2 of 1905 that lima beans of certain varieties contained prussic acid, samples of the bean grown at the two stations mentioned above were forwarded to the Imperial Agricultural Chemist for analysis and report as to whether the beans contained prussic acid in such proportion as to render them unfit for consumption. The seed from the Koilpatti station was reported to be free from Cyanogenetic glucoside, while that from Bellary was stated to be probably free from such glucoside. Further investigation will be made in this important matter.

26. *Agricultural Exhibitions and Associations.*—Agricultural exhibitions in conjunction with Cattle Shows were held at Bellary in May 1905, at Anakápalle in February 1906 and at Tanjore in March following. At the Bellary Agricultural Exhibition, the lectures delivered by Mr. Benson on the evils of the admixture of cotton found in ordinary field crops in the Bellary and Kurnool districts and by Mr. Chatterton on the use of oil-engines and chrome-tanning processes excited a good deal of interest. During the Tanjore Exhibition, a convention somewhat after the American system was held at which Mr. Benson delivered an address on tillage and tillage implements, and Mr. Sampson, Agricultural Expert of the Court of Wards, addressed the meeting with reference to his experience in South Africa, while several members of the Association recounted their experience in practical agriculture. As stated in paragraph 23 of the report for 1904–05, a Central Agricultural Committee was established in connection with the Victoria Technical Institute with the Director of Agriculture as Chairman, and Mr. H. K. Beauchamp, C.I.E., and M.R.Ry. Dewan Bahadur Rajaratna Mudaliyar Avargal, C.I.E., as Honorary Secretaries. Several Rajas, zamindars, large land-owners and other leading men became Members of the Committee. The Madras Chamber of Commerce, the Madras Landholders' Association, the South Indian Planters' Associations and the District Agricultural Associations which have been formed in almost all the districts of the Presidency together with a number of branch Associations, are also represented on the Committee. The Committee holds quarterly meetings and discusses matters connected with the improvement of agriculture as also the various questions raised by District Agricultural Associations. The Proceedings of the Committee are published, and it further issues bulletins on matters of special interest and circulates them to District and Branch Agricultural Associations. The bulletins of the Madras Agricultural Department are supplied to all the Associations, and steps have been taken to supply the District Agricultural Associations with the bulletins of other Provinces. Several of the District Agricultural Associations have started or are about to open experimental farms. Many of the Agricultural Associations are now paying special attention to the main agricultural defects of their districts and taking steps to remedy them with the advice of the officers of the Agricultural Department. They are also carrying on experiments in the conservation of cattle manure according to the loose box system and in improving the supply of manure by growing such plants as indigo, wild indigo, guinea grass, sunn-hemp, etc., and such trees as the rain tree, pungam, etc., the leaves of which can be utilized as green manure. The experimental cultivation of new crops such as foreign varieties of sugarcane, ground-nut, several varieties of exotic cotton and tobacco, Banko paddy and lima beans was undertaken in several districts. Attempts were made to extend over a wider area agricultural practices hitherto restricted to certain districts, *e.g.*, the cultivation of sunn-hemp as a second crop, the growth of pulses on the bunds between paddy fields, the introduction of seed-drills from the Ceded districts and the plantain fibre-extracting machine from Tanjore and Melrosapuram, the application of tank and channel silt to dry land, the improvement of the supply of fodder by the cultivation of sorghums and the ploughing of black cotton soil in such districts as Tinnevelly with the cotton soil plough which is in use in the Deccan districts. The more noteworthy and promising of these experiments are the "co-operative field experiments" undertaken by the Members of the Tanjore Agricultural and Industrial Institution at the instance of the Deputy Director of Agriculture and under the advice of an Agricultural Inspector specially deputed for the purpose. The Vizagapatam District Agricultural Association has opened a dépôt at Vizianagram for the manufacture and sale

of improved ploughs and other cheap agricultural implements which are said to be in great demand not only in this Presidency but also in other Provinces. The question of encouraging cultivation under wells by the introduction of efficient irrigation pumps was also receiving special attention.

27. *Pumping experiments.*—During the year under report Mr. Chatterton was in charge of the pumping experiments. At the beginning of the year, there were eight Government engines at work or in course of installation, and during the year three more engines were installed—two at the Hagari Agricultural station and one at the Central Farm at Coimbatore. In addition to these, nine engines have been installed for private individuals for purposes of irrigation and others have been employed in pumping water or sewage for various Sanitary and Municipal bodies. There are also several engines owned by private individuals and installed by them without the assistance of the Government Department. The total number of engines at work or almost ready for work for irrigation purposes at the end of the year was 35. An expenditure of Rs. 21,908 was incurred by Government during the year under report on pumping experiments and the total charges since the commencement of the work amounted to Rs. 65,033. The convenience of oil-engines as a source of motive power has been sufficiently demonstrated, and the experiments so far made have proved that in several parts of the Presidency there is considerable scope for the employment of large numbers of engines and pumps provided the water-supply is sufficient and constant. As regards the cost of pumping, though the results obtained so far are by no means final, yet Mr. Chatterton is confident that with increased experience the cost will be considerably diminished. Loans aggregating Rs. 24,500 under the Land Improvement Loans Act were granted in seven cases during the year to private individuals for the purchase of oil-engines and pumps. The last two seasons having been of an abnormal character as regards rainfall and the water-supply in some cases having been much less than was anticipated, the collection of statistics regarding the duty of water as evidenced at pumping stations has not yielded much information of practical value. A set of boring instruments capable of boring to a depth of 50 feet was in almost continuous use during the year and the results obtained with it have been of considerable value as a preliminary to well-sinking. In the tract of country between Pondicherry and Cuddalore, artesian and sub-artesian wells are very numerous, and in the Coimbatore district where the wells are merely deep excavations in the partially disintegrated rock, valuable additional sources of supply have been opened by sinking boreholes. An oil-engine driving class was opened during the year at the School of Arts for the purpose of training boys and young men to look after oil-engines. The class is, however, not yet in a satisfactory condition owing to the difficulty experienced in getting a competent instructor.

28 *Meteorology.*—The rainfall registered at the various rain-gauge stations was tabulated as usual and the results published by the Meteorological Reporter to the Government of Madras. The total number of stations in the Presidency at the end of the year was 463 (inclusive of 75 in the Native States) or nine more than at the end of the previous year; and of these, 373 stations were inspected.

29. *Statistics.*—The following returns were published in connection with local enquiries under Provincial direction:—(1) Monthly season reports in three sections (rainfall, cultivation and prices of food-grains and salt); (2) Annual crop forecast reports; and (3) Quarterly reports of cattle mortality.

30. *The Madras Agri-Horticultural Society.*—The income of the Society from various sources, including the Government grant of Rs. 4,000, amounted to Rs. 20,648. The annual flower show was held on the 25th February 1906 at the nursery gardens of the Society and was on the whole up to the average of the previous years.

IV.—BOTANY.

31. A detailed report on the work done by the Government Botanist is appended. In connection with *Systematic Botany*, a fine collection of germination stages of *Ochlandra travancorica* was made in the Travancore hills and forwarded to Dr. Stapf at Kew. A special study was made of the Madras *root parasites* and their hosts; and a large collection of the *haustoria* of several species of trees was made in spirit for future work. An article on the sandal *haustoria* was also sent to the Editor of the

Agricultural Memoirs at Pusa. The flora of the Tafiparamba farm received special attention, and a large number of peppers (*Piper nigrum*) were collected and worked out chiefly from the Nilgiris, the Tambracherry Ghaut and the Wynaad, the Palnis, and the Anamalais: collections of balsam (*Impatiens*), Gentians (*Gentianaceæ*), lemon grasses (*Andropogon Schœnanthus* and *A. Nardus*), etc., were also made and sent for authoritative naming. Attention was paid to the herbarium: about 4,600 sheets were mounted, of which the more important were 679 sheets of peppers and 115 sheets of balsams. In connection with *Economic Botany*, no special tour could be undertaken during the year as the time of the Government Botanist and his staff was occupied mainly with the work done at the agricultural stations under his control: and his more important contributions to Economic Botany have been noticed in section III. Under *Entomology*, an additional Assistant was appointed during the latter part of the year and deputed to Pusa to be trained by the Imperial Entomologist. Certain pests that affected a variety of crops such as sugarcane, ground-nut, indigo, cottons (both exotic and indigenous), paddy, pepper and cucumber were examined and remedies were also applied for the eradication of some of them, though with inconclusive results. Owing to the increase of agricultural work and other causes, little progress was made during the year in working out the life-histories of insect pests in the field, but it is hoped that this work will be vigorously pursued on the return of the additional Assistant from Pusa. Under *Mycology*, an Assistant was newly appointed and received preliminary training under the Government Botanist. Special attention was devoted during the year to a study of the fungus diseases which affected sugarcane, among other crops, at the Samalkota station and of the "*Tikka*" disease affecting ground-nut which assumed rather a formidable appearance in the South Arcot district. At the instance of the Imperial Mycologist, an attempt was made at inoculating healthy pepper vines of all ages obtained from the Wynaad with the fungus described by him as causing the current disease in the plantations, but the Assistant deputed by him for the purpose fell ill immediately after inoculating the vines and his services ceased to be available. The outbreak of disease in palmyras in the Gódávari district has already been referred to in section II *supra*.

V.—VETERINARY.

32. The detailed report on the operations of the Civil Veterinary Department is appended. The Madras Veterinary College worked well during the year. The teaching staff was strengthened by the appointment in January 1906 of a third lecturer. The students of the first and the second year classes did well at the annual examinations conducted by the Superintendent, Civil Veterinary Department, and *ex-officio* Principal, and all of them obtained promotion, excepting only one of the students of the latter class. A fresh batch of 30 students, instead of the usual number 20, commenced their term in January 1906. The students received instruction free of charge, and 30 of them (ten in each class) held scholarships sanctioned by Government. A hostel with boarding accommodation for 25 students was attached to the College during the year.

33. *Veterinary dispensaries.*—As in previous years, the establishment of Government Veterinary dispensaries at mufassal stations generally remained in abeyance during the year for want of local men qualified to take charge of them: a dispensary was, however, opened in the Bellary district in the middle of January 1906 by the Society for the Prevention of Cruelty to Animals. There were, besides this, five Veterinary hospitals at work in the Presidency, of which two were maintained by Government at Madras and Saidapet, two more by the District Boards of Trichinopoly and Madura and the fifth at Pithápuram by the Court of Wards. The dispensaries were well attended, and the number of in and out-patients treated was generally on the increase. At the dispensary attached to the Madras Veterinary College, horses and dogs formed the bulk of the patients, but there was a noteworthy increase in the number of cattle patients treated.

As local Veterinary graduates should become available from January 1907, Government provisionally sanctioned a scheme for the eventual establishment of 82 dispensaries (including those already established) as men and money become available, and submitted to the Government of India proposals for the reorganization of the

subordinate Veterinary staff which was to consist ultimately of 3 Deputy Superintendents, 15 Veterinary Inspectors and 132 Veterinary Assistants.

34. *Cattle disease.*—Preventive inoculation against cattle disease was continued during the year. The work was carried on in the districts of Ganjám, Gódávari, Kistna, Guntúr, Nellore, Bellary, Chingleput, Tanjore, Madura and Tinnevelly, and the total number of subjects inoculated against anthrax and rinderpest rose from 12,437 and 8,251 in 1904–05 to 22,152 and 12,689, respectively, in the year under report. The marked rise in the number of protected individuals is a very satisfactory feature of the year; and with the strengthening of the staff of Veterinary Assistants in the manner indicated in paragraph 33 *supra*, a steady and rapid development of this important branch of work may be looked for.

35. *Pony-breeding operations.*—Of the 14 stallions referred to in paragraph 34 of the report for 1904–05, two were sold and another was destroyed during the year under report. Four new Arab stallions were purchased in December 1905, so that the full complement of stallions (15) was maintained towards the close of the year. The three stallions disposed of during the year did little or no service, and those newly purchased commenced service only in February so that there were practically only 11 stallions at stud throughout the year. The total number of mares covered by these 11 stallions was 300 against 356 in the previous year giving an average of 27 mares per stallion against 25 in the previous year. Of the 356 coverings in 1904–05, the Superintendent has ascertained the results in 167 cases only; 52 cases were successful and in 115 cases the results were *nil*. The results are not traceable in 23 cases, and reports from Revenue officers are due in the remaining 166 cases.

Seventy-three entire ponies in the Coimbatore district and 31 in the Salem district were castrated against 63 and 16 respectively in the previous year. There were two deaths among castrated subjects and in one case compensation was paid to the owner.

36. *Pony and Cattle Shows and Cattle Fairs.*—No pony shows were held during the year. The Madras Cattle Disease Act (II of 1866) was put in force at most of the cattle fairs held in the Tinnevelly district; and at two of the more important of these, Veterinary Assistants helped the local authorities in carrying out the provisions of the Act. Cattle Shows were held at Anakápalle, Ongole and Pithápuram in the Vizagapatam, Guntúr and Gódávari districts, respectively, and Agricultural Exhibitions and Cattle Shows were held at Bellary and Tanjore. Government contributed Rs. 1,000 from Imperial and Rs. 500 from Provincial funds towards the prizes awarded at the Anakápalle, Ongole and Tanjore Shows, besides granting medals for the best cow and the best bull and certificates to all prize-winners. The results of the Ongole Show in its commercial aspect were more encouraging than in the previous year, as cattle to the value of about Rs. 42,000 either changed hands on the spot or were sold soon after its termination. Another special feature of this Show was the exhibition of a cow fed upon prickly-pear as well as the practical demonstration, by the owner, of the method of preparing this novel kind of fodder.

37. *Cattle-breeding.*—As stated in paragraph 36 of the report for 1904–1905, enquiries were made by the Superintendent, Civil Veterinary Department, in the neighbourhood of the breeding districts, with the object of providing selected persons with breeding bulls in the most congenial localities: and as the result thereof, seven young bulls of the famous Nellore or Ongole breed were purchased at the cattle show held at Ongole in the year under report and entrusted to breeders in seven villages situated in four taluks of the Guntur district, and orders issued for the submission of periodical reports on their condition by the Tahsildars and village officers concerned to their Divisional-officers. The results of the experiment will be carefully watched. The conduct of similar experiments in the vicinity of the cattle-breeding tracts of the Coimbatore district could not be undertaken during the year as owing to the unfavourable character of the season no fully-developed young bulls of the Kangayam and Alambadi breeds suitable for distribution as sires were available. Certain suggestions made at the first meeting of the Board of Agriculture held at Pusa in January 1905 for the improvement of Indian work and milch cattle were fully discussed, and the Board's proposals as to the general lines on which efforts should be made in this direction were approved by Government.

VI.—AGRICULTURAL EDUCATION.

38. Mr. Benson's suggestions for improving the method of imparting agricultural instruction to the minors under the Court of Wards at Newington, referred to in paragraph 37 of the previous year's report, were approved by the Court during the year; but the new arrangements were not given effect to before the close of the year.

39. *Higher education.*—The College of Agriculture continued to work under the revised curriculum introduced in the year 1902–03. In view of the contemplated abolition of the College (*vide* paragraph 7 *supra*) no students were recruited in January 1906. The number of students on the rolls therefore fell off from 58 in 1904–05 to 31 in the year under report. The College had to work without a Professor of Agriculture throughout the year; further, from the 22nd January 1906 when the Principal, Mr. Keess, went on leave, the Acting First Assistant was in charge of the College without prejudice to his duties as Lecturer on Veterinary subjects or to his supervision of the College Farm and Botanical Gardens. The results of the final examinations, however, showed an improvement as compared with those of the previous years—a result which was probably due to the revision of the curriculum in 1902.

The Veterinary Hospital attached to the College continued to increase in popularity, the total number of cases treated having risen from 1,232 in 1904–05 to 1,252 in the year under report: the number of bovine patients specially showed a large increase from 489 to 551.

The agricultural operations on the College Farm were affected by the unfavourable season. The oil-engine and pump worked successfully during the year.

The students of the College made two tours of agricultural study first in October 1905 in the South Arcot, Tanjore, Trichinopoly and Tinnevelly districts and the second time in January 1906 in the first-mentioned three districts and Madura.

VII.—THE PUBLICATION OF AGRICULTURAL INFORMATION.

40. The following bulletins were published during the year under report:—(1) No. 51.—Progress report on the work of the Samalkota experimental sugar farm during 1903–04; (2) No. 52.—The Agathi plant; its growth in connection with the cultivation of the betel vine, which is trained thereon; (3) No. 53.—The cultivation and curing of tobacco as followed near Dindigul, Madura district; (4) No. 54.—Note on Irrigation by pumping from a well at Melrosapuram; and (5) No. 55.—The great millet or sorghum in Madras. A note on sugarcane cultivation with special reference to irrigated delta lands was translated into Tamil and Telugu and copies of it were circulated with District Gazettes and distributed among ryots throughout the Presidency exclusive of the West Coast districts. Similarly, a note on the cultivation of the sunflower in South India was translated into the vernaculars and published in diglott in District Gazettes. The several Agricultural stations referred to in Section III *supra* were visited by a number of local cultivators to whom the object with which the stations had been established and the improved methods followed there were duly explained. As several of the ryots in the vicinity of the Koilpatti station applied to the Manager for a loan of the cotton-soil plough in use there, a second plough was purchased during the year and lent or let out on hire to those who desired to try it. Improving on the scheme reported on last year, under which selected ryots were trained at the Samalkota station, the Agricultural Department undertook during the year under report to give practical training at one or more of the Agricultural stations, for a period of six months or one year, to specially selected apprentices deputed by the Central Agricultural Committee, by District and Branch Agricultural Associations and by private gentlemen. As in the previous year, an Agricultural Inspector was occasionally deputed to help the Tanjore Agricultural and Industrial Institution, and the Deputy Director of Agriculture also visited the district and helped the members of the Association with advice in the conduct of their "Co-operative field experiments". An Agricultural Inspector was also placed at the disposal of the Penukonda Agricultural Society with a view to inspect the sugarcane plantations affected with disease in the Hindúpur taluk and help the ryots with advice as to the remedial measures to be adopted for the eradication thereof.

41. Copies of the Industrial Monograph on "Tanning and working in leather" were distributed during the year to the various Agricultural, Planters' and Trades' Associations and to Editors of newspapers. Further, vernacular translations of the abridged Monograph were circulated with the District Gazettes and spare copies were also distributed amongst tanners and leather workers. The Industrial Monograph on "Stone Carving and Inlaying" due in September 1905 was submitted to Government after the close of the year under report. The subject chosen for the Industrial Monograph for 1905-06 is "Carpet making", and Mr. Thurston, Superintendent, Government Central Museum, has been instructed to prepare it with the co-operation of Mr. Chatterton. It is not, however, due until September 1906.

42. The number of papers received from and communicated to other Provincial Departments was as follows:—

	Received.		Sent.
	Indian number.	Foreign number.	Number.
Total publications	395	751	17

APPENDIX I.

ADMINISTRATIVE REPORT ON THE AGRICULTURAL STATIONS UNDER THE CONTROL OF THE DEPUTY DIRECTOR OF AGRICULTURE.

I have the honour to submit the following half-yearly (annual) report on the work entrusted to me. Hitherto since my appointment was placed in its present position, no such report has been prepared or called for; whilst formerly the report of my work was embodied in the general administration report of the department. In accordance with the orders of the Government of India, the mass of detail which it is not advisable to publish generally, but which should be printed in a handy and convenient form for departmental and expert use, is omitted from this report and may be got ready later on in, say, July or August next.

2. *The Bellary farm.*—Though the character of the season was reviewed in my report No. 2671 (*a*), dated 28th October 1905, it is necessary to repeat and complete the remarks then made. Though the rainfall of the first six months of the year was on the whole favourable, it presented some characteristics which detracted from its value. There was an unusual fall of rain during the latter half of April which was of no practical value, but rather injurious in moistening the soil and so preventing the destruction of weeds. May was practically rainless except for light showers which had no effect under the high temperatures then prevailing, and though there was a heavy fall early in June, this was followed by almost entirely dry weather for nearly two months and thus the sowing of early crops was prevented. During the latter half of August there was good and ample rain and this was taken full advantage of in sowing korra (*Setaria italica*) with cotton, several sorts of sorghum (some of which however should have been sown earlier) and finally cotton alone on the areas set aside for these crops. These, the major part of the sowings on this farm, were fully a month earlier than those of 1904, but after the burst of rain alluded to there was a serious period of drought during September (which is usually the wettest month of the year at Bellary) and under it the newly-sown crops languished. A fair amount of rain fell during the early part of October, but later there ensued an almost entirely rainless period, except for one shower in January too late to be of any value, which most seriously affected all the crops. Had anything like the usual rain fallen during the latter half of October and November, the prospects of the farm would have been very good. As things were, the crops suffered, first from the dry period in September and again from the drought of the later months. This was especially the case with the korra and sorghum crops, and the crop of the latter late variety, which is the chief cereal crop of the farm, was very light in consequence. The cotton crops suffered least and when it is possible to prepare a complete report regarding them this will appear, although these too suffered a good deal and instead of a bumper yield only a moderate outturn was obtained. This crop also suffered considerably from attacks of insects.

Particulars of the rainfall will be given in the "scientific report" of this station.

3. *Cultivation.*—The whole of fields Nos. 2 and 5 were thoroughly broken up with the cotton soil plough and the two plots of the tillage series of experiments were worked with a country plough, but otherwise the tillage was carried on with the *Gorru* and *Guntaka* of the locality, except in the case of a small area under the well where a Swedish plough was used. Sowings were almost all made with the local drill (*gorru*) and its attachments and after cultivation with the local bullock-hoe (*dantalu*). Thus, as far as tillage is concerned, the practice of the neighbourhood was almost altogether followed. More work was however put into the land than is customary and the improving state of the farm bears evidence to this work. Great benefit to the cotton crop was experienced from the amount of "after cultivation" put into it; in fact, in the face of the long drought, it would have fared badly, but for this. For manure, a large purchase of horse manure from the cavalry lines in the previous year had been composted and was used during the season; whilst in another field a considerable amount of poudrette, accumulated in previous years by the Bellary jail, was obtained and applied. The night-soil from that jail is now being taken by the farm and trenched on the small area of irrigable land there is. In the experimental field for cotton, a variety of manures were applied the results of which will be recorded separately, as it is most inadvisable to publish the results of a single year's trials.

As noted in my report of October last, the series of tillage experiments in field No. 3 were continued, though no deep tillage was performed on any of the plots there during the year. The outturns obtained from the several plots present, as is so often the case with field experiments, considerable discrepancies which it would serve no good purpose to discuss here, but I must note that the clearly marked effect of the previous season's deep tillage on the standing crop, to which I alluded in that report, was not exhibited in any very clear way when the test of the scales was

applied. And I mention this because it shows how carefully impressionist reports must be examined when they deal with practical agriculture. So far as the figures of the year go they appear to indicate a slight benefit from the previous deep tillage in the case of the grain crop, but that in the case of the cotton crop the superficial tillage with the country plough performed during the year gave slightly better results. On the other hand, the yield of cotton from the plots treated with the *gorru* and *guntaka* for the whole period of these experiments was much below that from either of the other plots and yet in the case of the grain crop these plots yielded better than those worked with the country plough and not much less than those worked in the previous season with the cotton soil plough.

4. *Manuring experiments.*—Under the recent orders regarding the preparation of these reports, it is not necessary to discuss here the experiments in the methods of collecting cattle manure which have been continued on this farm. As stated in my report already quoted, the collections were made on the three systems adopted in previous years and applied to the identical plots manured in the previous years. Although a new pit was made for the collection of the manure and it was provided with a shed over it, this has not proved altogether successful in securing the satisfactory decomposition of the collections. The manure in this pit lost a most extraordinary amount of nitrogen and phosphoric acid, whilst in the manure heaped in the open, to which the urine of the cattle was not added, the proportion of nitrogen and potash was unduly high. The portion of the field No. 2, where these manures were applied, was sown with korrapatti (Italian millet two rows and cotton one row) and came up well; but the whole suffered much from the unfavourable season. Bearing in mind the previous history of the plots to which these collections were applied, it would serve no useful purpose to discuss the results here, and it would demand far more space than could be given to the matter; but it may be stated that, on the average of the two plots now manured with these collections for three seasons successively, the box manure gave much the best results so far as the korra crop was concerned and the worst for the cotton crop; whilst the best yield in the case of the latter crop was obtained from plots to which no manure has been applied during the whole period.

In the field where these collections were applied, plots to which the following manures were applied, were included during the year; these plots having received no manure in the previous are :—

Plots 4 *and* 7.—Oil-cake, at 1,000 lb. per acre.
Plots 6-*a and* 11-*a*.—Saltpetre, at 300 lb. per acre.
Plots 6-*b and* 11-*b*.—Superphosphate, at 300 lb. per acre.

The design in this case is to test the value of these manures on cotton grown in rotation, it being remembered that the great deficiency of the Bellary farm soils is in nitrogen and phosphates. Particulars of the results as well as the quality of the [illegible] will be recorded in the "Scientific report" of the farm to be prepared later on; but here it is sufficient to state that the oil-cake gave better results than the box manure even in the case of the grain crop and the saltpetre a material increase on the unmanured plot, but the superphosphate showed no effect at all. In the case of the cotton crop, however, whilst the saltpetre plot showed a small increase over the unmanured, both the superphosphate and oil-cake plots showed the smallest yields of the whole series.

Alongside the above series, another has been started to test the effects of manures on cotton, that crop being grown continuously for a period of years yet to be determined. The series is as follows :—

Plots Nos. 13 *and* 19.—Oil-cake, 1,000 lb. per acre.
Plots Nos. 14 *and* 20.—Superphosphate, 300 lb. per acre
Plots Nos. 15 *and* 21.—No manure.
Plots Nos. 16 *and* 22.—Oil-cake, 1,000 lb. + superphosphate 300 lb. per acre.
Plots Nos. 17 *and* 23.—Saltpetre, 300 lb. per acre
Plots Nos. 18 *and* 24.—Basic slag, 300 lb. + saltpetre 200 lb. per acre.

The cotton was sown in rows two feet apart and the seed used was some specially obtained from one of the best cotton-growing villages in the district, and is believed to be superior to the stock previously worked on at this farm. The sowing was about a fortnight after that of the mixed crop alluded to above and though a remarkably good stand was obtained and it grew well in its early stages, it suffered a good deal from the shortness of the rainfall in the later season. Although every possible precaution was taken in laying off and arranging the plots to secure uniformity, the results obtained are very disrepant and seem to indicate that none of the manures had any effect on the yield during the season under report. One year's results are of course of little value alone, but the almost entire absence of effect may in part be due to the lateness of the manuring and especially to the deficiency of the later rains.

5. *Cotton.*—The series of experiments proceeding with this crop can only be dealt [illegible] on and may then be stated in detail. It included two separate lines of work—one the [illegible] to improve the stock worked on in previous years on the farm by selection and crossing *inter se*, and secondly the experimental growth of some sorts found in the ryots' [illegible]

appeared to be worth attention or which needed more accurate and continuous observation than is possible in such cases, in order to determine what they were and their value. On the first line of work, besides the large main area of the farm sown, as already noted with Badnehal seed, there were 12 plots sown with different strains of cotton raised and selected on this and on the Koilpatti farm in previous years with a view to further selection and crossing. Some of these did fairly but not well on the whole. Of the produce of the crosses of the two previous seasons, 36 plots were sown, most of them naturally very small ones and whilst in character of growth these crosses have come on true to type, it remains to be seen how the lint turns out. In a few cases, the yield was very poor, but in a majority it was decidedly an improvement on that obtained from the uncrossed strains. In some of the most promising strains, the growth of the plants showed an astonishing vigour, and if illustrated with photographs this report might convey a wonderful impression of the progress and success of the work. These plots, however, suffered a good deal in February from attacks of aphides and also from boll-worm. The plants were most prolific and as they also developed an amount of branches never or seldom to be seen in "Westerns" cotton. Had it not been for this and the unfortunate character of the latter part of the season, some phenomenal yields would have been obtained. The work being done was inquired into by Professor Gammie, the highest botanical authority on Indian cottons, during December 1905, and it is a pleasure to be able to record the fact that the work I have been carrying on for the last three years was fully endorsed by him as being on the right lines.

On the second line of work mentioned above, plots were sown with cottons of eighteen different strains collected in the early part of 1905, besides a plot of half an acre with "Bombay" cotton —which is probably "Dharwar Americans"—and some Peruvian and a small quantity of the much-vaunted Caravonica cottons. The eighteen sorts first mentioned were nearly all either "Northerns" or "Westerns," that is to say, the seed was found in the areas which the trade depends on for these sorts; but in some cases they merely showed evidence of ill-directed introductions in former years and in others no peculiarly valuable characters, though it is still too soon to pass a final verdict as to whether it is of any use to continue their growth on this farm. With the starting of the Nandyal farm during the current year, all work in connection with the strains falling into the group of "Northerns" will be transferred to that place. The "Bombay" cotton flourished fairly, but the outturn was not satisfactory, still I am not certain whether or not to recommend a continuance of the work with this sort. The Peruvian, the seed of which was received from a firm in England two years ago, has proved a failure and the Caravonica done no good whatever. The seed of the latter was very poor and, though raised with care and tended assiduously, the plants made no growth on the soil of this farm. The growth of these latter varieties is not, however, an important item of the objects of the farm and will scarcely demand further notice.

6. *Sorghums.*—These are normally the main cereal crop of the locality, but owing to the exceptionally favourable opening of the season in August a much larger area of "korra-patti" was put down than usual, whilst all the late sorghums suffered most severely from the deficiency in the later rains. This is a very serious matter in Bellary where the late sorghum crop is the main fodder crop and a failure of this exhausts the reserves which it is customary to maintain. The comparatively late time at which the rains came also prevented the sowing of any of the earlier sorts of sorghum on the farm and nothing satisfactory was possible in reference to them. Of the early sorts, plots of fourteen varieties were sown from seed selected in previous years, but the conditions were such as not to allow of any conclusions being drawn as to their respective values and effort was concentrated on securing the best possible supply of seed for next year. In the same field six sorts of Bombay fodder sorghums were sown with very similar results but from another small trial under irrigation it appears that the "nilwa" and "sundhia" varieties of fodder sorghum, which have such a reputation in Western India, maintain their reputation at Bellary and especially the former, though the latter is the quicker grower.

The farm crop of late sorghum—the local *bilai jola*—was a poor one for the reasons already stated and nothing further could be done in the way of improvement by selection. And here I must note that, except in the case of some visitors from a distance to the Bellary exhibition, there was little or no demand for the farm-grown seed of the previous year. The ryots admitted the excellence of the sample, but said "why should we buy it? We have our own seed which we carefully gathered at the threshing floor and it is quite good enough for us!!"

7. *Paspalum dilatatum.*—This fodder grass does not flourish on the soil of the farm. It will exist if watered from time to time, but it even then comes nowhere near the sorghums as a fodder plant, and it is most improbable if it can stand the long dry season without water.

8. *The Koilpatti farm.*—Again a certain amount of repetition from my report already quoted is inevitable. As stated therein, although the rainfall of April was as a whole good, it was distributed in several showers, and as it followed on a season of remarkably short rainfall or rather of such an early cessation of the usual rains, it was insufficient to stimulate any late crop of cotton or to help out the low supplies in the wells. The rainfall of May and June was very light, and in July there was practically none and in August also very little. Altogether up to the middle of September no real relief from the drought of the previous year was experienced and the deficiency in the supplies in the wells retarded the customary planting of the ragi crop, etc., whilst little could be done towards the sowing of any early crops on the red soil. This long dry weather was, however, fully utilised in breaking up a large portion of the black soil area with a view to cleaning it

thoroughly and in carting tank silt on to the red soil for its improvement. Of the latter, 2,160 cart-loads were carried during the season and there can be no doubt that the land of this portion of the farm is gradually ameliorating.

The later rains from October onwards usually represent about three-fourths of the total fall of the year, and although the average amount was received its distribution was extremely bad. Half the total fall at the season was received during the first half of October, and this was followed by a spell of dry weather for about 25 days and this by an excessive downpour for about 4 days in the latter half of November. From 24th November till 6th January no rain fell and then only a light shower, and this was followed by another fortnight of dry weather with only a little rain at the end of the period, and then no more up to the end of the year. Altogether though the total fall was not much to complain of, the vicissitudes of the season were severe and unfavorable. Particulars of the rainfall will be given in the detailed record of experiments made in the farm later on.

9. Besides the application of tank-silt mentioned above, the improvements made include the deepening of one of the old wells on the red-soil block, which however has not proved a success as the rock is extremely hard and impervious; and the sinking of a well in the black soil area where a strong supply has been met with, which may be further developed in the future and as it is in the centre of the block, now extended, it will be most convenient as a place for subsidiary buildings, the erection of which will be a source of economy in labour. In this part of the farm, the portion previously liable to surface wash is being gradually brought into shape and levelled down by cattle labour as opportunity permits. In order, if possible, to improve the water-supply of the red-soil area, an exploration by boring was made during the year of some land just outside the farm area with fairly promising results, but these operations need to be carried further before any final decision can be arrived at in the matter. If a good supply is found, this block can be easily brought to a high state of cultivation.

10. Pursuant of the policy urged by the Board of Agriculture, that, where cotton farms are started, they should be made large enough to produce a really useful quantity of seed before it is distributed into the hands of even selected ryots, proposals for extending the cotton-soil area were made during the year and accepted during the month of March, when the land, which brings the total area of cotton soil to about 100 acres, was acquired; but it was not handed over to this department, until after the close of the year. The permanent retention of the farm having been decided on, the fencing of the red soil block and the erection of a seed-store, [illegible] bationer's quarters were sanctioned, but only the latter work was begun as the plans [illegible] for the others have not yet been received from the Public Works Department. The provision of these facilities will all tend to better work and efficiency.

11. No late crop was obtained from the cotton standing at the end of [illegible] year, but as the whole of those operations has been made the subject of a [illegible] report, it is unnecessary to allude to them further here.

12. Cultivation on this farm is carried out by the [illegible] use of the ordinary plough of the locality, the implements in common use in the Coded [illegible]stricts, certain patterns of small iron ploughs which are found most useful, because so expeditious, under certain conditions, and last, but not least, so far as the black soil is concerned, the heavy cotton soil plough made by Messrs. Massy & Co. on lines suggested to them many years ago by me, which has been found so successful in the Bellary district under somewhat similar conditions of soil. With this last-named implement, a large portion of the cotton soil of the farm was broken up during the year, and the result in improved cleanness was very marked and I am satisfied, after several years' effort, that this result would not have been attained if the ordinary tillage practice of the locality had been adhered to.

And here it is appropriate to mention the fact that the use of this plough which, with other patterns of heavy iron plough, is now in common use in the Bellary country, as the result of the combined efforts of the late A. Sabapathy Mudaliar and this department, having been brought to the notice of the local cultivators by its having been used on the farm during 1904 and 1905, has now made a step further towards its introduction. Several persons last year applied for the loan of the farm plough to try it on their own lands, and as that was not possible a second plough was purchased and lent or hired to those who wanted to try it. The information obtained as to the results of these efforts is on the whole satisfactory and now it remains to be seen whether and how soon the Tinnevelly cotton soil ryot will move on, as the Bellary ryot has in the last quarter of a century, and purchase these implements for himself. So far as the farm is concerned, what has to be done in the future is to continue to let out a plough to those wishing to try it, and possibly to set up a workshop later on for the purpose of repairs and the sale of parts, etc.; but possibly, if it grows into a reality, the District Agricultural Association may undertake this as they might a good many other lines of work.

The trials commenced with a view to testing the value of deeper tillage than is customary as a prophylactic against drought were suspended during the year as the land set aside for the purpose could not be brought into proper condition with the ordinary tillage of the locality. It can be renewed next year.

13. The experiments designed to test certain methods of conserving cattle manure, to which allusion has been made in referring to the Bellary farm above, are duplicated on this farm and were continued during the year. So far as collection goes, there were discrepancies in the

results, as revealed by analysis, that cannot be easily explained; whilst it must be sometime yet before the outturns of the plots, of cotton, to which the manures were applied can be known in full.

As at Bellary, the scheme of manuring was extended in this series during the year and two sets of plots were added which were manured as follows:—

Plots Nos. 3 *and* 6.—Oilcake 1,000 lb. per acre.

„ *Nos.* 4 *and* 14.—Superphosphate 200 lb. + saltpetre 300 lb. per acre.

The field to which these manures were applied was cropped in the usual rotation with cotton during the year.

Another series of experiments, which it is proposed shall be continued with cotton grown continuously on the same land from year to year was laid down and started in the adjoining field in plots each measuring one-tenth of an acre. They were manured in the past year as follows:—

Plots Nos. 1 (*a*) *and* 5 (*a*).—Oilcake 1,000 lb. per acre.
„ *Nos.* 1 (*b*) *and* 4 (*b*).—Superphosphate 300 lb. per acre.
„ *Nos.* 2 (*a*) *and* 5 (*b*).—Saltpetre 300 lb. per acre.
„ *Nos.* 2 (*b*) *and* 6 (*a*).—No manure.
„ *Nos.* 3 (*a*) *and* 7 (*a*).—Oilcake 1,000 lb. + superphosphate 300 lb. per acre.
„ *Nos.* 3 (*b*) *and* 7 (*b*).—Saltpetre 200 lb. + superphosphate 200 lb. per acre.
„ *Nos* 4 (*a*) *and* 6 (*b*).—Saltpetre 200 lb. + basic slag 300 lb. per acre.

The results of these applications will only be known at the end of the season, but it must be remembered that the past season was not favourable to obtaining any marked results and that from such experiments results must not be looked for in a hurry.

14. The chief crops to which attention is given on this farm are cotton, cumbu (*pennisetum typhoideum*), and certain peculiar or local sorts of sorghum, the growth of which is, for the most part at any rate, confined to the southern districts of the Madras Presidency. Other crops are grown as incidents of cultivation and to make use of the land available. With cotton, 12·75 acres in all were sown, and the crop is still standing so that the work done therewith must be made the theme of a later report. Following up the work of the past, it was possible to sow considerable areas with uppam and karankanni cottons separately, and a supply of a new stock of the former sort was obtained and sown separately. Besides this, the produce of the crosses made in the previous years has been further propagated and the work of selection both for early yielding and for prolificacy has been carried on. The Cambodia cotton to which allusion was made last year was grown on a larger area but neither in this nor in the case of the other experiments with this crop would any good purpose be served by further reference thereto at present.

15. With cumbu, 7·2 acres were sown, of which rather less than a half was sown with the local variety. This was got in rather earlier than the foreign sorts and did rather better, but it too suffered from the early cessation of the rains and yielded only 1,057 lb. of grain. The foreign (Guzerat) sorts sown were Nadiad, Bhavanagiri, and awned, and none of these did well under the seasonal conditions experienced. The Nadiad kambu was the worst and yielded only 47 lb. of grain per acre, thus for the second year proving unsatisfactory. The other two varieties started well, but were checked by the dry weather that set in in December and they yielded only awned 206 lb. and Bhavanagiri 166 lb. per acre. These two varieties, however, are well worth further trials, and the awned especially.

16. Fodder sorghum was grown as usual, but in the state of the season it was not considered worthwhile to repeat, during the year, the experiment in cutting the crop at different stages as was done in 1905.

The growth of the irungu varieties of sorghum, for the purpose of their proper botanical identification and study, was continued and the results obtained will be recorded later on. It is sufficient to say here that now enough seed has been propagated by "sorts" to allow of field tests of the varieties being made; some of the sorts appear to be decidedly superior to the others. No further botanical study of these varieties was made during the year and it will be desirable to transfer all that class of work to the Central Institute in future, as the Principal of that institution will have the necessary aid of specialists in such work.

17. The propagation of seed of the varieties of paddy named banko and halki was continued on small areas with results less favourable, but not unsatisfactory in the case of the former, which with 29 acre-inches of water gave 1,700 lb. of grain per acre. The halki variety gave only 929 lb. per acre with 33 acre-inches of water; but it is possible that the latter was not planted quite as closely as may be desirable for it. The banko paddy seed that could be spared was all eagerly taken up.

18. *Paspalum dilatatum.*—A small plot of 0·125 acre was planted out with this grass, which has a reputation in Australia as a drought resistant fodder plant, the sets being placed two feet apart in either direction. It struck well and stooled considerably and between April and October, gave in 5 cuttings 3,030 lb. of green fodder. The plot was then extended by sub-dividing the stools to an area of 0·45 acre and during December one more cutting of 864 lb. was obtained. Owing to the want of water, the crop could not be irrigated regularly, and in fact designedly one half of the extended plot has not been watered at all since it struck root. The evidence so far

available is that the grass will not, on a light soil, withstand an ordinary hot weather, and though it will yield fairly if tended carefully and frequently watered, this is not enough to establish it as a valuable fodder plant for ordinary cultivation.

19. *Sweet potatoes.*—The varieties grown in the previous year were again propagated on a small scale and a trial made of the effect of lifting the vines to prevent their rooting, which is not always done, and the results show that there is some small advantage from this practice. At the same time, a trial of the advantage of planting the vines in flat-beds and on ridges was made, and this also showed some slight advantage from the former method, but I am not inclined to attach great importance to these results, as the season was exceptional and the water supply bad. So far as could be roughly determined, it was found that the flat-bed plot required a little more water than that ridged, but here again the exceptional state of the supply renders conclusions difficult.

20. *Ragi.*—Of this crop some 3·14 acres irrigated under wells was grown and the crop did fairly. With this crop the test of the ridge and flat-bed systems was continued and though the conditions were not favourable to a satisfactory record, it is worth noting that again the advantage appeared against the former. The yield obtained on the ridge system was 2,588 lb. per acre with a consumption of 3,249 c. ft. of water for 0·27 acre, and 2,370 lb. per acre for 3,460 c. ft. of water for a similar area on the latter system.

21. Chillies were, as usual, grown under the wells, but the early exhaustion of the water-supply led to a comparative failure of this crop and what was obtained was due to careful attention to intercultivation. With the chillies a few plants of several varieties of tobacco were grown with the object of producing seed true to variety and to this end the flower heads were protected from insects. A few sorts of American tobaccos were included amongst these varieties, and of these one sort, Kentucky white burley, attracted a good deal of local attention on account of the size and weight of its leaf. It may be further grown next year.

The attention which has of late been given to the so-called jute of the Northern Circars and the fact that the plant producing it is found growing in gardens throughout the Presidency, led to the sowing of a little *Hibiscus cannabinus* with a view to obtaining seed of the two kinds that are commonly mixed together and this seed can next year be sown with a view to making a variety test of this fibre plant.

22. The year under report was signalised by a beginning in the way of extension. The lines of extension which it is decided to follow are those long ago recommended by the Agricultural Committee of 1889, to start a farm in each separate agricultural tract, and also another of wider scope and design as a central institute for research and teaching for the Presidency as a whole. The selection of a site for the latter near Coimbatore engaged me for a large portion of June 1905 and my selection was accepted in July by the Director in company with a number of other officers. As soon as this selection had been approved by Government, steps for the acquisition of the land (some 450 acres including 46 acres of wet land and a considerable area under wells) was proceeded with, but it was not until February last that any steps could be taken to attempt to bring the land into form or to equip the farm for the current year's work. Most valuable time was lost, and what could be done was greatly hurried in order to get it finished within the financial year. What was possible was to erect temporary shedding for the cattle and other farm purposes; to purchase enough working cattle for the farm, in which I desire to note the great help given me by senior Veterinary Assistant V. P. Subramania Mudaliar; and to gather together the implements and tools most urgently required for the farm. Up to the end of the year, but little of the land required, except that portion which will for the most part be required for building purposes, had been handed over to this department, so that but little progress towards framing designs for laying out the farm for its future uses was possible and this work was further retarded by the fact that it has been decided to obtain some new officer to be Principal of the Institute.

Besides the above, designs for the Institute buildings were prepared by the Government Architect in communication with myself, the Government Botanist, and, I must note, in so far as the accommodation on the chemical side is concerned, with the advice most freely given of Dr. Lehmann, Agricultural Chemist to the Government of Mysore. Designs for the farm buildings were made and estimates for their construction were afterwards drawn up and have been handed over to the Public Works Department, whilst designs for the necessary residences for the staff first needed have been prepared, and a general scheme for the arrangement of the buildings made out. An exploration for the water-supply of the Institute was begun under Professor Chatterton, but could not progress far owing to unexpected difficulties, which have since been got over.

What the farm needs at present is that the officer who is to be Principal of the Institute should go into residence thereon, and work out his own ideas. This he will not be able to do for some months to come owing to the delays which have arisen over the acceptance of a plan for the rest-house which is needed for his accommodation at first. That is not likely to be ready for another three months or so.

23. Besides the Central Institute farm, another large farm was opened during the later months of the year at Hagari, about 9 miles east of Bellary, which is intended to deal with problems connected with the irrigation of *paddy and cotton* on the black-cotton soil which forms so large an item in the area commanded under the great Tungabhadra irrigation project. A much larger area than will be required for this comparatively limited scheme of work was taken

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up under the idea that the scope of the experiments would include the whole question of utilising water on black-cotton soil. It amounts in all to 225·16 acres exclusive of sand dunes along the river side. As some of the land was still under crop until the end of March, the whole area was not handed over to this department until the 30th idem; but prior to that date a commencement was made towards bringing the land into a proper state, by breaking up the worst of it in the usual fashion of Bellary with the cotton soil plough. At first, work had to be done with hired teams, but during March a beginning at stocking the farm was made and cattle were purchased, then and later, sufficient to afford three full teams for such ploughs, and all the implements essential to immediate requirements were obtained. Temporary sheds were run up for the cattle and an officer placed in charge to conduct the preliminary work. Before the end of March 43·37 acres of land had been broken up and since then the work has progressed steadily.

This farm is to be irrigated by pumping from the bed of the Hagari river and an installation is being set up there to provide the water, it being intended to simulate as far as possible the conditions under which water will be ultimately supplied from the Tungabhadra. In one detail, it is hoped that it may be possible to simulate the conditions under which cotton is irrigated in Egypt, and though it is understood that that system is, in Egypt, being abandoned as far as it is possible to do so, it is proposed to try to grow cotton under 'basin' irrigation. For this purpose, three small basins are under construction which will be filled whenever a freshet in the river affords a chance of obtaining water charged with silt.

The necessary farm buildings and quarters for the subordinate in immediate charge of the farm operations were designed, and their erection under the supervision of Professor Chatterton was sanctioned.

For this farm too what is required is a European officer in continuous, and almost daily, charge, as the problems to be solved are novel and it is only by continuous observation and power to adapt action to conditions as they arise that those set out are likely to be solved. I was able at the last meeting of the Board of Agriculture to enlist the co-operation of Dr. Leather and Mr. Fletcher, Deputy Director of Agriculture in Bombay, who has had some experience of Egyptian agriculture towards the work, but as yet it has not been possible to obtain any help or advice from those officers.

24. Another station, the starting of which was sanctioned during the year, is that at Attur, about 3 miles from Chingleput on the banks of the Pálár. At this place a pumping installation had been set up with the object of showing how the underground river that runs in the bed of the Pálár might be tapped and utilised by pumping, and the question was raised as to how the land attached to this pump might be utilised for experimental purposes. I suggested that it might possibly be used for experiments in the growth of exotic and perennial cottons under irrigation and for the growth of fruit trees, with the special aim of studying the methods of dealing with fruit for export and the like. To this has been added the study of fodder crops for the locality. The starting of this farm only came under discussion late in the year, and partly for that reason, and partly because the well originally sunk for the pump proved a failure, in so far as the idea with which it was dug is concerned, but little was possible towards the actual commencement of the work. A small grant was made on 23rd October 1905 to enable me to sow the seed of a number of sorts of cotton, but this was given so late that the crops have not done well; a result also in part brought about by the fact that the soil of the only portion of the farm land that is commanded by the pump as it now stands is exceedingly poor. The actual sanction for starting the farm was not received until 10th February 1906 and efforts were made to provide within the financial year its equipment and materials for the buildings that will be needed for the most part successfully. The area of the farm is 66 acres, of which a major portion was immemorial waste. The removal of the prickly-pear and rank vegetation growing on it was taken in hand, and about 55 acres have been cleared for cultivation. Otherwise there is nothing particular to record regarding this station.

25. On a representation I made that it was advisable to provide a station for studying "Northerns" cotton in the country where that trade variety is produced, and for propagating pure seed thereof—the crops now found being in an almost hopeless state of admixture owing chiefly to ill-advised introductions of other kinds,—and in due course for the improvement of this sort by selection and crossing, sanction was granted towards the end of the year for the acquisition of the land required at first for these purposes near Nandyal, the site having been selected in August last. Nothing further than this was possible in respect of this farm during the year, but it should be mentioned that besides the work with the local cotton mentioned, it is proposed to devote attention here, as at the other farms, to the great question of the proper manner of conserving cattle manure; to the deeper tillage problem; to the sorghums of the locality and their improvement; and to the possibility of introducing some new sort of indigo which may be sufficiently remunerative to induce the ryots to continue the cultivation of that crop.

26. The experimental plantation of agaves at Hindupur was maintained and a number of suckers collected into nurseries with a view to its future extension; but, though the Government towards the end of the previous official year expressed the wish that certain points regarding the cultivation of these plants should be tested experimentally, it was not found possible to do anything in the directions adverted to. The plantation does not need drainage; the comparative growth under shade and in the open cannot be properly tested on this plantation owing to the

absence of shade; nor was it possible to do anything effectual towards testing the comparative value of clearance of only the large growing plants and thorough weeding, etc., as when the orders were received the whole place had been cleared out, but one portion of the plantation has since then been left to nature and the results may be observed hereafter. Owing probably to the thorough clearing out of the plantation, especially on the side near the railway line, it did not suffer from fire during the year, but otherwise no marked change appeared. The growth remained as irregular as ever, but from a number of well-grown plants the leaves were cut, and these yielded on hand-scraping the satisfactory rate of 3 per cent. of fibre, the rate varying from 2·5 to 4·3 per cent., that from the leaves of the older plants being the greater. The fibre was very favourably reported on, but the cost of preparing it by hand at Hindupur was found to be prohibitive. This latter point is a matter for further trials, and it should be possible to work more cheaply. The question of extending this station to a really effective area for experiment is at present suspended owing to other more pressing calls on the time and staff available.

27. The alkali land experiments being conducted at Terkuteruvu, a place most inconveniently chosen some thirteen miles from Madura, under the influence of the Periyár irrigation, were continued under the supervision of the local officers of the Public Works Department. Inspections made during the year and recent analyses of the soils of the plots taken under treatment show that the chief defect therein has been, for the most part, removed by the drainage and tillage which these plots have undergone. These results would have probably been attained much earlier had the land been properly fenced at the commencement. This fencing has now been put up and what these plots now need is chiefly good cultivation. Some of the plots yielded fair outturns last season, and arrangements have been made for the continuance of the experiments during the current year.

In the same district advice was given to a number of private individuals as to the reclamation of similar land, but it is not yet known what action they have taken in the matter.

Advice on similar problems has been sought by, and as far as possible has been given to, persons owning alkali land in other parts of the Presidency; but such work is sadly circumscribed by the fact that I have not yet received the help, which Government long ago asked for me, in the form of an Agricultural Chemist.

28. In the later months of the previous official year, notwithstanding the fact that the season had been most unfavourable to the crop, it was decided to attempt some experiments in curing tobacco at Dindigul with a view to turning out a higher class of leaf than is secured under the ordinary practices of that centre. To this end the co-operation of Messrs. Spencer & Co., the Cigar Manufacturers of that place, was sought, and was most cordially given, and a certain quantity of the produce of three different tobacco gardens of no great repute was purchased, and handed over green to that firm for drying and curing. Curing was carried on both in shade and in the open as usual; but the arrangements possible in this initial experiment were far from perfect. A final report from independent experts on the leaf cured has not yet been received, but it may be stated that the appearance of the leaf was surprisingly good, and samples laid before the Board of Agriculture at Pusa in January last attracted much flattering attention. It should also be noted that in the case of the leaf from one garden which had a reputation for burning with a black welt at the end of a cheroot, the burning was perfect. So far as I can personally judge the result as to flavour was not altogether successful, but that difficulty can be got over as experience in fermentation is secured. What is clear is that, in every season and with each crop, the processes may need modification, and local experience is one of the most important requirements in curing tobacco. These experiments are now being repeated by the same firm, but the conditions of the season just over were even more unfavourable than those of 1905. The tobacco crop, however, demands much study from other points of view besides curing, and in these the help of the long-expected chemist will be required.

29. In the districts of Bellary, Kurnool, Anantapur, Kistna and Tinnevelly an attempt, begun in haste in the previous year, to collect the seed of superior crops of cotton, was carried through as far as possible. The operations were conducted on a considerable scale in the first two, and the last named district, and for the most part the seed was collected by direct agency of the staff of this department. In Tinnevelly the assistance of Messrs. Harvey Brothers was sought and freely given in the purchase of seed, and the department is greatly indebted to the agent of that firm at Virudupatti for much aid and advice in the matter. The seed collected was not however very freely purchased by the ryots, though in this respect better results might have accrued had the sales been begun earlier, and had it been possible to issue the seed on credit. So far as enquiries have been possible, the purchasers of the seed collected have been more than satisfied with the results, and if the operations can be repeated, they should be more successful in this respect, whilst the sale and distribution of such seed is a thing which might well be undertaken by the newly-organised Agricultural Associations in the districts where the collection of seed may be possible, and is advisable at present. Nothing that is likely to really affect the quality of the produce is, however, in most localities, likely to come of such operations, unless and until it is possible to arrange for growing pure and good seed specially, and this can only be properly started by opening seed-farms after the initial work has been carried through at the experimental stations. On this point a special report was recently submitted.

30. After a period of inactivity in that respect, which has lasted almost uninterruptedly since my office was merged in that of the Director in 1885, the correspondence induced by enquiries from persons interested who seek information and advice in agriculture revived.

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vigorously during the year. This has in part only been due to the work of the District Agricultural Associations that have sprung into being, but it should be noted that, through these Associations, a certain amount of seeds has been distributed, but information as to results of these trials has not in many cases come forward, nor is it likely that such distribution will lead to much useful result unless the matter is taken up and dealt with systematically under good advice. So far as I am aware only one of these Associations has shown any really useful vitality during the year, and that is the Tanjore Agricultural and Industrial Association. The Members of that Association, at my suggestion, started a number of "co-operative field experiments" in certain simple details of agricultural practice, and, when I visited the district in August last, I found that a very satisfactory beginning in this direction has been made. For a good many months, the Association received the help of one of our Agricultural Inspectors, but it was necessary to remove him elsewhere later on, and such work cannot at present be expected to go on properly unless the workers receive constant advice and encouragement from experts. What the Tanjore people have done can, however, be undertaken in all districts, if the members of the Associations will devote their attention first to ascertaining in what direction action can best be taken. In fact, the most useful function that these Associations can at present fulfil is to extend the sphere of investigation which is the primary function of an Agricultural department.

31. *Staff.*—I was on duty throughout the year, and excepting a week's casual leave in July, and the usual holidays at Christmas, I was on tour for 248 days, being so occupied for half the month or more in every month but April, July and October. My journeys involved 17,600 miles travel by rail, and nearly 300 by road. The long journeys necessary to get from Bellary to Koilpatti, and thence to Coimbatore and Chingleput (Attur) account for this great mileage, which also included the usual annual visit to Pusa as a Member of the Board of Agriculture. The experimental stations should ordinarily be visited at least once a month during the cultivation season; and I paid 8 visits to Bellary including Hagari in most cases, 2 to Nandyal, one of which was in connection with the award of a premium for crops of "practically pure" Northerns cotton, 3 to Hindupur, 7 to Koilpatti, and 11 to Attur. The latter place was visited usually *en route* to or from other places. Besides this, during the first half of the year, 3 visits to Coimbatore were necessary in connection with the selection of a site for and the starting of the new Institute, whilst the greater part of the last two months of the year were spent there also. The Agricultural Shows at Bellary in May, Conjeeveram also in May, and Tanjore in March, were attended. At the former I delivered an address on "cotton and its improvement," and at the convention held in connection with the latter another on the subject of "tillage, and tillage implements" was given.

Of the other members of the purely agricultural staff, the Sub-Assistant Director was only on duty up to 23rd October 1905, when he most unfortunately had to proceed on sick leave. During April and May he was engaged chiefly in collecting cotton seeds in Kurnool and (Bourbon seed for the Inspector-General of Agriculture) in Coimbatore. He then proceeded to Nellore to assist the local Agricultural Association, and visited the Ponnalur tank. After that he went on to inspect the Local Fund farm at Bezwada, and was occupied in matters connected with the distribution of cotton seed in Nandigáma, as well as in visiting the Telaprole and Pithápur estate farms. After that, he visited the Komaramangalam estate in Salem, and spent the greater part of August and September in working out details for the farms being started at Hagari and Nandyal, and in distributing the cotton seed stored at Bellary. The breakdown of this officer, Rao Bahadur C. K. Subba Rao, has been a very serious loss to the department at a time when it needs every man it can find. His position was taken with effect from 1st December 1905 by M.R.Ry. R. Ramaswami Aiyar, the Senior Agricultural Inspector, who returned on that date to duty from privilege leave and who was then posted to charge of the Hagari farm. This officer had during the first four months of the year been engaged in connection with the tobacco-curing experiments referred to above, the collection of cotton-seed in Tinnevelly and with alkali land experiments in Madura.

The Inspectors at Bellary and Koilpatti remained unchanged until near the end of the year when the former was deputed on cotton-seed enquiries in the Bellary district and his place taken by a probationer who has been under training at Bellary. Inspector G. Rajagopala Naidu was on miscellaneous duty for the first part of the year in Tanjore, at Penukonda, and in Madura, during the absence of Inspector R. Ramaswami Aiyar on leave, but when the starting of the Central Institute farm at Coimbatore was ordered he was, no one else being available, posted thereto, and was in immediate charge of the works. When the farm at Attur was started, Probationer C. Narayana Aiyar was placed in charge and was subsequently promoted to the grade of Inspector. Two Inspectors of this staff were on duty under the Government Botanist throughout the year, and in July a probationer, who had for a short time been on duty at Koilpatti, was also taken away for the same purpose. Probationers were attached to both the Koilpatti and Bellary farms throughout the year, and towards the end of it two were deputed for duty at Coimbatore. In December an Overseer for the Hagari farm was appointed direct, but he has all his experience yet to gain. He received [illegible] appointment in virtue of his having passed at the top of his class from the College of [illegible].

CAMP COIMBATORE,
29*th May* 1906.

(Signed) C. BENSON,
Deputy Director of Agriculture.

APPENDIX II.

ADMINISTRATIVE REPORT ON THE AGRICULTURAL STATIONS UNDER THE CONTROL OF THE GOVERNMENT BOTANIST.

A.—Samalkota Agricultural Station.

I have the honour to forward the following Administration report of the Samalkota Agricultural Station for the year 1905–1906.

The energies of the limited staff were largely taken up throughout the year in the acquisition and laying out of the land purchased by Government. In previous years the land of the farm was rented from ryots and for this reason no permanent works or improvements could be undertaken.

The block of land acquired is about 36 acres in extent. It is of an extremely irregular character and the soil is of a very tenacious description. The work of reclaiming has been very heavy. The whole has been cleared of the heavy scrub and fenced according to the usual native methods, mere heaps of dead thorns, date-palm fences, cactus and Korakapalli (*Pithecolobium dulce*). A considerable number of large trees occurred at intervals in the farm. These have been sold by auction, dug out and removed.

The whole cultivable land has been divided into a series of blocks, the areas of these have been calculated and an accurate map of the farm has been prepared. In many cases the configuration of the land has been altered, bunds have been removed, earth carted from the high outskirts to raise low pieces and irregular plots levelled so as to make the land more suitable for comparative experiments in the future.

A path has been made all round the farm and a special coolie is constantly employed in keeping it in order, this being rendered necessary by the rank growth of the local vegetation. Six foot-paths have been made between all the blocks and these are raised a foot above the level of the land for complete separation of the blocks and easy inspection. This has been found necessary because of the irrigation and other difficulties in heavy wet land growing both paddy and sugarcane.

The main channel down the farm has been much altered. It was an irregular waterway, sometimes swelling out to a width of twenty yards and at other places winding irregularly through the fields with large trees on its banks. It has been practically re-made and now consists of a straight manageable irrigation channel of uniform width passing through the length of the farm. It has been carefully sloped and, to prevent erosion, turfed throughout. This work has also necessitated a considerable amount of stone revetment in places.

Three permanent dams with revetments and aprons have been made along the course of the main channel, the local temporary palm-trunk ones having been found unsatisfactory and liable to be washed away during heavy floods. Irrigation pipes have been laid, under the road and paths, from the main channel and from block to block and three drainage channels have been constructed.

The drainage of the farm has been very difficult to regulate as the land slopes rapidly in certain directions and much wash has been experienced in unusual rains.

A new sluice with road-bridge has been made over the branch channel (which acts as the drainage channel to the farm and irrigates villages several miles away). This has been built at the expense of the Pithapore estate.

A signboard in Telugu and English has been placed on the roadside opposite the entry to the farm. A ballast across the canal has been purchased from the Department of Public Works and a main 16-feet road has been made right through the farm. This road is raised some two feet above the general level of the land and acts as an embankment on one side of the irrigation channel. The earth for its construction has been carried from the bed of Elleru drainage river, advantage having been taken of the clearing of that watercourse by the Department of Public Works contractors both for this and other purposes in the laying out of the farm. The road has been turfed at the sides and levelled, and passes out of the farm at the south and again into the Elleru drainage channel.

The bund along the Elleru river has been handed over by the Department of Public Works to the farm. This consists of an elevated ridge some 20—30 yards wide and extending for half a mile along the entire length of the farm. It was formerly under date trees and under-growth and, besides forming a surreptitious feeding ground for goats and cattle, harboured large numbers

of jackals and wild cats. Much of this has now been cleared. An immense breach at one place which in times of flood endangered the farm lands, has been filled up, and a considerable portion has been covered with sandy silt from the river bed.

The acquisition of this bund is of great value to the farm. It affords sites for buildings. The jaggery store-shed has been completed and now contains a seed-loft and a room for microscopic and other better-class work, besides the main jaggery room. A number of large iron seed bins have been constructed. The store-shed has also a verandah and two tool rooms. Two cattle-sheds have been erected, one for the farm cattle and the other for the Nellore bulls. Sites have been selected and cleared for the Agricultural Inspector's quarters and the bungalow for the Inspecting officer. A considerable portion of the bund has been cleared of date-trees and covered with sandy silt from the Elleru excavations. It is proposed to utilise the whole as a cattle-run and efforts will be made to plant it up with grass. A road will be made along the river border and a fence will be necessary to keep out the cattle which use the river as a road. The enclosing of this part will greatly improve the farm and do away with much of the internal fencing now existing. A local cyclonic storm in March blew down the whole of the fence already erected.

There has been considerable reclamation of land from the water channel in its upper part and a plot is being put under lucerne below the bungalow site. Three pairs of cattle have been purchased during the year from local ryots and a pair of fine Nellore-breeding bulls were obtained at the last Ongole cattle show.

These are some of the chief pieces of work done during the year in the laying out of the permanent farm. There is much to be accomplished yet, but the back of the work is broken and in no former year has anything of the kind been attempted. It will be understood that this addition to the work of the farm officers without any increase in establishment has made considerable inroads on the time which should have been devoted to the study of sugarcane.

2. The area available for sugarcane growing is about 25 acres. The original small piece of land rented has been added to year by year until the final acquisition of the present block. During its whole existence, the farm has been divided into two parts, right and left of the main channel, a wet area where sugarcane is in rotation with wet paddy and a dry area where the rotation is with dry crops. The land has now been planned out with respect to the parts available for sugarcane growing during each year. The usual practice is to plant sugarcane, in rotation with wet paddy, once every five or six years. The farm plan will attempt it once in three. In the dry area sugarcane may be attempted in alternate years. This, if successful, will give us about 10 acres under sugarcane each year. A set of plans has been prepared showing the area under sugarcane each year since the founding of the farm.

3. The functions of the farm are as follows:—(1) Raising or obtaining immune varieties of cane and multiplying these for distribution—Although the demands for seed on the farm has vastly exceeded expectations, it has been found impossible to devote more than 2 acres to the nursery for distribution and it is doubtful whether this will be longer manageable. The preliminary study of the different varieties collected, in some ways the chief work of the farm, is done in the varietal plots. (2) Simple experiments have been made in growing canes in different ways and in manuring them with different substances. It is obvious that little room is left for rotation experiments. Besides the general separation of the farm into the wet and the dry areas, three blocks have, however, been placed apart for definite experiments in rotations, these being under two-years, three-years and four-years courses respectively. The area of the farm is entirely inadequate for a proper working out of this problem. (3) A general study of the sugarcane industry in all its aspects, from the botanical differences of the several varieties to the making of jaggery—This has been carried on in a more or less desultory manner as opportunity offered.

4. It is submitted that the preliminary purpose for which the farm was started has now been in a certain measure accomplished. Canes of all sorts have been collected and tested and those of value have been multiplied for distribution over the Presidency. This work of obtaining new canes of value, it has been pointed out, must be continued, for each cane in turn is likely to become subject to disease. But it is time to consider whether the farm should not undertake the larger questions hitherto merely touched upon, the point of view in sugarcane matters having considerably changed during recent years. For the proper development of a nursery for distribution, for experiments in rotation, for studies in the quantity of water required in the delta for sugarcane cultivation, and, lastly, for improvements in the manufacture of jaggeries and low-class sugars a greater area is needed. It is submitted that the present is a fitting occasion for some decision to be arrived at as to whether the work of the farm should be expanded in these directions. The Samalkota farm is in many ways well situated for such work and large areas of land can conveniently be added if necessary.

5. The year under review was generally unfavourable for experimental work. The heavy laying-out operations have already been referred to. The insufficiency of the staff was early pointed out, but no addition was made in this direction. The close and continuous inspection of the plots which had been a feature of the work on the farm from its commencement had accordingly to be given up.

The urgent need for the distribution of canes to various places including other farms has greatly disturbed the experimental plots, so that it was impossible to reap the whole of each plot and compare it with others.

Lastly, and of most importance, there was an outbreak of disease due to the state of the weather. This is indicated in the monthly rainfalls for the past three years herewith reproduced :—

Month.	1903–1904.	1904–1905.	1905–1906.	Remarks 1905–1906.
March	..	..	8·70	Heavy unseasonable rain not required by the young canes.
April	..	..	1·80	
May	3·60	3·98	1·22	
June	5·11	5·95	2·90	
July	12·53	4·05	3·85	
August	8·58	3·65	7·93	
September	6·58	2·55	8·17	
October	6·01	11·64	1·62	Cane forming time. North-east monsoon failed.
November	7·38	..	..	
December	..	..	..	
January	..	..	..	
February	..	..	1·36	Unseasonable rain during milling.
Total	49·79	31·82	37·05	Seasonable rain for the cane's growth during 1905–1906, 25·19 inches in place of 45 inches.

Shortly after planting the plots an unprecedented fall occurred by which many of the sets were covered deeply with earth, and much time and labour was needed to supply the vacancies thus caused. The plants however recovered and there was every prospect of an exceptionally abundant harvest. When, however, the time came for the canes to form, viz., in October—November, the north-east monsoon totally failed. Instead of some 10 to 12 inches at this time only 1·68 inches fell, and there was no rain for the rest of the growing season. Finally, while reaping the canes, a couple of inches fell in February, which caused trouble in the milling. The actual rainfall during the time when the canes were in the ground, while below the average, was greater than in the previous year (March 31st—April 1st) but the time and manner of falling was most unfortunate, resulting in a serious outbreak of disease. This vitiated the results from many of the plots, and, in the absence of the regular inspection notes formerly carried out, the net results were in many cases of little value. The only consolation (and a very poor one indeed) was that the disease was worse in the district than in the farm, practically the whole of the up-land canes, forming half of the area planted, being a total failure. Advantage was taken of the recent addition of an Assistant in Cryptogamic Botany to the Government Botanist's office to make a careful study of the disease on the farm. All the diseased canes were carefully examined and a chart was made indicating the direction of spread. Such "disease maps" have become a feature of the farms under the control of the Government Botanist and it is hoped, by the comparison of the maps of successive years, that we shall be placed in a position to form more definite conclusions as to the canes and mode of distribution of the chief pests.

6. The general line of experiments on the farm was similar to that adopted since the commencement of its history. The area under sugarcane during the year was about 10 acres, and the special variety with which experiments were conducted was the Red Mauritius, the cane which has been most widely appreciated during recent years.

The varietal plots were slightly rearranged, some canes being transferred from class II to class I as they seemed to be worthy of more extended cultivation. Certain canes in the same way were added to the collection.

In the Methods plots experiments were conducted in the use of trash, in green dressing, the part of canes to be planted, the number of sets to be planted per acre, stool planting, wide planting, nursery seed-bed, bamboos for supports and June and September planting, while the question of ratoons received special attention because of the spread of disease.

In the manurials, cattle manure, castor cake in large and small doses, a mixture of pungam (*Pongamia glabra*) and nim (*melia azadirachta*) cake obtainable locally, and a "general cane manure" were given to the canes and the results recorded. The compost pits received the usual attention and a great mass of this substance was added to the land in preparation for the new crop.

Various other subjects received attention. The "disease plot" was continued, unsuccessful attempts were made to raise seedling canes on the farm and in the green house at Ootacamund, studies were made regarding early-maturing canes and the destruction of jackals, while canes were planted in June and September for sale at local festivals.

A careful botanical study was made of the canes grown on the farm. The artist painted such as were new and the Botanical Assistant investigated the botanical characters of each. Specimens of the canes were selected and packed off with paintings, drawings, descriptions and measurements to the Director of the Government Plantation in the Mauritius, in order that we might be able to call the canes hailing from that country by their right names.

All the canes of class I varieties were analysed as usual and in many of the plots a series of ripening analyses were made in order to determine the proper time for reaping the canes and the effect of different manures on their ripening. A quantity of jaggery was stored in the jaggery shed and will be placed in the market when the usual rise in price takes place. Meantime, the jaggery has been analysed at the commencement of the experiment and will be again examined before sale to see if this local method can be profitably adopted and what loss is incurred in jaggery during storage.

7. The number of visitors has been well sustained during the year. The Government Botanist inspected the farm seven times. It was also visited by the Director, the local factory officials, the Cryptogamic Botanist to the Government of India, the Agricultural officer to the Court of Wards, the Government of Bengal Jute Expert; the Superintendent, Civil Veterinary Department, the Brazilian Commissioners, numerous District Munsifs, Deputy Collectors, Tahsildars and High Court Vakils, about 40 students of the Training College, Rajahmundry, the Municipal Commissioner, Berhampur, the Secretary, Chamber of Commerce, Cocanada, and various other gentlemen. Besides these, hundreds of local cultivators went round the farm at frequent intervals and a few travelled from other districts.

Arrangements were made for two Agricultural officers to be trained at the farm, but of these only one remained for more than a few days. He was recommended by the Central Agricultural Committee and spent two months on the farm.

As in preceding years, canes of good varieties were distributed to careful cultivators in the several taluks of the district. These small selected plantations were twice inspected during the year by the officer in charge. His reports tell of successful cultivation and the general replacement of the local varieties by the farm canes. The new canes have now obtained a firm foothold in the district and almost all the canes distributed are being retained or sold for planting. In the drought-striken Peddapur taluk the whole of the local canes were wiped out, while the farm canes, although greatly distressed, withstood an absence of irrigation for over two months and were then saved by irrigation from wells.

The distribution of canes was as large as usual, many applicants having perforce to be refused because of insufficient material. Heavy consignments were forwarded by truck to Palur and Melrosapuram, a truck load to the Nellikuppam factory for distribution to the local ryots, about 10,000 selected canes to local ryots, cultivators of other districts (as Kistna and Guntúr), the Court of Wards Estates, district Agricultural Associations, Hyderabad, Bengal, Eastern Bengal and Assam, Bangalore and other parts.

A note on "Sugarcane cultivation, with special reference to irrigated Delta lands" was printed and distributed as a leaflet of the department, and an article was written for the first number of the Agricultural Journal of India on the general aims of the farm.

8. Other crops grown on the farm were wet paddy, several local varieties of which and the 60 days Tanjore kind being grown. An acre was put down with the best local plantain. In the dry area dry paddy and redgram were successfully grown in rotation with sugarcane, while other such rotations were chillies' and turmeric. The latter crop was especially successful, but the drought diseases attacked the chillies and redgram, so that the outturn from these was not so good as usual.

Some varieties of Bengal jute were sown on the farm. But owing to insufficient knowledge of the crop and its correct time of sowing the results were not satisfactory. The experiments are being tried again under the advice of the Bengal Jute Expert, who visited the farm and inspected the fibre produced.

B.—Palur Agricultural Station.

I have the honour to forward the following Administrative Report of the Palur Agricultural station for the year 1905–1906.

2. The farm consisted, during the year under review, of 16 acres of wet and dry land. The wet land is irrigated by a channel from the Tiruvádi anicut while the dry land is fairly supplied by a couple of wells. Samples of soil were forwarded to the Agricultural Chemist to the Government of India for analysis and he reported on it as follows:—"well supplied with mineral plant food, and should prove very fertile if manured with ordinary farm manures." Perhaps the greatest agricultural defect of the district is the scarcity of such manures.

3. The land was enclosed by local fences and laid out with paths and in plots. In the wet land the bunds provided suitable divisions but the dry land was split up into half-acre plots, these being considered convenient from the experimental point of view. As the land was only rented as an experiment for two years, no permanent buildings were erected, but a mud-walled office, seed-house and cattleshed were put up. A pair of cattle was purchased locally.

4. Rather suddenly, towards the end of official year, it was decided to make the station permanent. With some difficulty a block of land was selected surrounding the present site as a nucleus, marked out and purchased at a cost of Rs. 27,824, comprising an area of 51·69 acres.

Of this about 38 acres are dry and fairly provided with wells and 13 are wet land of the same description as that mentioned above. The new land with its standing crops was not however handed over to the farm officers before the close of the year.

5. The farm was placed under the management of an Agricultural Inspector. On January 1st an assistant was added, but the heavy work of reaping the ground-nut and sugarcane in the early part of 1906 and the necessary studies for the acquisition of the new land did not permit of any touring being effected. The Agricultural Inspector was removed from the charge of the farm at the end of the year and sent to Samalkota for training in sugarcane cultivation in which he seemed to be deficient. His place was not supplied before the end of the year.

6. The weather was, in the main, unsatisfactory, as was the case generally over the Presidency. The crops being capable of irrigation at need did not however suffer so much on this account. The first three months of 1905 were, as usual, dry. A couple of inches fell in April 1905, 1⅛ inches in June and about 1 inch in July. As this is the first year of the farm's existence it is not possible to compare this rainfall with that of previous years, but it may safely be regarded as deficient—under five inches in six months. The ground-nut and indigo of the district during this period suffered, the former from the surul puchi (*Anacampsis nextoria*, Meyr.) and the latter from general drought. In October-November nearly 36 inches of rain fell and this abnormal fall affected the crops in the neighbourhood. No rain again fell from the 27th of November till the 15th of January. Indigo and other sowings were delayed and the ragi of the district was seriously injured.

While the total rainfall for the year April-March was over 54 inches, it fell unseasonably and rendered cultivation difficult.

7. The main functions of the farm are two-fold, the study and improvement of the ground-nut and the introduction of better class canes. Perhaps to this may later be added the manufacture of jaggery. These functions have been held steadily in view during the year.

All the available varieties of ground-nut in India have been got together. These were obtained chiefly from the Bombay and Saidapet farms while several additions were also received from Ceylon. Most of the Saidapet seed was bad. As there was considerable doubt as to the correct naming of these varieties, Japan, the United States of America, and the West Coast of Africa were asked to send their best varieties, while a hundredweight of Mauritius seed was imported direct in order to test its value side by side with that obtained ten years ago. The ryots complain that it has rapidly deteriorated. These varieties were as far as possible compared in their growth and yield with the local kinds. There were two crops during the year, one rainfed and the other irrigated, but both on dry land. A small area of wet land was also planted. The various kinds grown were subjected to a careful botanical analysis and fifteen samples of pods were forwarded to the Agricultural Chemist to the Government of India for determining their oil-content.

8. The sugarcane varieties introduced on the station, were such as had succeeded at Samalkota or were thought likely to be of use in the lighter South Arcot soils. A small plot of dry irrigated land was planted and the canes analysed in due course. The larger wet area canes were planted later and had not matured sufficiently at the end of the year for examination at the mill. The analysis was kindly carried out by the chemist to Messrs. Parry & Co. at the Nellikuppam factory. Owing to water difficulties the nursery system of planting was introduced and this has arrested the attention of the cultivators and is being followed in several directions.

9. Indigo, which was formerly a successful rival of ground-nut in South Arcot and is still largely grown, was introduced on the station as a rotation crop. Among other kinds grown were the Java-Natal (*Indigofera arrecta*) and the newly re-discovered *Indigofera longeracemosa* of Travancore. As already stated the indigo crop suffered severely on account of unfavourable weather.

A set of cakes of locally prepared indigo was forwarded to the Indigo Expert to the Government of Bengal. He analysed these and compared them with the Bengal product.

10. The remaining rotation crops were gingelly (*Sesamum indicum*, D.C.), ragi (*Eleusine coracana*, Gœrtn.) and paddy, while a few cotton plants were also grown. Guinea grass (*Panicum maximum*, Jacq.) was successfully introduced on the farm and should be of value in this fodderless region.

The great deficiency in farm manures led to some attention being paid to the preparation of weed-pits similar to those at Samalkota. The absence of vegetable matter rendered this work one of great difficulty. Owing to the labour difficulties in the district a set of cattle drills and harrows was introduced from the Ceded Districts and these were used in several of the farm operations.

A careful map has been prepared and recorded of all the crops on the plots for each half-year as well as such previous history of the land as could be obtained.

11. The diseases of the ground-nut were carefully examined during the year as opportunity offered. An unsuccessful attempt was made by the Entomological assistant to work out the life-history of the surul puchi. Preliminary trials were made in spraying the crop for millepedes and tikka. Light traps were constructed for the study of the night fauna of the crops and jaggery traps were prepared for jackals in the cane.

Disease maps have been inaugurated as at the Samalkota farm.

12. It is full early for the station to attempt to influence the surrounding cultivation. The ground-nut varieties have as yet not been fully acclimatised nor are there sufficient quantities for distribution. All applications were therefore answered with good selected seed of the local kind. About 1,000 pounds of seed were distributed during the year to about half a dozen Madras localities, Assam, Central Provinces and United States of America. There appears to be some prospect of the farm's usefulness in this direction being appreciated. The sugarcanes are not yet ready for distribution. It will take a year or two before much selection can take place. Meanwhile, the Red Mauritius is asked for on all hands, and our supply has not been at all equal to the demand. About 1,300 canes have been distributed, largely through the aid of Messrs. Parry & Co. who want to see this variety widely grown over the district.

13. The visitors to the farm have been noted in the farm books. The Government Botanist inspected the farm seven times. The Director visited the farm in December. The officers of the Nellikuppam factory and various local officials and ryots have been in the habit of coming to see the farm's progress.

C.—Taliparamba Agricultural Station.

I have the honour to forward the following Administrative Report of the Taliparamba Agricultural station for the year 1905–1906.

2. The lands were acquired in the latter part of 1905, but, by the permission of the owners, the farm operations were undertaken at an earlier date and were in full swing at the commencement of the year. At first under a fieldman despatched from my office, the permanent incumbent, an Agricultural Probationer, arrived on 16th July 1905. The farm was, during the rest of the year, under his sole charge.

The total area of the station is about 84 acres. This is of a most varied character, consisting of pepper gardens, hill-paddy, wet land, scrub, pasture and forest. In some parts panthers are of frequent occurrence and rocks and caves abound. The whole area has been brought under control and the pepper gardens located. These cover altogether about 16 acres.

3. Paths and roads have been made in all directions, culverts and bridges built to regulate the torrents in the rainy season and much of the scrub of Lantana cleared. The two existing huts have been thoroughly repaired and five new ones built at various spots for the permanent labourers, so that the whole area has become inhabited. An inspection shed has been converted into a convenient office. Sites have been selected for the Agricultural Inspector's quarters and an inspection bungalow, and these sites have been approved. No work has however been undertaken on them by the Department of Public Works.

4. The wells throughout the cultivated part have been examined and cleared of silt and a set of borings has been made to determine the water-level in the different classes of land. Water supply is a matter of difficulty during the dry, hot half of the year. A fire-line has been drawn round the pasture land and the grass cut as far as possible. Trespasses are frequent and it has been found necessary to consider the advisability of erecting a cattle-pound.

5. The pepper area, much of which has been allowed to run wild for years past, has been completely cleared, dug and largely terraced. It has been divided roughly into three blocks according to the lie of the land, its previous history and former ownership. The whole has been divided up into 80 inspection plots of convenient size with paths between.

A series of farm maps have been drawn but the detailed survey of the plots remains to be done.

6. The weather has been rather abnormal, judging by local report. A rain-gauge has been put up and the individual falls recorded. Five years' rainfalls have been copied from the Taliparamba village register, but, although these will act as a general guide, they cannot be too closely relied on because of the difference between the two localities. It appears that the earlier part of the year is very hot and dry while the fall during the South-West monsoon is very heavy. Some 100 inches fell in the three months June—August and another 15 in October. This rainfall appears to have been excessive, and as all the cultural operations on a pepper farm are in full swing during the monsoon, the rainfall during June—August is of special interest. The opening months of 1906 were unusually dry and hot.

7. The main functions of the farm are the improvement of the pepper industry in all its aspects, including the raising of new and improved varieties and their wide distribution over the district. With a perennial which bears first in its fourth year this will be slow work. Of minor importance are other crops detailed below. It is over 100 years since the founding of the Anjarakandi "spice garden" by the East India Company and it is time that the rich Malabar littoral should again have a garden devoted to cultures likely to succeed in its climate. While, then, we are waiting for the tardy results of the pepper vines, such other plants will be introduced as appear likely to be of use in the district.

8. The following are the lines of study at present being carried out. As time proceeds it is certain that individual alterations will be introduced. The Malabar coast has never had attention given to it by the Agricultural Department, and all the cultivations are new.

The study of pepper in all its branches has been undertaken. At first a close study has been made of all the local practices and these are being compared with those of other parts, especially the Wynaad. As will be seen below, it is intended to scour the whole district in order to learn the exact method of procedure and where it may be improved.

9. Although touring has not been neglected, the actual pepper on the station has received most attention. The 80 plots have been rather exhaustively studied and the harvest from each plot kept separate. The total value of the crops on the station was about Rs. 1,000 and would have been considerably greater but for the low price of pepper. Among other lines of observation in the plots, the effect of shade and aspect, soil and moisture are being studied and recorded. Experiments in mulching, manuring, moulding and pruning are being carried out. Leaf pits have been dug as in the North Canara gardens.

10. The standards to which the pepper vines cling have received an exhaustive study, their botanical and vernacular names having been in most cases determined and their relative popularity among the native pepper growers. Several new trees have been introduced for this purpose. The flora of the whole station has been examined and a provisional list prepared for the determination of the best pepper localities from their natural covering of plants.

11. The pepper varieties grown on the farm have been carefully examined, and their sexual differences noted, this being important from the crop point of view. Several new kinds have already been collected and introduced into the farm, notably the three best Wynaad kinds and cultivated pepper from Bombay and Burma. Several tours by the Government Botanist have been largely devoted to the study of wild peppers and a number of these have been introduced into a botanical garden in the station. The diseases of the vines have been carefully noted and certain areas have been marked and numbered as "disease spots". These will receive quite special attention. Finally, in order to carry out without confusion this extensive programme, a system of labelling the vines has been introduced and a set of registers has been started on the farm.

12. As a subsidiary study the cultivation of the district is being investigated. The following have received special attention:—the growth of hill-paddy with muruku (*Erythrina indica*, Lam.) standards, the wet paddy and the local grams and pulses. A collection has been made of the pasture grasses on the upper part of the station and a large number of guinea grass (*Panicum maximum*, Jacq.) roots have been introduced for fodder purposes. A first attempt was made in planting cottons of long staple, but the seed was sown too late and the growth was unsatisfactory. A set of lemon-grass (*Andropogon Nardus*, Linn.) plants is established, the roots being received from Cochin and Ceylon. A small number of rooted cuttings of rubber (*Ficus elastica*) have been received from Burma.

13. Although there was only one agricultural probationer on the farm, touring was considered to be so important that his place was temporarily supplied from head office while he toured through some 30 villages in the adjoining taluks of Chirakkal and Kottayam. Naturally this was for *his* information as we are not yet in a position to try and disseminate knowledge excepting in a very small way. The Government Botanist visited the farm three times during the year but also undertook as many tours in other parts in connection with pepper. The study of the Wynaad varieties resulted in interesting discoveries with regard to variety and sex and these were published in the form of a bulletin of the Agricultural Department. A short note on the same subject was published in the *Agricultural Journal of India*. The Director paid a short visit to the farm in December and not a few of the local proprietors and cultivators have from time to time been conducted round by the officer in charge.

(Signed) C. A. BARBER,
Government Botanist.

MADRAS,
25*th May* 1906.

APPENDIX III.

ADMINISTRATIVE REPORT OF THE SUPERINTENDENT OF PUMPING EXPERIMENTS.

I have the honour to submit the administrative report of the department devoted to experiments in irrigation by pumping.

2. During the time I was on furlough and in fact till practically the end of the official year 1904–1905, the work was under the supervision of Mr. S. Rajagopalasawmy Mudaliar, a Supervisor of the Public Works Department, whose services have been specially lent for this work. At the time I took over charge from him, engines and pumps were at work at the following places:—

(1) Melrosapuram—3½ H.P. engine and 3″ pump.
(2) Agricultural College, Saidapet—6½ H.P. engine and 4″ pump.
(3) Cuddalore—3½ H.P. engine and 3″ pump.
(4) Mánámadura—3½ H.P. engine and 3″ pump.
(5) Kadiampatti—6½ H.P. engine and 4″ pump.
(6) Coimbatore Jail—6 H.P. engine and a pair of plunger pumps.

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All these installations except No. 6 had been paid for out of funds originally placed at my disposal by Government. But in addition a number of other installations were in course of erection, most of them belonging to private individuals—

(1) M.R.Ry. Tota Ramanujam Chetty, Kattalai—25 H.P. engine and 12″ pump.
(2) „ K. Vasudeva Aiyangar, Trichinopoly—3½ H.P. engine and 3″ pump.
(3) Bezwada Technical school, District Board Kistna—3½ H.P. engine and 3″ pump.
(4) Attur, Government—8 H.P. engine and 5″ pump.
(5) Villupuram, Government—9½ H.P. engine and 6″ pump.

3. On taking over charge, with the exception of the engine at Cuddalore, Mánámadurai and Melrosapuram, all of which were 3½ H.P. engines driving 3″ pumps, none of the installations were working satisfactorily and a great deal of distrust as to their suitability for irrigation work had been engendered. In this report it is not necessary to detail the investigations which were made to ascertain the cause of bad working, and it will suffice to say that in the main it was found to be due to placing on the engine a greater load than they could safely carry for any length of time. Added to this certain minor defects obscured the main issues and rendered the work of getting the engines into good running order much more troublesome than it should otherwise have been.

4. During the year, I think we may safely claim that irrigation by pumping with engines and centrifugal pumps has passed completely beyond the experimental stage and that as soon as the results which have been achieved are fully known, there ought to be a great development in this direction. At the outset it was generally assumed, by those who were supposed to know, that the experiments would end in failure because there were so few wells capable of yielding a sufficient supply of water to afford employment to even the smallest size of engine and pump. As regards the greater part of the country this is probably true, but during last year it has come to our knowledge that there are extensive tracts of land underlaid with water in sufficient volume to give profitable employment to large numbers of engine and pumps. In not a few instances it has been found that with an engine and pump it is practicable to sink wells to considerably greater depths and thus draw upon a much larger volume of underground water and within limits by no means so narrow as we originally anticipated it has been ascertained that the provision of vastly increased pumping power has rendered it practicable to make use of supplies of water hitherto unknown or regarded as inaccessible.

5. As to the cost of raising water by oil engines and pumps the results obtained so far are by no means final and I confidently anticipate that with increased experience the cost of pumping will be considerably diminished. In the detailed account for each station the actual cost of pumping is given where it is known with any approach to accuracy, but here in general terms it may be stated that the cost of lifting water with small oil engines and pumps where work can be found for the engine for at least six hours a day is less than one-half that by which it can be done with cattle and that too under normal conditions. If there were any large demand for cattle for working mhotes, the cost would rise enormously and in fact would be prohibitive for ordinary irrigation work. The ryot can only successfully irrigate from wells so long as his cultivation is confined to an area which can be watered by the cattle he is bound to keep for his general agricultural work. Directly the area under well irrigation exceeds this limit the cost becomes excessive and it is only under extraordinarily favourable circumstances it is worth while for him to go in for such irrigation. With the engine and pump the cost of irrigation can be very accurately determined and the larger the volume of water or the greater the depth from which it is lifted the more efficiently the work can be done and the less the cost per unit. Any rapid expansion of well irrigation using either the picottah worked by men or the mhote by cattle is not possible. With engines and pumps the only limit to extension is the volume of water and the amount of capital available. It is true that very few landholders are in possession of sufficient ready money to enable them to adopt a method of lifting water which involves a considerable capital outlay, but by means of the Agricultural Improvement Loans Act the difficulty has been got over and a considerable amount of money has already been disbursed for the purchase of oil engines and pumps. The following is the list of the loans which have been granted:—

			RS.
(1)	M.R.Ry.	Tota Ramanujam Chetty, Trichinopoly	8,000
(2)	„	Tilla Govinda Gramani, Nellikuppam... ...	3,000
(3)	„	Govindasawmy Mudaliar, Pagalpatti	2,500
(4)	„	Appasawmy Mudaliyar, Pallavaram	5,000
(5)	„	T. S. Narayanasawmy Aiyar, Tirukarugavur... ...	2,000
(6)	„	T. Nataraja Pillai, Kubur	2,000
(7)	„	Muthusawmi Mudaliar, Satyavizianagram	2,000

A considerable number of other applications are under investigation. The procedure adopted with regard to these loans is that with the borrower's consent the money is paid over to me to enable me to purchase the necessary machinery and to get it erected *in situ*. When the work is completed a statement of accounts is rendered to the borrower and the balance, if any, paid over to him. If, as I anticipate, there is a considerable extension of cultivation under engines and pumps in the future, it is likely that the great majority of the installations will be put up with money borrowed under this Act.

6. The work of the department during the year has been growing steadily and the establishment has been increased by three supervisors and two draftsmen, so that at the present time I have under me four supervisors and one sub-overseer, and for these men, in the investigation of the many proposals which come before us and in the carrying out of such projects as are brought to maturity, ample work has been found. At the beginning of the year there were eight Government engines at work or being erected and during the year the number has increased by the installation of a 28 H.P. engine and 10″ pump and a 3½ H.P. engine and 4″ pump at the Hagari experimental farm and by the installation of a 9 H.P. engine and 3″ pump at the new Government experimental farm at Coimbatore. For private individuals the following work has been done :—

(1) In the Arni Jaghir a 9½ H.P. engine and a 5″ pump have been set up in the Palace garden at Satyavizianagram.
(2) A 2½ H. P. engine and 2″ pump for Mr. N. Subramaniam in the Luz.
(3) A 5 H.P. engine and a 3″ pump for the Zamindar of Kasimkóta at Kasimkóta.
(4) A 6½ H.P. engine and a 4″ pump for Mr. Gopinath Tawker at Surapet.
(5) A 9½ H.P. engine and a 4″ pump for Mr. Panduranga Mudaliar at Cuddalore; also a 6½ H. P. engine and a 4″ pump at Siruvanur.
(6) A 14 H.P. engine and a 5″ pump for Mr. Appasawmy Mudaliar at Chittatur.
(7) A 9 H.P. engine and a 4″ pump for Mr. Tilla Govinda Gramani at Nellikuppam; with this plant a sugarcane mill has also been installed
(8) A 7½ H.P. Engine and a 4″ pump for Mr. Narayanasawmi Iyer at Tirukarugavur.
(9) A 7½ H.P. engine and a 3″ pump for Mr. Govindasawmy Mudaliar at Pagalpatti.

In addition to these engines the erection of which has been in part or wholly supervised by the department a number of other engines have been installed by private individuals without our assistance. Amongst them may be mentioned—

(1) A 2½ H.P. engine and a 3″ pump for Mr. Ratnasabapathy Mudaliar at Tondiarpet.
(2) An 8 H.P. engine and a 4″ pump for Mr. Abraham Pandither at Tanjore.
(3) Four 9 H.P. engines and pumps for sugarcane cultivation in the neighbourhood of Nellikuppam by Messrs. Parry & Co.
(4) One 12 H.P. and one 18 H.P. engine for Mahamadia & Co., Dhárápuram.
(5) A 3½ H.P. engine and a 3″ pump for the Thambiran Swami at Anduthorai.
(6) Two engines of 4½ and 6 H.P. respectively, for a Subba Naidu of Nellore.

whilst the Madura District Agricultural Association have recently purchased a 9 H.P. engine and a sugar mill to which they intend to add shortly a centrifugal pump for watering the lands of the old experimental farm near the Tamkum bungalow in Madura.

7. In addition to the oil engines already mentioned which have been purchased for pumping water for irrigation a considerable number of oil engines are employed in pumping water or sewage in connection with the sanitary engineering works of several towns. Amongst them may be mentioned—

(1) Five 40 H.P. and two 32 H.P. engines purchased by the Corporation of Madras.
(2) An 8 H.P. engine at Vellore.
(3) A 1½ H.P. engine at Guindy.
(4) A 1½ H.P. engine at Vizianagram.
(5) A 9 H.P. engine for Bangalore.
(6) A 7½ H.P. engine for Salem.

Further three engines aggregating 42½ H.P. have been supplied for pumping water from Kole lands on the West Coast.

8. Summarising the above figures 35 engines aggregating 182 H.P. are or will be shortly employed for irrigation work, 12 engines aggregating 291½ H.P. for the water-supply and sewage of towns and three engines totalling 42½ H.P. for the drainage works.

9. The convenience of the oil engine as a source of motive power is now very generally recognised and even in the South of India where industrial development is in such a backward state the number of oil engines in use amounts to nearly 200. There are a large number of oil engine makers in Great Britain and between the productions of the best makers there is probably but little to choose. When these experiments on pumping with oil engines began, the circumstances were somewhat different. At that time the Hornsby-Akroyd patents had not expired and unquestionably the Hornsby-Akroyd engine was then the engine best adapted to the conditions out here. Excellent engines were then made by such firms as Crossley Brothers, Ruston Proctor & Co. and Tangye & Co., but they were only suitable for working with kerosine oil; whilst the Hornsby-Akroyd engine would work almost equally well with liquid fuel, the cost of which in Madras varies from one-third to one-fourth that of kerosine oil. In a factory the cost of running the oil engine is but a fraction of the daily working expenses, but in a pumping installation the cost of running the oil engine is everything, and economy in fuel consumption is therefore a matter of great importance. The Hornsby-Akroyd patents have now expired and there are a large number of oil engines on the market which will run

either with liquid fuel or kerosine oil. But, so far as I am able to judge, it appears to me that Messrs. Hornsby & Sons of Grantham are still turning out the most suitable engine for our work. I have carefully considered the question as to whether we should try other types of engine and I have decided that it is inadvisable to do so mainly for the following reason. The successful working of oil engines for pumping depends entirely upon the fact that they can be safely left in the hands of comparatively unskilled men, but it is necessary that repairs, renewals and breakdowns should be attended to promptly and at the least possible cost. If, of the oil engines of one type, there are a large number at work it would pay one firm in Madras to make a speciality of the business and to keep in stock special parts required for renewals, whilst if the business were split up between two or three agency firms it would probably not be worth the while of any one of them to go in for it. Without going into details at inordinate length, it is perhaps difficult to adequately convey an impression of the importance of keeping to one type of engine, but the fact has been very forcibly impressed upon us during last year by the changes which Messrs. Hornsby & Sons have introduced into their own engines. Every change in pattern means an increase in the stock of spare parts which have to be kept available for immediate use and already there is difficulty and delay in carrying out renewals of parts of engines which have been installed three or four years ago owing to spare parts not being kept in stock either by the owners of the engines or the agents who imported them.

10. Ever since these experiments were started I have devoted a good deal of attention to studying other methods of developing power than by means of oil engines of the type we are now generally using and it will be convenient here to record the conclusions arrived at as they determine how the various schemes which come before me are dealt with. Excluding electrical methods of driving pumps which may become of great importance in the future but which at present are entirely outside the range of practical engineering in this Presidency, motive power can be obtained from steam engines, Diesel engines, and gas engines worked by producer plants. The cost of fuel whether coal or wood practically excludes steam engines altogether. For the experiments in pumping which were started at Attur a Diesel engine of 8 H.P. was got out from home, but before employing it on pumping work it was set up in the School of Arts workshops and has remained there ever since. It now forms part of the equipment of the engine driving class and when the engine is in good order it works with great fuel economy and very steadily, but unfortunately it is always getting out of order and is much too troublesome a motor for practical work. The defects are partly due to faults in the design but mainly to the small size of the engine and the makers now admit that it is not a practical motor. The smallest size of engine which is now on the market is, I think, one of 15 B.H.P. and this is said to be not altogether satisfactory in the hands of a native driver. It is an expensive motor and requires a skilled mechanic to look after it. Though it is much more economical than a Hornsby engine of the same size, the saving in fuel is more than balanced by the extra cost of superintendence and the larger amount which has to be allowed for interest and depreciation. It is not exactly easy to say at what power the Diesel engine becomes more economical than the Hornsby as so many factors have to be taken into account and each case must be dealt with on its own merits. But for irrigation work I am of opinion that the employment of the Diesel engine is not likely to prove of marked advantage for engines of under 40 or 50 H.P.

11. With the gas engine worked by producer gas I have as yet no experience in connection with pumping, but I should have no hesitation in advising the adoption of this method of producing power where the conditions are favourable. The lowest limit of size is probably about 15 B.H.P. and the main question is the cost of fuel which can be used in the gas producer. Anthracite coal is the best fuel to employ, but with coke or charcoal satisfactory results can also be obtained. All the Indian coals are unsuitable for use in suction gas producers. In Madras there are two suction gas producer plants working in the Mount Road. One of them uses anthracite imported from Wales and the other Bengal coke. Both work satisfactorily. The latter plant was tried with locally purchased charcoal with satisfactory results, but some additional scrubbers between the producer and the engine appeared to be necessary to get rid of the increased amount of tar produced. It would be desirable to set up a suction gas producer plant for irrigation work and to carry out experiments on it, but as the necessity for these experiments involves some uncertainty as to the results it would probably be better that they should be done at Government expense than at the risk taken by any private individual.

12. Whilst I was on furlough Mr. Rajagopalasawmy Mudaliar purchased a set of boring instruments capable of boring to a depth of 50 feet and during the year under review these have been in almost continuous use and the results obtained with them have been of considerable value. As a preliminary to well sinking the information yielded is often of great value and in not a few instances the boreholes themselves are a ready means of tapping supplies of underground water under pressure. In the tract of country between Pondicherry and Cuddalore artesian and sub-artesian wells are very numerous and there are a considerable number of skilled well-borers who have much experience of this kind of work. In the Coimbatore district where the wells are merely deep excavations in the partially disintegrated rock valuable additional sources of supply have been opened out by sinking boreholes, which penetrating to a much greater depth than it is practicable to sink the wells, frequently intercept water under pressure in fissures, and such water not unfrequently rises up the borehole with considerable velocity. We have no definite knowledge

as to the exact conditions, which must prevail, for the sinking of boreholes to be a profitable undertaking and it is probable that only by experience shall we be able to find out the boundaries of such areas.

13. The collection of information regarding the duty of water on the lands under the pumping stations has not yielded much information of practical value. In the first place the last two seasons had been of an abnormal character and the water-supply has in some instances been much less than was anticipated and in other cases though the water-supply was ample the deficiency of rainfall necessitated the application of an unusually large quantity of water to the soil. Information collected under such circumstances would nevertheless possess a considerable value if it could be relied upon. But so far it has proved in practice difficult to get records properly kept. The idea at the outset was that the centrifugal pump might be used as a meter to measure the water running on to the land, but experience shows that in the hands of native drivers the speed of the oil engine is generally below normal with the result that the centrifugal pump delivers only from three-fourths to seven-eighths of its full discharge. This introduces an element of uncertainty which would be of greater importance if the cultivation under the pumps was carried on under normal conditions. Most of the pumping installations are watering what was formerly dry land and the process of converting it into wet land or into land bearing garden crops takes a year or two and sometimes longer. In several instances the experimental crops have proved a failure either because no attempt should ever have been made to grow them or because the cultivation was not carried out under proper conditions. In any case the duty of water is not to be obtained from the records of a single season and I anticipate that valuable information will be obtained at some of the larger pumping stations only if provision is made for getting accurate records. This is likely to prove a great difficulty as except at the Agricultural College I have been unable to get the system of agricultural accounts kept which was devised and approved of by the Board of Revenue in resolution No. 153, dated 25th April 1904.

14. Our anticipations regarding the possibility of entrusting oil engines to the care of native drivers on a comparatively low rate of pay have been fairly well realised and during the year an oil engine driving class has been opened in the School of Arts for the purpose of training boys and young men to look after oil engines. A considerable number of pupils attended during the year and all those who have qualified themselves have easily found employment. The engine driving class is however not yet in a satisfactory condition. This has been mainly due to the difficulty of getting a competent instructor. It is necessary that such a man should be a good fitter with a practical knowledge of oil engines and their working, that he should be able to maintain discipline among a lot of boys, that he should speak Tamil fluently, and above all things that he should be able to teach the class what he wants them to learn and to explain in simple language the details of the processes which constitute the cycle of operations in an oil engine.

15. In the appendix, Table I furnishes a summary of the expenditure on the pumping experiments from the beginning from which it will be seen that the total expenditure in 1903–1904 was Rs. 13,646-9-6, in 1904–1905 Rs. 14,397-11-0, and in 1905–1906 Rs. 21,908-1-11. To these figures may be added a sum of Rs. 5,304 for the pumping station in the Coimbatore Jail, Rs. 4,064 expenditure at Melrosapuram, Rs. 3,717 at Villupuram and Rs. 1,996 expenditure at Attúr in the Public Works Department, making a total expenditure of Rs. 65,033-6-5. In Table II expenditure for 1905–1906 is classified under the heads of establishment, supplies and services and contingencies, and in Table III details of expenditure under the latter two heads are given for each installation and included in this are some small items of expenditure incurred in boring operations on various Government farms. The accounts for 1905–1906 do not include any of the expenditure for the pumping stations on the experimental farms at Hagari and Coimbatore. The expenditure at Attúr includes the cost of an 8 Horse Power Diesel engine which was got out as an experiment but was never sent there and it is now used for demonstration purposes in the engine driving class at the School of Arts. There is also to the credit of the Attur installation a sum of Rs. 450, due to the sale of the 5″ pump to Mr Appasawmy Mudaliar. The accounts of the installation at Villupuram include the cost of the Priestman engine which ought never to have been sent there. The Kadiampatti installation is debited with the cost of two centrifugal pumps. The first one proving unserviceable was returned to Madras and after certain alterations was set up at Attur in place of the 5″ pump and it is now working perfectly satisfactorily.

16. During the year under review I have endeavoured as far as possible to supply all those interested in the agricultural development of the country with as much information as possible regarding the development of lift irrigation by means of engines and pumps, and to this end I have delivered lectures at Madura, Tinnevelly, Tanjore, Bellary, Coimbatore and Madras and I have contributed nine articles on the subject to the columns of the *Madras Mail*. As there is practically no literature on the subject of irrigation by pumping, there has been a considerable demand for these papers and I have lately arranged with Messrs. G. A. Natesan & Co. to issue them in book form under the title of "Lift Irrigation". The publication will be similar to the one issued about three years ago entitled "Agricultural and Industrial Problems in India" and is being done at Messrs. Natesan & Co.'s risk.

Appendix.

In the following notes details are given of some of the pumping stations which have been at work or under course of construction during the past year.

Melrosapuram.—This is the first pumping station which was started in the Presidency, the engine having begun work in 1902 and the results which have been obtained there up to the end of April 1905 are fully set forth in Bulletin No. 54 of the Agricultural Department entitled "Note on Irrigation by pumping from a well at Melrosapuram." To the information there given, the following details of the working of 1905–1906 are added. The failure of the north-east monsoon in 1904 produced a very marked effect upon the supply of water yielded by the well during nearly the whole of 1905. In the early months of the year the rainfall was insignificant During the south-west monsoon there was an average rainfall and early in October several days of very heavy rain occurred. The water-supply yielded by the well gradually decreased till the middle of August, after which date its capacity was not fully tested due to the fact that the rainfall enabled pumping to be dispensed with for part of the time, but it was not till the heavy rains of October when over 20 inches fell that the subterranean reservoir was properly replenished.

From an agricultural point of view the year therefore was a very unsatisfactory one. The working expenses including charges for interest and depreciation amounted to Rs. 1,873, whilst the value of the produce was only Rs. 1,331. As I have pointed out before this farm has never been worked in an economical manner and probably less so than ever last year. The engine was run for 944 hours and started 449 times and the average lift was 27½ feet. On so high a lift the engine was undoubtedly overworked and it would probably have broken down had the runs on this lift been of long duration. The Worthington Volute pump which was put in just before the beginning of the year has proved extremely satisfactory and has developed an efficiency over all of fully 50 per cent. This is an extremely good result and it is a great pity that the Worthington Company have discontinued its manufacture as they could only produce it at a high price and were unable to meet the competition of less efficient but cheaper pumps.

Besides the oil engine and pump, there is at Melrosapuram a Chicago aermotor with a 10 feet wheel and observations of the work done by this aermotor have been maintained during the months that it was at work. Last year Government sanctioned the purchase of a 16 feet wind engine of the type which had been awarded the gold medal at the trials of wind engines made by the Royal Agricultural Society of England in 1903. This windmill arrived during the year and was erected at Melrosapuram just before the close of the period under review. The mill is very substantially constructed and is provided with an arrangement whereby the stroke of the pump can be altered to suit the force of the wind. The wind-mill has been at work for some months now, but as yet I have not had time to carry out any systematic experiments with it. The records maintained will show the actual amount of water lifted every day and a comparison can be instituted between this windmill and the Chicago aermotor which is at work only a few hundred yards off. Such results as are available will be included in the second report to be submitted later on.

The Saidapet Installation.—This installation consists of a 6½ H.P. engine and a 4″ centrifugal pump. The water is lifted from a well connected with the Adyar river by means of a culvert. This is the only installation where accurate figures regarding the working of the pump and the agriculture under it have been maintained. It was assumed when the installation was designed that the maximum lift would not exceed 25 feet. But the failure of the north-east monsoon in 1904 caused the Adyar river to fall to a much lower level than it had ever been known before, and the maximum lift in August was over 30 feet. Whilst working on these high lifts the engine gave a good deal of trouble and proved extremely unsatisfactory. Finally an accident happened which it was considered would take more than a week to repair and as the crops on the ground were of unusual value owing to the dryness of the season, it was decided to at once put in a new engine which happened to be available and to repair the damaged one at leisure. Shortly after this a very heavy thunderstorm occurred which raised the water-level in the river 12 feet and since then no further trouble has been experienced except such as was due to the carelessness of the driver. Since the beginning of the year this source of trouble has been entirely got over as the driver has been given to understand that every time the engine gets out of order he will be fined Rs. 5. The total cost of working the engine including a bill of Rs. 471 for repairs and including an allowance of 12½ per cent. for interest and depreciation on the capital outlay amounted to Rs. 1,345. The engine worked on 202 days for 1,820·4 hours and lifted over 2·5 million gallons of water on an average height of 24 feet. The value of the crops raised amounted to Rs. 2,373 and the expenditure to Rs. 1,693. The value of the crops would probably have been much greater but for the fact that the cholam crops became diseased and had to be removed just at the time when the price for fodder was abnormally high. The cost of lifting the water during the year was equivalent to 4,126 cubic feet lifted one foot high for one anna.

Attur.—This experimental installation from which so much was expected has hitherto proved a failure owing to the small supply of water yielded by the well. The original proposals were formulated in the Public Works Department and sanctioned in G.O., No. 427 I., dated 16th April 1903, and a site for the well was finally selected by the Chief Engineer for Irrigation, the Rev. A. Andrew and myself. Subsequent experience leads me to think that no worse site could possibly have been selected. I mention this to show how little we really knew about the water-supply to wells and about the location of well sites when these experiments were initiated. At that time it was not deemed necessary to make a preliminary exploration of the ground by putting down borings as it was tacitly assumed that on the banks of a river like the Pálár an ample water-supply would be got at without any difficulty. As a matter of fact the well which was 15 feet in diameter and which was sunk by Mr. S. Rajagopalasawmy Mudaliar during my absence on furlough after penetrating the surface deposits of sand entered into a bed of alluvial clay which was found subsequently by boring to extend to a depth of more than 80 feet. To assist in sinking the well an 8 H.P. engine and a 5" pump were erected and when the well-sinking operations were continued to a depth of 33 feet it was found desirable to put in a smaller pump. The 5" pump was accordingly removed and a 4" pump substituted. The water-supply from the well amounts to an average of about 20,000 gallons per day and is only sufficient to keep a few acres of land in the immediate neighbourhood under cultivation. At the outset a considerable area of land had been acquired for experimental purposes and when it was demonstrated beyond doubt that the well was a failure, I had a series of borings made in the river-bed and all over the land which had been acquired with a view to selecting a site for the new well. When it was finally decided to convert the Attur station into an experimental farm, a site was selected for a new well and as a preliminary a 2½ feet pot-well was put down as far as it could be got without incurring expenditure on pumping. Tests were then made with a manual pump and it was found that from this pot-well 1,500 gallons per hour could be obtained with a very small depression of the water-level. A well 15 feet in diameter is now being sunk on the spot and it is anticipated that it will yield sufficient water to keep the engine and pump fully at work and to supply the experimental farm with as much water as is needed. I have thought it desirable to dwell at some length on the failure of this well at Attur, because it is from our failures possibly even more than from our successes that we acquire information which enables progress to be made. The Rs. 2,000 or 3,000 which have been spent at Attur will yield a very good return if they prevent a repetition of similar mistakes in the future.

Villupuram.—This installation was started in the Public Works Department and designed by Mr. S. A. Subramania Aiyar, the Executive Engineer, South Arcot Division, and was sanctioned in G.O., No. 48 I., dated 9th January 1904, and transferred to the Board of Revenue in G.O., No. 633, Revenue, dated 15th June 1904. At the time I took over charge I found that the work had been almost completed and that a 6" pump and a second-hand Priestman oil-engine had been installed. This engine had been in use for sometime in the Public Works Workshops where it had proved very troublesome to work. It had then been returned to the Stores and finally issued for use on an experimental pumping station. On my first visit to Panampattu I found the engine completely erected and supposed to be ready for work. With a great deal of trouble we managed to set it in motion and it was obvious that the valves were in such a defective state that they would have to be reground before any useful work could be got out of the engine. This was done, but other defects were also discovered and as my previous experience with this type of engine made me absolutely certain that it would prove a failure for pumping experiments, I recommended that a Hornsby engine of the same size should be substituted for it and the Priestman engine discarded. This was done and the installation completed. After a few days running it was found that we could obtain an average supply of 30,000 gallons of water per hour from the well without difficulty. The well and pumping installation were situated on a small patch of land which had been specially acquired for the purpose and when negotiations were entered into with the neighbouring ryots, it was found that they were unwilling to pay anything for the water and hoped that they would get it from Government free of charge. As the working of this installation was one of great interest to Messrs. Parry & Co., who hoped by similar means to greatly extend the area of sugar-cane cultivation in the South Arcot district, an arrangement was finally come to with them, whereby for a period of two years they undertook the management of the installation and agreed to bear all the working expenses and to make such arrangements with the ryots in regard to cultivation as they could. The result has been very satisfactory. Between August 1905 and 1st April 1906, the engine was worked for 813 hours 21 minutes on an average lift of 13¾ feet. The average discharge of the pump was about 24,000 gallons per hour and the cost of working equivalent to 5,800 cubic feet of water lifted one foot for one anna. After the rains were over, it was found that the ryots in the immediate neighbourhood were willing to pay water-rates up to as much as Rs. 5 per acre per month for the irrigation of paddy and groundnut crops as they found it cheaper to obtain a supply of water from the pumping station than to employ coolies to lift it from their own wells by means of a picottah. This result is one of very great importance in establishing the proposition that well cultivation is at any rate in some districts limited by the resources of the ryots and not by the supply of water. Subsequent observations in this part of the country lead me to think that only a small portion of the total available supply of underground water is at present used and the reason that more is not used is that the cost of raising the water becomes prohibitive when current market rates for labour have to be employed.

Cuddalore.—In February 1904, I arranged with Mr. Devanayagam Mudaliar to provide him with a 3½ H.P. engine and a 3" inch pump to raise water from a well on his lands near the banks of the Penniar river. The original well was only 12 feet in diameter and he undertook to sink another one alongside of it 20 feet in diameter. Whilst the work was in progress Mr. Devanayagam died, but his brother Mr. S. Pandurangam Mudaliar took it up and has carried it on ever since, displaying in the development of the resources of his land the greatest possible energy and enthusiasm. At the beginning of the year the new well had been sunk and the supply of water was fairly satisfactory, but the average lift was 27 feet which was a heavy strain for a 3½ H.P. engine driving a 3" pump. When Mr. Pandurangam Mudaliar had satisfied himself that irrigation by pumping was a profitable way of investing money, he decided to return to us the 3½ H.P. engine and the 3" pump and to instal at his own expense a 9½ H.P. engine and a 4" pump. This was done and the work of erecting the same was undertaken by one of my subordinates. It was obvious however that the water-supply to the well was insufficient to give anything like full employment to a 4" pump and in the early part of this year Mr. Pandurangam Mudaliar employed some well-borers from Pondicherry to put down a bore-hole at the bottom of one of his wells. I may mention that last year we put down one to a depth of 50 feet without any result, but the second attempt with the Pondicherry men proved much more successful as, at a depth of 56 feet below the bottom of his well, water under pressure was tapped and it came up the pipe into the well and filled it up to within 13 feet of ground. After a few days' pumping, however, the supply decreased and it now amounts to about 140 gallons per minute. A second bore-hole put down at first yielded a good supply of water, but after a few days it fell off and the supply is now comparatively small and it is now intended to put this bore-hole still deeper when possibly the supply will improve. The work of Mr. Pandurangam Mudaliar in connection with these borings is very interesting and may become of great importance as it reveals the existence of sub-artesian water in the immediate neighbourhood of Cuddalore. During the year the 3½ H.P. engine and the 3" pump were worked for 915 hours at a cost of Rs. 372-7-0 and the cost of lifting water was 5,000 cubic feet lifted one foot high for one anna. The 9½ H.P. engine and 4" pump worked 639 hours at a cost of Rs. 478 or at the rate of 12 annas per hour; this on an average lift of 27 feet is equivalent to 6,750 cubic feet lifted one foot high for one anna. The total quantity of water lifted during the year amounted to 3,017,000 cubic feet whilst the area under cultivation was 14·78 acres. The land therefore received 4·7 cubic feet of water over the whole surface. The total expenditure amounted to Rs. 1,757-11-0 and the gross income to Rs. 1,943, the small profit actually realized being due to the fact that the system of intense cultivation has just now been introduced on the farm and requires more than one year for the realisation of the full return. Notwithstanding the unusual dryness of the present season, the area under cultivation has now reached 25 acres and it is Mr. Pandurangam Mudaliar's intention to gradually extend the cultivation till either all the land he possesses is fully cultivated or the limit for which the water-supply is possible is reached. In addition to the cultivation at Cuddalore, Mr. Pandurangam Mudaliar has a second pumping station at Siruvanur about 10 miles west of Villupuram. Here he has an ordinary well sunk into a bed of sand which yields sufficient water to keep a 4" pump at work. The place is somewhat inaccessible and I have only been able to visit it once. At that time cultivation had not yet been started and it is only recently that work has been seriously taken up. I understand that Mr. Pandurangam Mudaliar has only a share in this property and the other members of the family have to be consulted before new developments can be undertaken.

Kattalai.—In G.O., No. 533, Revenue, dated 25th May 1904, it is stated "Government are pleased to permit M.R.Ry. Tota Ramanujam Chettiar to pump water from the Cauvery near the village of Kattalai for the purpose of irrigating his land. He will be allowed to take water free of charge for five years, at the termination of which period water-rate will be levied under the rules applicable to the case". Acting on this Government Order Mr. Tota Ramanujam Chettiar has erected with the assistance of this department a 25 H.P. Hornsby-Akroyd oil-engine and a 12" pump. Previous to the issue of this Government Order I designed for Mr Tota Ramanujam Chettiar a pumping station consisting of a 25 H.P. engine and a 12" centrifugal pump, the whole to be erected on the padigai inside the river flood bank and the water raised from the river to be carried through the bank by means of a culvert. The plant was ordered from England, but the steamer conveying it became a total wreck on the Spanish Coast and a good deal of delay was thereby caused, so that on my return from furlough the pumping station had not been completed. In the original design the 25 H.P. engine was provided to drive the pump direct, but this was modified in my absence by the introduction of a countershaft and the addition of an 8" pump which Mr. Tota Ramanujam Chettiar happened to be the possessor of. At the time the installation first began to work, the water in the river was unusually low and the engine did not work satisfactorily. The difficulty of finding out what was the matter was greatly enhanced owing to the indicator with which our investigations were made having been supplied by the makers with incorrectly marked scales, and it was only when the errors in the indicator were discovered that proper remedies could be applied. Without going into details it was found that the engine was considerably overloaded when the water in the river was low and that this was partly caused by the introduction of the countershaft and partly by a too sanguine estimate of the minimum water-level in the Cauvery river. The installation is now worked with the 12" pump when the water in the river is fairly high and with the 8" pump when the water-level is low. In practice the result is satisfactory as the area under

cultivation during the dry months of the year is much smaller than during the flood season when the whole of the land is under cultivation During the year commencing with August and ending with February the engine worked on 70 days for 665 hours and supplied water to about 180 acres of land. The volume of water lifted from the river was about 16,000,000 cubic feet and the cost of working, including interest and depreciation, at the rate of 6 500 cubic feet lifted one foot for one anna. Had the pump worked a greater number of hours the cost would have been proportionately lower. During the greater part of the season the water-supply was derived from the Amaravathi spring channels, but this supply though abundant at times was precarious and insufficient to bring the crop to maturity. The land was cultivated by lessees who sublet it and it is not practicable to give actual figures regarding the increase in yield due to the employment of the engine and pump. But a comparsion of the 180 acres irrigated by the engine and pump with lands under the same spring channel shows that the gross yield increased by about Rs. 10,000, whilst the working exponses amounted to Rs. 1,266. The total capital outlay on the whole installation was about Rs. 14,000. Allowing for increased cultivation expenses which it is impossible to estimate, there is no doubt whatever that a very good return on the installation was secured even during the first year of its working, but owing to old leases being still in force Mr. Tota Ramanujam Chettiar only secured a comparatively small proportion of the profit.

Nellikuppam.—Mr. Tilla Govinda Gramani, a ryot at Nellikuppam, obtained a loan of Rs. 3,000 under the Agricultural Improvement Loans Act and a loan of Rs. 2,000 under the Land Improvement Loans Act. A well has been sunk on his land 20 feet in diameter and a 9½ H.P. engine and 4″ pump erected The supply of water has proved extremely satisfactory and he is able to keep the engine and pump running as long as he likes, which means that the well is capable of yielding between 300,000 and 400,000 gallons of water a day. In addition to the pump a mill for crushing sugarcane has also been installed and the engine can drive either. I am not sure that the arrangement will prove satisfactory as I expect that the irrigation under the pump will necessitate pumping all through the sugarcane season and that no power will be available to drive the mill. Eventually therefore it seems likely that either another engine will have to be provided to drive the mill or that the mill will remain practically unutilised. Native agriculturists are very keen about having combinations of this kind, but I am totally opposed to them and it was only because Mr. Tilla Govinda Gramani had purchased the mill before he came to me about the engine and pump that I agreed to give the arrangement a trial. A much more satisfactory arrangement is to provide a sugarcane mill and a rice huller to be driven by one engine, the former being used during the sugarcane season and the latter during the rest of the year.

Kadiampatti.—The engine and pump at this installation belong to Government and part of the working expenses were met by the department during the year, the total expenditure amounting to Rs. 739–3–10. The installation consists of a 6½ H.P. engine and a 4″ pump and it was installed early in 1904. During the whole of the first season the installation worked so badly that Mr. Anderson, the owner of the land, watered by the pump, was involved in considerable pecuniary loss. Immediately after taking over charge on my return from furlough I went down to Kadiampatti and put the installation in good working order and since then it has given no trouble. The unsatisfactory working was due to changes in the design of the plant whilst I was on furlough, which resulted in trying to make the engine work at double its designed power. The history of this plant is interesting as showing how easy it is to get into a hopeless muddle when slight defects are wrongly diagnosed. This installation draws its water from a well which was specially sunk for it by Mr. Anderson on the banks of a ravine through which the drainage of a small valley in the Shevaroy hills passes. As the percolation into the well did not realise Mr. Anderson's anticipations, an adit was run into the ravine at a sufficiently low level to draw off any water coming down. From June to December there is a very good water-supply, but in the early months of the year the supply falls off and in March, April and May it is only sufficient for a small area. During the year the engine was run on 272 days for 1,877 hours and about 3 million gallons of water were raised an average lift of about 20 feet. A great variety of crops were cultivated and many of them resulted in an unsatisfactory return, especially there was a heavy loss on the plantain cultivation, owing to the failure of water-supply during the hot weather. It is not worth while quoting the figures I have obtained from Mr. Anderson, as many of them are comparatively rough estimates, but he has supplied me with sufficient information to show that on the whole the employment of the engine and pump was fairly profitable and he is sanguine that this year he will be able to obtain very much better results profiting by the experience of the last two seasons.

Coimbatore Jail.—This installation is interesting in many respects. It was entirely erected by the Public Works Department and handed over to us in working order. The engine is a 6 H.P. Ruston Proctor oil-engine which will only work with kerosine oil. The pump is a double plunger pump locally made by Messrs. Massey & Co., and it works on an average lift of 62 feet. Mr. Gadsden, the Superintendent of the Central Jail, has kindly furnished me with the following figures. The pump was worked for 1,630 hours and raised 5,343,000 gallons of water. The land under the pump yielded produce to the value of Rs. 958 and the working expenses including Rs. 490–12–6 for kerosine came to Rs. 727–11–6. If it had been possible to use liquid fuel,

the profit on the installation would have been more than doubled. The water-supply to the well is about sufficient to keep the engine and pump at work for five hours a day and it is possible that it might be further increased either by running out horizontal adits or by deepening the well.

Manamadura.—This installation was erected at a well sunk about half a mile to the south of the Vaigai river near the Manamadurai Railway station. The land was acquired by the Madura District Board for an experimental farm and was handed over for working to the Rev. C. S. Vaughan of the American Mission. Unfortunately the soil was in a poor condition and Mr. Vaughan has not had at his command sufficient funds to do justice to the enterprise so that it has resulted in a failure, and the engine and pump are now being removed to be erected elsewhere. The only result of any practical value which has been obtained at this Manamadura installation is the fact that from a well 12 feet in diameter sunk to a depth of only about 16 feet it has been possible to extract as much water as a 3″ pump working continuously could lift. The water-level in the well varied about 18″ during the year and though the engine was only worked for 830 hours there is but little doubt that it could have been worked continuously and that at least a quarter of a million gallons of water per day could have been obtained from this source or sufficient for probably 100 acres of sugarcane or plantains in that neighbourhood.

Bezwada.—The District Board have opened a demonstration farm in the immediate neighbourhood of Bezwada on land between the Ryves' and Ellore canals and to supply it with water an engine and pump have been erected, the supply of water being obtained from the Ryves' canal. The engine is one of 3½ H.P.and the pump a 3″ Worthington, similar to that put down at Melrosapuram. The engine commenced working in August and up till the end of March had been run for 1,472 hours at a cost of Rs. 890–15–0 which includes Rs. 335 for interest and depreciation on an expenditure of Rs. 2,682. The average lift was 19½ feet and the discharge about 10,000 gallons per hour. The cost of working was at the rate of 3,200 cubic feet lifted one foot high for one anna.

Chittatur.—This is a private installation erected for Mr. P. Appasawmi Mudaliar with a loan of Rs 5,000 under the Agricultural Improvement Loans Act. The water-supply is derived from the Adyar river on the banks of which a well has been sunk and connected by a brick culvert with the lowest portion of the river-bed. The engine is a 14 H.P. Hornsby and and the pump a 5″ Gwynnes centrifugal, being that which was removed from the well at Attur to which reference has already been made. The area of land owned by Mr. Appasawmi Mudaliar amounts to about 100 acres, but as the engine and pump were only started in February, the area brought under cultivation is not yet very large. The capacity of the pump is about 24,000 gallons per hour and at present it is being run from 8 to 10 hours daily. As Mr. Appasawmi Mudaliar is the retired Head Accountant in the Inspector-General of Police office, he understands keeping records properly and as he has promised to maintain the registers which have been drawn up, next year we ought to secure some useful information regarding the duty of water on his land.

Trichinopoly junction.—In the early part of last year the late Hon'ble Mr K. Vasudeva Aiyangar of Sriraugam purchased a 3½ H.P. engine and a 3″ pump which were erected at a well on some land belonging to him near the Junction station. The well was a very old one and had fallen into ruins. When first inspected it was found to be 24 feet square and contained about 16 feet of water. It was emptied by the pump in a comparatively short time and the springs were found to yield but a very unsatisfactory supply of water about 25,000 gallons per day during the cold weather and about 15,000 gallons a day in the dry months of the year. The Honourable Member undertook the work of improving the well himself and deepened it all over to the extent of 8 feet and on the west side he enlarged it by 9 feet, making it a rectangle 33 feet × 24 feet and 26 feet deep. On this work he expended Rs. 750 and without much result. I was unaware that he was doing this, otherwise I should have advised him to have confined the deepening to a much smaller area and not to have enlarged the well at all This is a case where two or three borings might have been put down at a very small expense and would have yielded a great more information than has so far been obtained. Quite recently I received a long letter from the late Honourable Member discussing what might be done to improve the supply to this well and asking me to come down and see it and finally settle what should be done. I accordingly made an appointment with him, but on my arrival at the Trichinopoly station I heard of his untimely death on the previous day. I understand that his sons take considerable interest in this method of irrigation and it is probable that they will continue the work begun by their father.

The other pumping stations which have been erected possess no unusual features and none of them have been at work long enough for any results regarding the duty of water to have been obtained.

TABLE I.—Expenditure on pumping stations.

—	1903-1904.	1904-1905.	1905-1906.
	Rs. A. P.	Rs. A. P.	Rs. A. P.
Cuddalore	1,530 0 0	435 6 2	284 2 0
Kadiampatti..	2,426 9 6	1,380 10 4	739 3 10
Manamadura	1,640 0 0	939 2 1	809 4 10
Saidapet	2,850 0 0	678 9 9	251 12 4
Attur..	5,200 0 0	3,083 1 7	1,645 13 1
Melrosapuram	..	517 14 9	3,160 1 4
Villupuram..	..	1,089 12 6	3,672 1 9
Pandur	..	..	128 10 0
General account	..	1,629 3 6	2,944 4 6
Establishment	..	4,643 14 4	7,917 8 9
* Miscellaneous	..	..	355 3 6
Total ..	13,646 9 6	14,397 11 0	21,908 1 11
Total expenditure 1903-1906 ..	Rs. 49,952-6-5.		

	Rs. A. P.
* Coimbatore	117 12 6
Talaparamba	119 13 0
Koilpatti	65 12 0
Hagari	51 14 0
Total ..	355 3 6

Expenditure by Public Works Department.

	Rs.
Coimbatore Jail	5,304
Melrosapuram	4,064
Attur	1,996
Villupuram	3,717

TABLE II.—Cost of establishment from April 1905 to March 1906.

Designation.	Salary.	Travelling allowance.	Total.
	Rs. A. P.	Rs. A. P.	Rs. A. P.
Supervisors	* 5,227 2 3	1,570 11 6	6,797 13 9
Sub-overseer	420 0 0	187 0 6	607 0 6
Peons	178 0 3	334 10 3	512 10 6
Total ..	5,825 2 6	2,092 6 3	7,917 8 9

		Rs. A. P.	Rs. A. P.
Supplies and Services—			
Purchase of machinery		2,327 13 0	
Repair of „		634 4 0	
Maintenance of „		1,586 0 3	
Wages		1,239 14 5	
Materials		2,246 6 8	
Tools and plant		4,731 4 8	
Petty works of construction		323 14 0	
			13,089 9 0
Contingencies—			
Petty repairs		412 5 8	
Telegrams		28 4 0	
Postage		50 1 0	
Tour charges		72 7 0	
Office expenses		326 10 0	
		11 4 6	
			901 0 2
Total ...			13,990 9 2

TABLE III.—Expenditure on pumping installations and general head of account, 1905-1906.

—	Purchase of machinery.	Repairs of machinery.	Maintenance of machinery.	Materials.	Wages.	Tools and plant.	Petty construction.
1	2	3	4	5	6	7	8
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1. Mánámadurai ..	..	51 0 0	274 4 3	314 9 8	105 2 9	4 1 4	..
2. Kadiampatti ..	..	66 4 0	50 14 6	387 11 9	104 0 0	102 5 7	..
3. Attur	..	66 8 0	341 6 0	431 4 6	593 7 0	131 7 4	..
4. Villupuram ..	2,253 0 0	..	714 2 6	119 1 3	257 6 8	4 1 4	323 14 0
5. Melrosapuram ..	..	90 4 0	52 15 0	331 14 0	9 8 6	2,279 7 9	..
6. Cuddalore	..	96 12 0	103 14 0	10 4 0	..	50 0 0	..
7. Saidapet	..	223 12 0	3 0 0	20 8 0	..	4 1 4	..
8. Pandur	..	..	..	102 9 0	..	..	..
9. Hagari	..	..	27 6 0	..	..	..	..
10. Koilppatti	..	..	..	0 8 0	22 13 0	..	..
11. Taliparamba ..	..	..	..	0 2 0	94 1 6	..	..
12. Coimbatore	..	..	..	46 10 6	48 7 0	5 8 0	..
13. General	74 13 0	39 12 0	18 2 0	481 4 0	..	2,150 4 0	..
Total ..	2,327 13 0	634 4 0	1,586 0 3	2,246 6 8	1,239 14 5	4,731 4 8	323 14 0

—	Repairs.	Office expenses.	Tour charges.	Telegraph charges.	Miscellaneous.	Postage.	Total.
	9	10	11	12	13	14	15
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
1. Mánámadurai ..	50 14 10	9 4 0	..	..	..	..	809 4 10
2. Kadiampatti ..	..	23 0 0	..	..	..	..	739 3 10
3. Attur	18 6 3	58 6 0	..	..	..	..	1,645 13 1
4. Villupuram ..	..	..	0 8 0	..	..	..	3,672 1 9
5. Melrosapuram ..	333 3 7	51 12 6	11 0 0	..	..	..	3,160 1 4
6. Cuddalore	..	23 4 0	..	..	..	..	284 2 0
7. Saidapet	..	..	0 7 0	..	..	..	251 12 4
8. Pandur	..	26 1 0	..	..	..	..	128 10 0
9. Hagari	..	..	24 8 0	..	..	..	51 14 0
10. Koilpatti	9 13 0	32 10 0	..	..	..	..	65 12 0
11. Talipparamba ..	..	10 7 0	15 2 6	..	..	..	119 13 0
12. Coimbatore	..	13 7 0	3 12 0	..	..	..	117 12 6
13. General	..	68 3 6	17 1 6	28 4 0	16 7 6	50 1 0	2,944 4 6
Total ..	412 5 8	321 7 0	72 7 0	28 4 0	16 7 6	50 1 0	13,990 9 2

MADRAS,
9th June 1906.

(Signed) A. CHATTERTON,
Professor of Engineering,
on Special Duty.

APPENDIX IV.

ANNUAL REPORT OF THE GOVERNMENT BOTANIST.

I have the honour to present the following report of the work done in my office during the year 1905-1906.

2. The work of the Government Botanist has undergone a further modification during the year. Agriculture and farm management and the various matters connected with the expansion of the Madras Agricultural Department have occupied most of his time. The acquisition, laying out and management of three considerable Agricultural stations, all of them undermanned, have left little time for the more scientific aspects of the Government Botanist's duties. At the same time the addition of fieldmen to the staff has had the desired effect, in that the work of the Assistants in their various branches, systematic botany, economic botany, mycology and entomology, has been less interfered with than was the case last year. The office has, however, been very seriously undermanned, especially in the clerical section, where although the work has nearly doubled, no increase of clerks has been sanctioned. Added to this, there has been an unusual amount of sickness right through the office and the whole of the work of the official year has been conducted under the greatest difficulties. These facts have seriously militated against the careful inspections which formed such a marked feature in the work of the Samalkota farm in previous years and which it was intended to introduce at Palur and Taliparamba.

Numerous changes in the office arrangements have been necessary at various times owing to alterations in the character of the work and additions to the staff. The work of rearrangement of the collections, commenced last year, has been completed. The additional microscopic room has been finished and is at present devoted to the Mycological Assistant. The Entomological room was found to be infested with white-ants and had to be refloored. The main room was without ventilation and too dark and sky-lights have been added. A Mycological Assistant, an additional Entomological Assistant and a Librarian have been added to the staff.

3. The Government Botanist spent 206 days away from head office and, on account of ill-health, was obliged to use to its full extent the sanctioned transfer of his office to the hills for two months. Seventeen visits were paid to the three Agricultural stations under his control. A tour in the Wynaad was devoted to the study of the cultivated and indigenous peppers. The latter were also studied and collected on the *Tambracherry ghaut* and in the *Palnis*. Two visits were paid to the small experimental farm at *Vadagarai*. Several visits were made to *Coimbatore* in connection with the founding of the Central Research station of the department while the farms at *Pittlapur* and *Melrosapuram* were also examined. As in the previous year the Government Botanist attended the *Pusa* Agricultural Conference in January, spending four days at the *Royal Botanical Gardens* at *Sibpur* and the *Museum* of the *Reporter on Economic Products en route.*

The Assistants and fieldmen spent altogether 536 days on tour. Besides numerous visits to all the three farms, tours were made in *Vizagapatam* for the study of jute, *Mysore* for the collection of the sandal flora, *Travancore* for collecting specimens for Kew, *Udamalpet* for the study of a serious outbreak of disease in horsegram (*Dolichos biflora*), *Attur* to study and combat the pests of the cotton plant, *Melrosepuram* for the inspection of land for a proposed sugarcane nursery, *Tanjore* to attend the Agricultural and Industrial Show, *Kodaikánal* for the collection of grasses and peppers, and the slopes of the *Palnis* for various other collections.

One of the farm officers toured over the *Gódávari* district assisting Dr. Butler in the study of the palmyra disease, and prepared a village map of the affected area. He also made two tours through the taluks of the district to note the relative merits of the new and the local canes. The Taliparamba officer examined the pepper cultivation in thirty villages of the *Chirakkal* and *Kottayam* taluks. Besides this numerous visits were paid by the various members of the staff to the *Saidapet farm* for the collection of specimens of economic plants and the study of various diseases.

4. The work in *Systematic Botany* has been of a varied character. The whole collection has been kept thoroughly cleaned during the year. The sheets "not yet added to the herbarium" have been completely rearranged for ready reference. This necessary work was somewhat laborious as the number has now reached over 10,000 sheets. A very large number of sheets have been mounted during the year. Of these the chief collection was that of *peppers* with 679 sheets while the *balsams* numbered 115. Of other plants 3,825 sheets were mounted, bringing up the total to 4,619.

The *balsams* (*Impatiens*) received some attention and further collections were forwarded to Sir Joseph Hooker for determination. The results were unexpectedly interesting in that some ten new species were discovered to occur in South India.

The *sandal* (*Santalum album*) flora collected in the typical Mysore zone was worked out by the Assistant.

A very large number of *peppers* (*Piper nigrum*) was collected and worked out by the Government Botanist, chiefly from the Nilgiris, the Tambracherry ghaut and the Wynaad, the Palnis and the Anamalais. Valuable drawings of the more important species were added to the collection.

The flora of the Taliparamba farm received marked attention, the trees and shrubs growing on the farm being collected and named.

A collection of the different species of *barberry* (*Berberis*) was made for Mr. Drummond, I.C.S., chiefly from the Nilgiris, and a set of the seeds of *sundew* (*Drosera*) was obtained for an American correspondent.

The whole collection the *Gentians* (*Gentianaceæ*) was forwarded to the Reporter on Economic Products for naming. Part of the collection of ebonies (*Diospyros*) sent to Calcutta for the same purpose was returned. The *Lemon grasses* (*Andropogon Schœnanthus* and *A. Nardus*) were also forwarded to Calcutta and afterwards to Kew for similar treatment.

A special expedition was undertaken to the Travancore hills for the collection of germination stages of *Ochlandra travancorica*. This was done at the instigation of Sir Joseph Hooker and the results were the formation of a very fine collection in spirit of all stages, which was forwarded to Dr Stap at Kew.

A special study was made of the Madras *root-parasites* and their hosts, the latter being named by the Assistant. A very large collection of the root connections (haustoria) was made in spirit for future work. This was chiefly of *Santalum*, *Osyris*, *Thesium*, *Olax*, *Canajera* and *Ximenia*. A first paper on the sandal haustoria was sent to the Editor of the Pusa memoirs in September.

Numerous minor lots of plants were named for correspondents, largely Forest officers, during the year. Among these was a set of plants forwarded by the Collector of Malabar from the *Laccadives*.

Two hundred sheets of plants were forwarded to the Director of the Botanical Survey for incorporation into the local floras of the Calcutta herbarium, and forty Calcutta sheets were received in exchange from him.

5. The work in *Economic Botany* has been found inseparable from that of the farms. No definite agricultural tour by the Government Botanist has been possible in the year, and the work has been more or less desultory. Now that the farms are established and are to have adequate staffs, the Assistant in Economic Botany should be freed for more definite work in this direction.

A considerable amount of correspondence has taken place in connection with stocking the farms with various seeds and, from the nature of the case, this work has fallen on the head office staff. Varieties of pepper, groundnut and sugarcane have been obtained from different parts of India and the world, lemon grass roots (*Andropogon Schœnanthus* and *A. Nardus*), guinea-grass *Panicum maximum*), cottons of various kinds, paddy, cholam (*Andropogon sorghum*), Mahogany (*Swietenia mahagoni*), teak (*Tectona grandis*), rain trees (*Pithecolobium saman*) and so on have been continuously collected and forwarded during the year.

A small garden has been made in the office compound, and this has been enclosed and tended. In spite of all precautions, however, it has been found impossible to keep it free from trespass and the labels are frequently torn out and even plants removed. This matter has caused considerable annoyance and has entailed a good deal of work during the year.

Advantage has been taken of the nearness of the Saidapet farm for the study of many plants and their diseases. During the year most attention has been given to cottons growing there and sugarcane, but all sorts of diseases have also been examined *in situ* and in the laboratory. No actual cultivation has been undertaken at Saidapet under the Government Botanist's control, as was done formerly.

The lemon-grasses (*Andropogon Nardus* and *Schœnanthus*) have received rather special attention during the year. The naming of the sub-varieties was found impossible in our office, and the whole collection, after specific naming in Madras, was sent first to Calcutta and finally to Kew for careful working over. It is felt that for the proper understanding of the value of the different varieties, they must be authoritatively named, and the present large collection if thus treated will form a valuable basis for the study of this important product.

A similar but much more difficult piece of work was the naming of the "*Mauritius canes*" which have crept into our Agricultural stations. These were all carefully examined for botanical differences in the field, they were then measured and drawn. The painting of previous years was completed and the canes were analysed. All these results and two-foot pieces of all the varieties were sent over to the Director of Forestry in Mauritius for determination, if possible. The results will be eagerly awaited, for the confusion that has arisen by different names being given to the same cane is likely to seriously interfere with the distribution of the best kinds. Another piece of work connected with sugarcane was the preparation for the Inspector-General of Agriculture of a scheme for enquiry into the sugarcane industry to be conducted by the various Provinces in preparation for the next meeting of the Agricultural Board.

The *Peppers* of the Peninsula have received a good deal of attention and some progress has been made towards the naming of all the wild forms and the determination of the species which have given rise to those cultivated. The work is extremely complicated and the specimens will probably need comparison with European collections before it can be completed.

6. In *Entomology* the staff has been increased during the year by the addition of a second Assistant. As he was at once sent to Pusa for training this has made no difference in the available assistance in this branch of work. On the whole the work in Entomology has not been satisfactory. A considerable number of posts have been passed under review, but the Assistant has made little progress in working out life-histories in the field.

The Barbados canes which were found to be infested with *mealy-bug* were treated with kerosine emulsion. The groundnuts at Saidapet were studied for *surul-puchi* (*Anacampsis nextoria*), but the results were inconclusive. The Assistant was sent down to the Palur farm to make a more thorough study of this serious pest but no practical results were recorded. The indigos at Saidapet were reported diseased and investigation showed the presence of *aphides*. The exotic cottons at the Agri-Horticultural gardens were examined for *boll-worm* with which they were seriously infected. An attack of *millipedes* on the groundnut at Palur was reported by the farm officer and the Entomological Assistant was sent down to investigate it. It was proved that the *millepedes* really did eat the kernels but nothing was learnt of their relative abundance in the different plots. Spraying was done with salt but the results were not clear. An attack of a serious nature being reported from Udamalpet on the local horsegram (*Dolichos biflora*) the Assistant was deputed to work out the pest, but he did not succeed in getting any trace of the insect, as the attack was over. The Assistant was despatched to Attur to conduct spraying experiments on the cottons growing there, but the results have not been reported. A similar spraying was done on the cottons in the compound of Messrs. Binny's factory. *Scale insects* were examined on prickly-pear from Tenkasi, *caterpillars* on paddy from Saidapet, *boll-worms* on cotton

from Proddatur, *acari* on cotton from Samalkota, *Lecanium* on *Ocimum sanctum* from Madras, cucumbers attacked by *caterpillars* in Bezwada, *caterpillars* defoliating *cycas* in Madras, *galls* formed by *scale insects* on *Acacia leucophlœa*, *Mytilaspis* on pepper from the Wynaad and many minor matters.

The office obtained some considerable increase in appliances during the year and the Assistant was instructed to study the various spraying apparatus and given every opportunity for using them. It is not likely, however, with the Government Botanist's many other duties, that any great progress can be made until the Assistant returns from Pusa. A considerable addition to the fieldmen will then be necessary before any practical field operations can be attempted.

7. The study of *Mycology* has taken more definite form in that an Assistant in this subject was added to the Government Botanist's staff in November 1905. It was urged that, when the proposed European Mycologist arrives, it will be of advantage for him to find some one of his Assistants already *au fait* with the commoner Madras fungus diseases. The new Assistant is to be trained by Dr. Butler at Pusa, but was, at his request, retained in Madras for preliminary study.

The whole of the collections of plant diseases were separated from the general economic collection and placed in two rooms which are devoted to Entomology and Mycology respectively. The fungi in these collections were arranged and cursorily examined by the new Assistant after his entertainment.

Owing to the serious outbreak of disease on the Samalkóta Sugarcane farm (primarily due to the exceptionally severe weather) the Mycological Assistant was deputed to make a thorough study of it and other pests on the farm. He spent about ten weeks there altogether and, besides making himself thoroughly acquainted with the sugarcane diseases, observed and wrote reports on similar outbreaks of fungus diseases in red-gram (*Cajanus indicus*), chillies (*Capsicum frutescens*), green-gram (*Phaseolus Mungo*), cow-peas (*Vigna catiang*) and sunn hemp (*Crotalaria juncea*). Other diseases reported to this office of a fungus nature included the following:—a disease on tomatoes due to a *macrosporium*, *rusts* on indigo and cumbu (*Peninsetum typhoideum*), and diseases on paddy of doubtful nature. It may be pointed out in this connection that not a few cases have occurred of specimens sent to this office arriving in an entirely unsuitable condition for examination. A memorandum on the preservation and forwardal of specimens to the Government Botanist's office has been prepared and widely distributed. I regret to say that the influence of this circular has been practically *nil*, and that specimens of all kinds continue to arrive in a condition absolutely unfit for examination or preservation.

The diseases caused by fungi which have received special attention during the year are those of the farms, sugarcane, pepper and ground-nut, while the outbreak of a serious disease in palmyras (*Borassus flabelliformis*) has also occupied us a good deal.

The *sugarcanes* of the Gódávari district have, on account of the failure of rains during the year, suffered wholesale from disease. Probably some 5,000 acres have been destroyed. The canes reared in the Samalkóta farm and widely distributed during recent years have, it is satisfactory to remark proved far better able to cope with the drought and attendant disease than the local kinds (which have been annihilated in the Peddápur taluk), but, all the same, none of the varieties collected on the farm have proved themselves perfectly immune. A very careful map of the place of origin and spread of the disease in all the plots at Samalkóta was prepared by the Mycological Assistant, and has been recorded for comparison with future observations of the same kind. The whole of the sets replanted on the farm have been carefully examined by him and none but apparently sound sets have been planted for the next year's crop.

Upon the recommendation of Dr. Butler an attempt was made at *inoculating healthy pepper* plants with the fungus lately described by him as causing the current disease in the plantations. For this purpose a special officer was sent to the Wynaad, who brought down a fine collection of living plants of all ages, from ungerminated seed to vines several years old. These were planted in large pots in the office compound. An Assistant from Dr. Butler's office was despatched and he inoculated the vines, but unfortunately succumbed to an attack of dysentery and left after a few days. The matter is here recorded because, although unavoidably frustrated, it caused a great deal of work and demonstrated the possibility of bringing such plants safely to Madras and rearing them there, where conditions of isolation, etc., are ideal. The vines on the pepper farm at Taliparamba which have died during the year have been carefully noted. It is usual that such deaths occur in patches, several together, and all such spots have been carefully marked and numbered as "disease spots" for further detailed study. The Mycological Assistant has cut many sections of dead pepper vines to make himself thoroughly acquainted with the appearance of the disease.

In *ground-nut* the disease called "Tikka," not hitherto regarded as a very formidable disease in South Arcot, has made rather a formidable appearance during the year - this also probably being influenced by the exceptional weather. It has been carefully noted, and certain varieties have been marked as specially liable to the disease. A preliminary spraying with Bordeaux mixture was performed but more for practice than anything else because of the nearness of the crop to the harvest. As before, the appearance of the disease has been carefully studied by the Assistant under the microscope.

A few isolated collections of fungi were made at Kodaikánal and forwarded to the Mycologist at Pusa. A serious disease having made its appearance among the palmyras (*Borassus flabelliformis*) in the Gódávari district, the Government Botanist was deputed to investigate it. He examined a number of trees on the spot and afterwards examined their tissues under the microscope. There being marked evidences of a fungus disease the matter was referred to Dr. Butler for investigation. Dr. Butler himself visited the plantations and an officer was deputed to accompany him. The latter prepared a careful map of all the villages of the infected areas (the two taluks of Ramachandrapuram and Cocanada) and this was forwarded to Dr. Butler. The disease appears to be caused by a species of *Pythium* new to science and Dr. Butler has proposed certain remedial measures which are under consideration.

8. There are three Agricultural stations under the direct management of the Government Botanist, the *sugarcane farm* at *Samalkóta*, the *ground-nut* and *sugarcane farm* at *Palúr* and the *Pepper farm* in *Taliparamba*.

Work upon all of these has been continuous throughout the year, there being no period of rest, as is usual in dry-crop farms. This work has been particularly heavy during the year under review. Besides the growing of the crops and the recording of results, plans have been prepared in most cases for future lines of experiment, the freshly acquired land has been laid out. Levelling, removal of bunds and trees, regulating water-channels, making roads, paths, bridges and culverts, preparing plans for and erecting buildings of various kinds and enclosing the area in fences, and other work of a fundamental character has been successfully carried out.

The actual work on these farms has been already adverted to in the administrative reports and as the scientific results will be dealt with in another series of reports, it is presumed that nothing further is required on the subject here. It may be noted, however, that, in place of the full complement of nine men for the three farms only four men were entertained during the year, and those not from the beginning, rendering the work of great difficulty all round. As the fieldmen attached to the Government Botanist's office were largely employed in supplying vacancies on these farms, the following notes as to their work are appended:—

Of the *three fieldmen* sanctioned for the Government Botanist's office, one was entertained throughout the year, the second joined duty on April 16th, while the third was appointed in the middle of August.

The *senior fieldman*, having been transferred from the Overseership of the Nilgiri Parks and Gardens, was placed in charge of the Taliparamba farm in the absence of a permanent incumbent, and conducted it for the first four months of its existence. Owing to short-handedness at Samalkota he was deputed to draw up plans and estimates for the laying out of the farm and the buildings there. On leave being granted to the Agricultural Inspector, he was placed in charge for six weeks. He was deputed to Palur to assist in reaping the groundnut crops in August. All the estimates for the buildings on the farms were prepared by him during the year. Owing to the many calls on the Government Botanist's time, it has been found necessary to depute an Assistant at Head Office to deal with matters connected with the farms generally, and the senior fieldman was set apart for this work in the middle of December, and has thus freed the Economic Assistant for other work. He was also deputed to represent the Government Botanist at the Tanjore Agricultural Exhibition.

The *second fieldman*, after being trained in the office and having acted on several occasions in charge of the Palur farm, was posted as Assistant Agricultural Inspector there in the beginning of January in the absence of an agricultural probationer sanctioned. The place of the second fieldman thus rendered vacant was not filled up during the remainder of the year.

The *third fieldman* joined the office in August. He was sent to the Taliparamba farm for a month in order to allow the agricultural probationer in charge to tour in the chief pepper taluks. He was afterwards placed under the Assistant in Systematic botany to work out the flora of the Taliparamba farm and help in the rearrangement of the sheets of the herbarium.

9. The *Library* in the Government Botanist's office has been steadily increasing for some years past. Not only has marked attention been paid to getting together a series of works useful for the study of the Madras Flora, but botanical, entomological, mycological and agricultural books and periodicals of every description have been carefully sought out and added. Under direction of the Board, all the books of the Agricultural Department were brought together during the year and a librarian sanctioned. After advertisement, one was selected out of fifty candidates and he commenced his duties on January 4th. For convenience sake, the library was housed in the Government Botanist's office, and the librarian placed under his control. His first duty was to separate the books of the Government Botanist's private collection which had hitherto formed the nucleus of the office library, and had been used by all the Assistants since the commencement. A thorough study was made of the several local libraries, and reports were prepared on the *Connemara Library*, the *Library of the Madras Literary Society* and that of the *Presidency College*. A similar study was at the same time made by the Government Botanist of the Library of the *Director of the Botanical Survey at Sibpur* and that of the *Pusa Institute*. The books and periodicals received from the Board's office were found to be a good deal neglected, and much time was spent in putting them in order. At present a rough division has been made into the following classes:—*Systematic Botany*, *Economic Botany* and *Agriculture*, *Physics and Chemistry*,

Entomology, *Mycology*, *Serials* (excluding systematic botany), *Reports* and *Bulletins*. The numbers of the periodicals have been bundled together and got ready for binding. At the same time catalogues of all sorts have been looked through for useful works, and considerable additions have been made to the library. Slip catalogues have been prepared of the serials and works in systematic botany, and a list of the other works in the library is in preparation. This will ultimately be transferred to a slip-catalogue when the card index bureau ordered arrives.

10. A *pupil* from Hyderabad was trained for several months in the office under the various Assistants and visited several of the farms. He left, however, before his period of training was completed.

Several *papers* were written for publication during the year. An illustrated account of the *varieties of pepper* growing in the Wynaad plantations was prepared, and is being printed as a bulletin of the department. A note was issued on the *treatment of sugarcane in delta lands*, and this was translated into Telugu and Tamil and widely distributed. A short paper was contributed to the Agricultural Journal of India on the *work of the Samalkota farm*, and notes were also prepared on *pepper varieties*, *striga on hill-paddy* and the *groundnut pests in South Arcot*. A paper was prepared on the *structure of the sandal haustorium* for the memoirs of the Agricultural Department of India and an account of the *Visagapatam Flora* was prepared for the District Manual.

11. The *Artist* has continued to do satisfactory work during the year. He has painted 21 sheets of canes growing at Samalkota farm, drawn 30 sheets from the Government Botanist's sketches, chiefly of wild and cultivated peppers, and sketched 13 sheets of different varieties of cotton plant from herbarium material. This latter work was largely in the nature of training. Besides this, he has spent much time on preparing and making copies of various farm maps and plans of buildings and has painted a number of labels for various purposes. The *Photographic collection* has been increased by about 100 numbers, and the whole has been brought together in a series of labelled boxes with a register of contents. As has been pointed out, an additional artist capable of doing photographic work is badly needed.

MADRAS,
9th June 1906.

C. A. BARBER,
Government Botanist.

APPENDIX V.

ANNUAL REPORT OF THE SUPERINTENDENT, CIVIL VETERINARY DEPARTMENT.

I have the honour to submit the annual report of the department in my charge, for the year 1905–1906.

2. The same staff continued in charge of the College, and during the commencement of the year another Lecturer was appointed, but as he was found subsequently to be unsuitable, he was asked to revert to his former appointment, and other arrangements have been made to fill the vacancy temporarily. The Civil Veterinary Department consisted as before of six Veterinary Assistants; of those, two belong to the senior grade and others were recruited from the Bombay Veterinary College.

The numerical strength of the office establishment remained the same, but as the work has been rapidly increasing it will be necessary to augment the staff. During the year three persons were added to the menial establishment.

3. In addition to my work at head-quarters, I was on tour for 135 days or for about 4½ months, and travelled 11,015 miles by rail and 370 miles by road. I paid two visits to the chief pony-breeding centres in the Coimbatore and the Salem districts. The Veterinary hospitals in the districts of Madura, Trichinopoly, Pithápuram were constantly visited by me, and with a view to select suitable sites for the opening of other hospitals, I visited Tinnevelly, Tanjore, Ootacamund, Bellary, Rajahmundry, Vellore and Cannanore.

A hospital has since been started at Bellary. At the request of the Secretary of the North Malabar Agricultural Association I proceeded to Tellicherry and Cannanore and advised the Committee on cattle-breeding and fodder crops. I also addressed the Palghat Agricultural Association on the subject of cattle-breeding. An extended visit of over a month was made in the breeding centres of the Coimbatore district around Kollegal, and although very fine hardy cattle are bred in the locality there is room for improvement of cattle-breeding. The branch of work relating to cattle disease received my best attention, and I inspected personally most of the places where the Veterinary Assistants had been at work. Under instructions from the Board of Revenue, I proceeded to Coimbatore to attend the Agricultufal Committee, and in December I went to Bombay to purchase Arab stallions for pony-breeding operations.

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II.—VETERINARY COLLEGE.

All three classes are now being held in the new buildings which the Director of Land Records and Agriculture opened officially in October last. The total strength is now 75 students, viz., class A 30, class B 25, and class C 20. Two of the students now in class C, Iyasawmy Pillai and M. Hassain Hazari, and one student Mir Anwaruddin in class A have been exempted by Government from the educational qualification which is necessary for admission into the College. Table I.

2. The annual examinations for both the classes B and A were conducted by me personally, and 21 (including S. P. Swaminatha Aiyar of the Saidapet Veterinary hospital) and 25 passed respectively. There was only one failure in class B. In class B two students, Kumarasawmy Pillai and Hyavadana Rao, and in class A 13 students secured more than 75 per cent. of the total number of marks. The new class that has been formed during the year was examined twice by me, viz., at the end of December 1905, and again in March 1906. Advantage was taken to secure subjects from animals that died or were destroyed at the hospital for dissection purposes.

3. In order to afford students as much experience as possible in operative surgery all operations were fully demonstrated to them, and in many cases the senior students were allowed to perform operations themselves on the dead as well as living subjects under the supervision of one of the staff, so that they may become well accustomed to the methods in which the various operations have to be performed. The attendance of the students in all classes during both the terms was fair on the whole, but I regret to say that I have had to issue serious warnings to some of the students.

4. During the year the Library and the Museum were enriched by a further supply of books, veterinary models, and furniture for preserving anatomical specimens.

5. An extensive supply of guinea grass and lucerne was always available for the in-patients in the College compound, and it was of immense advantage to poor and delicate animals.

6. The students evinced active interest in the various games as in last year, and competed for the annual Athletic sports in cricket, tennis and gymnastic exercises. Special attention has been paid to the physical development of the students.

7. The Dobbin Hall has been converted into Hostel for students, and accommodation has been provided for 25 boarders. There are now 22 students in the Hostel which has become very popular. There is a comfortable reading room in the Hostel in which are papers, professional periodicals, and games for the amusement of the students.

8. There had been no illness among students nor complaint regarding their diet and I am glad to report that it has been conducted to the satisfaction of all.

III (*a*).—CATTLE DISEASE.

The total number of deaths during the year was 90,293 from diseases and 15,301 from other causes. The difference is very slight when compared to the figures of the last year, and under "Epizootic aptha" and "other causes" the loss was somewhat less. More than 43 per cent. of the total deaths from diseases was classified under unspecified diseases. Rinderpest, diarrhœa and dysentery was responsible for 21·09 per cent. of the mortality, and anthrax 15 per cent. The deaths from the remaining contagious diseases were 20·9 per cent. approximately. Table II.

2. Rinderpest was somewhat prevalent, especially in the Ganjám, Gódávari and Kistna districts, but the number of deaths shows a decline over the figures of last year. This has been especially so in the first two districts, and it is a hopeful sign of the good which is being done by preventive inoculation. Only a very small percentage of cattle had been protected, and there had been only a very few deaths among inoculated cattle. The total deaths from anthrax was below that of the previous year. In Nellore and Gódávari districts there had been comparatively few deaths. In Tanjore there was a serious outbreak of anthrax among the cattle, and careful measures were promptly applied from the beginning, and many cattle (10,453) were inoculated. In the Kistna district there was also some noticeable loss from anthrax, but for want of information no measures were taken.

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3. There is nothing particular to be said under any of the other headings except that there is still much confusion in the nomenclature of the diseases, and the regular submission of returns. It is to be regretted that this must continue, as only a few places can have the aid of Veterinary Assistants at present. Cattle mortality was severe in Kistna, Kurnool, Gódávari, Ganjám, Nellore, Anantapur, South Arcot, Madura and Bellary districts, *i.e.*, in 9 out of the 22 districts in the Presidency; and in the first three districts there has been more than 7,000 deaths, and in the rest between 5,000 and 6,000. Except in Ganjám, Gódávari and Nellore districts it was not possible to arrange for inoculation on a large scale, and in Kurnool, Anantapur and South Arcot inoculation was not attempted at all owing to the absence of reliable returns. These figures would indicate the imperative need of having more inoculators and Veterinary hospitals.

4. Taking into consideration the large number of cattle in each of the above-mentioned districts as well as the heavy recurring mortality at these centres, it can confidently be forecasted that there will be no lack of work either in the direction of inoculation or in the treatment of cases in the Veterinary hospitals. That the number of deaths reported is misleading may be gathered from the fact that although only about 90,000 head of cattle are said to have died in the Presidency, 2,645,675 hides were exported from Madras alone, while the number utilized in this country would make the figure still higher. This statement is made to show how unreliable all our figures of cattle mortality are.

5. Among horses there were 439 deaths, and these were not however due to any contagious diseases scheduled under the Act.

6. The work of inoculation has been reviewed more fully in the subsequent paragraphs.

III (*b*).—Veterinary Hospitals.

Table V. There were at the end of the year six Veterinary hospitals including the one that was opened in the Bellary district by the Society for the Prevention of Cruelty to Animals in the middle of January 1906.

2. Statement No. V appended hereto gives full details regarding the number of in and out-patients treated in each of these hospitals

3. A larger number of cases was treated than in the previous year, and the practice at the hospitals in Madura and Trichinopoly was most satisfactory. The owners of cattle for whose benefits the rural hospitals are chiefly intended and the wealthy people have equally availed themselves of the usefulness of these hospitals, and the number of cases treated is a guarantee of their growing popularity. Below will be found a list of the various operations performed in the Veterinary College hospital during the year.

Name of operation.	Number of cases. Horses.	Cattle.	Dogs.	Name of operation.	Number of cases. Horses.	Cattle.	Dogs.
Major—				*Major*—cont.			
Suturing wounds	53	3	23	Difficult parturition	..	..	13
Amputation of tail	3	3	15	Neurotomy	2	..	..
Do. of penis	2	..	2	Total ..	144	68	188
Do. of horns	..	6	..				
Trephining	3	..	..	*Minor*—			
Castration	5	..	2	Opening of abscesses	6	15	28
Tracheotomy	2	..	..	Paring corns	14	..	..
Paracentesis thoracis	..	..	1	Do. seedy toes	5	..	..
Do. abdominis	..	..	5	Do. thrush	10	..	..
Setoning	13	5	..	Do bruised soles	5	..	..
Excision of tumours	48	47	13	Application of sand crack clams ..	4	..	..
Removal of cancerous growths ..	..	..	97	Scarifying	2	..	2
Removal of worm in the eye ..	..	..	..	Administering enemas	10	..	19
Setting of fractures	4	..	..	Nail-cutting	..	..	7
Do. of dislocations	2	3	17				
Æsophagatomy	2	..	..	Total ..	56	15	56
Rumentomy	3	..	..				
Phlebotomy	..	1	..	Grand Total ..	200	83	244
	2	.	..				

4. In Pithápuram the number of bovine patients increased by 195. It is important that this hospital should be maintained as more progress will be shown in future years.

5. In Saidapet there had been a slight increase in the total number of cases treated, and this was chiefly among cattle patients. This is significant of the fact that the hospital enjoys the confidence of cattle owners. The number does not include cases of infectious disease.

6. In the College hospital at Madras it is very gratifying to remark that the number of cases treated during the year under report exceeded those of last year by 232 cases. There was a very marked increase in the cattle patients which were mostly the property of private individuals. The Madras Corporation had also forwarded their cattle for treatment, and it is hoped that each succeeding year will show a steady increase in the number of cattle patients, as it is the most important branch with which our Veterinary Graduates will have to be concerned. There were 16 deaths among cattle treated in this hospital during the year under report. But I may mention that very frequently animals are brought to this hospital only as a last resource, and when it is almost hopeless to do anything for the poor beasts.

The students had the opportunity of seeing and taking care of many animals in the contagious wards which were suffering from foot and mouth disease. 1,138 cases of canine patients were treated, out of which there were 58 casualties. Many of the cases were of a most interesting and instructive nature, and the students were most attentive in pursuing this class of practice. In the equine practice 767 cases were treated with 16 casualties. As has already been remarked concerning bovine cases, the animals were always brought at a very late stage of the disease when recovery seemed almost hopeless. There were 400 major and 127 minor operations performed during the year as against 329 and 124 in the previous year.

7. It is not necessary to enter into details concerning the District Board Veterinary hospitals at Madura and Trichinopoly as the figures speak for themselves. For Madura the total number of fresh cases was 2,098 and the daily attendance was 68. For Trichinopoly the number of fresh cases was 1,081 and the number of animals treated daily worked out to about 50.

8. The cost of maintaining these institutions is about Rs. 600 including both medicines and contingencies but excluding establishment charges. Table VI.

9. These hospitals have undoubtedly supplied a long-felt want, and judging from the popularity of those already in use, I have no hesitation in stating that the veterinary dispensary will become popular wherever it is located. It is however submitted that these dispensaries should at first be supported entirely by Government and free treatment given to all animal patients brought for treatment. These are new institutions which have been offered to a very conservative people, and it will be some time before it may be expected to gain the confidence of the ryot, but when once their fear has been allayed they will readily take advantage of the aid. It will however be the poor animals which will most benefit as they will receive humane treatment.

Proposals for the working of all the dispensaries under one head and upon uniform lines will be submitted later.

10. The total collections for treatment in the Madras Veterinary College hospital were Rs. 7,091-13-1 against Rs. 6,364-12-1 during last year. Table VI.

IV (*a*).—Pony-breeding Operations.

At the commencement of the year there were 14 stallions at work, viz., 9 in the district of Coimbatore, 4 in Salem, and 1 in Madura. The stallions "Abdulla" and "Nile" were disposed of locally on account of their age for Rs. 106 and Rs. 105, respectively. Another stallion "Baby" was destroyed. In December, 4 new stallions were purchased at a cost of Rs. 2,000, and at the end of the year the complement number of stallions, 15, were at work. In Coimbatore the stallions were spread over the district, and 3 were placed at Kangayam which is the chief breeding centre in the district. One was at Pollachi throughout the year. "Rahiman" after his return from Ootacamund was stationed permanently in the Kollegal taluk. Two of the new stallions were sent to Aravakurichi and Palladam where they commenced work in February 1905. One pony worked until August in Kangayam and afterwards was sent to Dhárápuram. "Jumna" was stationed at Erode and Perundurai and "Ali" stood at Udamalpet for the greater portion of the year. In the Salem district operations were confined to the northern half of the district, viz., Hosúr, Krishnagiri, Pennagaram and Tiruppattúr taluks. At Hosúr there were two, and at Krishnagiri one stallion throughout the year under the charge of the Sub-Collector. The one in charge of the Head Assistant Collector worked for eight months in Harur and afterwards transferred to Tiruppattúr. A stallion was stationed in the Madura district in Palni and Vedasandur. The total number of coverings for all the 15 stallions was 310, viz., Coimbatore 179, Salem 101, and Madura 30, which does not however include the 18 coverings of "Abdulla", "Nile," and "Baby" which were disposed of. The first two did not cover any mares for eight months since August, and the third for five months since November. "Rahiman" was without work at Ootacamund for three months and the new stallions commenced work only in February, and one of them has not done any work yet. Calculating upon this it will be observed that only 11 out of 15 stallions had been at work during the year without intermission, and the average coverings per stallion was therefore 28 as against 27 in the previous year. The average was the same during 1903-1904 and this would show, I think, that the pony-breeding operations will become popular particularly as the people recognise that it is purely optional whether they bring their mares to be covered or not. Considering that the year was an extremely dry one the progress in this line is a matter for congratulation. Next year it is hoped that a fair will be held where ponies may be exhibited and prizes awarded. The results of coverings are annually improving, and when this is recognised I firmly believe that greater use will be made of the Government stallions. Table XI.

2. In the Salem district there were 101 coverings for four stallions. The work of "Carbon" in charge of the Head Assistant Collector was very poor, and it covered only 8 mares. "Tigris" maintained its good work and the apparent reduction in the number of mares covered during the year is no doubt due to the fact that he was not very well during the months of August and

October. "Sunshine" covered 33 mares, the highest number on record in Salem, and it was observed that although he was a slow coverer his services were very effective. The average coverings in Salem was 25 per stallion which though less by three than in the previous year is accounted for by the fact that one of the stallions had contributed only a very poor share. The work in Madura showed, however, an improvement, and the number of coverings rose from 19 to 30. Madura would require a small sized animal and it is intended to place a smaller sire here in future.

3. The proposal to station these stallions in a few other districts had to be kept in abeyance until the Veterinary Hospitals have been established in a few more centres. After the rains have set in, it is proposed to transfer a stallion to Bellary. It will be a tentative measure and he will be attached to the Veterinary Hospital.

4. *Results of coverings.*—The total number of coverings in 1904–1905 was 356. The certificates referring to these cases were forwarded in time to the Tahsildars concerned for report. The results were reported in only 190 cases and of these 23 have been reported as untraceable. A list showing the names of taluks and the number of cases in each taluk on which report is due is submitted herewith. As far as the results have been ascertained 52 coverings were successful which gives a percentage of 31·1 on known cases. It has been reported that 115 cases proved empty or were unsuccessful. As there is no proper check, I cannot but form the opinion that these reports are filled in indiscriminately, and they therefore, I regret to say, cannot be take as a correct standpoint for judging the progress of pony-breeding operations. That the in duction of good stallions has had a beneficial influence on the indigenous pony is abunda clear to anyone visiting Coimbatore, and when it is remembered that most of the wonde "Jutka" ponies are bred in the districts of Coimbatore and Salem it will be understood this department is justified in continuing the work. When Veterinary dispensaries have bee established, the castration of unsuitable ponies will be vigorously pushed.

Table IV. 5. *Castration.*—This work was carried on as usual only in the districts of Coimbatore and Salem. Two salustries were employed in the Coimbatore district in the taluks of Dhárápuram, Kangayam, Karur, Méttupálaiyam, Bhaváni and Kollegal. The total number of ponies castrated rose to 73 against 63 last year. One of the salustries was on leave during the latter part of March 1906. The salustry in Salem was, with the exception of one month, continuously employed at Hosur, and 31 ponies were castrated against 16 last year. These salustries have also been looking after the stallions, and they were not infrequently ordered to proceed to other stations when reports of ordinary illness among Government stallions are received. These men have thus been of considerable service, and it is necessary for the good results of pony breeding that castration of unsuitable entires should be continued. There were two casualties among the castrated animals at Coimbatore due to tetanus, and in one case a compensation of Rs. 20 was claimed and paid to the owner.

IV (*b*).—Cattle Fairs and Shows.

Table XIV. There were several cattle fairs in the Tinnevelly district but only to two of them, held in Kazhugumalai and Muthulapuram, respectively, was it possible to render departmental assistance. These two fairs are important from the fact that very large number of cattle are collected. It was reported that at each of these fairs over 15,000 cattle were present. In almost all the districts of this Presidency cattle fairs are held weekly, as well as annually. It is important that, as in Tinnevelly district, the Madras Cattle Disease Act II of 1866 should be enforced in all the big fairs in order to prevent sick cattle being brought in contact with the healthy ones. Naturally these cattle fairs afford a fertile source for the spread of cattle disease and therefore they should be carefully looked after. During the year Cattle Shows were held in Anakápalle, Vizagapatam district; Ongole, Guntúr district; and Pithápuram, Gódávari district. Full reports of these important Shows have already been submitted. Altogether about 1,634 cattle were exhibited at these Shows and Rs. 4,212 besides other valuable presents were distributed in awards. The Shows were a decided improvement on those held in the previous year at Ongole and Vizianagram, and it is confidently anticipated that annually these Shows will become of greater importance. The great feature of these Shows was the number of excellent bulls and heifers ranging from two to five years old. There is a great deal to be done in improving the stock of buffaloes. These should eventually prove of very great commercial value. Some attention was paid at these Shows to the exhibition of sheep and goats as well as poultry. It is hoped that under the auspices of the district Associations these Shows will be held annually.

Besides the Shows above mentioned there was one held at Bellary, and one at Kottacheruvu in the Anantapur district, both held in connection with the Agricultural exhibitions. Although the class of exhibits were inferior, both in number and quality, they should be encouraged as they are likely to afford great object lessons.

Table VIII. 2. Seven young bulls of the Nellore breed were purchased at the last Ongole Show and distributed to villages in the Guntúr district for breeding purposes. Owing to the unfavourable season of the year, it was not found advisable to purchase Kangayam and Alambadi breeds. The Ongole bulls have been entrusted to selected breeders and the results will be anxiously watched.

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V.—Veterinary Assistants.

The chief duty of Veterinary Assistants consisted in attending outbreaks of cattle Table VII. disease and carrying out in oculation of cattle in the herds affected with disease. In each of the districts of Ganjám, Gódávari, Bellary and Tanjore, a Veterinary Assistant has been on duty throughout the year. Tinnevelly, Madura, Chingleput, Nellore, Guntúr and Kistna are the other districts in the Presidency which received Veterinary aid in the treatment of cattle as occasion required When Veterinary graduates are available it will be necessary to station one assistant permanently in each of the above districts for inoculation work. They afford a vast field for such work owing to the enormous number of indigenous cattle, and the large collection of cattle at certain times of the year for grazing purposes, fairs, etc., which renders the spread of epidemics more easy. It is to be regretted that owing to the small staff it was found impossible to render aid in all cases, therefore only the more urgent reports were attended to. For example in the Ganjám district where one Veterinary Assistant has been permanently stationed, reports were received regularly from 149 villages, and of these it was possible to attend only to 61 villages. These 149 villages were spread over eight taluks, and 7,183 cattle were inoculated. In the Gódávari district only 2,996 cattle were inoculated. Until very recently the method of forwarding outbreak returns had been very defective, otherwise more useful work would have been done there. From Tanjore reports were received very regularly from Tirutturaippúndi, Negapatam, Máyavaram and Pattukkóttai taluks and as a result it was possible to take immediate measures and 14,229 cattle were protected. It forms nearly one half of the total number of inoculated cattle. In Bellary district the Collector has taken considerable interest in proclaiming to the people this new form of treatment, and the benefits attained in the other parts of the Presidency. It would appear that he called upon the Tahsildars to personally instruct the village officials about this treatment, and to request them to hold meetings in the villages for the purpose of submitting their cattle for protective inoculation in times of epidemic cattle disease, and for intimating the Revenue authorities immediately on the occurrence of an outbreak. He has further caused a notice to appear in the District Gazette about inoculation and the movements of the Veterinary Assistant. The Sanitary, the Plague and the Police Inspectors were asked to report to the Veterinary Assistant any cases of outbreak among cattle in the villages they visit. These orders have facilitated the work of the Veterinary Assistant and kept his whole time properly occupied. The Veterinary Assistant has been recognised throughout the district as an employé of the Revenue department and there was less obstruction in the performance of his duties than at the commencement of his work. 1,290 cattle were inoculated here. I take this opportunity to state that if similar procedure is adopted in other districts, the work of the Veterinary Assistant will be more fully appreciated. From Sivaganga I was informed that a petition had been received from the headmen of several villages asking that a Veterinary Assistant might be sent to inoculate their cattle as disease had broken out and those animals which had not been protected were dying in large numbers, while those which had been inoculated were immune. This I consider to be extremely gratifying, and will no doubt help to make our work popular.

2. Contagious disease is prevalent in some form or other throughout the year, and in order to render efficient help, it is absolutely necessary that returns of outbreaks should be forthcoming from each district regularly. One Veterinary Assistant visited Nellore, Guntúr and Kistna districts, and inoculated in all 6,424 cattle for both rinderpest and anthrax. Chingleput and Madura districts received a passing attention, and 603 cattle were protected against anthrax. In four villages of Sáttúr taluk in the Tinnevelly district sheep were affected with anthrax in an unusual degree. 2,521 sheep and 128 cattle were inoculated with anthrax serum with eminently Table III. satisfactory results. The total number inoculated during the year was 33,153 cattle, and 2,521 sheep in 31 taluks, comprised in the districts already mentioned. The following table will show the steady progress attained in this work :—

[illegible]	Malignant sore-throat.	Anthrax.	Rinderpest.	Total.
1902-1903 ..		377		377
1903-1904 ..		6,329	2,805	9,134
1904-1905 ..		12,437	8,251	20,688
1905-1906 ..	[illegible]	22,152	12,689	35,674

There was not only an increase in the total figures, but also under each disease. During the year serum was obtained for malignant sore-throat and 833 cattle were protected against that disease.

3. As the work of inoculation is being appreciated now in all the districts where it has been introduced, I would emphasise the importance of requiring the revenue officials to forward summary returns of outbreaks of disease every week to the office of the Superintendent, Civil Veterinary Department, when they occur in any village.

October. "Sunshine" covered 33 mares, the highest number on record in Salem, and it was observed that although he was a slow coverer his services were very effective. The average coverings in Salem was 25 per stallion which though less by three than in the previous year is accounted for by the fact that one of the stallions had contributed only a very poor share. The work in Madura showed, however, an improvement, and the number of coverings rose from 19 to 30. Madura would require a small sized animal and it is intended to place a smaller size here in future.

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Table III.

	Malignant sore-throat.	Anthrax.	Rinderpest.	Total.
1902-1903	..	377		377
1903-1904	..	6,329	2,805	9,134
1904-1905	..	12,437	8,251	20,688
1905-1906	883	22,162	12,689	35,674

There was not only an increase in the total figures, but also under each disease. During the year serum was obtained for malignant sore-throat and 883 cattle were protected against that disease.

3. As the work of inoculation is being appreciated now in all the districts where it has been introduced, I would emphasise the importance of requiring the revenue officials to forward summary returns of outbreaks of disease every week to the office of the Superintendent, Civil Veterinary Department, when they occur in any village.

4. The services of Veterinary Assistants M. Hasan Ali Sahib and Narasinga Rao were lent to the District Boards of Madura and Trichinopoly, respectively, when in the former station the place was vacant and in the latter Mr. Richards, the permanent incumbent, was on privilege leave for two months. M. Hasan Ali Sahib has been deputed during the year to investigate certain reports of deaths among inoculated cattle in Berhampur and Tuni, and it was found out that either the deaths were wrongly reported or that they were due to other diseases against which the cattle had not been immunized. The deaths among inoculated cattle were only 134 according to reports received in this office. This gives a percentage of ·37 deaths among the animals inoculated, and must be considered to be entirely satisfactory; otherwise the ryots would not have accepted the inoculation for a second time. In places where its benefits were known, the assistance of a Veterinary Assistant has been asked for. Opportunity was taken at some of the cattle fairs, which Senior Veterinary Assistant Subrahmania Mudaliar attended, to demonstrate to large crowds the harmlessness of the treatment

5 The four new Veterinary Assistants were chiefly employed on inoculation work, but they have also treated cases, both medical and surgical, among horses and cattle during their tours. It has been reported that their help has been frequently applied for, but they could not treat more cases for want of the requisite medicines.

The two Senior Veterinary Assistants V. P. Subrahmania Mudaliar and M. Hasan Ali Sahib have been employed on other work as well, such as attendance at cattle fairs and shows, and treatment of Government stallions, in cases of sudden illness. The latter has done good service in assisting the local committees in the organization of the cattle-shows that were held during the year. He was also employed temporarily in the Veterinary College in teaching Botany and Chemistry.

6 The services of Senior Veterinary Assistant, V. P. Subrahmania Mudaliar, were lent to the Deputy Director of Agriculture for the purpose of purchasing bullocks for the Coimbatore farm, and on this duty he was occupied for a month and eleven days. He was employed for some time in translating into Tamil the book on "The more deadly forms of cattle disease in India".

7. Four of the Veterinary Assistants were on privilege leave during the year, three of them for a month each, and the other for a month and twenty-five days.

8. The following doses of serum were received from the Imperial Bacteriologist during the year:—

	Doses.
Rinderpest	14,000
Anthrax	21,000
Hæmorrhagic septicæmia	14,000

VI.—Expenditure of the Department.

Tables XII and XIV (a). The report on the expenditure of this department during the year, with statements XII and XIV (*a*), will be furnished separately on receipt of final returns from the Accountant-General.

VII.—Conclusion.

In conclusion, I have the honour to bring to notice the valuable help I have had from Mr George D'Silva, who held charge of the Veterinary College during my absence on tour. He maintained the excellent discipline of the College and attended to the Hospital practice throughout the year. He was ably helped by the two lecturers Mr. Valladares and Mr. Sampathu Iyengar. The Head Clerk Mr. Srinivasulu Naidu conducted the heavy and steadily increasing work of my office to my entire satisfaction. In addition to his other duties he has been made Manager of the Students' Hostel which, to make it work amicably and economically, requires close attention which he devotes out of office hours.

Madras,
7th May 1906.

(Signed) W. D. Gunn,
Supt., Civil Veterinary Dept.

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Appendices.

Table I showing the main results of Veterinary colleges and schools during the year 1905–1906.

Veterinary colleges and schools.	Name of course of instruction if more than one course followed.	Number of students. Admitted during the year. Scholarship-holders.	Admitted during the year. Paying students.	Passed final examination during the year.	Failed to pass final examination.	Remaining under instruction at end of year. In ordinary course.	Remaining under instruction at end of year. Instruction prolonged by reason of failure to pass.	Students admitted during the year classed by educational qualifications. Matriculated with higher qualifications.	Knowing some English but not matriculated.	Knowing no English or very little English.
1	2	3	4	5	6	7	8	9	10	11
Veterinary college, Madras.	..	11	Tuition is given free.	..	..	75	..	27	3 (2 Eurasians. 1 Muhammadan (exempted).)	..

Veterinary colleges and schools.	Receipts. From fees.	Receipts. From other sources.	Receipts. Total.	Expenditure. Salaries of Instructing staff.	Expenditure. Other expenses.	Expenditure. Total.	Employment of students passed out during the three years preceding. Total number passed.	In service of Government or Local Board.	In services of other bodies or Institution.	In private practice.	Number unemployed.
	12	13	14	15	16	17	18	19	20	21	22
Veterinary college, Madras.	..	Rs. A. P. 58 0 0 (sports fees).	Rs. A. P. 58 0 0	Rs. A. P. 5,212 13 11	Rs. A. P. 2,564 3 3 (scholarships for students).	Rs. A. P. 7,777 1 2	..	..	..	..	..

Table II showing number of deaths (contagious diseases) amongst animals during the year 1905–1906.

Province.	Equines. Anthrax.	Equines. Surra.	Equines. Dourine.	Equines. Other contagious diseases.	Equines. Total.	Bovines. Rinderpest, diarrhœa and dysentery.	Bovines. Anthrax.	Bovines. Malignant sorethroat.	Bovines. Black quarter.	Bovines. Epizootic aphtha.	Bovines. Other diseases.	Bovines. Total.
1	2	3	4	5	6	7	8	9	10	11	12	13
Madras Presidency ..	16	..	..	286	302	19,050	13,474	8,888	5,952	4,074	38,905	90,293

TABLE III.—Statement showing result of preventive inoculation during the year 1905–1906.

Districts.	Name of disease against which inoculation was carried out.	Method of inoculation followed.	Number of outbreaks in which inoculation was undertaken.	Rinderpest.		
				Equines.	Bovines.	Others.
1	2	3	4	5	6	7
Tanjore	..	..	58	..	2,943	..
Tinnevelly	..	..	10	..	..	..
Madura	..	..	1	..	..	..
Bellary	..	..	23	..	72	..
Gódávari	..	..	35	..	2,893	..
Ganjám	..	..	43	..	5,312	..
Chingleput	..	..	7	..	..	..
Nellore	..	..	23	..	..	..
Guntúr	..	..	39	..	..	..
Kistna	..	..	21	..	1,469	..
Total ..	..	..	260	..	12,689	..

Districts.	Anthrax.			Hæmorrhagic septicæmia.		
	Equines.	Bovines.	Others.	Equines.	Bovines.	Others.
	8	9	10	11	12	13
Tanjore	..	10,453	..	..	883	..
Tinnevelly	..	128	2,521	..	..	..
Madura	..	271	..	..	..	..
Bellary	..	1,218	..	..	..	..
Gódávari	..	103	..	..	..	..
Ganjám	..	2,171	..	..	..	..
Chingleput	..	382	..	..	..	..
Nellore	..	3,212	..	..	..	..
Guntúr	..	1,743	..	..	..	..
Kistna	..	..	..	..	..	..
Total ..	..	19,631	2,521	..	883	..

TABLE IV showing the number of animals treated and castrated by Veterinary Assistants on tour during 1905–1906.

Province.	Number of villages visited.	Number of Veterinary Assistants employed.	Castrations performed.				Treated for contagious diseases.	
			Equines.	Bovines.	Others.	Total.	Equines.	Bovines.
1	2	3	4	5	6	7	8	9
Madras Presidency ..	..	6	4	5	25	34	..	..

Province.	Treated for contagious diseases—*cont.*		Treated for non-contagious diseases.				Total number of cases treated and castration performed.	Remarks.
	Others.	Total.	Equines.	Bovines.	Others.	Total.		
	10	11	12	13	14	15	16	17
Madras Presidency ..	..	..	..	..	..	..	..	Veterinary Assistants on tour had no opportunities for treating patients except by inoculation.

TABLE V showing number of animals treated at Veterinary hospitals and dispensaries during the year 1905–1906.

Province.	Number of Veterinary dispensaries.	Number of Veterinary Assistants employed at dispensaries.	In-patients.											
			Remaining on 1st April.			Admitted during the year.			Total.			Discharged during the year.		
			Equines.	Bovines.	Other animals.	Equines.	Bovines.	Other animals.	Equines.	Bovines.	Other animals.	Equines.	Bovines.	Other animals.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Pithápuram	1	1	..	..	..	8	6	2	8	6	2	7	6	2
Bellary	1	1	..	..	..	..	..	..	..	..	..	..	..	..
Madura	1	1	2	..	..	32	12	3	34	12	3	33	12	3
Trichinopoly	1	1	15	19	4	..	..	..	15	19	4	..	..	..
Saidapet	1	1	12	2	3	68	108	46	80	110	49	73	108	47
Madras	1	4	32	22	14	457	243	411	489	265	425	470	251	409

Province.	In-patients—*cont.*			Out-patients.						Total number of in and outpatients treated during the year.				Expenditure.	
	Balance on 31st March.			Number treated during the year.			Average daily attendance.								
	Equines.	Bovines.	Other animals.	Equines.	Bovines.	Other animals.	Equines.	Bovines.	Other animals.	Equines.	Bovines.	Other animals.	Total.	Receipts.	
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
														Rs.	
Pithápuram ..	1	..	..	44	622	134	1	2	1	52	628	136	816	..	Rs. 1,311-1-2.
Bellary	..	..	..	757	1,970	686	10	26	9	86	175	90	351	2,090	Rs. 2,090. The hospital was opened on the 15th January 1906.
Madura	1	..	..	13,031	9,741	1,997	36	27	5	998	916	154	2,068	..	Rs. 2,082.
Trichinopoly ..	..	..	..	5,368	11,611	2,395	14	30	6	302	607	172	1,081	832	Rs. 2,381.
Saidapet ..	7	2	2	1,706	3,264	1,579	5	9	3	338	549	348	1,235	3,200	Rs. 1,518-1-7.
Madras ..	19	14	16	2,191	734	3,646	6	2	10	767	296	1,150	2,213	7,091	Rs. 7,975-8-5.

TABLE VI.— Abstract showing receipts and expenditure of Veterinary dispensaries during 1905–1906.

Province.	Receipts.						
	Last year's balance.	By Local Fund grants.	By Government grants.	By Municipal contribution.	By Fees.	By other sources.	Total.
1	2	3	4	5	6	7	8
	Rs. A. P.	Rs. A. P.	Rs. A. P.		Rs. A. P.	Rs. A. P.	Rs. A. P.
Pithápuram	Under Court of Wards there is no special provision.						
Bellary	..	740 4 4	787 9 0	..	2 0 0	560 4 5	2,090 1 9
Madura	No special provision has been made.				582 12 0	249 8 6	832 4 6
Trichinopoly	No special provision has been made.				746 3 10	91 11 3	3,199 15 1
Saidapet	..	..	2,362 0 0	..	7,091 13 1	..	17,055 13 1
Madras	..	..	9,964 0 0	..			

Province.	Expenditure.						
	Pay.	Travelling allowance.	Medicines, instruments, etc.	Furniture, etc.	Contingencies.	Total.	Balance.
	9	10	11	12	13	14	15
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Pithápuram	1,171 0 0	1 6 6	125 10 9	12 15 11	..	1,311 1 2	..
Bellary	339 4 6	104 4 0	607 9 0	* 857 0 3	189 0 0	2,096 1 9	..
Madura	1,187 13 2	71 9 0	301 14 11	311 10 7	208 13 8	2,081 13 4	..
Trichinopoly	1,456 0 0	13 6 0	662 2 9	..	249 9 6	2,382 2 5	..
Saidapet	859 8 0	..	373 9 7	..	285 0 0	1,518 1 7	..
Madras	..	..	1,189 7 6	..	6,786 0 11	7,975 8 5	9,080 4 8

* Includes cost of building Rs. 714-6-3.

TABLE VII showing total strength of subordinate Veterinary staff employed during 1905–1906.

Province.	How occupied.	Whether paid from Provincial or Local Funds.	Veterinary Inspectors.	Veterinary Assistants.	Remarks.
1	2	3	4	5	6
				NO.	
Madras	Inoculation and inspection of cattle fairs and shows.	Provincial	..	6	
	In charge of hospital	Local Fund	..	2	
		Court of Wards ..	..	1	
		Society for the Prevention of Cruelty to Animals, Bellary.	..	1	
	College work ..	Provincial	..	1	
		Total ..	..	11	

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TABLE VIII.—Return of stud bulls for the year 1905–1906.

Province.	Property of Government.				
	Number on 1st April.	Obtained during the year.		Casualties during the year.	Balance remaining on 31st March 1906.
		Number.	Average price paid.		
1	2	3	4	5	6
			Rs.		
Madras	..	7	75	1	6

Province.	Property of local bodies.				
	Number on 1st April.	Obtained during the year.		Casualties during the year.	Balance remaining on 31st March.
		Number.	Average price paid.		
	7	8	9	10	11
Madras	..	..	..	..	..

TABLE IX showing main results of the working of Provincial cattle farms during the year.—*Nil.*

TABLE X.—Return of horse, pony and donkey stallions under local bodies for the year 1905–1906.—*Nil.*

TABLE XI.—Services and produce of each class of horse, pony and donkey stallions during the year 1905–1906.

Horse, pony or donkey.	Province.	Stallions on register on 31st March 1905.	Stallions actually employed at stud.		Number of mares covered.		Average number of mares covered per stallion employed at stud.		Remarks.
			Year under report.	Previous year.	Year under report.	Previous year.	Year under report.	Previous year.	
1	2	3	4	5	6	7	8	9	10
The stallions at stud are under the Provincial Department of Government.									
Pony	Madras	14	15	14	328	356	* 28	† 27	* Three stallions were since disposed of and they covered only eighteen mares. Four new stallions commenced work only in February and there has been only [illegible] coverings. [illegible] average is calculated for [illegible] stallions [illegible] coverings. † Four [illegible] annual [illegible]

TABLE XII showing average cost of feed, keep, attendance, etc., of horse, pony and donkey stallions during the year 1905–1906.

Province.	Horse.		Pony.		Donkey.		Remarks.
	Year under report.	Previous year.	Year under report.	Previous year.	Year under report.	Previous year.	
1	2	3	4	5	6	7	8
Madras	Rs. A. P. ..	Rs. A. P. ..	Rs. A. P. 23 14 7	Rs. A. P. 23 5 0	Rs. A. P. ..	Rs. A. P. ..	The total expenditure for upkeep alone of Government stallions amounted to Rupees 4,303-12-8 and this has been distributed for fifteen stallions—*vide* paragraph 1 of section IV (*a*) of the annual report.

TABLE XIII.—Abstract of particulars regarding horse fairs and shows held in non-selected districts during the year—*Nil.*

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TABLE XIV.—Abstract of particulars regarding cattle fairs and shows held during the year 1905–1906.

Province.	Number of cattle fairs and shows held.	Total number of stock present.							Average price of animal sold.				
		Bulls.	Bullocks.	Cows.	Young stock.	Buffaloes.	Camels.	Others.	Bulls.	Bullocks.	Cows.	Buffaloes.	Camels.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Tinnevelly cattle fairs ..	2	5	33,000	80	150	250	..	..	50	75	35	30	..
Cattle shows.													
Anákapalle (Vizagapatam district).	3	74	200	15	40	67	..	29	..	..	..	..	..
Ongole (Guntúr district).		409	260	224	..	65	..	169	100	200	100	..	..
Pithápuram (Gódávari district).		20	130	78	9	43	..	76	..	..	..	..	..
Bellary *		9	23	7	2	26	..	7	..	..	..	..	..
Total ..	..	512	613	324	51	201	..	281	100	200	100	..	..

Province.	Amount realised in fees.	Total number of animals that competed for prizes.	Prizes awarded						Number of medals awarded.	Remarks.
			From Imperial funds.	From Provincial funds.	From Local bodies.	From other sources.	Total.	Amount actually awarded.		
	15	16	17	18	19	20	21	22	23	24
Tinnevelly cattle fairs ..	..	..	Rs. ..	Rs. ..	Rs. ..	Rs. ..	Rs. ..	Rs. ..	..	
Cattle shows.										
Anakápalle (Vizagapatam district).	..	425	500	..	300	..	800	876	4	2. Government of India.
Ongole (Guntúr district).	..	1,127	500	300	300	..	1,100	2,587	4	2. Do. do.
Pithápuram (Gódávari district).	..	356	..	..	250	750	1,000	749	3	2. Do. do.
Bellary	..	74	..	250	..	..	250	281	..	
Total ..	..	1,982	1,000	550	850	750	3,150	4,493	11	

* *Note.*—A cattle show was held at this station in conjunction with an agricultural show.

TABLE XIV-A.—Statement showing cost of the Civil Veterinary Department during the official year 1905–1906 in the province of Madras.

Major heads.	Amount. Imperial.	Provincial.	Local.	Total.	Remarks.
1	2	3	4	5	6
	Rs. A. P.	Rs. A. P.		Rs. A. P.	
1 Salaries of officers	17,775 0 0	..	..	17,775 0 0	
2. Do. of subordinates	..	9,233 11 11	..	9,233 11 11	
3. Travelling allowance of officers ..	..	2,891 3 6	..	2,891 3 6	
4. Do. subordinates.	..	3,023 7 6	..	3,023 7 6	
5. Other allowances	..	600 0 0	..	600 0 0	
6. Supplies and Services	..	8,451 14 1	..	8,451 14 1	
7. Contingencies	..	1,088 8 9	..	1,088 8 9	
8. Prevention of diseases	..	..	..	..	
9. Schools and Colleges	..	21,005 6 9	..	21,005 6 9	
10. Prizes at fairs and shows	1,000 0 0	500 0 0	..	1,500 0 0	
Total ..	18,775 0 0	46,294 4 6	..	65,069 4 6	

TABLE XV.—Comparative statement of cattle mortality for five years ending 1905–1906.

Causes of death.	Number of deaths among Cattle for the official year. 1901–1902.	1902–1903.	1903–1904.	1904–1905.	1905–1906.
Diseases.					
Rinderpest, Diarrhœa and Dysentery ..	18,614	14,555	17,655	19,772	19,050
Anthrax	13,218	13,496	16,887	14,996	13,474
Malignant sore throat	7,662	9,063	13,759	11,317	8,838
Black quarter	2,421	2,989	7,616	7,688	5,952
Epizootic aphtha	4,722	11,456	4,683	2,767	4,074
Others	37,333	35,417	32,548	33,886	38,905
Total ..	83,997	88,976	93,158	90,871	90,293
Other Causes.					
Snake bite	1,761	2,109	2,278	2,247	2,011
Wild animals	10,811	10,937	10,886	12,061	13,232
Criminal poisoning	34	71	71	62	58
Total ..	12,606	13,117	13,235	14,370	15,301
Grand Total ..	101,603	102,093	106,393	104,241	105,594

TABLE XVI.—Statistics of mortality among cattle, horses and ponies in the several districts of the Madras Presidency during the official year 1905–1906.

Number of deaths among

Cattle.

Districts.	From diseases. Rinderpest.	Diarrhœa and dysentery.	Anthrax.	Malignant sore-throat.	Black quarter or quarter ill or evil.	Epizootic aphtha.	Others.	Total.	From snake-bite.	By wild animals.	From criminal poisoning.
1	2	3	4	5	6	7	8	9	10	11	12
1. Ganjám ..	3,643	781	702	214	285	1,266	6,891	66	282	1	
2. Vizagapatam ..	640	518	272	102	230	391	2,153	37	60	4	
3. Gódávari ..	2,287	1,551	223	196	268	2,739	7,264	74	126	3	
4. Kistna ..	2,012	1,651	693	195	240	3,044	7,835	224	52	12	
5. Guntúr ..	872	718	924	367	84	1,097	4,062	68	65	4	
6. Kurnool ..	1,192	749	333	852	192	4,184	7,502	113	431	2	
7. Bellary ..	498	355	415	790	130	3,036	5,224	25	223	6	
8. Anantapur ..	409	800	301	1,003	78	3,835	6,426	35	261	..	
9. Cuddapah ..	884	487	214	721	129	1,858	4,293	62	604	2	
10. Nellore ..	523	370	496	275	232	4,650	6,546	149	151	7	
11. Chingleput ..	623	995	564	31	75	596	2,984	109	8		
12. South Arcot ..	407	666	311	63	517	3,523	5,487	187	298	..	
13. North Arcot ..	445	479	623	106	369	796	2,818	181	612	..	
14. Salem	268	204	156	153	111	777	1,669	47	309	..	
15. Coimbatore ..	466	171	322	324	95	1,613	2,991	102	777	8	
16. Trichinopoly ..	484	423	173	22	148	2,278	3,528	61	45	4	
17. Tanjore ..	910	1,136	1,136	82	124	436	3,824	98	..	1	
18. Madura ..	1,534	936	356	338	609	1,548	5,312	165	210	1	
19. Tinnevelly ..	329	307	44	9	23	564	1,276	101	39	..	
20. Nilgiris ..	..	1	94	18	2	23	138	5	361	..	
21. Malabar ..	555	172	349	19	114	171	1,380	102	2,715	..	
22. South Canara ..	69	4	137	72	28	380	690	10	5,603	..	
Total ..	19,050	13,474	8,833	5,952	4,074	38,905	90,293	2,011	12,232	58	

Number of deaths among—*cont.*

Districts.	Cattle—*cont.* Total.	Grand Total.	Total stock by the latest census.	Horses and ponies. From diseases. Diarrhœa and dysentery.	Anthrax.	Others.	Total.	From snake-bite.	By wild animals.	From criminal poisoning.	Total.	Grand Total.	Total stock by the latest census.
	13	14	15	16	17	18	19	20	21	22	23	24	25
1. Ganjám ..	349	7,240	305,856	..	..	..	..	..	..	..	..	..	..
2. Vizagapatam ..	101	2,254	128,721	..	..	..	..	..	..	..	..	..	..
3. Gódávari ..	203	7,467	534,543	2	5	21	28	1	1	..	2	30	1,486
4. Kistna ..	288	8,123	786,471	..	6	33	38	2	3	..	5	43	1,918
5. Guntúr ..	137	4,199	..	..	..	5	5	3	9	..	12	17	..
6. Kurnool ..	548	8,048	197,082	2	1	24	27	..	8	..	8	35	32
7. Bellary ..	254	5,478	602,360	6	1	49	56	1	11	1	13	69	2,735
8. Anantapur ..	296	6,722	1,548,723	4	..	50	54	1	11	..	12	66	3,369
9. Cuddapah ..	668	4,961	942,078	..	..	17	17	1	4	..	5	22	1,651
10. Nellore ..	307	6,853	..	..	..	6	6	2	1	..	3	9	..
11. Chingleput ..	119	3,103	662,698	..	..	1	1	..	..	..	..	1	952
12. South Arcot ..	486	5,973	1,166,329	8	..	2	10	..	2	..	2	12	2,685
13. North Arcot ..	793	3,611	886,082	..	..	4	4	2	6	..	8	12	1,480
14. Salem ..	366	2,025	1,069,586	1	1	2	4	2	9	..	11	15	3,611
15. Coimbatore ..	887	3,878	1,151,637	1	2	14	17	2	16	..	18	35	3,070
16. Trichinopoly ..	100	3,623	669,139	..	..	3	3	..	..	..	..	3	905
17. Tanjore ..	99	3,923	936,740	3	..	2	5	..	..	..	..	5	1,363
18. Madura ..	376	5,688	1,143,614	4	1	15	20	2	19	..	21	41	3,633
19. Tinnevelly ..	140	1,416	482,925	..	..	2	2	1	2	..	3	5	870
20. The Nilgiris ..	366	504	64,850	..	..	..	..	..	11	..	11	11	1,820
21. Malabar ..	2,817	4,197	966,068	2	..	3	5	..	3	..	3	8	1,087
22. South Canara.	5,618	6,303	660,182	..	..	..	..	..	..	..	..	..	235
Total ..	15,301	105,594	14,755,704	33	16	253	302	20	116	1	137	439	32,897

GOVERNMENT OF MADRAS.

REVENUE DEPARTMENT.

READ—the following paper :—

Proceedings of the Board of Revenue (R.S., L.R. and Agri.), Mis. No. 4542, dated 27th July 1906.

ABSTRACT.—Submitting report on the operations of the Agricultural Department during the year 1905–1906.

ler—No. 886, Revenue, dated 11th September 1906.

Miscellaneous.

Recorded.

2. The year under report was marked by a steady expansion of the operations of the Department; but many of the department's chief undertakings are still in a very early stage, while in respect to staff, the period was one of transition so that few definite results were to be expected. The crying need of the department is still additional men. The recruitment of experts in Europe is under the consideration of the Secretary of State, and there is good reason to hope that some progress in this direction will be made during the current year. The establishment of a new College of Agriculture at Coimbatore was determined on during the year under report and the necessary site for the College and Farm was acquired. Building operations have since commenced, and when this College is erected, and the staff necessary to man it has been entertained, the Agricultural Department will be in a position to train a satisfactory supply of Agricultural Inspectors and to meet the demands for skilled guidance and advice that are now received.

3. Some useful work in regard to sugarcane was done during the year at the Samalkóta Agricultural station, and the canes there raised are reported "to have taken a firm hold on the district." But the hope of finding a cane, which shall be immune from disease, does not seem likely to be realized, as it is stated that each variety is likely in turn to become subject to attack, and no remedy or preventive has yet been discovered. The season was unfavourable for the experiments conducted at Bellary and Koilpatti stations, nor can any conclusive results in such matters as deep tillage and manures be expected except from a prolonged series of experiments. The investigation of the pepper plant at the Taliparamba station was in too early a stage to yield results. The attempt to supply the ryot with selected cotton-seed met with an encouraging degree of success, and will be repeated during the present year, along with other measures for the improvement of this important crop. The conditions of the year were not favourable to the experiments connected with tobacco. Pumping experiments conducted under the control of Mr. Chatterton have demonstrated the utility of oil-engines as a source of motive power for raising water for irrigation, and in seven cases, loans have been taken by private individuals with a view to establishing pumping machinery. This result is encouraging. The Veterinary College has not yet turned out its first batch of trained students, and little fresh work could therefore be done in the expansion of Veterinary operations. A number of cattle shows and agricultural exhibitions were held and appear to have attracted much public interest.

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4. The report draws attention to the need for the early appointment of a separate Director of Agriculture and the Government realize that the work connected with the Department is constantly increasing. They have therefore decided to appoint a Director of Agriculture under the Board of Revenue which will relieve the present Director of much administrative work.

5. The annual report has necessarily been considerably increased in bulk by the recent orders requiring a brief account of the administration of the several agricultural stations to be appended to the Director's report, but the Government consider that there is room for greater compression. The first three appendices should be combined into one and the contents arranged strictly under the headings of the several agricultural stations, the officer in charge of each appending his name to the summary of the work done.

(True Extract.)

A. G. CARDEW,
Ag. Secretary to Government.

To the Board of Revenue (Revenue Settlement, Land Records and Agriculture).
" the Public Department.
" the Educational Department.
" the Inspector-General of Agriculture.
" the Inspector-General, Civil Veterinary Department.
" the Minister of Agriculture, Argentine Republic.
" the Entomologist to the Government of India.
" Monsieur Chailley-Bert.

Copy to the Government of India, Department of Revenue and Agriculture (with C.L.).

Editors' Table.

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* Agent for the sale of the Legislative Department publications.