1899.

Queensland.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE

YEAR 1898-99.

REPORT OF THE UNDER SECRETARY FOR AGRICULTURE.

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ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE FOR THE YEAR 1898-1899.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE.

Department of Agriculture,
Brisbane, 30th June, 1899.

Sir,—I have the honour to submit the Twelfth Annual Report of this Department, and, in doing so, the duties of the technical officers having become established, will depart from my former custom of dealing with the different branches of cultivation in particular, and leave those officers to report upon the special province of agriculture they profess, teach, or are responsible for.

The principal changes during the past year have been the resignation of Mr. Buchanan, the Overseer of the State Nursery, Mackay, and the death of Mr. E. Cowley, the Overseer at Kamerunga. In the latter, an officer has been lost who was enthusiastic in his efforts to advance tropical agriculture. Consequent upon these vacancies and upon the establishment of a Sugar Experiment Station at Mackay, a change has been made in the administration of both places. Kamerunga has been placed under the charge of Mr. Newport, the Instructor in Coffee Culture, who, with a working overseer under him, will make the nursery his headquarters, and, in the intervals of the demands for instruction in the cultivation of coffee and other tropical products, will give attention to nursery work. Mackay will be under the Chemist-in-Charge of the Sugar Experiment Station, and greater attention will be paid to the cultivation of sugar-cane of the right kinds. Students in chemistry are to be admitted to the laboratory under certain conditions.

In all respects, the Department has advanced considerably in the past year. The farms at Biggenden and Gindie, which at the time of my last report were in the earlier stages of inception, are now more firmly established.

The farms at Westbrook and Hermitage, considering the season, have done very well indeed, and at the College the increased interest shown by the farmers and the continued attendance of a full quota of students is evidence that this establishment is appreciated, and that the efforts of the Principal to further its interests are meeting with their reward. The *Agricultural Journal* continues to attract attention, and the applications to be supplied with this periodical have become so numerous that the circulation is now over 5,000 copies a month.

The technical staff has been increased during the year by the appointment of Mr. Howard Newport as Instructor in Coffee Culture. Mr. Newport will be stationed in the Northern district, with headquarters at the State Nursery at Kamerunga, over which he will, as before stated, exercise a general supervision, the immediate duties of the overseer being performed by Mr. Brooks, who has been transferred from Mackay for that purpose. The increase in the area under coffee and the further enterprise in this direction that is in sight fully warrants an appointment, that has a further value in the fact that Mr. Newport is fully versed in many other tropical branches of agriculture, with the knowledge of which he will be able to inculcate the farmers in the North, and so add to the already long list of products that can be placed on the markets from Queensland.

The necessity forced on us in order to retain a place in the Southern markets for our fruit required that inspectors should be present at ports other than Brisbane, especially for the banana trade.

The Pan-Agricultural Conference (if I may coin the term) for this year was held in Mackay; and with it the different districts of Queensland—the Southern, the Central, and Northern—have each had the opportunity of discussing subjects peculiarly relating thereto, in addition to the subjects that affect the whole colony. The first Conference of representatives of all the agricultural societies was held at the Agricultural College, the second at Rockhampton, the third at Mackay, and of these it may be said that the last was the most successful, and the most representative; for not only were the number present greater than before, but the site of the meeting was peculiarly adapted for the gathering together of the two great branches of agriculture that obtain here—the tropical and the temperate. Sugar-cane and other tropical products are, of course, grown in greater or less areas south of Mackay, but they are mixed more or less with sub-tropical products; while at Mackay the point of regular division may be said to be fixed. Here the Southern men met the Northern men, who know nothing of wheat cultivation and such like; and the Northern men met Southern men, who had never seen a canefield or a sugar-mill, and who, before they visited Mackay, had the wildest ideas of the difficulties to be overcome in the North. At former Conferences, representatives from the North were few in number, the time required to come South for such a purpose having been possibly a bar; but that hindrance not being present at the Mackay Conference, their presence and influence in the debates had greater weight than heretofore. A full report of the proceedings will appear in the August number of the *Agricultural Journal*, but, as it may be interesting to show the scope covered by the Conference, the programme, so far as the papers read and the subjects set down for discussion are concerned, is here inserted :—

PROGRAMME.

Monday, 26th June, 1899.

First Session ... ... 9·30 A.M.

Reception of Delegates by the Mayor of Mackay.

Chairman's Address.

Appointment of Committees.

Sugar Industry and its Requirements... ... E. Denman, Mackay.

Subject for Discussion—Green Manures.

Second Session ... ... 2·15 P.M.

The Possibilities and Difficulties of Tropical Agriculture in Queensland and how it will be affected by Federation ... ... A. Henry, Herbert River.

Labour Problem in connection with the Sugar Industry ... ... G. W. Pott, Bowen.

Subject for Discussion—How to Eradicate the Cane Grub.

Tuesday, 27th June, 1899.

Third Session ... ... 9·30 A.M.

The State in its Relation to the Farmer ... E. Swayne, Mackay.

Agricultural Credit or Cheap Money for Farmers D. Thomatis, Cairns.

Subject for Discussion—Eradication of Nut Grass.

FOURTH SESSION ... ... 2·15 P.M.

Our Farming and Industrial Associations Socially and Economically Considered ... F. W. Peek, Beenleigh.

Some Reasons why English Farmers possessing Capital do not come to Settle as Farmers in Queensland ... ... J. Hudson, Rosewood.

Rust in Wheat—A Probable Preventive ... W. Deacon, Allora.

FIFTH SESSION ... ... 7·30 P.M.

Cultivation of Citrus Fruits ... ... G. Williams, Brisbane.

Drainage ... ... W. Gibson, Bingera.

Sub-drainage ... ... A. Watt, Gatton.

Subject for Discussion—How will the Agricultural Interests of Southern Queensland be affected by the adoption by the Colony of the Commonwealth Bill.

WEDNESDAY, 28TH JUNE, 1899.

SIXTH SESSION ... . 9·30 A.M.

Pig Industry ... ... W. R. Robinson, Toowoomba.

Advantages of Separated Milk over Skimmed for Rearing Dairy Calves ... ... J. Williamson, Beenleigh.

Subjects for Discussion—Tick Inoculation. In Cattle, how long does the First Impregnation affect subsequent Stock, and does the Service of a Cow by a Bull of Inferior Milking Strain affect the Quantity and Quality of her Milk.

The determination that the colony should be represented at the Greater Britain Exhibition now being held in London, so far as agriculture is concerned, gave the opportunity for bringing before the people of Great Britain the possibilities of Queensland in a manner that has not before occurred. The time for preparation was too short; had it been longer, a more representative display might have been placed on exhibition, but even with the limited time available some 289 packages of exhibits were got together, covering what may be termed the established products as opposed to the possible products. The results have been greater than might reasonably have been expected, and the object lesson there presented has done much to increase the importance of Queensland as a field for immigration in the eyes of those in Great Britain who are contemplating settlement in other countries. From the reports received it would seem that great interest has been shown in the products displayed, not only by the ordinary sightseer, but also by those who from present and former connection with farming occupations are in a position to criticise and appreciate the different objects placed for their inspection. The inquiries made concerning the grains, the meats, the wool, hides, butter, cheese, and such like have been met, and have fully taxed the resources of the officer in charge of the exhibits in satisfying those seeking information. From a commercial standpoint the display has resulted in success, and it is more than probable that business of a profitable nature will result, and will amply repay the expenditure that has been incurred. A feature of the court has been the prominence given to perishable products, such as butter and fresh meat; a regular supply has been kept up from this end, the former, together with cheese, having been forwarded every fortnight from the Agricultural College, the meat, of course, being supplied by the meat companies. To provide accommodation for these perishable products, a cold room was erected. The Queensland Court, so far as this Department is concerned, has been under the able management of Mr. C. Luck, who in turn

has been under the direction of Mr. Jack, the Government Geologist. Without going into details, the following list covers in a summary manner the exhibits forwarded from here :—

List of Exhibits sent to Greater Britain Exhibition.

Arrowroot
Books, maps, diagrams, and photographs
Butter
Butter-box ends (branded)
Bran
Brooms
Cheese
Cigars
Cornflour
Coffee
Coffeetina
Chicory
Chaff—
  Lucerne
  Oaten
Earthenware
Flour
Grain—
  1. Barley—Chevalier, Cape
  2. Maize—Golden King, Yellow Dent
  3. Wheat—Belatourka, Allora Spring, Marshall's, Indian Pearl, Early Pera, Mixed varieties.
Grasses
Hay—Lucerne, Oaten, Wheaten, Panicum
Hides
Honey
Kauri Gum
Leather
Meat (fresh)
Meat (preserved)
Models
Olive Oil
Pollard
Rice
Rum
Sugar—White and brown
Shells
Spirits
Timber
Tobacco
Treacles—Molasses, Golden Syrup
Wine
Wool.

Wheat and Barley.—The grain crops generally did not return the high yield that was obtained during 1897, but, notwithstanding the unfavourable season that was experienced, Queensland held her own in comparison with the remainder of Australia, and in those parts where rain fell at the proper time the yield was up to that of former years. Dry weather was experienced at sowing time, with the consequence that much land that had seeded failed in the requisite germinating power, and produced no crop whatever. To quote wheat as an instance of the misfortune that befell all winter-sown grain, it will be seen upon reference to the statistics of the Registrar-General that the seed planted in 23,914 acres failed to germinate. The Maranoa district was particularly unfortunate, and some of the farmers there, who had sown fairly large areas, needed asistance for the planting season this year—assistance which was given in the shape of seed, to be paid for from the coming harvest. The area that was reaped for grain—46,219 acres—produced 607,012 bushels, or an average of 13·13 bushels per acre. Although the area under wheat is annually increasing, there is yet room for great expansion before we arrive at the position of an exporting country, for upon the statistics of 1898, Queensland only produced 26 per cent. of the annual consumption. For the present year, it is anticipated that the area under wheat for grain will be fully 25 per cent. in advance of 1898, and if the favourable season now being experienced continues the yield may be expected to be a record one. The repurchased estates upon the Darling Downs, that were selected as soon as they were thrown open, will be responsible for much of the increased area, for they are all situated within the wheat belt, and the owners have lost no time in preparing land for this cereal. In the Central district the area is gradually increasing, and, should the present year continue to be as favourable for wheat as it now is, 1900 will find a very respectable area seeded to wheat. Barley, especially malting barley, until the erection of a malting-house in Toowoomba, received so little attention from farmers for other purposes than hay or green feed that the Registrar-General did not consider it necessary to divide the varieties in his annual statistics. The decision, however, of the maltsters, that Queensland-grown malting barley is sufficiently good for their purposes, has aroused an interest in that variety, and the area cultivated is now sufficiently important to demand special attention in the statistics. In 1898 there were 1,953 acres sown to

malting barley, that produced an average of 13·78 bushels to the acre—a yield that was affected, as in the case of wheat, by the bad season. In all there were sown to barley some 2,944 acres; and when it is remembered that hitherto this crop has been used entirely for feeding purposes, the preparation devoted to the particular variety favourable to malting is evidence that the farmers are of opinion the crop is worth cultivating—an opinion that is confirmed by the fact that some £46,000 were sent out of Queensland during 1898 for the purchase of malt and malting barley, the greater part of which, if not all, should have remained here.

Maize.—This crop that, with sugar, has become a staple crop, suffered with the other grains from the bad season, but, apart from this, there was a decrease in the area planted. It may be that the increase in the area placed under wheat last year is to some extent responsible for this change, for each of the wheat-growing districts upon the Downs, excepting Toowoomba, show a considerable falling-off, but the fact remains that in 1898 there were 6,886 acres of land under maize less than in 1897. In the Toowoomba district the decrease was 42 acres only, but in the Warwick district 489 acres, and Allora 1,815 acres. Laidley shows a falling-off also of 559 acres, Harrisville 869 acres, Rosewood 304 acres, Bundaberg 524 acres, Ipswich 893 acres, and this falling-off took place notwithstanding that the price of maize remained at a fair figure during the year. Indeed, the market remained so good that the produce merchants imported a shipload of maize from America, all of which passed into consumption without visibly affecting the market. Of course, with the lessened area under crop, and the bad season for grain crops, the yield was not up to former years. There were in all 102,835 acres under maize, that produced 2,252,481 bushels, giving an average of 21·90 bushels to the acre, as against 25·55 in 1897.

Rice, being a crop more especially adapted to the North, did not come under the ban that was placed upon the grain crops that are grown in the South, and was favoured with a good season. This is becoming a staple grain crop in that part of Queensland, the area for 1898 showing an increase of 418 acres over 1897, that for the former year being 863 acres, with a yield of 38·133 bushels or an average of 44·19 bushels to the acre as against 29·19 for 1897. Hitherto rice has been in the experimental stage, has been grown in many parts of the colony, and has fluctuated in area as success or non-success has been met with. It is, however, now settling down to be the property of the Northern district, and it is to that part that the future supply may be looked for, but it behoves the farmers to be careful to grow the variety to suit the market, for of all grains rice is most subject to prejudice and favouritism. It is the grain that in the largest quantities comes into the hands of the consumer in the form that is most nearly allied to the original state, and so is dependent upon the fancies of the consumer for the variety that shall command the highest price. From the figures of the Registrar-General, Queensland at present produces 14 per cent. of its annual consumption, the statistics being production (estimated at the rate of 162 lb. of paddy to the 100 lb. of clean rice) 1,318,176 lb. of clean rice and the imports 8,235,564 lb. of a value of £49,456. The principal district for rice is that of Cairns, which produced 82 per cent. of the total yield, 708 acres being cropped for 33,540 bushels of an average of 47·30 bushels to the acre.

Butter.—The butter trade and manufacture has passed the period when the supply was subordinate to the demand, and consequently the question now to be faced by the manufacturers is to establish themselves by regular consignments of first-class butter in a market outside our boundaries. The market naturally looked for is Great Britain, but the means of communication suitable to the trade direct from Queensland, being intermittent and not always adapted to the requirements of the case, the assistance of the Department was invoked towards the establishment of regular and suitable carriage to Sydney to connect with the mail steamers that leave at fixed intervals throughout the year. At the

time when arrangements were due for the export season of 1898, the prospects of an increased export trade were very favourable, and an agreement was made by this Department with Messrs. Howard Smith and Sons, Ltd., to provide, upon a guarantee of a certain quantity each week, proper accommodation upon their steamers, whereby butter could be shipped from here and placed on board the oversea steamers in a fit state for export, the manufacturers on their part undertaking to ship only by that line, in order to support the agreement made by the Department, and this undertaking they carried out in so far as their output was concerned. Unfortunately, however, before our shipping season commenced, the dry weather had such an effect upon the supply that in place of the shipments reaching a weekly average of 1,500 boxes for a period of four months, or a total anticipated output of 24,000 boxes, only 4,282 were exported. Notwithstanding the very adverse season, a considerable increase on former years is shown by the following figures :—

	Tons.	Value.
1895	17	£1,407
1896	Nil.	
1897	188½	£16,805
1898	436	£37,586

As the arrangements for the carriage of the butter between Brisbane and Sydney were anything but satisfactory, the needed relief must be looked for in some other direction.

The inspection and grading of dairy produce advocated in my Report for last year, as well as in preceding years, has met with much opposition from the proprietors of butter factories in and around Brisbane, an opposition that was sufficiently strong to urge several of them to write letters upon the subject to the Press, based upon, as stated by them at a deputation to you on the 3rd September last, my last Annual Report. It may have been the source whence the opposition was evolved, but it is hardly fair to only quote my Report for 1898-9 upon the subject; for the inspection of dairy produce, and of dairies, has been urgently advocated for several years by me, and by Mr. Mahon when dairy instructor. It is not clear why the factories should have such an objection to inspection and branding, for, if their produce is of good quality, there will be nothing whatever to fear, and the brand will be at the least some guarantee of quality. A law is not made for those who act honourably; it is for those who attempt to evade honest dealing that restriction is necessary. Moreover, with the keen competition that prevails in Europe, it is our bounden duty, even at the expense of some inconvenience to a small section of the community, to place upon the European market, as first-class commodities, only the best we can produce; and it stands to reason that, if there is not some inspection of what is exported, there will be sooner or later some person or firm who will attempt to make a big haul by trading on the reputation that has already been established, by sending inferior goods under a first-class label. Butter, more than any other article requires inspection, for the reason that in London it is not sold in the open market, as other commodities are, but changes hands directly between merchants, with the consequence that the ruling price is not fixed by the trade generally, but by the importers.

Coffee.—Though this, like rice, is grown upon the coast side of the main range from Cooktown to the Tweed Heads, the tendency is towards cultivation in the tropics, where plantations are now being cultivated upon a commercial scale. It has only been within the last three years that the interest shown in this product has demanded the attention of the Registrar-General from a statistical point of view, but from that time the increase in area has each year shown a fair advance. Taking the last two years for an example, it will be found that in 1897 there were 180¼ acres of productive coffee trees and 130¾

of non-productive, and in 1898, 199 acres and 233 acres respectively. The figures show an evident advance in the area planted, and the information to hand points to the statistics of the present year being yet more favourable. The imports for 1898 were 170,886 lb., and upon that basis there is room for the use of 602 acres before we overtake our consumption, which, upon the present population of 498,523, is at the rate of ·456 lb. of coffee per head each year. The market in Europe, however, is good, and though we may not yet have learned how to offer our goods in the most attractive manner, the opinion expressed by the trade in London upon Queensland coffee is very favourable, and by the time we are in a position to place a fair quantity for export that method of preparing our coffee will have been attained, and we shall be able to compete with those countries wherein coffee-growing has been prosecuted for centuries. The appointment of Mr. Newport as instructor in coffee culture has given an impetus to this branch of tropical agriculture, and as he has also an intimate knowledge of what may be termed allied products, such as spices, the benefits to the farmers of the North will be greater than was anticipated. The death of Mr. E. Cowley, and the exigencies of the Diseases in Plants Act at Cairns has precluded Mr. Newport, up to the present, from giving that attention to instruction he would have wished, for the reason that he was retained in Cairns to supervise the nursery, and to attend to the inspection of fruit. Arrangements have, however, now been made to release him from that detention, and his services will henceforth be at the command of the coffee-grower. A report from him upon this subject is attached herewith.

Wool.—The establishment of wool sales in Brisbane, upon a firm basis, has been of benefit and value to the community generally; for, in addition to the employment given to those directly engaged in the business, much money is circulated that hitherto has gone to Sydney. The possession by the Government of the Exhibition Buildings and grounds provided a suitable place, in the annexes, wherein to expose the samples for the examination of the buyers, and favourable arrangements have been entered into with the Wool Selling Brokers' Association, whereby for a period of years the association become tenants of the annexes, excepting for the time necessary for the Annual Show of the National Agricultural and Industrial Association. The first sale was on the 29th October, 1898; since when sales have been held on the 17th December, 1898, 14th February of this year, and on the 17th May, the quantity of wool upon which the bonus granted by Parliament was claimed amounting to the respectable total of 1,527 tons 1 cwt. 2 qr. 14 lb.

Chilled Meat.—As with wool, the incentive offered by the bonus upon the export of chilled meat has gone far to establish a trade in this line that did not before exist. Bonus has only been available since the 1st July, 1898, but during the year ending the 30th June last, claims were received and dealt with covering the total of 1,320,008 lb. This bonus can only be paid upon meat that is exported and sold within Australia, and is not available for frozen or other meats exported beyond Australia.

Diseases in Plants.—The operations under the Diseases in Plants Act have been somewhat enlarged during the past year, but not to the extent that could be wished if it be intended that the insect pests shall be fought with the vigour that they should be. The result of the decision of Victoria to practically enforce inspection of bananas prior to export has been, as far as can be learned, satisfactory, for not only is more care taken by the banana planters as to the fruit they export, but the Victorians are apparently satisfied with the efforts made here to prevent diseased fruit from coming into their markets. Inspection of imported fruits has been of decided benefit, and has led to a great improvement in the class of fruit exposed for sale in the shops. To properly deal with the imports further help is, however, necessary, for the inspector, even with such help as other technical officers of the Department can give from time to

time, is not able to do all that should be done in this direction. The cleansing of orchards and the registration of nurserymen has not been enforced as required by the Act for a like reason, but a beginning has been made in the former case by the travelling cyanide plant. Considering the quantity of fresh fruit imported the number of condemnations have been small, and are evidence of the care taken by the southern inspectors in carrying out their work. Grape cuttings continue from time to time to be met with in larger or small quantities, and are invariably seized and destroyed. The necessity forced on us in order to retain a place in the southern markets for our fruit required that inspectors should be present at ports other than Brisbane, especially for the banana trade, and accordingly inspectors have been stationed at Geraldton and at Cairns, and assistance in a similar manner has been given to the orange export trade at Maryborough. Opportunity has been taken during the year to further approach the great question of cleansing our orchards from some, if not all, the pests that attack them. A complete system of treating growing fruit trees by what is generally known as the cyanide treatment has been initiated, and so far as the operations have been carried out under the direction of the Instructor in Fruit Culture they have been successful, but as the plant has only lately been arranged after many experiments successfully carried out after fighting against difficulties and failures, the operations have not yet covered much ground, but as I am advised that it will be possible to continue throughout the year, the area covered will quickly expand. Roughly outlined, the treatment is effected by placing tents over the trees and applying the cyanide of potassium and sulphuric acid in the form of a gas or fumes to destroy the scale pests that are present. Particulars of the treatment and the work effected are, however, fully detailed by Mr. Benson in his report. The Assistant Instructor in Fruit Culture, Mr. Voller, has during the past few months been stationed in the Central district, where his teaching has been well received, and is resulting in greater care being given to the art of fruit raising and a greater interest in the well-being of the fruit trees. Orchardists are now beginning to find out, as the dairymen did with their cows, upon the expansion of the butter trade, that it pays only to keep the best, and to give that the best attention.

The following list shows in some degree the nature of the insect pests that have to be watched for in the fruit arriving here :—

Tasmania—

Apples	...	*Fusicladium dentriticum*
Pears ...	...	,, *Pyrinum*

New Zealand—

Apples	...	Codlin Moth and Scale insects

China—

Oranges	...	Parlatoria Scale

California—

Apples	...	Codlin Moth and Scale

Italy—

Citrus fruits ...		*Mytilaspis fulva*, or Mussel Scale

New South Wales—

Citrus fruits ...		Red Scale, Mussel Scale, Black Brand, Fruit Fly Larvæ (*Ceratitis capitata*)
Peaches	...	San José Scale and Larvæ of *Tephritis Tryoni* and *Ceratitis capitata*
Pears ...	...	San José Scale, and Larvæ of *Tephritis* and *Ceratitis*
Quinces	...	Ditto ditto
Apricots	...	*Ceratitis capitata*
Plums	...	San José Scale and Fruit Fly
Persimmons	...	Fruit Fly Larvæ

Sugar.—The public business in connection with the Sugar Works Guarantee Act, was last year transferred from the Department of Public Works, a transfer that involved a class of work that was of a different nature to that previously falling on this office. Outside of the business that in the ordinary course might have been expected in the administration of the Act, the retirement of the Inspecting Engineer, Mr. Fiddes, on account of the completion of the work for which such an appointment was necessary, the inability of the Moreton Central Sugar Company to meet their liabilities, with the consequence that the Government had to come to the assistance of the company to keep it going, and the inquiry upon a petition of some of the shareholders into the working of the Mulgrave Central Mill may, it is thought, be submitted to you as events that are worthy of notice in the transactions of last year. The older Central Mills—the Racecourse and the North Eton at Mackay—have apparently continued on their course of prosperity, and have met their liabilities to the Government. The production of sugar was greater during the last year than in any previous year, and reached the respectable total of 163,734 tons, a net increase, according to the Registrar-General, of 67·2 per cent. over that of 1897, and within 807 tons of the total imports into Australasia, including New Zealand, during that year. It may be interesting here to quote the average quantity of cane to make a ton of sugar in the different districts of Queensland. In the South it required 10·20 tons, in the Central 9·61 tons, and in the North 8·65 tons. These percentages are evidence of the future locality of sugar production, for though sugar-cane cultivation will perhaps never be absolutely absent from the Southern district, the trend of settlement in this direction is to the North, and each year it becomes more apparent. The prospects for the present year are, according to the *Sugar Journal*, not quite so bright as regards the total output as that for 1898-9, but the estimated decrease is not great—148,500 tons against 163,374 tons—and as an early start is anticipated, with anything like a fair crushing season, the estimated output in all probability will be reached.

Agricultural Societies.—A marked change for the better has been manifest in the quality of articles entered for competition at the various Agricultural Shows held during the year, and is evidence of increased interest being taken by the producers in the growth and general preparation of their exhibits. What may be termed the shop element, by which I mean articles not of colonial production, has almost disappeared, and the products of our manufactures are coming strongly to the front. This I consider a most healthy state of affairs, and shows that we have practically laid our swaddling clothes aside. The large exhibits of agricultural implements and the large amount of business done by the exhibitors clearly indicate prosperity in agricultural centres. There is room, however, for great improvement on the part of some of our societies, and I hope soon to see the space now yearly occupied by side shows of a most questionable character occupied by exhibits more in keeping with the object for which societies have been formed.

During the past year a change has been effected in connection with the Exhibition Buildings and grounds at Bowen Park. The main hall is in course of conversion into a museum building, and the annexes have been arranged for use by the Brisbane Wool Selling Brokers' Association during eleven months of the year, and by the National Agricultural and Industrial Association during the show month. The tenancy in each case is for five years. The lower portion of the grounds has been let to the National Agricultural and Industrial Association for a similar period. Under the contracts the whole of the buildings and grounds will have undergone a complete change before the end of the year, and I have no doubt but that the changed condition of affairs will be satisfactory to all parties.

Relief.—In my last Report I had to express regret that owing to the disastrous nature of the flood occurring during that year in the Wide Bay district the Department was called upon to supply certain kinds of seed to

farmers in that district. This year seed had to be distributed to farmers in the Wallumbilla, Roma, and Mitchell districts, not, however, owing to flood, but owing to the diametrically opposing cause—that of drought. Large areas in these districts were seeded to wheat at the proper sowing season, but the protracted spell of dry weather prevented the seed from germinating in most parts, and where it did germinate the young plants were not sufficiently established to enable them to resist the drought, and they consequently perished. This seed was supplied upon a guarantee similar to that of the previous distribution, a guarantee which, I doubt not, will be duly honoured if conditions are at all favourable.

In looking back twelve years and calling to mind the humble habitation of the Department in two small rooms under the wing of the Lands Department, it is with much gratification that we have arrived at the present block of buildings, under the roof of which the whole of the administration branch of the Department, with the exception of the Stock Institute, is now located. The rapid strides the Department has made and is still making have naturally resulted in a very great increase of work and responsibility on the part of all the officers, and I have no hesitation in saying that one and all have willingly and faithfully discharged their duties. It affords me very great pleasure indeed to be associated with such a staff of officers, and I feel assured the aim and desire of all is to do their utmost to advance the interests of the Department, and benefit the community in whose interest they labour. The reports of the following officers of the Department are appended herewith:—

Principal of the Queensland Agricultural College	Curator, Botanic Gardens
Agricultural Chemist	Manager, State Nursery, Kamerunga
Colonial Botanist	Manager, State Farm, Westbrook
Entomologist	,, ,, ,, Hermitage
Instructor in Fruit Culture	,, ,, ,, Gindie
Viticulturist	,, ,, ,, Biggenden
Tobacco Expert	and the Report of the Chief
Instructor in Coffee Culture	Inspector of Stock.

PETER McLEAN,
Under Secretary.

REPORT OF THE PRINCIPAL OF THE QUEENSLAND AGRICULTURAL COLLEGE.

Sir,—I have the honour to submit my first Annual Report as Principal, and to attach to it the report of the officers in charge of the several branches at the College.

Since my appointment on the 1st July, 1898, the following changes amongst the officers have taken place:—

Mr. Boyd, the Secretary, resigned in January last, and has been succeeded by Mr. Pitt, the English and Mathematical Master, who has undertaken the secretarial work in addition to his other duties.

Mr. Schmidt, the Science Master, resigned, and has been succeeded by Mr. P. Sutherland, B.A., lately a master at the Agricultural College in Victoria.

Mr. Quodling, the Farm Foreman, was transferred to the State Farm, Westbrook, and has been followed by Mr. Watt, formerly Manager of the State Farm, Gindie.

Mr. C. McGrath, an Assistant Dairy Instructor, was appointed to the charge of the Dairy; and upon the resignation of the Assistant Chemist (Mr. Watson), Mr. L. Nott was appointed as his successor.

In addition to the regular staff of masters, valuable instruction has been given by the Visiting Technical Officers of the Department. Mr. Quinnell, M.R.C.V.S., visits the College each week, lectures on and gives practical demonstrations of veterinary science. Messrs. Nevill (the Tobacco Expert), Rainford (the Viticulturist), and Benson (the Instructor in Fruit Culture) have each, upon different occasions, added to the knowledge at the command of the students, and have, moreover, under their charge plots of land, which they cultivate according to their particular specialties. Before proceeding further, I desire to express my thanks for the loyal support received during the year from all connected with the College and the Department generally.

The conduct of the students has been good, if exception be made for those trivial lapses that are to be expected amongst a body of young men of the age of the majority of those that enter; and the rules and regulations have been respected and adhered to.

The first term of the second year commenced on the 12th July last, with 36 students, and the second term on the 12th January with 39, who came from all parts of Queensland, and amongst whom were two from New South Wales. Those now on the roll are all strong and healthy, and promise to be in every way a credit to the College.

The Year's Work.—The first half was unsettled from two causes—an outbreak of scarlet fever, and from the necessity of repeating much of the work of my predecessor to obtain a starting point. A difficulty I had to meet was the opinion held by many students, and apparently in some instances by their parents, that a short time at the College was sufficient for a maximum amount of knowledge, and the evident desire of some parents that their sons, with but a limited education, should take up subjects that are distasteful to them, and which they can never hope to master. The College course covers so many subjects that it would require more than ordinary intelligence for a student to become proficient in each and all branches during a residence of three years. It would seem to be ill-advised on the part of those responsible for the future of the youngsters who come here to be taught to endeavour to force the knowledge to be gained within the limits of a given time, for the consequences are detrimental to the student and to the College. It were wiser for those who only intend to remain, say, a year to devote the whole of that time to one subject and learn it thoroughly. Another argument against the many-subject course is the fact that some boys have an unconquerable dislike to or inability for bookwork, and at the same time have a great liking and ability for fieldwork. In these cases, to force lads, whose intention is to pass their lives as farmers, to undertake what is to them a hopeless drudgery, is a sheer waste of time, and almost amounts to cruelty. Acting upon this hypothesis, I have during the past year, the acquiescence of parents being previously obtained, initiated a system of special work, under which students devote themselves to particular kinds of work. This system has been found to work well; indeed, in connection with the dairy course it has worked too well, for, this being a favourite occupation, the applications have been greater than the capacity of the dairy, and the consequent ability of the instructor to give proper attention to, and to do justice to, his pupils. The result on this point (for the dairy will only admit of a class of ten at a time) has been that it has been necessary to refuse applications for the dairy course, and students have left the College for that reason, instead of awaiting their turn and in the meantime acquiring knowledge in other branches, that would have been useful even to them as dairymen, should it have been their intention to devote themselves exclusively to that pursuit.

Notwithstanding that the indoor work is made as plain and attractive as possible by the teachers, the inclination of all students, excepting a small minority, is towards practical work; and, though this preference might well be encouraged with first and

second year men, I am of opinion that for third-year men the theoretical and scientific teaching should be insisted upon, because the practical knowledge previously gained, combined with the theoretical and scientific instruction, will finish that course which the College ought to impart to those whose intention it is to follow agriculture, and who have, for that purpose, spent three years of their lives to gain that knowledge. Scientific and theoretical knowledge will not alone suffice for the farmer, and from my experience it would seem that those who have only attained that knowledge invariably endeavour to become teachers, and will not risk their training or prove their knowledge by becoming farmers. Science, theory, and practice should go hand in hand. The latter may stand by itself, and thrive after a manner, but the two former will fall unless accompanied by practice. It is upon this basis that it is my intention to conduct the agricultural education of those who trust themselves to my guidance. The results of the examinations, as shown by the grade-sheets herewith, will furnish a guide to the progress made by the students.

QUEENSLAND AGRICULTURAL COLLEGE.

Grade Sheet—December, 1898.

		Agriculture, Principles.	Arithmetic.	Botany.	Chemistry, Lectures.	Chemistry, Practical.	English.	Mensuration.	Surveying.	Anatomy.	Zoology and Nat. Science.	Carpentering.	Dairying.	Practical Farming.	Gardening.	Conduct.
A.	Anderson	88	...	...	...	90	...	...	75	96	93	92	90	...	...	100
	Bayley ...	93	...	...	89	85	...	...	0	...	...	85	92	...	...	100
	Isaacs ...	90	...	...	70	80	...	...	...	...	...	87	65	...	...	100
	Preston ...	84	...	...	90	85	...	...	0	97	...	...	84	..	90	100
	Reid ...	89	...	...	96	90	...	...	99	...	...	...	90	...	...	95
B.	Barth ...	80	...	...	76	...	...	82	...	72	57	77	54	70	92	96
	Burn ...	90	...	...	97	...	...	90	...	91	93	90	86	71	90	95
	Culpin ...	82	...	...	70	...	...	71	...	...	...	80	60	65	80	100
	Henry ...	85	...	...	76	...	...	81	...	78	71	87	55	67	85	96
	Jackson ...	92	...	...	...	...	...	...	...	...	...	82	80	70	90	94
	Johnson ...	88	...	...	...	...	...	23	...	18	13	76	60	60	78	98
	Jones ...	84	...	...	83	...	...	64	...	73	81	75	60	65	85	99
	Mayne ...	70	...	...	...	...	..	18	...	...	...	80	58	50	65	90
	McIlwraith	90	...	...	83	...	..	39	...	...	...	90	90	70	75	100
	Palmer, F. ...	78	...	...	...	...	...	34	...	...	...	80	56	60	90	98
	Philp ...	95	...	...	78	...	...	64	...	86	70	83	94	65	90	100
	Shine ...	89	..	...	71	...	...	85	...	64	70	80	60	65	89	98
	Thallon ...	75	...	...	64	...	...	27	...	45	40	86	85	64	78	100
	Webb ...	76	...	...	72	...	...	66	...	73	51	92	88	70	90	100
	Whitehouse	90	...	..	...	...	...	25	...	...	...	92	76	72	95	100
C.	Byrne ...	80	60	62	...	71	...	...	...	36	...	81	65	64	78	95
	Conachan ...	86	43	58	...	61	...	...	...	36	...	85	55	68	90	100
	Cusack ...	78	73	60	..	84	...	...	...	59	...	78	70	46	82	95
	Dyne ...	83	11	0	...	53	...	...	...	11	...	72	60	68	90	96
	Holcombe ...	80	13	59	...	62	...	...	...	19	...	75	60	64	90	95
	Nott ...	85	33	...	...	72	...	...	...	49	...	70	80	65	70	90
	Palmer, W.	90	...	...	...	...	...	...	...	...	...	87	70	72	95	100
	Sigley ...	90	51	...	...	63	...	...	...	...	...	92	60	68	82	100
	Stupart ..	80	57	65	...	64	...	...	...	33	...	68	56	66	82	98
	Thynne ...	70	77	42	...	70	...	...	...	2	...	82	75	60	78	90
	Wilson ...	80	32	0	...	72	...	...	..	0	...	85	84	66	80	95
	Youngman ...	88	53	85	...	81	...	...	...	80	...	84	87	66	90	100
Preparatory—	Gillham ...	70	23	...	...	70	...	...	..	...	52	71	55	58	82	100
	McKinnon ...	75	64	...	...	62	...	...	...	...	78	79	60	48	90	100
	Noakes ...	74	52	...	..	75	...	...	...	...	71	75	60	56	78	95
	Redmond ...	74	62	...	...	51	...	...	...	...	71	85	52	64	75	

Division.		Agriculture. Principles.	Arithmetic.	Botany	Chemistry, Theory.	Chemistry, Practical.	Dairying, Principles.	Dairying, Special.	Book-keeping.	Elementary Science.	English.	Farming, Special	Horticulture, Principles.	Mensuration.	Physics.	Surveying.	Technical Drawing.	Veterinary Science.	Blacksmithing.	Carpentering.	Dairying, Practical	Farming, Practical.	Gardening, Practical.	Conduct.
A	Anderson	...	...	...	91	85	...	...	89	...	...	...	...	...	...	...	65	...	80	93	...	...	...	100
A	Bayley	90	..	...	...	...	90	87	...	...	...	...	...	...	...	...	...	...	...	...	87	...	...	100
B	Barth	58	..	...	83	86	30	...	62	...	...	...	96	...	...	46	65	...	60	90	40	70	80	100
B	Brown	60	...	...	59	65	50	..	80	...	...	...	99	...	...	0	65	...	60	90	40	75	80	96
B	Burn	86	...	...	87	83	90	82	...	...	...	...	...	...	...	...	...	...	..	...	82	...	...	90
B	Henry	70	...	62	65	70	35	...	52	...	...	...	79	...	...	15	60	...	...	89	...	68	75	86
B	Jones	...	...	68	79	80	...	...	51	...	...	..	92	...	...	30	50	...	..	75	...	...	76	...
B	McIlwraith	90	...	...	79	82	90	83	...	..	...	...	99	...	...	0	60	...	70	...	83	...	...	90
B	Palmer, F.	70	...	...	...	...	70	...	69	...	...	...	91	...	...	...	50	...	...	...	60	...	76	96
B	Philp	86	...	...	...	...	50	...	64	...	...	90	89	...	...	...	..	...	...	80	...	...	...	100
B	Redmond, E. J.	68	...	...	...	...	86	74	100	...	...	...	97	...	...	84	...	...	...	...	74	...	...	100
B	Shine	80	...	70	68	80	48	...	71	...	..	...	99	..	...	54	60	...	...	80	50	76	75	100
B	Webb	78	...	...	75	80	90	82	58	...	...	...	77	...	...	37	65	...	...	...	86	70	...	99
B	Whitehouse	86	...	...	81	82	88	78	75	...	...	...	95	...	...	70	60	...	...	...	78	...	...	100
C	Bowler	50	...	...	...	...	42	...	53	...	...	70	79	...	...	...	...	...	40	...	...	70	...	100
C	Conachan	65	..	...	...	...	65	...	15	...	...	...	97	...	...	...	65	...	80	90	45	78	80	100
C	Corser	66	...	35	...	...	45	...	77	...	...	...	...	...	abs.	...	75	...	...	70	30	56	66	100
C	Cusack	76	93	abs.	...	...	55	...	63	...	...	...	91	74	50	...	75	...	...	75	50	70	70	96
C	Dyne	60	...	...	...	...	47	...	0	...	...	...	81	...	...	...	50	...	80	80	45	70	70	95
C	Fox	46	67	48	...	...	40	...	57	...	...	...	55	87	56	...	75	...	50	75	45	50	55	100
C	Holcombe	60	12	...	..	...	50	...	17	...	...	...	...	abs.	...	...	50	...	50	80	...	70	70	100
C	Nott	68	14	...	...	...	50	50	14	...	...	...	..	abs.	abs.	...	50	...	40	50	50	60	60	96
C	Palmer, W.	88	...	...	...	...	60	...	51	...	...	90	...	...	...	...	...	...	60	85	...	90	..	100
C	Sigley	...	...	...	...	...	...	50	abs.	...	...	...	...	...	...	...	...	...	...	90	50	76	...	94
C	Stupart	70	...	...	...	...	86	76	...	...	...	...	...	...	...	...	...	...	50	50	76	...	...	90
C	Thynne	70	64	10	...	...	50	...	41	...	...	70	62	70	38	...	80	...	...	85	...	70	...	90
C	Wilson	65	46	...	...	...	88	77	15	...	...	...	66	50	34	...	65	...	...	...	77	...	...	96
C	Youngman, E.	76	...	...	...	...	44	...	60	...	...	89	...	...	...	...	...	...	...	...	...	89	...	100
Preparatory.	Gillham	36	46	41	...	...	40	...	...	59	38	...	35	...	...	...	60	...	60	60	40	56	60	92
Preparatory.	McKinnon	65	85	...	...	...	46	...	100	...	59	...	74	...	...	...	50	...	...	80	40	66	75	94
Preparatory.	Noakes	50	61	abs.	...	...	45	...	...	78	73	...	71	...	...	...	...	...	...	50	38	55	72	86
Preparatory.	Redmond, J.	60	...	...	.	...	40	...	...	...	...	74	...	...	...	...	..	...	...	80	...	74	...	100
Preparatory.	Walker	36	63	31		...	25	...	...	...	37	...	48	...	...	...	...	..	...	50	35	40	65	70
Preparatory.	Youngman, H.	50	64	...	...	...	35	...	...	...	57	...	...	...	...	...	...	...	...	70	40	60	65	100

SUMMARY OF WORK FOR THE YEAR.

It is thought that, in dealing with this subject, priority should be given to the buildings that have been added to these premises, and to the improvements that have been effected. These, so far as the principal of them are concerned, are :—

Buildings.—A house for the English master, and one for the horticulturist.

A gymnasium with all the necessary appliances for the use of the students.

Cowsheds and stables, now nearly completed, of the latest design—the former to accommodate 40 cows, and the latter 30 horses—and a large barn in proximity thereto.

Additions to the herdsman's cottage.

Shelter-shed for stock near the Lockyer Creek.

Stabling and necessary outhouses at the garden.

Improvements.—Formation of a road 70 chains in length from the College buildings to the station.

A water service from the creek to the buildings, the railway paddock, the piggeries, and other places, that required altogether 1½ miles of iron piping.

Horse yard, calf paddock, and a blacksmith shop.

Painting.—The dormitories have been painted and thoroughly cleansed.

The foregoing, as indeed all the work that has come under the supervision of the superintendence of the Instructor in Mechanics, are described in his report; but there are two buildings that have been erected that call for more than a passing notice, and these are the dairy and the piggery.

The dairy now in use is an enlargement and transformation of the building erected during the first year. The old floors were taken up and replaced with concrete. There are three refrigerating chambers for the storage of butter, cheese, and meat, and a milk-testing room is available for that purpose. The plant is a most complete one, and covers a 14-h.p. boiler, 8-h.p. engine, a 1-ton refrigerator (Waugh and Josephson), 2-cwts. ice-making machine, ice tank, large filter, water tank, 130-gallon turbine De Laval separator, Babcock and Gerber milk-testers, streamlet churn, butter-worker, a complete cheese-making plant, pasteurising plant, and the numerous smaller appliances that are necessary for successful dairying, whether upon a large or small scale. The piggery is worthy of notice, because it includes all the latest improvements for the stabling of a large number. It has been built for the accommodation of 160 large or 250 small pigs.

Machinery and Implements.—The additions have been three double-furrow ploughs, one single-disc and one single-furrow plough, a mowing machine, a corn-planter, a wagon, one dray, a four-horse drag, and one portable chaffcutter.

Viticulture.—This is directly under the supervision of Mr. Rainford, the Viticulturist. The vineyard area under vines covers three-quarters of an acre on the bank of the Lockyer Creek, and some 2 acres in the course of preparation upon the hill adjoining the Principal's house. The instruction given by Mr. Rainford includes all that, practically or theoretically, it is necessary for any person to know that has the intention of cultivating the vine as a commercial undertaking. It is suggested, however, that the instruction would be greatly amplified were facilities given for wine-making. It might be that the College vineyard would not supply sufficient for that purpose, but the deficiency might perhaps be filled from the State farms on the Downs.

Tobacco.—The experiments upon 2 acres of land, directed by Mr. Nevill, for a time looked promising; but the dry weather proved completely fatal—a circumstance much to be regretted, for Mr. Nevill took exceptional interest in this experiment.

Orchard.—This has been under the supervision of Mr. Benson, who has given practical and theoretical instruction to those students who have assisted him in his work. The area planted covers about 3 acres, and the variety of trees to be found therein are many, and are generally thriving. In addition to this area some 6 acres are being prepared, 4 of which it is proposed to plant with trees of the Citrus family and 2 with olives.

Farm.—Here 136 acres of new land have been cleared, ploughed, and sown with wheat, oats, barley, potatoes, &c. This land has been subdivided into two paddocks that required one mile of additional fencing to complete the enclosure. Though not

exactly in the present instance within the province of farm work upon the College work, the clearing of old timber around the buildings and the planting of the railway road after first trenching the ground may be reported. This latter work is necessary to the education of the farmer, and therefore can, I think, be included under this heading.

Upon entering upon my appointment I found there was much of what may be termed dead work to be done, and especially so in the eradication of weeds, &c., that had fouled the arable land, and required, in some places, three ploughings before the land was clean. By the time this was accomplished with the limited means then at our disposal, the season had too far advanced for the planting of many crops that I wished and intended to plant. This drawback, added to the exceptionally dry season, has left us with poor results from the farm; good work was, however, performed, though at no small cost, in cleansing the land, and this having been well done, our trouble in that direction is ended. Altogether about 337 acres have been cultivated, 250 of which have undergone a second ploughing. From that area 130 acres have been cropped, and the greater part again prepared and replanted. The drought so affected some crops that, there being no prospect of them arriving at maturity, they were fed to the cattle or saved in the form of ensilage. The early maize, particularly, failed to cob, and was turned into ensilage rather than risk the loss of the whole.

From 41 acres—which included 24 acres of maize, 13 acres of sorghum, and 4 acres of imphee—about 200 head of cattle were fed for several months from 580 tons of ensilage that were made from crops that would otherwise have been lost. These remarks are made to emphasise the value of the silo, and in the hope of inducing farmers to take a similar course under like circumstances. Had the crops been allowed to remain in the field, as has happened before in Queensland, under the impression that it would not pay to cut, feed would have to have been purchased for the cattle and horses; and at the price of fodder last year the cost would have been ruinous, and considerably more than that of saving the ensilage and of the erection of the silo that will last for years.

Ensilage, and particularly that made from maize, is excellent fodder for horses and dry cattle, but it is not the best food if given alone for milking cows. Experiments were made with cows in milk, that after feeding were allowed to run in grass paddocks, but the experience gained was not encouraging, for they rapidly went off in their milk. The completion of the cowsheds, with the provision therein for properly housing cows in milk, will give opportunities for further experiments that will be taken advantage of. Ensilage made from sorghum or imphee was not relished or eaten with such avidity by stock generally as that made from maize. The details of the work upon the farm are given by the foreman in his report, but the following schedule of crops grown during the year may be of interest :—

	Crops 30th June, 1899. Acres.		Crops removed during year 1898-99. Acres.
Wheat	54	Oats	6½
Lucerne	34	Wheat	6½
Barley, Cape and malting	41	Maize and pumpkins ...	37
Oats	24	Early maize	24
Potatoes	15	Cow pea	13
Green fodder	12	Sorghum	13
Swede turnips	3	Potatoes	12
Carrots	2½	Fodders (panicum, &c.)	11
Mangolds	2½	Imphee	4
Beet	2	Sundry crops	2½
Onions	1		
Prairie-grass	2½		
Cocksfoot-grass	2		
Rye-grass	2		
Stud wheats	½		
Vegetables	4		
Orchard	3		
Strawberries	1½		
Vines	¾		
Total	207¼		129½
	129½		
Grand total ...	336¾		

Experiments with Grasses and Clovers.

The following grasses and clovers were planted from the 3rd to the 5th of September last. This late planting was caused by the want of seed and the state of the land; but, notwithstanding these causes and the dry season experienced, many of the varieties did remarkably well :--

1. White Clover, grew splendidly
2. Red „ „
3. Rye-grass, made rapid growth, and still growing
4. Prairie-grass, made rapid growth, and still growing
5. New Zealand Rye-grass, did fairly well
6. Perennial „ poor results
7. Italian „ very good
8. White or Dutch Clover, fair results
9. Hop Clover, very good
10. Alsike „ very poor
11. Perennial Red Clover, no good
12. Hybrid Cow Clover, poor results
13. Cow-grass „ good
14. Rough Cocksfoot, never germinated
15. Creeping Bent „
16. Meadow Grass „
17. Meadow Foxtail „
18. Texas Blue, never germinated
19. *Paspalum dilatatum*, few seeds germinated
20. Old Man Saltbush, no growth
21. Creeping „ „
22. Saltbush from Lake Dunne, no growth

Maize.

The following varieties have been grown for experimental purposes, but owing to the dry weather the results have been anything but satisfactory :—

1. Golden King
2. Paterson's Variety
3. Bristol's Early Yellow
4. Pennsylvania Long
5. Dent
6. Golden Dent
7. Maryland White Dent
8. White Horse Dent
9. Old Cabin Home
10. Southern White
11. Hawkesbury Champion
12. Macleay River

Stud Wheat.

The following are the varieties that were grown and harvested this year :—

1. Crown
2. Blount's Lambrigg and Hornblend
3. Jacinth and Amethyst and King's Jubilee
4. Vallalla
5. (Impt) Fife and King's Jubilee
6. Blount's Lambrigg and Saxon Fife
7. 144—18 (C^1)
8. Flutz Marshall's No. 3
9. Blount's Early Japanese and King's Jubilee and Ladoga
10. Vermont and Blount's Lambrigg
11. Jacinth and Ward's White
12. Vermont and Ward's White
13. Blount's Lambrigg and Ward's White
14. Long Boat
15. Vanessa
16. Marshall's No. 7
17. Marshall's No. 29
18. „ „ 9
19. „ „ 19
20. „ „ 8
21. Cretan
22. Hawker's
23. Australian Wonder
24. Hercules
25. Robin's Rust Proof
26. Frumenti Ferenese
27. Venning Rust Proof
28. Cook's 74
29. Budd's Early
30. Farrer's No. 102 and Z, Gatton Pedigree
31. 102 and Z, Gatton Pedigree and Blockhead's and King's Jubilee
32. F, Gatton 65 and Z

Last season having been an unusual one, very little reliance can be placed on the result of this planting, though laid down for experiment purposes. All, with the exception of the "Crown," were more or less affected with rust, and many varieties were totally unsuitable for milling. A noticeable feature in connection with these wheats was that each lot ripened very unevenly, as much as three weeks elapsing between the first and second ripening, and with some varieties a third harvest might have been gathered five weeks after the first picking. The best varieties were saved and again planted on the 23rd May, this year.

The following are the wheats planted on 23rd, 28th, and 30th May of this year:—

1. (185) Venning's Rust Proof
2. Crown
3. Cretan
4. Blount's Lambrigg
5. (279) Blount's Early Japanese
6. Skimudell's
7. 144 (18 E)
8. Marshall's No. 28
9. Marshall's No. 19
10. Gatton Pedigree
11. Hawker's
12. Jacinth (270)
13. (266) Amethyst
14. B. Farrer's (120)
15. Gatton Pedigree 102 (C 2)
16. (34) Marshall's No. 9
17. Gatton Pedigree, 65 and Z
18. Flutz, Marshall's No. 3
19. Indian, F 122
20. (12) Paros
21. Champlain's Hybrid
22. (137) Red Straw
23. (374) Hayricks
24. Early Baart
25. (7) Egyptian C²
26. (121) Indian Early
27. (123) Indian Z
28. (339) Gayndah
29. (4) Mica
30. (142) Battlefield
31. (310) Red Clawson
32. Algerian
33. Steer's Early Purple Straw
34. (138) Hudson's Early Purple Straw
35. (383) Comeback
36. (170) Zealand
37. (298) Indian D
38. (303) Australian Wonder
38. (126) King's Jubilee
39. (96) Canning Downs
40. (39) Hindostan
41. Indian Pearl
42. (380) Sweetheart
43. (125) Early Pard
44. Indian Tuscan (125)
45. Maffira
46. F.I. 57
47. Dutort
48. Steinwedel
49. Rattling Jack
50. From G. C. Armstrong
51. Yandilla (391)
52. Farrer (363)
53. White Lammas (from Young)
54. Egyptian (6)
55. Frumenti Ferenese (196)
56. Violet Pearl (400)
57. Robin's Rust Proof (182)
58. Budd's Early (102)
59. Blount's Lambrigg (255)
60. Marshall's No. 9
61. Long Boat (266)
62. Blount's Lambrigg (324)
63. Australian Wonder (19)
64. A. Farrer's 102 and Z

The interest taken by the students in the farm work has been gratifying, and satisfactory progress has been made by them. Many are capable of handling the teams and working the implements in a manner creditable to themselves and their instructors. Some are even proficient enough to carry on the general work with but little guidance and supervision, and this proficiency has to some extent been brought about by the system now in force of keeping them for an extended period in one branch of work instead of changing them each week, as obtained heretofore. By this means an interest is induced which was not before possible when a lad starting a piece of work, say ploughing a field, knew beforehand that his turn of duty would not be long enough to complete the work, and that one or perhaps more students would have a hand in it. Such a system, so far from inducing interest, would, in my opinion, be far more likely to bring about indifference. Although the farm hours are long, there have been no complaints from those who have to fulfil that duty. My thanks are due to Mr. Watt, the foreman, who has carried out his duties well, and who has gained the respect of the students to such a degree that there has been no trouble in dealing with them.

During the year I spent much time upon the farm, giving practical instruction, and lectures morning and evening upon the work of the day.

The students have been taken on several occasions to farms in the neighbourhood, so that they might compare the work of others with that carried on here. They also visited the State Farm at Hermitage, and upon their return were invited to write essays upon what they saw and heard, for which three prizes were offered, the first being a gold medal of the value of £2 2s. Some twenty essays were presented for award, and the first prize was awarded to Mr. Youngman, the second and third being divided between Messrs. Bayley and McIlwraith.

Dairying.—Good results have accrued financially and educationally. For the first half of the year circumstances were much against any advance being made, for the plant was insufficient and the buildings were in a state of transition and of improvement. During the rebuilding the manufacture of butter and cheese had to be gone on with in a place where carpenters and other workmen were constantly at work, so that it was then impossible to turn out any satisfactory production. During the

Greater Britain Exhibition, fortnightly consignments of butter and cheese have been sent to London. Hitherto the want of accommodation for the proper feeding and treatment of the milking cows has caused considerable waste, and has acted detrimentally to the dairy from a financial point of view. The rearing of young animals has also of necessity been to a certain extent neglected, and has not received the attention such an important matter should have, but with the completion of the new cowsheds and calf paddocks these difficulties will disappear. The following list of the dairy cattle that have passed through or are now at the College will show the material upon which the dairy depends for a supply of milk:—

College Herd.

July 1st, 1898.	Disposed of, 1898-99.	Purchased, 1898-99.	July 1st, 1899.
Bulls, old—			
Ayrshires ... 3	Sent Westbrook State Farm ... 1	...	Ayrshires ... 2
Jerseys ... 1	...	...	Jerseys ... 1
Holsteins ... 1	...	...	Holsteins ... 1
South Coast 1	Destroyed (tuberculosis) 1		
Cows, old—			
Ayrshires ... 11	...	...	Ayrshires ... 11
Jerseys ... 9	...	...	Jerseys ... 9
South Coast 10	Destroyed (tuberculosis) 4	...	South Coast ... 6
Holsteins ... 1	...	...	Holsteins ... 1
Grades ... 18	...	Purchased ... 29	Grades ... 47
Devons ... 0	...	,, ... 10	Devons ... 10
Shorthorns ... 0	Died 2	,, ... 30	Shorthorns ... 28
1 *year and under, males—*			2 *years and under, males—*
Ayrshires ... 4	...	...	Ayrshires ... 4
Jerseys ... 1	...	...	Jerseys ... 1
South Coast 1	...	...	South Coast... 1
Holsteins ... 1	...	...	Holsteins ... 1
1 *year and under, females—*			2 *years and under, females—*
Ayrshires ... 8	...	...	Ayrshires ... 8
Jerseys ... 6	...	...	Jerseys ... 6
South Coast 4	...	...	South Coast... 4
Holsteins ... 2	...	...	Holsteins ... 4
Sp. Tr. Account—			
Spayed cows 64	Sold 62		
	Killed for College 2		
Bullocks ... 50	Sold 50		
Total ...196	...	...	Total ...145

Total old stock and upwards of one year 145

Young stock, one year and under—

	Males.	Females.	
Ayrshires	7	5	12
Jerseys	6	4	10
South Coast	3	1	4
Shorthorns	6	9	15
Devons	1	2	3
Grades	4	19*	21

Total of all descriptions, 1st July, 1899 210

* Died 2

The additions to the dairy herd during the year were for the most part selected from herds within this district, and included in them were 30 very fine Durham heifers, obtained from the Lake Clarendon Estate. The price paid for the milkers bought ranged from £2 10s. to £4 10s. per head, but, with a few exceptions, I was fortunate in securing excellent milkers. It is intended to cross these animals—which may be termed grade stock—with the pure-bred bulls, to ascertain the effect of the different crosses.

Nearly all the milking cattle and the stud bulls have been subjected to the tuberculin test, and those that have been found to be diseased have been destroyed. The tests were made by myself, with the assistance of the students, who by this means were made familiar with the operations necessary. Some of them so profited by what they learned that they have since applied the test under my supervision.

In addition to the ordinary production of the dairy, special attention has been given to the manufacture of condensed and concentrated milk, and, so far as we have gone in this direction, the manufactured article has been found to keep sound and pure.

The report of the Dairy Instructor (Mr. C. McGrath) will furnish detailed particulars of the work.

Pigs.—The herd of pigs (under the supervision of Mr. A. Cullac) is gradually being gathered, and within a short time, now that the new buildings are in occupation, it is hoped that the breed will be much improved. The following table shows the stock in hand, and the sales that have been made :—

On hand 1st July, 1898	98	...	98		
Purchased—Tamworths	2				
Middle Yorkshire	3				
Yorkshire...	3				
Pure Berkshire	8				
Sundry	17	...	33		
Natural increase	69	...	69		
	200		200		
Sales	95	...	95		
Total number on hand 1st July, 1899	105		105		

The instruction given in pig-breeding and keeping covers the origin of the different breeds, their good and bad qualities, the results to be obtained from the different crosses, and the way to carry on pig-farming profitably.

The different methods of feeding as adapted to Queensland have not, from want of facilities hitherto, been carried out as systematically as could be wished, but it is proposed to give greater attention to experiments of this nature during the coming year. Instruction will also be given in bacon-curing.

Conclusion.—Having now traversed the different matters that pertain to this Report, I will draw your attention to the different reports that are attached hereto, which will be found, I think, to cover the detailed business of the College that I have not touched upon.

During the year I visited the Hawkesbury and Dookie Colleges, the principals of which in like manner visited Gatton. During our intercourse much was learned that was of mutual instruction and benefit.

During the year 768 letters were despatched, many of which were upon dairying and other matters not directly referring to College work, but concerning which inquiry was made of me. Some of these inquiries came from New South Wales and some from Victoria.

The visitors to the College increase in numbers as time goes by, and, though every attention is given to the inquiries, the staff is sometimes taxed to supply the information that is sought.

In social matters the students are well looked after; and with the gymnasium at their service, a cricket club, a football club, and a tennis court to occupy the leisure time, opportunities are not wanting for their amusement. Other clubs come to try conclusions with the College, and return matches are played in their appointed time.

On Sundays any student who desires to attend Divine service in Gatton can do so; facilities are given them so to do, and they are encouraged to attend church once in the day.

JOHN MAHON, Principal.

REPORT OF THE AGRICULTURAL CHEMIST RELATIVE TO THE QUEENSLAND AGRICULTURAL COLLEGE.

Sir,—I have the honour to submit herewith my Second Annual Report of my work in connection with the College as a Lecturer of Chemistry to the establishment, and giving at the same time the result of some analytical work carried out, as our spare time allowed us, in the interests of the College and for the general instruction of the public.

Analysis of Milk and Butter.—A number of analyses of milk were made to compare the results of the chemical methods of the fat determination with the practical methods of Babcock and Gerber. In all cases the fat as determined by Gerber's method comes out higher and a little nearer to the true percentage of fat than the value obtained according to Babcock's method.

All the individual separate determinations and readings are given in brackets.

Percentages of fat in various samples of milk, according to—

Chemical.		Babcock's.		Gerber's Method.	
[3·72 — 3·68]	3·710	[3·4 — 3·5]	3·45	[3·7 — 3·65]	3·68
[3·090 — 83·062]	3·076	[2·8 — 2·9		[3·0 — 3·05	
		2·8 — 2·8]	2·82	3·0 — 3·0]	3·91
	3·950	[3·8 — 3·8		[3·9 — 4·0	
		3·9 — 3·9]	3·85	3·95 — 3·95]	3·95
[4·295 — 4·260]	4·278	[4·0 — 4·1		[4·15 — 4·15	
		4·1 — 4·1]	4·08	4·2 — 4·2]	4·18
[4·230 — 4·260]	4·245	[4·1 — 4·1		4·2 — 4·25	
		4·0 — 4·1]	4·07	4·20 — 4·20]	4·21
Averages	3·852		3·65		3·81

Percentage of water in College butter—

Chemical Method.		Gerber's Method.	
[11·12 — 11·30]	11·21	[10·8 — 10·7 — 10·5 — lost]	10·7
[12·75 — 12·62]	12·69	[12·4 — 12·3 — 12·1 — 12·3]	12·3

I will now give the result of a complete analysis of an average sample of milk taken during three days at the Agricultural College. I presume this to be the first exhaustive analysis of Queensland milk, and it is interesting to observe that the whole analysis, and also the analysis of the milk ash, agrees very closely with the analysis given in various text-books :—

Analysis of average milk sample—

Specific Gravity	1·0311
Water [86·75 — 86·79 — 86·70]	86·752
Casein	3·174
Albumin	·322
Butter fat [4·23 — 4·26]	4·245
Milk sugar (lactose)	4·850
Ash	·724
Total solids [13·29 — 13·21]	13·25
(Total solids calculated from fat and specific gravity	13·13)

Analysis of milk ash :—

Sulphuric acid	SO_3	...	...	·285 per cent.	= ·002
Carbonic acid	CO_2	...	...	·390 per cent.	= ·003
Phosphoric acid	P_2O_5	...	...	29·430 per cent.	= ·213
Chlorine	Cl	...	...	13·343 per cent.	= ·097
Lime	CaO	...	...	22·520 per cent.	= ·163
Potash	K_2O	...	...	22·310 per cent.	= ·161
Soda	Na_2O	...	...	9·940 per cent.	= ·072
Magnesia	MgO	...	...	1·440 per cent.	= ·010
Iron	Fe_2O_3	...	...	·040 per cent.	= trace
Undetermined, Loss, &c.		...	...	·302 per cent.	= ·003
				100·000	= ·724

Green Manures.—A small patch of velvet bean (*Mucuna pruriens*) was grown on rather poor soil, of this a square yard was cut, weighed, and prepared for analysis.

The crop, although a poor one, yielded	17·20 tons per acre.
of which Organic matter	3·72 tons per acre.
Nitrogen	173 lb. per acre.
Ash	842 lb. per acre.

From these results it is shown that this bean compares very favourably with cow pea as a green manure.

Analyses of some of the College soils.—The analyses of the soils taken in various parts of the College grounds will be of general interest. The first samples are soils taken on the hill on which the buildings are situated, and the eastern slope of this hill was selected by the Principal for a small orchard and a vineyard. The soil is of only a little depth, and poor from a chemical point of view; the subsoil is a heavy impermeable clay. The slope of the land and also a thin gravelly layer which separates the soil from the subsoil favours drainage.

The other samples taken in the alluvial flat near the banks of the Lockyer represent fairly the soil of the better farms of the district. The land is excellent, and as agricultural land perhaps second to none in Queensland.

The soil is of great depth, and no line of demarcation visible between soil and subsoil. Both soil and subsoil are rich in lime, magnesia, and phosphoric acid. The organic matter, or humus, is, in spite of the black appearance, not so high as, for instance, in the red volcanic soils of Redland Bay.

Students' Work.—With regard to the students' progress I beg to state the following:—Class A, of five students, in the term July-December, continued the study of inorganic chemistry, the students gaining an average term grade of 87 per cent. (maximum 96 per cent., and minimum 70 per cent.). This class of students also continued their course of practical chemistry, gaining an average of 86 per cent.

The Class B, of ten students, started the usual course of elementary inorganic chemistry, making in the whole fair progress, average term grade being 77 per cent. (maximum 97 per cent., and minimum 64 per cent.)

In the second term, ending May, 1899, the Class A had dwindled down to only one student, who finished his course of inorganic chemistry and started organic chemistry; he also continued his practical work in the laboratory and started towards the end of the term with soil analysis.

The Class B was reduced to nine students, and on account of the term being so much broken very little progress was made; they finished in the lecture of inorganic chemistry the non-metallic elements, and gained an average of 75 per cent. (maximum 87 per cent., and minimum 59 per cent.). These students also began their practical course in the laboratory, and did, considering the short term, very creditable work. All showed a great interest in laboratory work, and some of the simpler analytical operations which were carried out gave results of astonishing accuracy, quite surprising considering that all the students handled a chemical balance for the first time.

Many of the students desire to devote more time to laboratory work, and I think this tendency should be encouraged, and that the students should be allowed to do extra laboratory work if they are mentally fit. Any afternoon the laboratory could be used by students, but I think it but fair that students who wish to go in for further studies in chemistry and analytical work, after having gone through the ordinary College course for a period of, say, two years, should not on any account be allowed to drop any of the other scientific studies, which, without exception, are a foundation or valuable auxiliaries to such studies.

I have, &c.,

J. C. BRÜNNICH, F.C.S.,
Agricultural Chemist.

Field or Block		College Hill—Orchard, 5 Acres.		College Hill—Vineyard, 5 Acres.		College Flats—Potato, 25 Acres.		College Flats (late Bull Paddock)—36 Acres.	
General description and properties—									
How long was land under crop?		New land		New land		New land		New land.	
Is land drained or not?		Sloping to east		Sloping to east		Fairly level		Fairly level, slight melon hole, principally towards S. and W.	
Description and outward properties of the various layers—		1. 3. 2.		1. 3. 2.					
Surface soil		Poor sandy soil, 14 in., $7\frac{1}{2}$ in., 11 in.		Poor sandy soil, 14 in., 11 in., 8 in.		Rich black alluvial soil, going gradually into black clayey subsoil.		Rich black alluvial soil, going gradually into black clayey subsoil.	
Intermed layer		Gravelly layer, from 1 to 3 in.		Gravelly layer, from 1 to 3 in.					
Subsoil		Sandy clay, stiff		Sandy clay, stiff.					
The analysis refers to		Soil.	Subsoil.	Soil.	Subsoil.	Soil, 12 in.	Subsoil.	Soil, 12 in.	Subsoil.
Properties of the soil—									
Reaction		Neutral.	Neutral.	Neutral.	Neutral.	Neutral.	Neutral.	Neutral.	Neutral.
Weight of soil per acre, 6 in. deep	tons	995	819	989	807	789	862	777	832
Capacity for water	per cent.	46·3	42·2	25·1	42·1	47·7	40·8	50·0	53·2
Absorbed weight per acre, 6 in. deep	tons	461	346	248	339	376	352	389	442
Capillary power, after 6, 12, 24, 36, and 60 hours		$7\frac{1}{2}$, 10, 12, 13, $14\frac{1}{2}$ in.	$2\frac{1}{2}$, $3\frac{1}{2}$, $3\frac{3}{4}$, 4, $4\frac{1}{2}$	$7\frac{1}{3}$, $10\frac{1}{2}$, 13, 14, 16	$2\frac{1}{2}$, 4, $4\frac{3}{4}$, $5\frac{1}{2}$, $6\frac{1}{2}$	$4\frac{1}{2}$, $6\frac{3}{4}$, $11\frac{1}{2}$, 15, 17	10, $11\frac{1}{2}$ $3\frac{1}{4}$, $4\frac{3}{4}$, $7\frac{1}{2}$	2, $3\frac{1}{2}$, $4\frac{1}{2}$, $6\frac{1}{2}$, 8	$2\frac{1}{2}$, $3\frac{3}{4}$, $4\frac{3}{4}$, $6\frac{1}{4}$, 7
Absorptive powers for salts	cc. of nitrogen	4·0	4·0	4·0	26	46	88	116	192
Porosity	per cent.	34·4	46·5	40·0	45·8	47·0	41·8	45·1	392
Mechanical analysis of the soil—									
Stones over 5 mm. diameter		4·690	7·142	9·261	17·320				
Gravel over 2 mm. diameter		7·395	10·622	7·386	8·035	...	...	...	..
Sand		64·555	51·275	62·861	36·450	...	...	...	...
Fine sand		3·698	3·224	3·970	5·683	3·545	3·403	2·463	2·290
Clay	Fine earth	16·712	19·827	12·967	21·683	·864 / 82·552	·998 / 83·559	·629 / 80·128	·755 / 79·975
Organic matter and moisture		2·950	7·910	3·555	10·829	13·039	12·040	16·780	16·980
Chemical analysis of the soil—									
Moisture		·866	3·551	1·105	4·397	4·612	6·807	5·110	7·278
Humus (humic acid, &c.)		1·255	·617	1·158	·715	3·287	1·836	3·620	1·912
Other organic matter and combin. water		·829	3·742	1·292	5·717	4·140	3·397	8·050	7·790
Chlorine	Cl.	·004	..	·004	...	·005	...	·005	...
Carbonic acid	$C0_2$	·180	·090	·180	·240	·540	·322	·490	·280
Total nitrogen	N	·025	·020	·056	·060	175	·123	·120	·105
Soluble in H. Cl. of 1; Sp. gr.—									
Sol. silica	$Si0_2$	·074	·172	·039	·035	·193	·180	·140	·121
Sulphuric acid	$S0_3$	·070	·093	·044	·044	·052	·023	·060	·051
Phosphoric acid	P_2O_5	·046	·030	·063	·002	·342	·256	·327	·304
Iron	Fe_2O_3	2·400	5·403	2·200	6·600	7·400	6·800	6·727	7·328
Alumina	Al_2O_3	1·876	11·055	2·445	15·111	6·733	8·746	8·710	11·505
Lime	CaO	·124	·152	·135	·122	1·010	1·224	·940	·900
Magnesia	MgO	·117	·292	·090	·348	1·052	1·150	·995	1·200
Potash	K_2O	·152	·076	·043	·136	·240	·252	·220	·232
Soda	Na_2O	·140	·200	·073	·138	·167	·185	·180	·151
Insoluble in HCl of 1; Sp. gr.		92·229	74·529	90·90	67·016	70·850	69·750	65·570	61·735
Total		100·362	100 002	99·771	100·621	100·623	100·928	101·144	100·787

*Figures in italics show strikingly the real value of the soils by giving the weight in tons of certain bodies per acre 6 in. deep. For instance, the orchard soil contains per acre only ·06 tons nitrogen, ·11 tons phosphoric acid, ·29 tons lime, ·35 tons potash; whereas the soil in the potato patch contains 1·3 tons nitrogen, 2·6 tons phosphoric acid, 7·7 tons lime, 1·8 tons potash.

REPORT OF INSTRUCTION BY MR. W. QUINNELL, M.R.C.V.S.

Sir,—I have the honour to submit herewith a brief Report on the lectures delivered and demonstrations given in Veterinary Science at the Queensland Agricultural College from November last to May, 1899.

The lectures and demonstrations were especially adapted to impart a sound education of practical utility to those interested directly or indirectly in the care and management of animals of the farm, and were as under:—

(*A.*) *Theoretical.*—The history and place of domestic animals in the Natural Kingdom.

Anatomy and Physiology dealt with the structures and functions of the varions organs, glands, and tissues of the animal economy.

(*B.*) *Practical.*—The conduction of *post-mortem* examinations and demonstrations in anatomy were given on the cattle that had re-acted to the tuberculin test and condemned at the College.

The Horse.—The points of the horse, soundness and unsoundness, methods of conducting an examination.

Lameness—its location by sight and by manipulation.

The Principles of Shoeing.

General.—Methods of approaching and handling of animals; of approaching and examining sick animals; of administering medicine; and contrivances used in casting and securing animals for operations.

Bandaging.—With a view of giving the students a thorough practical education in anatomy, and also to make them familiar with the lesions of those diseases which render the carcass of the ox, sheep, and pig unfit for human food, I would recommend that meat required by the College be slaughtered there, and that suitable premises should be erected for the purpose: no doubt cold storage could be obtained for any surplus meat in the chilling-room connected with dairy buildings.

On 25th May I held an examination in anatomy and physiology, the result of which I am pleased to state was highly satisfactory.

I have, &c.,

WILMOT C. QUINNELL, M.R.C.V.S. Lond.

REPORT OF THE SUPERINTENDENT OF THE MECHANICAL DEPARTMENT.

Sir,—I have the honour to submit my Report for the past year. The lectures and classes over which I presided differed from those of the previous year in so far that instruction in architectural drawing and building construction have been added. At the present, the work is confined to buildings that may in their future life be required by those who are students, the quantities required and the cost of building material being points emphasised with the object of enabling the students to understand their necessities when they make their start in life. The indoor and practical divisions of work are—general mechanics, special mechanics, blacksmithing, and architectural drawing and building construction.

The work during the year has been heavy, and has required the employment of a carpenter continuously, a blacksmith on two days in the week, and other tradesmen at different times. The principal works that have been carried out under my supervision have been:—

Water Supply.—The water supply from the windmill not being sufficient, a supply was obtained direct from the Lockyer Creek, the first experiment being to connect the 2-inch garden service with the $1\frac{1}{2}$-inch windmill service to ascertain whether the garden steam pump was sufficiently strong to force the water into the storage tank. The time required for filling the tank by this pump—eight hours—was, however, too long, and the large pump from the Goodna Asylum having been obtained, it was fixed in position connected with the 2-inch and $1\frac{1}{2}$-inch services, the pump being driven by the portable boiler. The storage tank is now filled in five hours, and better results even would be obtained were the delivery pipes $2\frac{1}{2}$ inches in diameter. Pumping is now done on alternate days, but it is suggested that the storage tank is not of a sufficient capacity; at present it is only sufficient for daily

requirements, and does not hold any reserve for use in case of fire. The College buildings are practically without protection, and it is submitted that the question is worthy of serious consideration. In connection with the improved water service, a Worthington pump of a capacity of 1,000 gallons per hour, with the necessary staging, was fixed at the well, and the delivery pipes were connected with the 1½-inch steam service and with the portable boiler.

The garden service was connected with the windmill, and 4,000 feet of 2-inch galvanised iron pipes, with the necessary standpipes, plugs, &c., were laid for irrigation purposes.

The water service was extended to the piggery by means of 2,400 feet of ¾-inch galvanised iron pipes, to which the necessary stopcocks, &c., were attached.

Water was laid on to the railway paddock by 2,000 feet of 1½-inch to ¾-inch piping, and the necessary troughing has been provided for the stock pasturing therein. As this service passed through the buildings provision was made for connecting it to the kitchen, dormitories, &c., if it be at any time required. I may here mention that in all the foregoing work the students took their part and worked well, and that in connection with the watering of stock they made seven galvanised iron water-troughs, each 12 feet long.

The general work can be briefly summarised—

Contracts.—Supervised the contract for the piggeries, which cover 120 feet x 36 feet, and are built according to the latest designs to accommodate thirty-two styes, and contain also two storerooms of a sufficient capacity.

The cow sheds, 110 feet x 33 feet, for 40 cows.

The stables, 131 feet x 33 feet, for 30 horses.

The barn, 37 feet x 34 feet.

These buildings are laid down to form the two sides of a rectangular block, the remaining sides of which it is proposed shall be filled in as opportunity may occur with other buildings, and so form an enclosed yard. The buildings contain the latest and most modern improvements. A tramline runs from the barn between the stalls, so that the animals are fed at the head. The mangers in the horse-stalls revolve outwards, so that the animals can be fed without entering the stalls at all. The floors are cemented throughout, and there is a sufficient loft accommodation provided.

Cool rooms at the dairy were erected by contract, and a complete refrigerating plant was installed with the necessary boiler and engine.

Painting the dormitories.

General work executed by the College staff and students.

Set of seed bins of galvanised iron and hardwood with flapdoors.

Alterations to the assembly hall.

Blacksmith's shop, with a veranda of 12 feet of galvanised iron, for which the necessary benches, forges, and other appliances have been provided.

Dairy.—A boiler-house of hardwood—the verandas were enclosed with lattice-work of beech—retaining-walls of brick on three sides, old flooring removed and replaced by cement. A considerable quantity of smaller work was here required and executed, such as stands for milk vats, testers, cupboards, shelving, &c.

Water tower for cooling the water after being used on the condensers, the water being kept in circulation from the steam-pump.

Saw-bench for steam saw.

Gashouse, 20 feet x 9 feet, for the gasolene service used in the laboratory.

Five thousand strawberry boxes and crates.

Stables and offices at the garden.

Altered the old barn into a silo.

Two rooms were added to the herdsman's cottage, and the old slab building on the creek was removed and utilised for other purposes.

Two portable poultry coops on wheels.

The work done in connection with the indoor education covered.

Shelving in the library.

Eight large desks in the class-rooms.

Shelving in laboratory.

The foregoing constituted the principal work with which I was connected, but in addition there were many minor matters that it is not necessary to enumerate here. The work at the College is so diversified that the education in mechanics that the students receive is of the best, and I am glad to be able to report that apparently they appreciate what they are taught.

R. QUINN.

REPORT OF THE FARM FOREMAN.

Sir,—I have the honour to report that upon entering upon my duties here in August last upon transfer from the State Farm, Gindie, the season was far advanced for the planting of the summer crop of potatoes, and finding the land had not been prepared I commenced work by putting into condition by cross-ploughing about $4\frac{3}{4}$ acres that had already been ploughed, and afterwards got ready a piece about 7 acres in extent, but which was so foul with weeds that it required much patience and perseverance to clean, for the ploughing that it had previously undergone had been so shallow that the weeds were lying just below the surface. These fields were planted to potatoes on the 18th August and the 9th September. The potatoes germinated and for a time promised well, but the dry season had such an effect that a crop of only about 6 tons of seed potatoes were saved, and were used for the winter planting. From the same cause a similar fate befell a paddock of 24 acres planted with maize in September. For a time it promised well, but through want of moisture did not crop, and though a failure as a maize crop, was utilised for fodder. The cornstalk-cutter was put to work upon it, and it was afterwards chaffed and made into ensilage. The same may be written of the patch of 13 acres of sorghum, for though it yielded two cuttings—the first a heavy one—the crop was considerably below the average of a dry season. The profit from this crop proved very acceptable in giving feed for the cattle and horses at a time when it was much needed, for the grass was scarce. Horses, however, do not take kindly to it until it is in ear and contains the maximum of saccharine matter.

The summer planting was commenced in November with 35 acres of pumpkins and maize, 20 acres of which received three ploughings, the remainder two. A good crop of pumpkins was gathered, and were and are being used for the pigs. The maize, however, owing to the continued unfavourable season, only produced half a crop. The paddock of 13 acres that last year had been under maize, and on which the stooks had been left standing, was in the same month set to cow peas. The spaces between the rows had been ploughed and were in good order, but on the land occupied by the stooks, couch grass, *Sida retusa*, and other obnoxious weeds had become rampant, and considerable work was needed to clean the land. The cow pea withstood the drought well, but ripened unevenly, and as the only showery weather we had came at the time the peas arrived at maturity, much seed was dropped on the ground. This, however, may prove a blessing in disguise, for the dropped seed has germinated well, and when the growth is ploughed in, the land it now covers will be greatly enriched with the green manure it will receive. An experiment was made with a late planting in October of wheat and oats, and although the straw was short, the ears developed well, the wheat especially. Rust, however, attacked it, and the crop was cut for green feed.

The remaining plantings for November and December were 9 acres of sorghum broadcast and 17 acres of maize in drills 18 inches apart, all of which was used for fodder or made into ensilage.

The lesson of the dry time passed through from July to December last is that of all crops the sorghums and the cow pea withstood the drought better and yielded better crops, so that these should be in evidence upon farms as a standby in case an adverse season should eventuate, for it is not always possible to forecast at the time of sowing what weather will have to be passed through before the crop arrives at maturity.

The present year saw operations commenced upon the new block of 100 acres that had been cleared by contract. Seventy acres of this area were subdivided into two paddocks of 30 and of 40 acres. The 30-acre block was prepared, though not so efficiently as I could have wished, and planted to potatoes at the latter end of February. The seed lay long in the ground for want of rain, and though after germination the growth was rapid, it was too late, for the frost came to check it, and only a medium crop can be expected.

The paddock known as the bull paddock, with an area of 32 acres, was then broken up, prepared, and on the 7th April sown to wheat, which at the present time looks very promising. The other sowings for this month were—

$11\frac{1}{2}$ acres divided into sections with two varieties of barley—Cape and Nepaul—and one of wheat.

6 acres with Swede turnips that appear to be thriving well.

$2\frac{1}{2}$ acres of Cape barley to keep the ground clean for a sowing of tobacco for which this area has been set apart.

15 acres of wheat that lay in the ground until the 27th May, but which now look very promising.

The sowing for May began on the 10th with 10 acres of black oats drilled to about 2½ inches, with one bushel to the acre, and covered by a light harrow. This crop looks well.

Following this were 12 acres of lucerne and wheat, 16 lb. of the former and ¼ bushel of the latter to the acre, both of which are in good condition.

In June, 2½ acres were put under three varieties of carrots—White Belgian, Long Intermediate, and Attringham.

2 acres under beetroot and 1 acre under brown Spanish onions.
13 acres lucerne, 15 lb to the acre.
15 acres of Battledore barley, 1 bushel to the acre.
Stud wheats.
Barley, turnips, and mangel wurzel.

All the crops planted during this month at present promise to return good yields.

The prospects for the coming season are bright; the farm lands are in good tilth and comparatively clean.

Though a very trying time was passed through last year, the farm produced an abundance of excellent fodder that kept in condition horses and dairy cattle upon the farm, and in addition provided material for the manufacture of a large quantity of ensilage. The material used for that purpose was very varied, and in the stacks consisted of cornstalks and sorghum, maize that had not cobbed, Kafir corn, and Hungarian millet.

The students have made fair and satisfactory progress, are keen in their inquiries, and polite in the manner in which they make them. The suggestion I have to make in connection with them is that the time allotted to each for farm work should be prolonged as much as may be convenient in relation to their other studies. It will be to their better advantage, and to that also of the teams, for the frequent changing of drivers is very unsettling to horses.

A. WATT.

REPORT OF THE HORTICULTURIST.

Sir,—I have the honour to submit to you my Report for the year ending 30th June, 1899.

The year has not been a good one for horticultural operations on account of the extremely dry weather, and from the limited means available for artificial watering. In the College grounds the work of grubbing out and removing unsightly trees and stumps has been carried on as opportunity offered, and groups of ornamental trees and shrubs have been planted in various places. An avenue of Coniferæ has been planted from the Tarampa road to the Lockyer Creek. On account of the dry weather these trees have not made the growth they would have done under more favourable circumstances; but most of them have made some progress, and being now well established will thrive better during the coming year. The trees and shrubs planted in the previous year have made great progress for the most part, and all of them are healthy and vigorous. Trenching and planting of flower borders has been carried on as time allowed, and these have been filled in part with plants that are of economic and medicinal value as well as ornamental.

Preparations are now being made to plant an avenue on the road from the College Station, and this, when finished, will add considerably to the beauty of the grounds. The usual routine work of mowing grass and keeping the grounds clean and in order has occupied a considerable amount of time. It will always be a matter of some difficulty to achieve any very marked success in growing shrubs and flowers on the College Hill until an adequate water supply is provided.

Orchard.—In the orchard, instruction has been given to the students in pruning and training trees, in spraying, cyaniding, grafting, and budding. Most of the trees continue to make excellent progress, and the peaches, plums, and figs will bear good crops of fruit during the coming season.

The San José Scale, which made its appearance last year, has been completely held in check by means of painting the trees affected with strong lime and sulphur wash in the winter, followed by repeated sprayings during the spring and summer with whale-oil soap and kerosene emulsion.

Five acres additional are now being prepared for fruit trees, and this area will be chiefly devoted to the citrus tribe.

It is also contemplated to considerably extend the vineyard.

Strawberries, owing to want of rain, did not yield so heavy a crop as was expected; but the plants are now most vigorous and healthy, and promise well for the coming season.

A variety of the Hautbois type, which has been named "Federator," has succeeded remarkably well here. The foliage is vigorous, and free from leaf blight, and the fruit is abundant, large, firm, of good flavour, and stands handling and transportation better than any of the varieties that have been tested here.

Pineapples.—The small plantation of pineapples has succeeded beyond my expectations. The plants are now healthy and vigorous, and look very promising.

Vegetable Garden.—In the vegetable garden the usual crops have been grown, and an abundant supply of vegetables maintained for the use of the College. The surplus has been sold at market prices, chiefly to local dealers. Among the garden products worthy of mention are the following:—

Asparagus, which has proved most successful, the crop being large and the quality excellent. I recommend that the area devoted to this vegetable be considerably extended.

Potatoes.—Of these, twenty-four varieties were grown, and were exhibited at several shows, where they were greatly admired.

Swede Turnips.—These were very large and of good quality, bringing from 3d. to 6d. per dozen when sold to the vegetable hawkers.

Lettuce.—Of these, twenty-four varieties were grown experimentally. None of them showed any special excellence, and some were quite worthless. So far as one trial can be held as conclusive, none of the twenty-four new kinds tried are as good as the standard varieties in general cultivation.

Pumpkin.—A few seeds of a variety named Mammoth Sower were sown. The pumpkins grown from these were very large, averaging from 50 to 80 lb. weight each.

Velvet Bean.—A small patch of this bean was sown on a piece of the poorest soil we have. The total weight per acre was 15 tons, after six months' growth in very dry weather. A sample was submitted to Mr. Brünnich, chemist to the Department, for analysis, and is dealt with in his Report.

Tobacco.—A small area of tobacco was grown, under the direction or Mr. Nevill, tobacco expert.

Lectures.—In addition to the practical work in the orchard and gardens, a short course of lectures was delivered, dealing chiefly with grafting, budding, spraying, and the management and cultivation of special crops, such as cauliflower, asparagus, onions, &c. The examination at the close of the term showed very encouraging results, most of the students appearing to have a thorough grasp of the subjects dealt with.

Owing to increased work in other departments, the average number of students engaged in practical horticulture has not been large; but those who have been at this work have, for the most part, shown an earnest desire to learn, and to make the most of their opportunities.

To encourage such students as show a taste for the higher branches of horticulture, I recommend that a bush-house be erected and stocked as soon as possible. Such a structure would also be of much value for raising young plants, for which purpose no facilities whatever at present exist. Some glass-covered propagating frames are also required.

Wheat Hybridising.—In October of last year, by your instructions, I proceeded to Queanbeyan, New South Wales, for the purpose of being instructed in wheat hybridising by Mr. W. Farrer. Under Mr. Farrer's able guidance I thoroughly mastered the art of hybridising, classifying, and selecting wheats, and trust that the knowledge thus gained will be of benefit both to the College and to the wheat-growing industry generally.

It may not be out of place to remark that Mr. Farrer's system of hybridising and classifying wheats is as near perfection as possible, and the element of chance or the likelihood of mistake is entirely eliminated from his experiments. In this work much more harm than good is likely to be accomplished by careless or incapable hands, and much time and patience are required to carry the experiments on successfully.

I have, &c.,

H. W. GORRIE, Horticulturist.

REPORT OF THE DAIRY INSTRUCTOR.

Sir,—I have the honour to submit my first Annual Report as Dairy Superintendent. During the year the progress made has been considerable, and the interest shown by the students has been keen and well sustained throughout. On taking up my duties in July, 1898, I found that the work of the Department was confined to the production of milk which was fed to the calves and pigs, and that no provision was made for the production of butter or cheese. A dairy building was in course of construction, and a Sharples' steam separator and 1 horse-power boiler had just been erected.

During the erection of the plant, the operations were confined to butter-making, which was carried on with the aid of a hand concussion churn and circular worker, the creaming being done with the Sharples turbine separator. The placing of the boiler in position gave the opportunity of adding cheese-making, which was commenced on the 21st of October last. In carrying on the work the object has been to make it as comprehensive, practical, and efficient as possible. Students receive a thorough grounding in modern methods of milk production and manufacture. They are made familiar with the handling, care, and feeding of dairy stock, and the method of milking, during the early part of their College course. The care of milk and its conversion into butter and cheese is demonstrated to them daily by the work of the dairy, where milk and cream testing, butter-making, and cheese-making comprise the daily routine. The number of students instructed averaged six a day, including four who devote all the time allotted to out-door work to this department.

In order to insure a uniform quality of butter, a process of pasteurising was adopted. The results from the use of the pasteuriser have been so satisfactory that the whole of the butter now manufactured is from pasteurised cream. A quantity of butter has been forwarded fortnightly to the Greater Britain Exhibition, London.

Acting on the request of a committee appointed by the Dairymen's Association of New South Wales, a series of tests have been made with a view of determining the average amount of moisture and also of matter other than butter-fat present in commercial butter.

The results have been forwarded, through you, to the secretary of the committee, and it was pointed out that it is advisable to carry on the investigation for a more lengthened period than had elapsed since the receipt of their communication.

In order to ascertain the value of each cow as a milk producer, a record of each is kept and a test made to ascertain the percentage of butter-fat in the milk; this will enable us to cull out the non-paying animals from the herd.

In the early part of the year the arrangements would not admit of the proper handling and feeding of the dairy stock, and though much has been done by way of improvement, we still await the completion of the large cowsheds, now in course of construction, to enable us to satisfactorily manage the herd.

During the present winter season we are rugging the purebred dairy cows in milk, and a number of the best of the grades. It is to this system and the supply of green fodder that we attribute the increase in the returns we are getting from the cows so treated as compared with the returns from same cows during the winter season of last year.

For some time we have conducted duplicate tests with the Babcock and Gerber testers, and from the following results it will be seen that the readings were slightly higher in the Gerber than the Babcock :—

	Babcock.	Gerber.
Sample 1	3·5	3·6
„ 2	3·8	3·85
„ 3	3·0	3·05
„ 4	2·9	3·0
„ 5	4·1	4·15
„ 6	4·2	4·25

We are feeding the cows in milk chiefly on green fodders: maize, sorghum, and lucerne during the summer months, and Cape barley at the present time. Provision was made, in the event of an unfavourable winter, for an ample supply of ensilage.

During last winter 22 head of the milking herd were fed at various times on green oats, green barley, cow-pea chaff, and chaff and molasses, with a view of ascertaining the effect of such different fodders on the milk and butter-fat yield. It was found that green barley was the best of the fodders used for milk production, and that the dry fodder—cow-pea chaff—was eaten more readily and produced more milk when treated with molasses than when fed dry or damped with water. Owing to the want of proper accommodation, we could not carry on the experiment for a more lengthened time as we wished to do.

During the time covered by this Report, 19,427 gallons of milk have been treated, 10,708 lb. of cheese and 3,303½ lb. of butter being the product thereof.

The institution and the resident officials connected with the College have been supplied with milk, butter, and cheese.

I have, &c.,

CHAS. McGRATH, Dairy Superintendent.

REPORT OF THE ENGLISH AND MATHEMATICAL MASTER.

Sir,—With reference to my work at the Queensland Agricultural College during the past year I have the honour to report as follows:—

At the commencement of the school year, four new students presented themselves for examination; of these three were found to be qualified to undertake the first year's work, the fourth was placed in the preparatory division. During the second term seven candidates were examined, five of whom were up to the standard required and two joined the preparatory class.

Owing to a change having been made in the College regulations, by which such students as desired were allowed to take up special subjects, or even to discard school work altogether, the classes have not been so large as during our first year. An alteration has also been made in our hours of study, which have been shortened to one hour instead of two hours and a-half each evening. The study, or preparation, has latterly been conducted under the supervision of one of the teaching staff.

Sickness, which has prevailed throughout the district, has interfered to a great extent with school work, and a full class has been the exception rather than the rule. Moreover, during the second term, the school was disbanded for upwards of six weeks owing to an outbreak of scarlet fever, and, needless to say, this has had a serious influence on the amount of work done. We have not, therefore, made as much progress as I should have liked.

During the year I have conducted classes in English, arithmetic, mensuration, and practical surveying. In the last two subjects I have endeavoured to give as much outdoor and practical work as possible. In my mensuration classes I have taught the students to calculate the areas of regular and irregular pieces of ground by means of chain only, chain and cross-staff, chain and optical square, in most cases working on plots of cultivation on the farm. In the surveying class I have taught the use of the theodolite and prismatic compass, with the methods of computing areas from data obtained by means of these instruments. A large amount of interest has been manifested in this work. Unfortunately, however, students, for the most part, will not follow up practical work and demonstration with study afterwards, consequently they are unable, in many cases, to make use of data obtained in the field to compute areas, &c. I should like, if possible, to continue my surveying class during a part of next term, when I propose to teach them the use of the level. This latter I hoped to have done last term, but owing to the break in the work mentioned above, was unable to do so.

A, to my mind, very excellent suggestion has been made by one of the staff who has had several years' experience at an institution similar to this in Victoria. It is that certificates should be issued to each student at the end of a term, or school year, as may be decided, stating the subjects in which he had reached the College standard. This plan, if adopted, would be advantageous in two ways: In the first place I believe it would supply a much needed incentive to study. Secondly, it would show exactly what subjects we are responsible for. This is especially necessary in the case of two subjects taught by myself—English and arithmetic. There are at present taking outdoor work only, students who are unable to spell, read badly, and cannot work any but the simplest examples in arithmetic. Unless we certify to the contrary, these young men, when they leave, will be taken as examples of our teaching, and great injustice will be done to the teacher.

A suggestion I should like to make is that if possible the school should primarily be divided into two classes—special and regular course students; the former to take outdoor work only, and the latter to take the whole course, or, at any rate, those subjects in which they have not reached the College standard. The system at present in vogue involves great loss of time and irregularity in attendance on classes. For instance, our morning's work is divided into three periods of one hour each. A student attends class during the first hour, misses the second, and attends the third. A great part of the middle period is wasted, outdoor work in most cases lying at some distance

from the class rooms; moreover, the student will probably be late for the third class, the result being that his entrance interrupts the work, and he loses a portion of the lecture. I am aware that there are difficulties in the way of carrying out my suggestion, owing to the student, when he finds a subject somewhat difficult, writing to his parents, and obtaining permission to discontinue the subject. I submit, however, that if the parents were advised that their sons must either take the whole course of study or none, they would at once withdraw such requests. The subjects taught here have been found by experience in similar institutions to be of use to young men as farmers and men of business; it therefore seems a pity that students should be allowed to discard them at will for want of a little perseverance in mastering them.

The conduct of students in class, I have found, for the most part, excellent; in fact, as far as behaviour is concerned, I could not wish to deal with better pupils. If they would only be a little more in earnest, and make more use of notes taken at lectures, I should be hard to please if I were not thoroughly satisfied with them.

In conclusion, I must thank your, Sir, for your unvarying personal kindness and assistance to myself in carrying out my duties.

I have, &c.,

P. M. PITT, English and Mathematical Master.

REPORT OF THE SCIENCE MASTER.

Dear Sir,—In this, my first report as science master at the College, I have great pleasure in testifying to the excellent conduct of the students, and especially so in connection with the assembly of large classes when it has been my duty to preside. Beginning duty immediately after Easter, I found that two-thirds of the session had gone and that there was little time for revision. The experiments in physics were somewhat hurried, and the same straining to do a fair amount of work was manifest in botany and bookkeeping. The results in the latter subject and elementary science exceeded my expectations, but in physics and botany they fell short, owing, I presume, to a want of inducement to settle down quietly to the study of the notes of experiments, &c., by the students who felt disposed to take those subjects; and here I beg leave to state that I should heartily support a change of footing in respect to the students' residence at the College, and I trust it will meet with your kind consideration—viz., that a student may be either a full-time class student, or altogether absent from classes; and to cause some interest to be felt in the work I would most earnestly recommend the granting of certificates at the end of each year. In this way I feel certain that the advantages to be gained at the College, with the aid of apparatus and equipment for demonstration kindly provided out of available funds, will be appreciated by a majority of the students. It would certainly be a gross misuse of opportunities to shirk the perusal of the splendid works of reference recently added to the College library, and many a leisure hour might be turned to profitable account by students whose interest has been excited by witnessing some demonstration in class work, supported in certain cases by reference to the standard authors.

During the next season I propose to make a collection of the native grasses, labelled and numbered, and to preserve individual specimens in a readily available manner. Students have kindly promised to make a collection for this purpose during the holidays, &c.—work which will entitle them to special consideration when marks are allotted for examination during the progress of the session.

In conclusion, I may state that I was very pleased to find cricket and lawn tennis clubs, as well as a gymnasium in the course of erection, all of them large factors in the maintenance of discipline at the College.

I have here also to acknowledge my obligations to all the members of the staff for kindly co-operation, and to you, Sir, for the facilities afforded me in the discharge of my duties.

I have, &c.,

PETER SUTHERLAND, B.A., Science Master.

REPORT OF THE AGRICULTURAL CHEMIST.

Sir,—I have the honour to submit herewith my Second Annual Report of the work performed by myself and under my direction as Chemist to the Department of Agriculture during the year ending 30th June, 1899.

Our departmental laboratory at the Queensland Agricultural College, of which I gave a short description in my last Annual Report, was just completed and in fair working order at the beginning of this financial year.

As my duties in connection with the Agricultural College as Lecturer of Theoretical and Practical Chemistry to this institution (for which I give a separate report) took up a large amount of my time, I applied for assistance, and Mr. A. A. Ramsay worked with me for a few weeks before he left to take up his position as Chemist of the Sugar Experiment Station at Mackay. Mr. J. Watson, his successor, worked in our laboratory for a few months, but had, I am sorry to say, to resign on account of ill-health. Since the beginning of February, Mr. F. Lan Nott has been my first assistant, and I have to thank him and his predecessors for the courteous and able manner with which they fulfilled their duties. I cannot omit to mention the assistance given to us in a lot of our general work by one of our College students, Mr. A. Reid, whose diligence and ability in laboratory work have secured him an appointment as assistant at the sugar experiment station.

The total amount of analytical work carried out during the year was the following:—

Soils, complete exhaustive analyses	36
Waters, complete analyses	4
Waters, partial analyses	2
Manures, complete analyses	6
Plants, green manures, seeds	12
Sugars, complete analyses	2
Preservatives, complete analyses	4
Milk, complete analysis	1
Milk, partial analyses	10
Butter, partial analyses	2

I must state that the work has been accumulating, and just now a large number of soils are on hand, and very little time was left for experimental and original work in connection with the College or some of the State farms. A lot of manual work, as the preliminary preparation of soils and other samples for analysis, could be done by unskilled labour, and for this reason I applied some time back for a laboratory servant.

A further amount of apparatus and chemicals, which was ordered beginning of last September, has only just partially come to hand, and this delay has caused us some amount of inconvenience. In the carrying out of our analytical work we find that we still require a large amount of apparatus, and I will try to add such gradually year by year.

I must also here state that in the course of time, as the amount of work to be carried out at the departmental laboratory increases, it might be found desirable and advantageous to its being removed nearer to the headquarters of the Agricultural Department at Brisbane. In this case, one person would suffice for the instruction of the College students in chemistry, and in the spare time a certain amount of work, chiefly in connection with the experimental work done at the College, could be carried out. Advanced students would be allowed to share, under the superintendence of the instructor, in such analytical work. A large quantity of the apparatus with which our laboratory would be stocked, could be removed to the laboratory at Brisbane. I thought it advisable to refer to this matter now, as I know that it is the Department's intention of procuring a plant for the testing of wheats, on similar lines as practised at the Agricultural Laboratory of New South Wales. Such a milling plant would require either steam, water, or some other motive power, also the erection of a special little building near our laboratory. For these reasons I would advise in the meantime purchase of the necessary appliances, but to wait with the erection of the mill until the site of our Agricultural Laboratory is definitively fixed.

With regard to results of some of our analytical investigations, anything of general interest is mentioned in my report in connection with the Agricultural College, and of these analyses the work on milk, and the comparison of the various methods of fat determination, and proving once for all for practical purposes the superiority of the Gerber test, are particularly interesting.

Of general interest are also the analyses of preservatives sold in the local market, and which are given in a short article on boracic acid, in the *Queensland Agricultural Journal*.

Some valuable results were obtained by the full analyses of the red volcanic soil of the Experiment Orchard at Redland Bay. These soils are found to be rather poor from a chemical point of view, but excel by their remarkable physical condition. The soils are very rich in organic matter, humus, and, strange to say, even considerably, richer in humus, than, for instance, the rich black alluvial soil of our College Farm.

Practical experience has shown a great difference between the forest and scrub land found in the experimental orchard, and this difference is borne out by the chemical analysis, the forest land being particularly poor in phosphoric acid.

It is my wish to get similar exhaustive analyses of soils from all our experiment farms, and also from various parts of the colony. At present we have a good number of samples of soils and subsoils from the Hermitage Experiment Farm on hand.

Our gas plant gives every satisfaction, and the amount of gasolene used is not excessive.

The greatest objection at present in the arrangement of our laboratory is the existing great danger from fire. Only recently (9th June) we had a narrow escape of having the place burned down, the fire having started one evening in a box used for the collecting of papers and sweepings and placed underneath the bench in an unused corner of the lecture-room. How the fire originated is left to surmise, but luckily help was near at hand and only little damage done. The Under Secretary, when inspecting the damage, suggested the fitting of a few standpipes, with fire-hose connections to our water supply, and a direct connection with the water tank. In addition to this, I beg to recommend increasing the capacity and also the water pressure by adding another tier of plates to this tank, and also to paint the interior of the laboratory with some fireproof paint—for instance, waterglass.

In the beginning of August I paid another visit to the Bauple Central Mill to inspect the place, and see and report if the instructions given by Mr. J. B. Henderson and myself with regard to the purification of the waste-waters and prevention of pollution of Tinana Creek were carried out in a proper manner. I saw that everything was in order and that the scheme worked quite satisfactorily, the water in the creek being perfectly pure. Similar complaints of pollution of water by sugar mills were made in other districts, and partly to inquire into this I received instructions to visit some of the central mills. In the beginning of October I visited the Moreton Central Mill, the Isis Central Mill, and other sugar mills in the Isis and Burnett district, and the Gin Gin Central Mill. The pollution of neighbouring creeks was prevented, in accordance with my instructions, at the Moreton Mill at Nambour, and similar steps will have to be taken at the Isis Central Mill at Cordalba.

I also inspected the Sugar Experiment Station at Mackay, and the newly-erected laboratory building. I could not hesitate in stating in my report given at the time that the building, and especially the internal fittings, did very great credit to the local contractor.

The correspondence was fairly numerous, 105 letters having been written to the Department and various private persons. The questions referred to me were on the greatest possible variety of subjects.

J. C. BRÜNNICH, F.C.S.

REPORT OF THE COLONIAL BOTANIST.

Sir,—I have the honour to submit the following brief Report upon the working of the Botanic Department under my direction during the year 1898-9 :—

The same great interest has been taken in plant-life by the public as in years past.

The Museum has suffered considerably from the exhibits having to be placed on one side during the time the alterations and additions to the buildings were in progress. I hope, however, when the new cases are finished and placed in position, to greatly increase the carpological collection, as well as that of the other products of the vegetable kingdom. If money can be spared for the purpose, I should like to add to the collection of Queensland woods, especially those of the Herberton district, which, after endeavouring for the past ten years or more to obtain material for their systematic arrangement, I am only now in a position to do by a recent visit of my assistant to that district. As a report of this visit will shortly be furnished, no further notice need here be made, except to say that the trip was botanically of special interest on account of the number of new species collected. Reliable information regarding previously only partially known plants was also obtained, which is of importance at the present time, as such is required for the new Flora, upon which I am engaged. I may here remark that a very large proportion of time during office hours is taken up by persons who prefer making personal visits for information regarding the systematic classification, cultivation, and properties of plants in general, besides those who forward specimens and correspond by letter on such matters. Of course, of these latter, the work is shown by the letter- book, but of the former no record is kept. A visit was made to the Darling Downs in quest of indigenous grass-specimens for an exhibit at the

Exhibition now being held at Earl's Court, London. In October I went to Nerang with Mr. Quinnell, the Government Veterinery Surgeon, to inquire into the cause of deaths of cattle from supposed poisonous plants. A report on this was handed to you soon after my return and published in the *Agricultural Journal* for November, 1898.

The publications have been: Articles (some illustrated) in the *Agricultural Journal* on economic plants, suspected poisonous plants, noxious weeds, and additions to the "Flora of Queensland and New Guinea"; a Bulletin (No. XV.) devoted entirely to Fresh Water Algæ; a full descriptive catalogue of the indigenous woods (samples of which have from time to time been forwarded to London) was prepared for the Exhibition at Earl's Court, London. This was to be printed in London, and a request was made for 1,000 copies for distribution here, as we have the duplicate collection in our Museum. The first part of the work on the Queensland Flora is now in the printer's hands, therefore a word or two may here be given as to the scope of the work. It will contain the flowering plants, the ferns and their allies, and will be published in six parts, each part to contain over 200 pages of royal 8vo., with probably 10 or more plates devoted to illustrating new or little known plants. Arrangements have been made for having the work prefaced by those useful "Outlines of Botany," by Bentham, which are generally given in works of a similar character. The arrangement adopted is in accordance with Bentham and Hooker's "Genera Plantarum," and the style as near as possible that of the "Flora Australiensis." The generic and specific names are explained, and, where such are known, vernacular names are given. A considerable amount of trouble has been taken in obtaining the correct aboriginal names, and in all instances where such are recorded the locality and authority for same are given. The descriptions are written up to date, and Bentham's notes on orders, genera, &c., given in the "Flora Australiensis," are all reproduced, either entire or slightly altered to agree with our present knowledge. The various plants which have become naturalised, and strays from cultivation, are all duly recorded. After the description and habitat, the economic properties, if known, are given, as well as the uses to which they have been put by the aborigines. I have borne in mind throughout that the work is principally intended for Queenslanders, but, at the same time, I fully believe there will be a demand for copies beyond Australia, and that the sale will be larger, and its usefulness greater, could the Minister see his way to allow it being sold at as low a price as possible to reimburse the expenditure.

As usual, exchanges of herbarium and museum specimens with kindred institutions have been conducted.

The library has been enriched both by purchase and donation, by a number of valuable, useful, much-needed works.

Besides the usual suspected poison plants sent for identification, *Hæmodorum coccineum* and a new *Hibbertia* (*H. Bennettii*, the Arsenic Plant) have been received. One or more species of the latter genus have in former years been suspected of causing the deaths of cattle, but before condemning these plants some careful experiments require to be carried out.

The plants received for determination under the designation of "noxious weeds" have been only those previously recorded as such, with the exception of some species of *Cassia*, *Calotis*, and a kind of "prickly-pear" which seemed to be *Opuntia ferox*, a species I had not heard of previously, having strayed from cultivation here. A printed circular was sent out to various sawmillers throughout the colony asking for information as to the kinds of wood cut at their mills, the cost of same, quantity available, &c., but very few replies were received. This information was required for the Imperial Institute, London, where a collection of our woods is on view. By request, a list of the indigenous woods which might prove suitable for using in building or fitting up the Royal Yacht was furnished from this office.

Following my usual custom, I give a list of the additional fungus blights and their hosts observed since last Report:—

Sphærotheca Castagnei, Lev. On leaves of cucumber plants at Toowong.
Æcidium Plectroniæ, Cke. On leaves of *Plectronia barbata* at Endeavour River.
Sphaceloma ampelinum, De Bary. On grape vines near Brisbane.
Phoma sycophila, Mass. On leaves of indigenous *Ficus* growing at Endeavour River.
Pestalozzia vermiformis, Mass. On leaves of indigenous *Eugenia* from North Queensland.
Cercospora circumscissa, Sacc. On leaves of peach-trees, about Brisbane.

I have, &c.,

F. MANSON BAILEY, Colonial Botanist.

REPORT OF THE ENTOMOLOGIST.

In addition to the information that has emanated from my office relating to questions concerning plant pathology and agronomic entomology on the occasion of personal interviews on the part of those interested, the following, amongst other topics, have formed objects of written communication and report :—

CORRESPONDENCE AND REPORTS.

(I.—ECONOMIC ENTOMOLOGY.)

Apple.—Wooly Aphis (*Shizoneura lanigera*), Glen Innes, New South Wales, Brisbane, and locality unspecified; Bag-worm (*Thyridopteryx Huebneri*), Stanthorpe; Codling Moth (*Carpocapsa pomonella*), Stanthorpe; Pernicious Scale Insect (*Aspidiotus perniciosus*), Warwick; Tussock Moth (*Orgyia sp.*), Brisbane.

Pear.—Parlatoria Scale Insect (*Parlatoria proteus*), Brisbane; Pernicious Scale Insect (*Asp. perniciosus*), Warwick.

Peach.—Fruit-gnawing Insects, Toowoomba; False Weevil (*Bracyhpeplus sp.*), Toowoomba; Fruit-boring Caterpillar (*Conogethes punctiferalis*), Pialba; Tree Cricket (*Œcanthus sp.*), Warwick; Peach Aphis (*?Myzus cerasi*), Pittsworth and Brisbane; Red Scale Insect (*Aspidiotus coccineus*), Rockhampton; Parlatoria Scale Insect (*Parlatoria proteus*), Mackay; White Scale Insect (*Diaspis amygdali*), Brisbane and Mackay; Fruit Fly (*Tephritis Tryoni*), Brisbane and elsewhere.

Apricot.—Soft Scale Insect (*Lecanium sp.*), Toowoomba.

Almond.—Red Scale Insect (*Asp. coccineus*), Pinbarren.

Plum.—Leaf-eating Beetle (*Monolepta rosea*), Cooroy; Pernicious Scale Insect (*Asp. perniciosus*), Cooroy; Parlatoria Scale Insect (*Parlatoria proteus*), Mackay.

Fig.—Soft Scale Insect (*Lecanium sp.*), Camooweal; Red Scale Insect (*Aspidiotus coccineus*), Brisbane and Mackay; Leaf-eating Beetle (*Galerucella australis*), Biggenden.

Orange.—Leaf-eating Caterpillar (*Papilio anactus*), Fairview; Orange Cut-worm (*Agrotis sp.*), Mount Gravatt; Tree Bug (*Oncoscelis sulciventris*), Brisbane; Stem-borers (*Uracanthus sp.*), locality unspecified; Fruit Fly (*Tephritis Tryoni*), Woombye, &c.; Red Scale Insect (*Aspidiotus coccineus*), Grantham, Cooroy, Toowoomba, Mackay, &c.; Circular Black Scale Insect (*Aspidiotus ficus*), Burpengary, Brisbane, Mackay, &c.; White Scale Insect (*Chionaspis citri*), North Coast Line, Tiaro, Mackay, &c.; Glover's Scale Insect (*Mytilaspis Gloveri*), Grantham, Burpengary, &c.; Fulvous Mussel Scale Insect (*Mytilaspis fulva*), Brisbane and Mackay; Soft Scale (*Lecanium hesperidum*), Cooroy, Maryborough, and Grantham; Long Soft Scale Insect (*Lecanium longulum*), Grantham; Black Scale Insect (*Lecanium oleæ*), Mount Gravatt and Mackay; Soft Scale Insect (*Lecanium sp.*), Charleville; Orange Mealy Bug (*Dactylopius sp.*), Gympie; Cottony Cushion Scale Insect (*Icerya purchasi*), Cooroy; Red Spider (*Tetranychus sp.*), Gladstone and Brisbane; Fruit or Maori Mite (*Phytopus oleivorus*), locality unspecified.

Queensland Nut (*Macadamia*).—Wood-boring Caterpillar (*Xyloryctidæ*), Brisbane.

Mango.—Fruit Fly (*Tephritis Tyroni*), Brisbane, &c.; Flower Beetle (*Monolepta rosea*), Nambour; Ross's Scale Insect (*Aspidiotus Rossi*), Maryborough; White Scale (*Chionaspis sp.*), Brisbane and Mackay; Soft Scale Insect (*Lecanium sp.*), Brisbane; Pink Wax Scale (*Ceroplastes rubra*), Brisbane, &c.

Passion Vine.—Undetermined Insect, Bundaberg.

Grape Vine.—Bronzy Eumolpid Beetle, Brisbane; Mealy Bug (*Dactylopius sp.*), Rockhampton; Wood-puncturing Insect, Brisbane; Lecanium Scale Insect (*Lecanium longulum*), Brisbane.

Coffee.—Slug-leaf Caterpillar (*Limacocidæ*), Cairns; Wood-boring Caterpillars (*Xyloryctidæ* and *Hepialidæ*), Mackay; Tree Cricket (*Œcanthus sp.*), Mackay; Pulvinaria Scale Insect (*Pulvinaria (?) camellicola*), Mackay and Buderim Mountain; Mealy Bug (*Dactylopius sp.*), Mackay; Circular Soft Scale (*Lecanium filicum*), Mackay and Daintree River.

Tea.—Leaf Mite (*Phytopus sp.*), Mackay.

Pineapple.—Mealy Bug (*Dactylopius bromeliæ*), Nundah and Pialba.

Strawberry—Aphis, Nambour.

Potato.—Leaf-eating Beetle (*? Halticdæ*), Cooroy; Leaf Miner, *Lita solanella*), Maryborough and Boowoogum; Borer of Tuber (*Lita sp.*), Brisbane

Sweet Potato.—Weevil Borer (*Cylas formicarius*), Gayndah, Eagle Farm, Zillmere, and Mackay.

Bean.—Stem Maggot (*Osci mis sp.*), Toowong, Boowoogum, Rockhampton.

Cabbage.—Caterpillar (*Hellula costalis*), Clermont; Diamond Moth (*Plutella cruciferarum*), Boowoogum; Cabbage Aphis (*Apis brassicæ*), North Pine and Boowoogum.

Tomato.—Mealy Bug (*Dactylopius sp.*), Brisbane; Fruit-boring Caterpillar (*Heliothris armiger*), Brisbane.

Pumpkin.—Leaf-eating Beetle (*Monolepta australis*), Childers.

Yams.—Hart's Scale Insect (*Aspidiotus Hartii*), Cairns and South Australia (imported from Queensland).

Sugar-cane.—Beetle Borer (*Sphenophorus obscurus*), Cairns and Mackay (introduced); Cane Grub (*Scarabæidæ*), Childers.

Kafir Corn.—Yellow Peach Moth Caterpillar (*Conogethes punctiferalis*).

Pasturage.—Yellow-winged Grasshopper (*Œdipoda flava*), Nebo; Gregarious Plant Bugs (*Lygæidæ*), Tambo.

Ornamental Trees.—Soft Scale (*Lecanium sp.*), on Schinus, Jimbour; Pink Wax Scale (*Ceroplates rubra*), and Fig Psylla Fly (*Psylla fici*), on Native Fig, Brisbane.

Ornamental Plants.—Aphis Scale (*Aleurodes sp.*), and Circular Black Scale (*Aspidiotus ficus*), on Orchids, Brisbane; Root Weevil (*Curculionidæ*), on Adiantum Ferns, Toowoomba; Leaf Caterpillar (*Calogramma festiva*), on Crinums, Wellington Point.

Plants Generally.—Mealy Bug (*Dactylopius*), Bundaberg; Slugs (*Vaginula*), Brisbane.

Timber.—Pine Anobium (? *Theca sp.*), several correspondents, Brisbane; White Ants (*Termitidæ*), Brisbane.

Stock Pests.—Cattle Ticks (*Ixodes bovis*), Brisbane; Horse Bot Fly (*Gastrophila equi*, Fabr.), South Queensland; Horse Stinging Caterpillar (*Limacocidæ*), Camooweal.

Miscellaneous.—Insects (*Brachypeplus spp., Coleoptera*), affecting stored fruit, Brisbane; Ants in their relation to plants; habits of Mealy Bug (*Dactylopius spp.*) Fruit-fly Maggot (*Tephritis Tryoni*), in native Eugenia, Bundaberg; predaceous insects (*Thalpocares sp.*), and Soft Scale Insects (*Lecanidæ.*)

Identification, &c.—Many insects have been submitted for the purpose of ascertaining their technical names, and these as far as possible have been specifically determined. This alone is a work that often involves tedious investigation and considerable literary research. Applicants for information of this description have been quite numerous, especially on the part of those engaged in the systematic collection of the objects referred to.

Apiculture and Sericulture.—With the exception of an inquiry concerning a special fatality amongst bees, no matters relating to either of these subjects have been referred to me. But that this office may, as it should, lend its assistance to promoting these important industries, it is desirable that the requirements of those connected with them, and who are necessarily interested in their development, should be represented to it.

New Importations.—Certain of these have been reported upon as in past years. Their consideration, however, finds place in my summary of work (as inspector under Diseases in Plants Act).

(II.—VEGETABLE PATHOLOGY.)

Numerous questions relating to Plant Pathology proper—*i.e.*, to the changes attendant upon fungus parasitism, as well as constitutional plant derangements, have been referred to this branch of the Department. This will appear from the topics within this domain of inquiry that have been dealt with:—

Peach.—Root Galls, caused by Nematodes, Alice River; Leaf Rust, caused by *Puccinia pruni*, Pers., Maryborough; Leaf Curl, caused by *Exosacus deformans*, Brisbane.

Apricot.—Leaf Blight, caused by *Phyllosticta circumscissa*, Toowoomba.

Oranges and Lemons.—Leaf and Fruit Scab, caused by *Ramalaria*, Gympie, Maryborough, Palmwoods, Cooroy, &c.; Leaf-incrustation, due to presence of *Strigula*, Gympie; Leaf Smut, due to presence of *Capnodium sp.*, &c, Charleville; Wood destruction of Lemon, apparently caused by *Glæosporium citri*, Cardwell; Bark Decay, Die Back, and Gumming, Maryborough; Premature Falling of Fruit, Maryborough, Brisbane, and North Coast R. Line.

Mango.—Leaf Blight, Brisbane.

Banana.—Various abnormal features in fruit, occasioned by *Glæosporium musarum* and otherwise, Cairns district.

Grape Vine.—Black Spot of Leaf and Fruit and Canker of Bark, caused by *Glæosporium ampelophagum*, Brisbane, Maryborough, Roma, &c.; Leaf Spotting, caused by *Cercospora viticola*, Brisbane; Powdery Mildew, caused by *Oidium Tuckeri*, Brisbane; Root Fungus, Alice River; Spotting of Fruit, due to use of improper fungicide, Brisbane.

Strawberry. — Leaf Disease, caused by *Sphærella fragariæ*, Palmwoods, Nambour, &c.

Pineapple —Fruit Core Rot, caused by *Acari* and *Monilea sp.*, Nundah district.

Coffee.—Leaf-blotching, apparently caused by *Cladosporium sp.*; Leaf Spot, probably caused by *Cercos pora coffeicola*, Mackay; Disease related to "Koleroga," Cairns district; Disease of Berry, caused by *Glæosporium sp.*, North Coast R. Line; Root Fungus, the same; Chlorosis, the same.

Tobacco.—Blue Mould and Leaf Spot, caused by *Peronospora hyoscyami*, Brisbane and Warwick.

Tomato.—Fruit Rot, caused by *Monilea fructigena*, Brisbane and Gatton; Leaf Disease, caused by *Cladosporium fulvum*, Brisbane.

Potato.—Bacterial Disease, Beenleigh, Pinbarren, Burpengary; Potato Scab, Toowoomba district.

Pumpkins. — Leaf Disease (*Oidium erysiphoides*), Brisbane, Biggenden, &c.; Wilting of Melon, Zillmere.

Cabbage.—Cabbage Mildew, caused by *Peronospora parasitica*, Pers., Brisbane and Gatton.

Sugar-cane.—Cane Disease, associated with presence of *Melanconium*, stage of *Trichosphæria sacchari*, Lower Burdekin and Mackay; Leaf Rust, caused by *Uredo kuhni*, Brisbane and Mackay; Leaf Freckle, caused by *Cercospora sp.*, Bundaberg and Mackay.

Lucerne.—Root Fungus, Mooloolah.

Serviceable Disease.—Red Scale destroyed by fungus (*Microcera coccophila*), Pinbarren; Parlatoria Scale of Pear destroyed by same, Tinana.

In addition to the foregoing many instances of Scale Insects being held in check, and indeed well nigh exterminated, through the attacks of parasitic fungi have come under notice and in previous years. Indeed there are good grounds for concluding that fungus parasites play a very important part in limiting throughout coastal Queensland the increase of these tree pests. Moreover, in some instances, the parasites alluded to admit of being cultivated on artificial media, and accordingly of having their natural range of occurrence extended. Their development as parasites, however, can alone take place under certain climatic conditions, such as especially prevail to the east of the Dividing Range, and they are inoperative in the Western portions of the colony. But it happens that wherever meteorological features favour this special activity, there, at certain seasons of the year, the parasites themselves spontaneously occur.

The matter of utilising a communicable disease that might sponstaneously spread when once introduced for the purpose of effecting the destruction of Prickly Pear (*Opuntia*) has engaged my serious attention. In addition to instituting some preliminary inquiries here, I have entered into correspondence with this end in view with foreign specialists as to the availability of a Prickly Pear Malady that has been reported to be existent in some parts of the Mediterranean region.

FIELD WORK.

Six official visits only to country districts have been made during the period embraced in this Report. These have been to the following places:—Redland Bay, Kilkivan, and Buderim Mountain, Mackay, Goodna, Beenleigh, and Maryborough. These, for the most part, have been of short duration, and for the purpose o

investigating occurrences of plant diseases in individual farms or orchards. Those to Beenleigh and Mackay, however, were of longer duration, and were the occasion of lengthy official reports on "Potato Disease," and on "The Condition of the Mackay State Nursery." Of these the former has been printed in the *Queensland Agricultural Journal* (Vol. V., pp. 57-63), and, with reference to the latter, it may be added that though not printed, the main proposal, and with which all the other recommendations were in keeping [*i.e.*, that the nursery should be transformed into a properly equipped Sugar Experiment Station with a scientific directorate, in accordance with the project submitted to the Department in June, 1895 (*vide* "Gumming in Cane," pp. 62-4)], having been already given effect to, will no doubt conduce greatly to the advantage of the industry in the interests of which it has been established.

EDUCATIONAL WORK.

The inclusion of "entomology" as a subject of instruction for second year's students in the curriculum of the Gatton Agricultural College has suggested to many the probability that this work, amongst other duties, would have devolved upon me. It is, however, an undertaking that could not be entered upon without considerable preliminary preparation being made in the first instance by the instructor in providing diagrams and accumulating specimens wherewith to illustrate his lectures, and this necessity of the case, together with the urgency of other claims on my attention, have doubtless operated in bringing it about that my services have not been availed of for the purpose mentioned. The delivery of single lectures on economic entomology and plant pathology to the members of horticultural and agricultural societies is, however, a matter that can more readily be entered upon, and it is therefore to be regretted that these members of the community do not more frequently avail themselves of the opportunity that they afford for their being instructed in subjects having so important a bearing upon their calling, seeing that I am always willing in this and other respects to meet their requirements. Whenever practicable, however, endeavour has been made to enlist the co-operation of these bodies in accomplishing the work of my office to the extent of obtaining from their members examples of pests whose occurrence in their gardens or orchards may have been the occasion of concern, submitting these in turn to me, and afterwards publishing at their meetings amongst themselves such information as their examination may have thus elicited. And yet, with the exception of the Stanthorpe society, no one of our societies has availed itself of this means of extending its usefulness.

PUBLICATIONS.

The following publications have issued from this branch of the Department, viz:—

1. "Strawberry Leaf Blight (*Sphærella fragariæ*)," *Queensland Agricultural Journal*, Vol. III., pp. 307-316.
2. "Fruitlet Core-rot of Pineapple," *op. cit.*, Vol. III., pp. 458-467.
3. "Experiments in Cyaniding Oranges," *op. cit.*, Vol. IV., pp. 450-456.
4. "Potato Disease," *op. cit.*, Vol. V., pp. 57-63.
5. "Plant Pests—Vaginula Slugs," *op. cit.*, Vol. V., pp. 63-70.

In addittion to these papers, a large number of Reports have been made to you on special subjects. Amongst these may be mentioned that on the condition of the Mackay State Nursery; Reports on the feasibility and expediency of introducing insectivorous birds as auxiliary in Tick destruction; on a reputed enemy of the Pink Wax Scale Insect; on an apparent instance of destruction of Prickly Pear (*Opuntia*) by spontaneously occurring disease; and on various matters arising out of the administration of "*The Diseases in Plants Act*, 1896." There has also been prepared a catalogue of Australian Moths belonging to the family Bombycidæ; but the publication of this has been rendered superfluous by the contemplated issue by the British Museum of a catalogue of the Lepidoptera Phalænæ of the world, the first volume of which has already appeared.

COLLECTIONS.

The collections under my care have been augmented by numerous small purchases, principally made during the first six months of the year; but other duties having so exclusively occupied my time, field work for the purpose of adding to them could not be personally engaged in. In January of the present year an opportunity that occurred of sending a collector to Cairns was embraced; but the engagement entered upon has, however, been attended so far by most disappointing results, and these are the more to be regretted, seeing that our Northern insects are as yet almost wholly unrepresented in the cabinets devoted to this branch of the Queensland fauna.

The rooms occupied by me until recently have, on account of a general dampness that prevailed, been entirely unsuitable for housing insect collections, and hence many specimens have from time to time "perished." Morever, this condition with regard to them was especially emphasised during the progress of the structural alterations that have been recently perfected, heavy rain being experienced whilst they were still without the protection of a roof. However, the accommodation now provided is such as to obviate the re-occurrence of such an undesirable a contingency.

In conclusion, in dealing with this subject I have to draw attention to very material accessions to the collections made as the outcome of the liberality of Dr. A. J. Turner, Messrs. R. Ilidge, McN. Robinson, F. P. Dodd, and others.

LIBRARY.

The accessions to the library by purchase have almost entirely been confined to current numbers of six periodicals devoted to the subjects of plant disease and systematic entomology. It has, however, in addition, received many valuable donations from correspondents resident in different parts of the world, whose contributions conduce very materially to its usefulness.

PRACTICAL RESULTS.

In my 1895-6 Report it was pointed out that as regards the grub pest of sugar-cane of the Mackay district, that benefit was already being experienced through giving effect to the recommendations regarding means for coping with it, made by me on the occasion of a visit thereto in October, 1894. With reference to these recommendations it may be stated that previous to the date mentioned this formidable insect was only known to the Mackay planters and farmers generally in its grub condition, and until then their efforts at repressing it had been exclusively directed towards attacking it during this phase of its existence. But it was at once pointed out by me, that great benefit would accrue from capturing and killing the perfect insect or beetle that arises in the course of the metamorphosis that this grub undergoes, and possibly also by paying some attention to the chrysalis or pupa, whilst at the same time the cane-growers were made familiar with the appearance of both beetle and pupa by the exhibition to them individually of examples thereof. Moreover, they were also advised, on the same occasion, to limit the extent of occurrence of certain specified native bushes whereon the beetle itself subsisted, by cutting these down in some instances. These recommendations were afterwards repeated in detail in a lengthy memoir prepared by me and circulated amongst those concerned early in 1895. One of the principal of them consisted in capturing and destroying the insect when in the perfect or beetle phase of existence; and, thanks to a method devised by W. T. Paget, of Nindaroo Plantation, of raising funds by voluntary subsciptions, that was put into operation to meet the necessary monetary outlay, and to the grant of a special Government subsidy, the recommendation alluded to having been meanwhile promptly entered upon, resulted in benefit to the planters to an extent scarcely anticipated from its adoption. That this is a correct view of what has happened is rendered evident by the testimony of more than one speaker in the discussion on the subject of "cane grubs," that took place at the recent Agricultural and Pastoral Conference, held at Mackay on the 26th June and three following days (*vid. Queensland Agricultural Journal*, 133-138). Thus W. T. Paget stated as follows:—"In 1894 we had the assistance of the Agricultural Department, and, thanks to the exertions of Mr. Chataway, Mr. H. Tryon, the Government Entomologist, visited the district, and personally I may say I am indebted to Mr. Tryon for teaching me how to tackle the grub." The same speaker then continued to dwell on the procedures followed during 1894-9, in carrying out the lessons that I had taught, and concluded with the following statement: "At the Nindaroo centre we have had to tackle the pest on an area of uncultivated land, extending for eight miles north and south and east and west; and we have tackled it so successfully that in five years, in one set of canefields, we have reduced the destruction of cane from many thousands of tons of cane per annum to practically nothing, and we have reduced the catch of beetles from 8,000 lb. to 800 lb." And on the same subject E. Swayne remarked: "The locality at Nindaroo is expressly favourable to the grub pest, most of the land being surrounded by scrub, and if it can be coped with there (as he remarked had been the case) it can, I think, be coped with anywhere" (p. 134). With regard to this redoubtable enemy to successful cane-growing, and the future position of the industry at Mackay in relation to its attacks, I cannot do better than repeat what has been stated by a correspondent in the March number of the *Sugar Journal*, as expressing opinions I myself hold: "The chief danger now seems to be that isolated parts of the district, which have hitherto not suffered severely from the pest in the past, will neglect its first appearance, and

so permit it to again secure a strong foothold. However, if this is guarded against, the pest should now be a thing of the past." But when I first commenced to prosecute the inquiry that has eventuated in this result, so great was the havoc that it was occasioning that I refrained from dwelling upon it, lest in so doing I should jeopardise the reputation of the Mackay district as a sugar-cane growing locality, for at that time, to use words spoken by Mr. E. Swayne at the Conference alluded to, with regard to cane grubs, "their numbers attained such dimensions as to threaten the stoppage of cane-growing to the north side of the (Pioneer) river."

In the Childers district the sugar-cane is to some extent being destroyed by a grub of analogous habits, but one that is not identical with that which has proved so harmful at Mackay. The injury, too, that it inflicts is sufficiently pronounced to produce general concern in that locality. It is hoped, therefore, that an opportunity be accorded me of following up the general advice that I have given as to methods to be employed in coping with it, by a series of special investigations in accordance with the scheme already propounded, when the subject was last officially referred to me for consideration and report, as the probability of similar good results arising from such an inquiry to those realised at Mackay is by no means a remote one.

As another instance of practical results arising from the work of this branch of the Department may be instanced that illustrated by the orange industry of the Wide Bay district. With regard to this it may be stated that in 1894 also there were complaints of the existence of disease, and of the occurrence of insect pests to an extent that was proving highly prejudicial—a condition of affairs that especially related to the celebrated Burrum district. These grievances were in due course brought under your notice, and resulted in my being commissioned to visit the districts concerned. This being done, I first gave advice to the growers personally, and then furnished them with an extended report entitled "The Disease affecting the Orange Orchards of Wide Bay and the Insect Pest prevalent therein," in which I not only described the different affections that had come under my notice, but also repeated the recommendations already given. These have been since continuously carried out, with the result that, whereas at the time of my visit it was scarcely practicable to place a single clean case of oranges on the market, thousands of cases—one grower this past season shipped upwards of 3,000—are now exported of unquestionable excellence in this respect.

ACKNOWLEDGMENTS.

I have to acknowledge the valuable co-operation of other officers of the Department, and above all of the various instructors in special provinces of agricultural and horticultural enterprise, who, in having their attention necessarily concentrated on particular groups of plants, are in a favourable position to detect the presence of diseases and insects that occur exceptionally in connection with them. Moreover, in the case of the Instructor in Fruit Culture, Mr. A. H. Benson, and his assistant, Mr. Voller, not only has assistance of this nature been accorded to a very marked degree, but the practicability as well as the efficacy of the various methods advocated for adoption for the extermination of these enemies to successful cultivation have been, moreover, demonstrated in the course of operations conducted in individual orchards with very noticeable good results, whilst at the same time also the lessons derived from the investigations of students of plant ailments have been inculcated far more widely than might otherwise have occurred.

Again, in questions relating to systematic entomology, and with which I am almost daily confronted, my office has received great assistance from Mr. C. W. de Vis, Curator of the Queensland Museum, who has spared no effort to make the resources of the institution over which he presides, especially so far as concerns the works of reference and the official collections that it contains, always most fully available.

HENRY TRYON, Entomologist.

ANNUAL REPORT OF THE INSTRUCTOR IN FRUIT CULTURE.

The opinion arrived at by both Mr. Voller and myself, after a fairly comprehensive investigation of Queensland orchards and Queensland methods of fruit culture during the preceding twelve months to that dealt with by this Report, was to the effect that the best method of improving and assisting the industry was by means of practical demonstrations conducted in the orchards themselves.

Acting on this opinion, our work during the past twelve months has been largely of a practical nature, and as far as can be judged at present this method of instruction is bearing good results in many parts of the colony. It is certainly very popular with

the growers themselves, and has undoubtedly created a very favourable impression amongst them, besides leading in many instances to improved methods of cultivation, pruning, and the treatment of fruit pests. I feel confident that this system of practical instruction is more valuable to our fruitgrowers in the present condition of the fruit industry than any quantity of lectures or articles, no matter how lucid the lecture or how well written the article. At the same time neither the lecture nor the article has been neglected, though I have endeavoured to make even this method of instruction as practical, concise, and non-theoretical as possible.

In addition to the purely educational side of our work we have carried out numerous experiments with a view of determining the best and most efficacious methods of fighting the vast army of fruit pests now devastating our orchards, and I am glad to say that on the whole our experiments have met with fair success. This experimental work has been of a decidedly practical nature, and has included both spraying and cyaniding, the work being either carried out personally or under our personal superintendence, as the value of experiments depends on the accuracy with which they are carried out. In order, therefore, to make this Report as concise and explicit as possible, I will deal with our work in detail.

1. Practical Work amongst Fruitgrowers.—The carrying out of this branch of our work has necessitated our visiting a considerable portion of the fruitgrowing districts of Southern Queensland, and latterly Mr. Voller has devoted his whole time to the Central division; pressure of work has, however, prevented our visiting the North during the year. The work has consisted in giving demonstrations of pruning, spraying, budding, grafting; in giving advice respecting the variety of trees to plant; the preparation, cultivation, and manuring of the land; the fighting of insect and fungus pests; and the utilisation and marketing of the fruit. The practical demonstrations have been followed up by many lecturettes, and information on all branches of fruit culture has been given in as far as our ability has permitted us to do so. During the latter half of the year a number of practical demonstrations of the use of hydrocyanic acid gas for the treatment of the various scale insects infesting fruit trees have been carried out in the following districts:—Redland Bay, Mount Cotton, Zillmere, North Pine, Woombye, Buderim Mountain, Montville, Maryborough, and Burrum River. The trees treated have been of various kinds and sizes—from those covered by a small bell tent to those that have required two large octagonal sheets of 50 feet in diameter to cover them—and the demonstrations, whilst being carried out in a practical manner, also served the valuable purpose of giving us practical experience of the conditions under which the gas does most good, and of the strength of gas to use under different conditions of the trees' growth. At the same time, these demonstrations have proved the exact strength of gas that is required to kill the insects without injuring the tree.

On the whole the results of the demonstrations were very satisfactory, and our fruitgrowers have shown a great interest in them, so much so that there has been a wide and increasing demand by the growers to have their trees treated by this Department.

The result of this demand on the part of the growers has been that this Department has agreed to undertake the treatment of orchards at certain prices and under specified conditions. These prices and conditions have already been accepted by a number of growers, and one large orchard in the Enoggera district has been treated, and work commenced on a second.

2. Experiment Work.—During the year a large amount of purely experiment work has also been carried out, such experiment work dealing largely with the destruction of fruit pests and the manuring of orchards.

The experiments conducted with the object of dealing with fruit pests included some 1,300 individual experiments that were carried out last spring and summer, both on the coast and on the Darling Downs, with a view of determining the best method or methods of dealing with the fruit fly. Full particulars of and the results obtained by these experiments were published in the April number of the *Queensland Agricultural Journal*, and although the experiments were not on the whole successful, still much valuable information was obtained on which we were able to offer advice to the fruitgrowers, which if followed up will tend to materially decrease this most destructive fruit pest. The advice then given was as follows:—

"In the course of the experiments we have, however, noted that the flies are especially attracted to certain varieties of fruits—especially early pears and apricots—in which to lay their eggs, and we have taken advantage of this fact to use some of these trees as trap trees. We allowed the flies to attack the fruit on these trees without molestation, and as soon as the larvæ developed we gathered and destroyed by boiling all of the fruit from these trap trees. In this way alone we destroyed many

thousands of the earlier crops of the insects, and are confident that the result of this destruction at Birnam was that the larger portion of the fruit was marketed in a sound condition; whereas had we allowed the fly to develop unchecked—first in the oranges, then in the red American plums, and finally in the early pears and apricots—the whole orchard would have been badly attacked, and there would have been little sound fruit.

"We strongly advise the use of trap trees in addition to the gathering and destroying all grub-infested fruit, especially early in the season; and we feel confident, from the experience gained by these experiments, that if these precautions alone are systematically carried out the ravages of the fly will be considerably diminished. At the same time we strongly advise the destruction of useless varieties, which are only a breeding-ground for the fly, and the compulsory destruction of all infested fruit, as the present method of allowing infested fruit to lie under the trees and rot is simply increasing the pest wholesale."

This method of dealing with the fly is, in our opinion, preferable to spraying with strong-smelling substance or using other means to try and repel the fly from attacking the fruit, as this latter method of treatment was by no means a success, nor was the use of poisoned or sticky baits with which to attract and destroy the mature insects. The best way to deal with this pest is only to grow good varieties of fruit that will pay to look after, and to destroy all the rest, which only act as a harbour and breeding-ground. During the coming season it is our intention to carry out further experiments, when every possible means of attracting the mature insects will be again tried thoroughly, as well as means of repelling or destroying them. In the case of other fruit pests, many experiments in spraying have been carried out, amongst them being the spraying of strawberry plants as a protection from the strawberry leaf blight, the result of which seems, so far, to be highly satisfactory. Numerous sprays have also been tried for various diseases in fruits and vegetables with more or less success, and a number of spraying compounds have been tested.

A great deal of experiment work has also been done in the use of hydrocyanic acid gas for the destruction of scale insects on fruit trees, as we have found from experience that the results obtained by this method of treatment in other countries have not been altogether applicable to Queensland conditions, and have required modifying accordingly. In order to find out the best material of which to make the sheets and tents, the best methods of preserving same, the quantities of cyanide required for individual trees and for different varieties of trees, the strength of gas necessary to kill all scale insects and at the same time not to injure the trees treated, and also the best and most economical method of working the outfit, we have carried out numerous experiments, the result of which is that the work now being done by the Department under Mr. J. Henderson's control is highly satisfactory. We have had numerous delays in carrying out the work owing to the difficulty in obtaining suitable material for the sheets and tents, but I am glad to say that we have now overcome that, and will be in a position shortly to carry out work on an extensive scale both cheaply and expeditiously. In the April number of the *Queensland Agricultural Journal* I wrote an article on "The Destruction of Fruit Pests," in which this method of treatment was fully described, as well as that of spraying, the illustrations accompanying the article being photographs of spraying and cyaniding as carried out by us in actual practice. In addition to publishing this article in the *Journal*, a number of extra copies were issued in pamphlet form, and have been widely distributed by us to fruitgrowers when visiting fruitgrowing districts. The pamphlet has been a great assistance to us, and is appreciated by the fruitgrowers themselves.

A number of experiments have also been carried out to test the value of various manures, at the Redland Bay Experiment Orchard, for various fruits and crops, but, with the exception of the quick-acting manures, it is premature to make any statement respecting their action. The manures experimented with have been of two classes—viz., mineral and organic; the former having the object in view of supplying the soil with either phosphorus, potash, lime, or inorganic nitrogen, or a mixture of some or all of these plant-foods; and the latter with supplying organic nitrogen and leaf mould to the soil.

In soil such as that of Redland Bay, which is somewhat deficient in phosphoric acid and nitrogen, we have obtained marked results from the use of sulphate of ammonia and superphosphate of lime, especially in the case of pineapples, corn, and sorghum; but potash salts have so far had little, if any, effect, the soil being evidently sufficiently rich in available potash for the plant's requirements. In the case of organic nitrogen, we have endeavoured to supply this to the soil by growing various leguminous crops, or, in other words, by green crop manuring. We have tested quite a number of beans, those showing merit having been illustrated and described from time to time in the *Journal*. Several of the beans—particularly the Velvet, Poor Man's, Small Mauritius,

and Narico—show great promise; the quantity of leaf mould they produce and the manner in which they improve the soil thereby, other than by the organic nitrogen they return to it, render them in my opinion very valuable acquisitions to the farmers, fruit and cane growers of the colony. What the results of the experiments will eventually turn out to be can only be proved by actual experience extending over a number of years, but, as far as I can judge by the results obtained at present, I feel certain that the growing of suitable pulse crops, such as those mentioned, for green crop manuring, will prove to be the best, cheapest, and most effectual method of supplying those soils that have become impoverished in organic matter and in organic nitrogen with these most essential ingredients of a fertile soil.

Many of our coastal scrub and forest fruit lands, especially those that have been under bananas, are becoming poor in organic nitrogen, and such soils will be greatly benefited by being planted to a pulse crop and allowed to rest.

The pulses recommended are deep rooters, and to a great extent drought-resistant. They tend to break up and loosen the soil and subsoil, and to obtain from and store up in the soil in an available form a considerable quantity of inorganic plant foods, such as potash and phosphoric acid, in addition to the nitrogen which they assimilate from the atmosphere. In addition to their great manurial value, the growing of pulses has another great recommendation, especially on land that is liable to wash with heavy rain, and that is of preventing washing. Rows of pulses planted at convenient distances will in most instances save many tons of soil being lost after very heavy rain, and thereby save the orchardist his best soil and a considerable amount of hard work, not counting the prevention of the injury done to the trees themselves by having the soil washed away from their roots. The question of orchard manures is one that our fruitgrowers have hitherto given little thought to, and even where they have used manures these have been principally bones in one form or another, or else the refuse manure from one or other of our meatworks. Practically no systematic orchard manuring has been carried out, though in many instances, especially in the case of our older orchards, it will pay well to do so, as few soils can stand heavy crops of fruit year after year without some proper return being made.

3. General.—In my last Annual Report I strongly recommended our growers to confine their attention to growing such fruits as are of commercial value and adapted to the soil and district in which they are grown, giving at the same time a list of commercial fruits. The advice given then still holds good, and I am glad to be able to say that some fruitgrowers are beginning to realise the importance of my suggestions and to act upon them, the result being that in one district alone—that of the North Coast Line from Caboolture to the Burrum—the planting that is taking place now is almost exclusively that of varieties of commercial value, and this is bound to bring this particular district to the front and to benefit its fruitgrowers individually and the colony generally. At the same time, I am again sorry to say that many growers will not take advice, but go on planting year after year many varieties that are absolutely unsuitable to the soil and climate in which they are planted, the result of which is always disappointment and loss. Thousands of trees have again been imported from the southern colonies, many of which are not of the slightest value to the greater portion of this colony. I have brought this matter forward from time to time in the *Journal* and elsewhere, and again warn growers not to be imposed upon by the agents of southern nurseries, and to remember that the climate of Queensland is a very different one to that of Tasmania and the colder parts of New South Wales and Victoria, and that fruits that do well in those places will not do well here.

The past season has on the whole been a fairly profitable one to our fruitgrowers. There was a mild dry winter followed by a warm dry spring, which injured the citrus crop in some parts, but at the same time kept the fruit fly in check, so that a considerable portion of the earlier deciduous fruits were marketable. The orange crop of the Maryborough district was a fair one both in quantity and quality, and that of the other parts of the North Coast Line was of excellent quality and a greatly increased output, so that the attention of southern buyers has been attracted and many are already canvassing for the trade. The quality of our citrus fruits is undoubted, and with quality we need never fear an over-production. It was the intention of the Department to ship some hundreds of cases of oranges to London during the season, but the prices of the southern markets were so satisfactory that our growers have preferred to sell them rather than risk the long ocean voyage. It is, however, probable that a shipment both of citrus fruits and pines will be made during the coming year, as in view of the extension of the industry now taking place it is advisable to try outside markets. The system of inspection and disinfection that all trees imported into the colony now undergo is having a beneficial effect in preventing the spread of fruit pests, and I am glad to say that two Queensland nurserymen now

treat every tree with hydrocyanic acid gas before sending them out of their nurseries; and it is to be hoped that their example will be followed by the trade generally, as the distribution of scale infested trees by our local nurserymen is now the chief factor in the dissemination of scale insects into clean districts. Several instances have come under our notice during the past year in which the infestation of an orchard can be clearly traced to trees obtained from local nurseries.

4. Experiment Orchards.—*Redland Bay.*—During the year the work at this orchard has been entirely experimental, and has been already alluded to in this Report under the heading of experiment work. The crops experimented upon have included corn, sorghum, oats, lucerne, pulses of many kinds, vegetables of sorts, and potatoes, as well as pines and bananas of kinds, citrus fruits of kinds, mangoes, custard apples, persimmons, &c. A very complete series of manurial experiments have been conducted and careful records have been kept. This orchard has also been the headquarters of the cyanide experiments, to which a large amount of the manager's time has been devoted. Early in the season a very severe hailstorm did considerable damage to the whole of the trees, bananas, and pines, entirely destroying the crop of the latter. The trees on the whole, the pines, and a portion of the cavendish bananas have done well and made a satisfactory growth, but the large mango trees again failed to bear a crop. The orchard has been kept in good order during the year, and the whole of the work has been carried out in a satisfactory manner by Mr. Henderson. In the matter of cyanıding, Mr. Henderson has been of the greatest assistance to me, and he has spared neither time nor labour to make it a success; in fact, the success that we have obtained is largely due to him.

Gatton College.—Owing to the presence of San José Scale, the orchard received a very severe pruning last winter, followed by a systematic fighting of this particularly destructive insect. The method adopted for its extermination consisted of painting the entire portion of the trees left after pruning with sulphide of lime, thickened with fine flour; and this winter treatment was followed up by several summer sprayings with kerosene emulsion. The result of this treatment is that at my last visit to the orchard, I failed to find any San José Scale left, thus proving its efficacy, and the care exercised in carrying it out by the College Horticulturist. During the year the trees have made a good growth (excepting some varieties of persimmons, which are being taken out and replaced with white Adriatic figs), and the land has been kept in a good state of cultivation. Peaches, Japanese plums, and figs promise well, but it is questionable whether citrus trees will be a success on the present site.

In order to test the value of the olive in this district, it is my intention to plant a number of trees on land adjacent to the College Buildings, where, if they succeed, they will be both ornamental as well as useful.

Westbrook.—This orchard has done well during the year; olives, figs, paches, apricots, apples, and almonds having made a very satisfactory growth, and though the prunes and plums and pears have not been equally vigorous, they have done well on the whole, some varieties especially so. Considerable difficulty was experienced in dealing with the San José Scale, which had a fair hold of the Bartlett pears and some of the peaches and plums, but I am glad to say that by taking stringent measures for its extermination similar to those used at the College Orchard, I only found a slight trace of the insect on two pear trees when pruning the orchard recently, and this will be stamped out at once. Instead of using kerosene emulsion as a summer remedy, a mixture of sulphide of soda and whale oil soap was used, and this has proved to be a very effectual remedy for young scale insects. Black aphis was bad at the beginning of the season, but was kept in check by spraying with resin and soda, followed later by black leaf tobacco extract and whale oil soap, this being an excellent remedy for this pest, which it destroys without injuring the tree. The orchard has been kept well cultivated throughout the year, the effect of the initial subsoiling and the thorough cultivation being that the trees never suffered from the dry spell in spring, but made a good growth throughout the season.

I am particularly pleased with the growth made by the imported Californian olive trees, and also of the olive truncheons planted in nursery, and beg to advise that a sufficient number of trees, say, 30 acres, be planted to test the commercial value of the olive as a crop for the stony lands of the Darling Downs.

Hermitage.—Like Gatton College and Westbrook, the Hermitage orchard was badly infested with San José Scale, and received a similar winter treatment with the exception that some of the worst infested Bartlett pears were treated with hydrocyanic acid gas, with the result that they are absolutely clean to-day. I am, however, sorry to say that I cannot say that the orchard is perfectly free of this scale, as there are still a few trees more or less badly infested, but stringent measures are now being taken to keep it down, so that I hope to be able to shortly inform you of its complete

eradication. The trees on the whole have done fairly well, though the growing of crops between the rows has considerably checked them, as it has prevented the orchard from being kept thoroughly cultivated, and the crops growing between the trees have also taken the moisture from the soil required by the trees for their own proper development. The dryness of the season also intensified the injury done to the trees by the lack of thorough cultivation. In future no crops will be grown in the orchard, as the trees are now old enough to occupy the whole of the ground. The manager of the Hermitage is somewhat handicapped, as he has no one capable of undertaking the orchard work, and is unable to attend to it thoroughly himself on account of his other duties, so that I deem it advisable that he be supplied with a man having a knowledge of such work, and I feel sure that such an arrangement would be to the advantage of the orchard. In conclusion, I may state that both myself and Mr. Voller have received every assistance from the managers of the various Experiment Orchards, and that the whole of the work has been carried out in a satisfactory manner.

A. H. BENSON.

ANNUAL REPORT OF THE VITICULTURIST.

SIR,—I have the honour to report upon my work for the twelve months ending 30th June.

I have made an extended tour through the Northern districts comprising Herberton, Townsville, Bowen, Charters Towers, Mackay, and Nebo, to visit farmers engaged in viticulture and offer any advice and assistance they required, and also to examine the soil and climatic circumstances of each district with regard to its adaptability for viticulture.

I made a report to you on my return, which was published in the *Agricultural Journal* for December, 1898. The general conclusions I arrived at were—That viticulture could be undertaken profitably in some of the Northern districts, provided the right kind of soil was chosen, a well drained soil being absolutely necessary. The great disadvantage which the vigneron has to contend against is the shortness of the winter and the consequently lengthy period of the vine's vegetation. This drain on the vine causes shortness of crop and occasionally unequal ripening, but a great deal of the latter may be put down to too much exposure of the grape to the burning sun. The system of topping the vines in the North is not advisable. The troubles referred to are more pronounced on the coast; inland, across the Range, a longer and sharper winter is experienced, and the vine gets more repose. One point in favour of viticulture in the North is the, generally speaking, remarkable absence of fungus diseases. I found certain varieties of grapes growing healthily and free from disease which in the South are a prey to *Oidium and anthracnose*, but, nevertheless, precautionary measures should not be neglected, otherwise these diseases may become acclimatised and difficult to extirpate. It is doubtful if the Northern vignerons will ever be able to get such good crops as in the South, but even then, with the better prices obtained for their fruit, a small vineyard of selected vines should prove a profitable investment. Across the Range there is a long belt of country adapted for viticulture and wine-making.

I have during the past year contributed several articles on viticulture to the *Agricultural Journal*, and attended various agricultural shows in the capacity of judge. I have also travelled about the country visiting vignerons, and offering advice and assistance where required.

I have taken charge of the vineyards at the State farms, and hope to make them instructive object lessons to those engaged in viticulture. The vineyard at the Hermitage Farm, Warwick, does not appear to be doing so well as that at Westbrook. Apparently the soil does not suit the vine, as the growth up to the present is decidedly stunted and poor; it may be that it contains too much alkali to suit the vine. The vineyard also is too small to be of any practical use, which is regrettable, as a State vineyard planted in good soil would be very instructive to present and future vignerons in a district capable of making wine equal to any in Australia.

On the other hand, the vineyard at the Westbrook Farm shows surprising vigour, the soil being evidently adapted to viticulture; and as this class of soil is pretty general, the vineyard will be an object lesson as to what can be done in that district. The vineyard is about seven acres in area, and capable of extension, but several rows were not planted when it was started in 1897, and many of the cuttings missed, and were not replaced last season. Steps are being taken this year to replace all misses. Part of the vineyard is being trellised, and the first crop may be expected this year.

This and other State vineyards will be cultivated on a system to make it as instructive as possible to vignerons and farmers visiting the farm. Where possible, each variety of grape will be pruned on three or four systems, such as the bush, the espalier, the long-rod, &c., so that vignerons may see for themselves how the different ways of pruning are effected. Records will be kept and published of the weight of grapes produced on a given number of vines by each system of pruning, the quality of the grapes grown, and in the case of wine grapes the saccharine density and acidity of the must. A certain number of vines will be planted for experimenting in various kinds of grafting, and the adaptability of certain stocks to new varieties of wine grapes. The results obtained will be published from time to time in the *Agricultural Journal*, as will be also the results of experiments in combating fungus diseases, &c.

Steps are now being taken to plant this season a vineyard at Gatton College and at the Biggenden State Farm, which will be cultivated on the same lines as the Westbrook vineyard for the benefit of the vignerons in those districts.

I suggested to the Minister the advisability of introducing into this colony some new varieties of grapes, more especially Spanish and Portuguese kinds, of which there are few, if any, representatives in Queensland; besides, vines have a tendency to deteriorate after being grown for many years in a new climate, and an importation of fresh blood, as it were, is beneficial. The Minister consented, and under the power given him by the Diseases in Plants Act a quarantine nursery has been formed on the island of St. Helena. Here the cuttings were planted as they arrived, and for twelve months they will be carefully examined for any trace of phylloxera or fungus disease not existing in the colony. As these cuttings were most carefully disinfected before shipment, there is little fear of any such appearance. Some seventy varieties of vines were there collected, many of which, both wine and table varieties, are new to this colony; several kinds of table grapes will, it is hoped, prove valuable additions to our vignerons' collections. A description of each new variety will be given in the *Agricultural Journal*, accompanied, where possible, by a plate, so that vignerons will be able to judge if it suits their requirements. As the number of cuttings of each variety was necessarily limited, it will require at least two years for these vines to be sufficiently propagated at the State farms to be available for distribution. Meantime they will be tested at Westbrook and elsewhere as to freedom from or resistance to disease, the system of pruning best adapted to them, and all other information collected and tabulated which will prove of assistance to winegrowers. The Spanish, Portuguese, and Madeira vines are fine representative varieties, and I have great hopes that by their introduction and cultivation our heavier white and red wines will be greatly improved.

Suggestions to make.—In view of probable events in the near future and the competition Queensland vignerons may be subjected to by southern winegrowers, it behoves them to take steps to meet and defeat that competition without loss of time, as if they wait till southern wines have gained a footing here it will be difficult to dislodge them afterwards.

In my opinion it will be necessary to improve the quality of many of the wines and lower the price; to be enabled to do the latter some economy must be practised in the matter of cultivation and manufacture. There is room for improvement in quality, as all but the most prejudiced must admit. There is no denying that, taking them all round, the wines from the south are superior to Queensland wines. As it is against those wines our vignerons will have to compete, it stands to reason that to be successful they must make equally good wine at equal prices. The man who from obstinacy refuses to admit this, but continues to produce inferior wines, will subsequently pass his time in drinking up his stock. The means I have to suggest for the improvement of dry table wines are planting better varieties of grapes or grafting existing vineyards with the same, and paying more attention to the fermentation and subsequent handling of the wines. Many of the clarets are made coarsely and with want of bouquet; the former defect arising from inferior grapes or too prolonged a vatting, the latter from insufficient acidity, or fermentation at too high a temperature. The sweet wines, generally speaking, are overdosed with cane-sugar instead of being sweetened with mother wines, made by checking fermentation with sound, clean spirit of wine, or the use of concentrated musts. In some cases, too, the cellarage arrangements are very defective, the wine being stored in casks improperly prepared and with uncleanly surroundings. Where wines are fortified the spirit used should be rectified to remove as much empyreumatic oil as the nature of the still will permit. All these and many other details, though apparently trifling in themselves, go to make the sum of good or indifferent wines.

In the matter of cost of production there is something radically wrong if it is a fact, as many vignerons assert, that vines cannot be cultivated under £5 the acre, and some put it even higher. I have taken considerable trouble to find out the cost of cultivation in the southern colonies, and have received information on the point from many of the largest winemakers in South Australia and New South Wales, as well as from the Agricultural Departments of Victoria and New South Wales, and the result of the whole correspondence shows that in South Australia the total cost of an acre of vineyard is, for bush vines, 35s. to 50s.; for New South Wales, 30s. to 50s.; and in Victoria 60s., the latter being presumably for trellis vines, though not stated. The cultivation consists of two ploughings, pruning, three scarifyings, hoeing strips, &c. The average yield for the three colonies is stated to be—

South Australia, $1\frac{1}{2}$ to $2\frac{1}{2}$ tons per acre.
New South Wales, $1\frac{1}{2}$ to 3 tons per acre.
Victoria not given, but probably the same.

The selling price of grapes for the last few seasons is stated to be—

For South Australia, £2 to £7 per ton, according to variety.
New South Wales, £3 10s. to £5 per ton.
Victoria, prices not given.

The lower prices for South Australia and New South Wales are for varieties mostly grown in Queensland, and which were fetching this last vintage £8 per ton, so that, if that price is maintained, a Queensland winemaker buying grapes will have to pay £8 per ton for his raw article, against £2 to £3 10s. paid by his southern competitors.

In justification of this high price, the Queensland grower says that his cultivation is much more expensive than in the south. Is that so? I think not. The cost of labour in the south is higher than here, as the average price of field labour in South Australia is given at from 27s. to 30s. per week, and 25s. in Queensland is good pay. The cultivation here and in the south is the same, with the exception of the number of scarifyings, the climatic conditions of Queensland fostering a quicker growth of weeds; but if to the southern returns another six scarifyings are added, which is more than enough, the extra cost is only about 15s. per acre, so that the cry of cost of cultivation is not justified. The total cost for the cultivation of the Westbrook vineyard last year was under 45s. per acre, and comprised two ploughings, nine scarifyings, pruning, &c., and during the whole year the vineyard was beautifully clean and free of weeds. As a rule State work is more expensive than private work, and what Mr. Quodling did at Westbrook can be done by any other man in Queensland. The secret of the whole matter is to do the cultivation at the proper time and never let the weeds get too much ahead and seed. No doubt many vignerons are always keeping the scuffler going, but the reason is that the land has never been thoroughly cleansed of weeds, and also allowing them to get too much ahead to attend to other work.

There remains the question of loss by rotting, and this, no doubt, is a serious matter in some seasons, but it certainly is more the exception than the rule, and against this loss should be credited the bigger yield per acre in Queensland as compared with South Australia and New South Wales.

The reason, then, for the high price of grapes in this colony must not be put down to the extra cost of cultivation, but to the scarcity of the article. There is a large and increasing consumption of grapes for table purposes, jam making, &c., and the production is limited. Many vineyards have gone out of cultivation because the owners prefer the easier work of wheatgrowing, and because many failures were experienced at first from want of knowledge of what to plant, and how to make and sell the wine. Queensland vignerons who have their own vineyards and who can cultivate them at a cost of 45s. per acre, as at Westbrook, will be able to hold their own against southern competitors if they attend to the quality of the wine, but vignerons who have to buy grapes at £8 per ton will not be able to do so, and no man will invest capital in the trade whilst such prices last. The remedy is for farmers to plant more vines of good quality, which, at half the present price, will always give a good profit, but when doing so let them take advice as to what should be planted, and how pruned and cultivated.

E. H. RAINFORD.

REPORT OF THE TOBACCO EXPERT.

Sir,—I have the honour to report upon the work done in this Department in the past year, and on the progress made in tobacco culture.

This industry may be said to be in a healthy condition, production about keeping pace with consumption, and prices are remunerative.

About 800 acres were grown the past year, a small increase over the year previous.

It has not been my purpose to encourage an increased production of the heavy pipe tobaccos for the present, but rather to improve the quality. When this is accomplished an outlet can be found for the increased production. In my last Report it was suggested that a material modification of methods was necessary to attain the best results possible; these relate to cultivation, curing, and handling, reducing the cost of production, increasing the yield, and developing the flavour of the product. Farmers as a rule are very conservative and are slow to alter their methods so long as their methods show a margin of profit, adopting innovations cautiously and gradually. If we are to increase the consumption of the home-grown product, or even maintain our present rate, we must improve the quality, for our reputation for growing the best tobacco in the colonies will not avail us unless we attain the highest possible excellence. To this end I have directed my efforts, with some degree of success. Better methods of making seed beds are being adopted, and the value of better cultivation is being recognised and practised. Curing-sheds are expensive, and for the present farmers are disposed to utilise those they have, but am confident these will come as they understand their value, and this will be demonstrated later on, as two modern structures are to be built the coming season in the Texas district. There has been a slight falling off in the consumption of colonial tobacco of 9,845 lb. weight in the past twelve months, which may be partly accounted for by the short crop of the previous year; there is also a reduction of the unmanufactured leaf in the hands of manufacturers of 79,171 lb.

The slight increase of imported leaf—6,197 lb.—is of no significance, as this is used mostly in the manufacture of cigarettes, for which our tobacco is unsuited. The increased import of manufactured tobacco emphasises what has been said—that we must improve the quality to increase the consumption.

The amount of locally-grown leaf used for manufacturing during the year was 607,114 lb. weight. One difficulty with our tobacco is lack of aroma; and I am quite satisfied it is as much the fault of manipulation after curing as it is in the curing, and experiments are now being made by me, by which I hope to demonstrate this fact, as well as prove that a desirable flavour can be imparted to it.

The experimental crops at the College, and in Texas, did not succeed on account of the drought and consequent failure of the plants; we shall make another effort this year. The amount of cigar leaf grown in the Northern part of the colony was very limited, but showed that a good quality of leaf can be grown there. To this industry I am giving all the encouragement possible, as I feel assured, if it is persevered in, and grown in connection with other crops, it can be made a most profitable industry.

R. S. NEVILL.

REPORT OF THE INSTRUCTOR IN COFFEE CULTURE.

Sir,—I have the honour to submit my Report.

Having reported myself at your office on my arrival from India on the 10th of January of this year, I commenced my duties by leaving Brisbane on the 21st, and proceeding, under your orders, to Cooktown, with the object of working my way southward through the coffee-growing districts as far as Mackay, and compiling a report on the industry.

It so happened, through force of circumstances that I shall give in detail later, that I was prevented from carrying out the programme originally intended, and, instead of being able to return to Brisbane in a position to draw up and submit to you a detailed report upon the industry in the whole colony, I only got as far as Cairns on my southward journey, and have remained here since.

At Cooktown I was enabled, by the courtesy of Mr. Jas. Dick, to go round the district somewhat, and to see what land there was under the cultivation of coffee, and also to judge of some of the soils and lands in their vicinity during the week I spent there. I much regretted that I could not then spare the time to see the Bloomfield district as well as the McIvor lands, which, from what information I could gather, and judging by the nature of the land, climate, and soil that I was able to see, would seem to be well suited to the cultivation of coffee—even more so than the vicinity of Cooktown.

Coming further south, I had to miss Port Douglas, including the Mossman and the Daintree districts, in both of which places coffee is being cultivated.

Judging by the letters I have received appealing for information and advice from these ports, it would seem that a visit there as soon as may be would be of advantage to the industry and benefit to the growers.

The rainy season coming on, it was desirable that I should push through with the larger centres, and visit the rest later on when time allowed.

I arrived in Cairns on the 4th of February, and from that date until my receipt of your telegram of the 8th March, requesting me for the time to confine my attention to other duties, I was assiduously visiting the coffee-growers and their estates, giving what information was required, demonstrating, to the best advantage in the short time I could spare to each, the necessary works that were due for execution at that time of the year, pointing out errors and omissions, explaining the theory and advantages of as well as the practical reasons for adopting the correct and more modern methods of cultivation, and making notes and collecting matter for the report to be submitted to yourself.

It will be seen, therefore, that my work in connection with coffee culture in this colony since I joined the Department has extended over a few days in January and but little more than the month of February—roughly speaking, for some forty days in all.

Being the only officer of the Department in the North, and on the spot when the last overseer of the Kamerunga State Nursery passed away, I was asked to take over charge pending the appointment of another overseer. Before this could be settled, the new regulations respecting the inspection of fruit and plants exported from this port came into force, and this complicated matters. The work of inspecting imported plants and fruit not being heavy, the appointment of inspector under "*The Diseases in Plants Act of* 1896" had until then been attached to that of overseer of the Nursery. The new regulation, requiring the examination of all bananas leaving this port for Victoria, made the work very much heavier; and there being no one else then available competent to carry out the examination for the minute signs of fruit fly in its initial stages, I was requested to do this work also. This necessitated my presence in Cairns on nearly every day in the week, and on the wharf frequently until late at night. These matters have now been arranged, however, by the transference of the sub-overseer of the Mackay Nursery for work on the Kamerunga Nursery, and by the appointment of an independent inspector for the port of Cairns under the Diseases in Plants Act. I hope, therefore, while still making this my headquarters and the centre of my operations, to be free after this for work in connection with the coffee industry. I trust also that my headquarters will be permitted to remain in the centre of the coffee-growing districts and the scene of my operations.

In the short time I have hitherto been able to devote to my industry I have visited the districts of Cooktown, and, in Cairns, of Hambledon, Kuranda, Myola, and Atherton. I have not been able to finish the district of Cairns yet, there being many more estates and growers to visit, including among them the two largest growers in the colony—the Hon. De Molyns and Messrs. Cutten Brothers.

I have visited 43 separate coffee-growers, representing some 200 acres of coffee. Many of these have only small areas, but I would submit these are as important as the larger growers, for it is on the success of the smaller ventures that the larger estates are opened and the large and prosperous industries built up.

With regard to *statistics*, I regret that I cannot as yet give any, since I have been able to go over so little of the land under the cultivation of coffee. As I go round I hope to be able to compile statistics. Those given to me, on my asking for them, in the Department's offices in Brisbane, showed some 283⅓ acres for 42 growers. This included Cooktown, Cairns, Nelson, Cardwell, Port Douglas, Daintree, Mackay, Yeppoon, St. Lawrence, and the Buderim Range. Whereas I have visited more growers representing in aggregate two-thirds of the area mentioned, in the districts of Cooktown and Cairns (in part only). I therefore am of the opinion that when I can give exact statistics both the extent of the industry and the number engaged in it will be larger than the Department and the public are aware of.

With respect to *soils and climates*, I have seen only a small portion of the colony as yet, and it would be impossible for me to make any but the most general statements until I have been able to thoroughly go into the whole matter, and have seen and appreciated the conditions to be found in all parts. Bearing in mind this fact, I can still say that both the soils and the climates obtaining in this country are infinitely superior to those in which coffee is grown in many—and indeed most—of the coffee-growing centres of the world.

Labour.—This also is a question that needs careful consideration, and, having had to do with the matter of labour for coffee culture in other countries, I feel the more diffident in making any statement until I have been enabled to take up the subject and make myself thoroughly conversant with all its details. Without losing sight of this fact, I am of opinion, from what I have seen, that while undoubtedly a difficulty (of what magnitude I cannot yet say) it would seem to be much less than many are inclined to think and make it.

The cultivation of coffee has hitherto practically been carried on only in countries where labour is cheap; consequently it has obtained for it-elf a name as an industry that cannot be successfully worked without an unlimited supply of cheap labour. Sufficient consideration has not been given either to the reduction of the amount of labour necessary for the work or to the choosing of soils and climate where the bearing capabilities will be so favourable as to counteract a comparatively more expensive labour supply. Those intending to invest capital in coffee cultivation, having little or no practical experience of it themselves, rush to countries where labour is cheap, and there put up with conditions of climate and soil that are frequently exceedingly poor. In this country the conditions of climate are exceptionally favourable, and of soil such that very few coffee-growing countries can in any way compete with. I am therefore inclined to think that economy of labour, by adopting modern and better methods of culture and thus reducing the cost of production; careful and scientific curing, allowing the produce to take its place as a high-grade article and bringing into competition its analytic qualities, which are high; together with the infinitely greater bearing capabilities that coffee here has over that of other countries, will enable Queensland coffees to compete favourably in the world's market, in spite of a disadvantage respecting labour.

The Market for Coffee.—There would seem to be a fear amongst some of the growers that owing to the recent drop in prices there will be no sale for coffee produced. In reply to this, and without going into details of imports and local sales, I would point out that the drop has been principally in the medium and low-grade article. Sir Frederick Able, in a letter that has already passed through your office, corroborates this when he says, speaking of the coffee market at the time of the arrival in England of the consignments of Queensland coffee sent last season: "Prices are depressed for all *except* the finest coffees."

So long as the coffee sent to the London market is a well-cultivated and well-cured article, and therefore takes its place as a high-grade coffee, there is no doubt whatever about there being a ready market for it. Prices of low grades may possibly remain low, and even have a tendency to drop, but high grades will always sell well. Roughly speaking, about two-thirds of the world's output of coffee is low grade and only one-third high grade, and the low grades must make way for the finer coffees.

It has been remarked—and printed and published also—that the fault of Queensland coffees is in the *curing*, which means that while its analytic properties are high it is otherwise a poor sample. From what I have been enabled to see, this is undoubtedly so, but this is only half the truth. The root of the matter lies in the cultivation. A badly cultivated sample will not, even with the best and most scientific curing, give the same profits that a well-cultivated sample will do, because in almost all cases it will have cost too much in production.

A coffee produced at 6½d. or 7d. per lb. and sold at 7d. or 7½d. does not pay to cultivate, or the profit is so small that the investment does not give even fair interest. When by good cultivation the cost of production is lowered to 4d. or 4½d., and the same article (putting better curing on one side for the time being) is sold at 7d. or 7½d., the difference, amounting to £28 a ton, is readily appreciated.

By cultivation it must be understood that methods, times, and seasons are meant. The most excellent work—be it weeding, draining, pitting, digging, forking, staking, topping, pruning, handling, mulching, manuring, or even picking—if not done by good methods or at the right time and seasons, so as to save and economise labour as well as to give the greatest amount of benefit to the plant, amounts to bad cultivation, since it means enhanced cost of production.

For instance, a handling in the second year, costing very little, would mean not only quicker and cheaper handling and a saving of labour in the third year—the two works together costing less than only the one operation in the third year—but enhanced stability and sturdiness of the tree, better and stronger wood, a direction of energy into the right channel and more, as well as a better sample of crop in the third and subsequent years.

The subject of statistics, soils, climatic conditions, markets (both local and open), values of present samples of coffee methods of culture in vogue and modernised, the labour question as affecting the industry, the classes and varieties of coffee in the colony, &c., &c., I would request your permission to allow to stand over until I can make myself better acquainted with the conditions obtaining in the colony.

It will be evident to you that it would not be reasonable to go into details of such matters after only forty days' observation, and that statements respecting them should be applicable to the whole colony; whereas, with the limited time I have been able to devote to the colony, any remarks I were to record must necessarily either be evolved from hearsay or unconsciously biased in favour of what I have been able to see. I

would request that I be allowed to compile a full and detailed report either during the year or, should my other duties hinder an early drawing up of such a report, in time to be included in the departmental report for 1899-1900.

I would also suggest that it would be of advantage to the industry in general if I were to monthly submit an article on one of the many details of culture for the publication in the Departmental *Journal*, so arranged that they could be subsequently embodied in a pamphlet which could be issued as a bulletin for use of resident growers in a compact form, or for newcomers who intend opening out in coffee.

Since my work in connection with the industry has been, for the unavoidable and unforeseen reasons above mentioned, stopped temporarily, I have received many letters asking for advice and information, and also for visits to different parts. I have endeavoured to give what instruction I could by letter, and a good deal of my time has been so occupied. Giving instruction by letter, however, on very vague data, to be applicable to districts and conditions I have not seen, necessitates the mentioning of so many different methods necessary for as many possibly different conditions of climate, soil, &c., that a great deal of inapplicable matter has unavoidably to be recorded, and a great deal of time wasted.

I have already had correspondence with and also been interviewed by several newcomers, who, hearing of my arrival and appointment, wish to invest in and open up in coffee.

Information has been asked for from time to time by the Department both for different parts of the colony and for outside, and duly given, and an article published in the *Agricultural Journal*.

HOWARD NEWPORT.

ANNUAL REPORT FOR THE STATE NURSERY, KAMERUNGA.

Sir,—I have the honour to submit the Annual Report for the year ending 30th June, 1899.

Before going into details of work for the past year, it is my painful duty to have to record the untimely death of the late overseer, Mr. E. Cowley. By his death the Department has lost an able and zealous worker and the district a clever botanist and naturalist. Unfortunately for myself, my arrival here was just too late to allow of personal acquaintance with Mr. Cowley. Since I took over charge of the management of this Nursery from Mr. Cowley, late in February of this year, my remarks in this report will, of necessity, apply to the work carried on since then, and matters as I found them to be, rather than to the work during the earlier part of the year by the late overseer.

The Weather.—The rainfall during the past year would seem to have been unusually heavy. It is nearly half as much again as last year, and the rainfall during the months of February, March, and April together amount to about two-thirds of the whole year's fall.

The floods, occasioned by this heavy rain, did some damage to the Nursery by killing some few trees and plants and in damaging the pumping machinery. The entire absence of surface drains in the Nursery, also, has resulted in the washing away of gravel from the roads and footpaths, and in some places of the surface soil also.

Sugar-cane.—During March I noted that some insect appeared to be attacking and damaging the cane in two out of the three fields under this product. I at once reported the matter and sent specimens to the Department, and Mr. Tryon proclaimed them to be the cane-borer. Upon this the instructions of the Department were prompt to destroy the two fields of cane in which it had been found, and to search the other fields carefully. The two fields of cane, therefore, have been destroyed, but hitherto no borer has been observed in the third field, though a sharp watch is being kept.

Citrus Family.—Fruit fly seems to be especially bad this year, and allows no fruit of the orange or lemon trees to ripen; a few only of the rough-coated lemon have escaped. Bark-splitting is bad among the citrus trees, and the scale *Lecanium longum* is to be found on some of the orange-trees.

Bananas.—The exports from the district remain good, though fruit fly and a species of rust are giving trouble in the vicinity of the Barron River. A supply of good Cavendish banana suckers, free from disease, will be kept for distribution. The New Guinea varieties have, I understand, been lately transplanted, together with the *Musa textilis*, to a new piece of ground. They have not borne yet this year.

Cocoa.—*Theobroma cacao.*—One of the old trees bore three pods early in the year, from which seed was obtained. There being no demand for seed just then, these were raised in the bush-house, where no difficulty was experienced in germinating them. There should be a fair supply of seed this coming season, the heavy rains having been all in favour of the cocoa-trees.

The effect of an attempt at pruning these trees, some time back, has been apparently to stunt their growth. Pruning is not generally resorted to, and considerably more moisture in the soil and humus is necessary for a satisfactory growth than is to be had in the present locality of the cocoa-trees in the Nursery.

Mangosteen.—Two trees in the bush-house have attained a height of 5 feet and 4 feet respectively, while those in the open vary from 18 inches to 2 feet. This is a slow-growing tree, but thrives best under much the same conditions as cocoa, needing a heavy moist soil rather than a light dry one. The fruit, if it can be successfully grown, will probably prove both popular and profitable. Its flavour and delicacy are unsurpassed, and the fruit, having a thick rind or skin, will travel well in cases or even sacks for journeys of a week or so.

Pepper.—*Piper nigrum.*—Pepper in its natural state grows on the stems of large and rough-barked trees in dense scrub land. It would probably grow readily in scrub lands in this vicinity, but it must have shade. The pepper in this Nursery being out in the open, and having only a small stick some 5 feet high to cling to, is not growing under sufficiently suitable conditions for satisfactory results to be expected. The plants seem to take to the soil and climatic conditions readily, however, and the growth seems as strong and healthy as could be expected. Planted under more favourable conditions, its culture would probably prove very successful.

Cloves and Nutmegs.—The soil in this Nursery is not suitable for these spices. Better and more satisfactory results might be obtained by growing these trees on the borders of unfelled scrub, where a certain amount of shade, humus, and leaf-mould would be obtained. Such districts as the Lower Russell, Daintree, and Bloomfield would appear to more nearly approach the conditions of their natural habitat.

Vanilla.—This orchid seems to grow readily in this district. I have met with it in several places other than these gardens. The bean is particularly valuable when properly cured, though it is easy to spoil its value by improper methods of drying and sweating. I have not seen any vines in bearing yet; those in the Nursery are suffering from the attack of the green arboreal ants which eat away the stem close to the ground. The plant does not necessarily die when the stem is severed, but derives its nourishment from the small short roots it puts out into the bark of the trees it grows on. It will, however, endeavour to get new roots into the ground, and will send down long succulent shoots, which would form new connections with the soil if not in their turn attacked by the ants. While putting all its energy into forming root, however, it is natural that it will not bear to the same extent as a healthy plant, and possibly will not bear at all.

Probably artificial fertilization will have to be resorted to, and unless the question has already been gone into, there will be room for some interesting entomological experiments.

The Plumeria or Pagoda tree-shade for the vanilla orchids in the nursery is insufficient, especially just now, when it is shedding its leaves. The trees are not tall enough or of large enough girth to give sufficient support, nor do they deposit sufficient leaf to form mulch that can retain the moisture. Some of the vanilla plants are already very nearly to the tops of the trees they have been set to grow upon. The bark of this shade-tree, moreover, does not give sufficient hold for the vanilla, but gives way here and there, allowing the orchid to hang in festoons, to its own detriment.

Divi Divi (*Cæsalpinia coriaria*).—These trees are growing well and bearing heavily. The crop is now beginning to come in. Cultivation is reduced to a minimum with this, and judging by the quantity of pods on each tree, it should prove a paying crop. Its bulk will, however, be its disadvantage, and will be a serious expense if any great amount of transport is necessary.

Coffee (*C. arabica* and *C. liberica*).—The field of coffee that had been planted here, and was, I am given to understand, some three years or more old, was rooted out by the late overseer. The few trees that have been left along the roadside are poor specimens, being neither of a good class, nor in any way cultivated, pruned, handled, or topped. The few berries on the trees are small, and quite unfit for seed. The plants in the bush-house are of a mixed variety, and are one and all too old and stunted to make good plants for distribution. I have had to refuse applicants for both plants and seed—a state of affairs that I hope may be remedied by next planting season.

As I am dealing with this subject separately in another place I will say no more on coffee culture here.

Ceara Rubber (*Manihot Glaziovii*).—This tree has taken to the district and soil. In the nursery it has become almost a weed. The large trees that are bearing seed scatter it about and it germinates readily, even in the middle of footpaths if left long enough. Section III., field 1, has been planted up with several hundreds of these trees about 6 feet apart, as well as a portion of field 3 of section III., and in a few years, when these trees are large enough to be tapped, they should prove a fair test of its economic value. There are any number of plants and cuttings available for distribution.

Para Rubber (*Hevea braziliensis*) is not doing so well as the Ceara. It appears to be considerably more delicate and to suffer during dry weather and hot winds. The plants are hardly big enough or old enough to judge of its possibilities yet.

Assam Rubber (*Ficus elastica*).—This thrives well here and is a most handsome plant. It will, however, be a very long time before there is sufficient stem to tap.

Fibre Plants.—*Agave rigida* grows well and is to be had here in quantity. Nearly all of the old plants are now flowering. *Musa textilis* has taken to its new quarters and is making new suckers rapidly. Ramie needs much more rain and moisture than it gets in this nursery. It is small and stunted. I have seen it grow luxuriantly in swampy ground *Fourcroya gigantea*: the mother plants have flowered and are dying away, giving place to innumerable young seedlings.

Palms.—These useful trees seem to grow well in this district. There are many handsome varieties in the gardens. *Phœnix rupicola* looks well and germinates from seed readily, but is difficult to transplant if allowed to grow too long in the seed-beds. *Elæis guineaensis* seed has been germinated after repeated failures. The palm is prolific and plenty of seed is available. I hope to be able to germinate in quantity and have plants for distribution soon.

Teosinte (*Euchlæna luxurians*).—The few plants grown here have not been very successful. Most of the seed seems to have been taken by cockatoos, which are troublesome. There being only enough seed for replanting, none has been available for distribution.

Kafir Corn (*Sorghum*).—This useful grain, known as "white cholum" in India, does not seem to have been raised during the past year. It is useful as food for man and beast, and supplies abundant fodder. It is broken or crushed, or boiled, and used as a substitute for rice. Is fattening food for cattle and horses in this state. There are several varieties, of which this is one of the best though small. It produces a large quantity of stalk and leaf, which is popular fodder for draught cattle in the East Indies.

Pawpaw.—The continued heavy rains in March had disastrous effects on our Pawpaw trees, killing many off by rotting the roots. Some would have recovered had not the wind blown them down before new roots could be made. Several good trees were lost, including the branching variety. There are several varieties not in the Nursery, however. Three distinct varieties are known in Southern India, besides a Chinese variety, apart from the branching variety here. The Singapore Pawpaw is not especially large, but turns a golden yellow when ripe, and has a fine flavour. The Chinese is a long pointed fruit, and is a dark green colour when ripe. This would probably travel better than most. The male tree is not a necessity in a garden, though there is nothing lost by retaining one should a number come up from the seed. The *Papaya carica* may be dicœcious, moncœcious, and even hermaphrodite. I hope to be able to deal with this interesting fruit tree later on by itself.

Jack Fruit (*Artocarpus integrifolia*).—The only tree of this useful fruit in the Nursery shows signs of a past crop, but none of a further crop this year. The tree is rather slow-growing, but the timber is hard and good. It is of a dark yellow, and is useful in making furniture. The tree is prolific. I have had over seventy fruit on one tree, averaging 35 to 40 lb. each, some fruit being 65 to 70 lb. each. The fruit has a strong but not unpleasant smell, though many object to it. Once the taste is acquired, the fruit becomes very popular. The seeds make an excellent vegetable, and are a good substitute for potatoes when boiled. When dried and ground the seeds or nuts give a wholesome meal. The nuts roasted are not unlike English chestnuts. The fruit, seeds, pulp, skin, and all except the rough outer covering are readily eaten by cattle, and pigs are specially fond of them and fatten on them.

Of the plants and seeds received during the year a few rooted cuttings of *Piper methysticum* are still in the bush-house. Before planting out I would await the result

of my suggestion to open up a piece of new scrub land in which plants of this nature may be experimented with under conditions more readily approaching their natural habitat.

Many of the plants subsequently mentioned in the list as being received would appear to have succumbed, as no trace of them can be found.

Para Rubber.—Of the 260 plants received some sixty odd have been planted out in the Nursery, and a few distributed. A good many seem to have died out.

Candle tree.—The seed sent up has germinated freely, and there is any quantity of seedlings available for distribution.

Durian (*Durio zibethinus*).—All the seed of this tree have failed to germinate. This is possibly owing to the seed having either dried in transit, or to being kept too moist in the seed-bed. The seed is somewhat difficult to germinate, and should be planted as soon as possible from the ripe fruit. I trust some more will be obtained shortly, for experimental purposes.

Ceara Rubber is germinating freely, but the African rubber (*Kickxia africana*) is not as yet showing any signs of germination.

Improvements.—Nothing of the nature of permanent improvement has been carried out this year. Ordinary wear and tear has had to be remedied, and small repairs were necessary to the dwelling-house and bathroom, after the departure of the late occupants. These have been effected, and the house has been repainted. The office and outbuildings, that also need painting, are now being done.

The advisability of purchasing, for the use of the labourers employed, the humpy that was erected in the adjoining paddock by one of the labourers at his own expense is under consideration.

Pump, Boiler, and Machinery.—As the late overseer remarked in his last report, it was found necessary to thoroughly overhaul this plant. The floods in March had done some damage by washing away the corrugated iron shed over the pump, and breaking off the foot-valve of the suction-pipe and washing it down stream. The boiler had not been tested or examined, apparently, for five years or so. This was done, and the shed replaced by a smaller and more substantial one. The foot-valve is presumably buried under some of the new sandbank in the bed of the river. A thorough search having failed to discover it, it was replaced.

The pump itself had to have new packing supplied for the pistons, and this has been fitted up, and now works well, but the injector mechanism on the boiler is now found to be worn, and not working properly. As the pump was not working, and could not be worked, when it was examined for repairs, this injector irregularity could not be tested. It is a constant source of trouble, and if a small donkey pump could be supplied for filling the boiler, as is, I understand, in use at the Mackay State Nursery, it would save a great amount of time, trouble, and labour.

The plant, as now situated, is inconvenient and awkward. The engine-house is near the house of the man in charge, but the pump is down on the bank of the stream some 100 yards off, and the water supply some fifty or sixty yards further off again. Whenever the river is in flood the pump is submerged, and the piping and foot-valve bent, damaged, or (as in this case) broken off and lost. This is gradually spoiling the pumping engine, and is a constant expense. I would therefore suggest that at the end of this dry season the pump be removed to a site alongside the engine-house, and three spears be sunk from there. This would cost only some £35 to £40, save subsequent expense in repairs, be above flood-mark, and enable the pump to do more work.

I would suggest that a piece of scrub land adjoining the present enclosure in the nursery reserve be opened up for the purpose of experimenting with such products as Vanilla, Pepper (three varieties), Cardamoms, Nutmegs, Cloves, Cocoa, Mangosteens, &c., &c.; all of which need more or less shade and constant moisture, mulch, and humus.

The opening up of such a block, say 5 acres in extent, would not necessarily be an expensive undertaking, for all the plants and trees mentioned (each an industry in itself, if proved capable of being grown under existing climatic conditions) it is necessary to have the larger scrub trees standing. The clearing would therefore be reduced to a minimum, and amount to little more than a brushing of the scrub.

The Pepper family and Cardamoms need dense shade, and but little more clearing would be necessary for the larger spice trees, and would give them many of the conditions essential to their successful culture, and also supply them with surroundings and soils infinitely nearer to those obtaining in their natural habitat.

Each of these products I hope to deal with in the course of the year, and to record my experience of them in the Departmental *Journal* from time to time.

HOWARD NEWPORT.

SCHEDULE A.

ABSTRACT of METEOROLOGICAL OBSERVATIONS for the YEAR ended 30TH JUNE, 1899, taken at the Kamerunga State Nursery, Cairns.—Readings at 9·20 a.m.

—	1898.						1899.						Totals and Averages.
	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	
Thermometer Readings—													
Mean maximum	74·0	76·8	81·1	80·9	84·8	90·3	90·1	87·1	83·8	82·9	80·0	82·4	Mean average maximum, 82·86.
Mean minimum	56·1	58·2	62·1	61·9	64·6	67·0	72·91	69·5	72·6	*	*	*	
Mean temperature	65·1	68·0	71·6	71·4	74·7	76·6	81·5	78·3	77·6	*	*	*	
Rainfall	In. ·935	In. 4·990	In. Nil.	In. ·120	In. 1·400	In. 1·857	In. 7·735	In. 10·965	In. 42·820	In. 8·730	In. 2·690	In. ·980	Total rainfall for 1893-99 —92·222. ,, ,, 1897-98 – 68·650.
Days on which rain fell	No. 10	No. 14	No. Nil.	No. 1	No. 1	No. 9	No. 19	No. 12	No. 22	No. 18	No. 12	No. 2	No. of days rain fell, 1898 99—120. ,, ,, 1897-98—139.
Thermometer in shade—													
Extreme maximum	77·5	88·5	85·0	91·5	91·5	93·0	97·0	93·1	91·0	87·0	85·0	85·0	Extreme maximum, 97·0.
On date	30th & 31st	9th	9th	30th	2nd	22nd & 25th	20th	1st	21st	14th	29th & 30th	5th	On 20th June, 1899.
Extreme minimum	44·0	49·0	52·5	56·0	64·5	64·0	65·0	64·2	69·0	...	..	...	Extreme minimum, 44·0.
On date	24th	4th	19th	4th & 30th	23rd	8th	12th	13th	19th	...	...	...	On 24th July, 1893.

* NOTE.—The minimum thermometer being out of order no readings could be taken for April, May, and June, 1899.

SCHEDULE B.—Seeds and Plants Available.

Plant.	Botanic Name.	Plants.	Seeds.	Cuttings.	Rhizomes.	Time.
Pineapple	*Ananassa sativa*	Few				
Yams (3 varieties)	*Dioscorea*	...	...	...	Few	
Bananas (Cavendish)		Quantity				
Paw-Paw	*Carica papaya*	,,				
Manilla Hemp	*Musa textilis*					
Sisal Hemp	*Agave rigida*	,,				
Arrowroot	*Maranta arundinacea*	...	...	...	Quantity	
Coffee	*Coffea arabica*	Quantity	Quantity	...	...	Plants January to March.
,,	*C. maragopipe*	,,	,,	...	...	
,,	*C. liberica*	,,	,,	...	...	
Divi Divi	*Cæsalpinia coriaria*	,,	...	...	...	Now.
Cassava	*Manihot utilissima*	...	...	Quantity	...	,,
Turmeric	*Curcuma longa*	...	...	...	Quantity	,,
Ginger	*Zingiber officinale*	...	...	...	Some ...	,,
Custard Apple		...	Quantity	...	...	,,
Ceara Rubber	*Manihot glaziovii*	Quantity	...	Quantity	...	,,
Assam ,,	*Ficus clastica*	...	...	,,	...	,,
Para ,,	*Hevea braziliensis*	Few ...	...	...	...	,
	Albizzia stipulata	...	Some	...	...	,,
	,, *odoratissima*	...	,,	...	...	,
	Cassia grandiflora	...	Quantity	...	...	,,
Weeping Fig	*Ficus Benjaminea*	...	...	Quantity	...	,,
Beatrice Palm	*Ptychosperma Beatricæ*	Few ...	Quantity	...	...	,,
African Oil Palm	*Elæis guineensis*	...	,,	...	...	,,
Phœnix Palm	*Phœnix rupicola*	Quantity	,,	...	..	,,
Sugar Palm	*Arenga saccharifera*	Few ...	...	...	...	,,
Ramie	*Bœhmeria nivea*	Quantity	...	...	...	,,
Sugar-cane	Large number of varieties.					
Tamarind	*Tamarindus indica*	..	Quantity			
Bamboo (striped)		...	...	Quantity		
Bread Fruit	*Artocarpus incisa*	...	...	,,	...	,,
Pepper	*Piper nigrum*	...	...	,,	...	,,
Guinea Grass	*Panicum maximum*	Quantity	Quantity	...	...	,,
Red Natal Grass	,, *teneriffæ*	,,	,,	...	...	,,
Vi Apple	*Spondias dulcis*	,,	...	...	...	,,
Candle Tree	*Parmentiera cereifera*	,,	...	...	...	,,
Annatto	*Bixa Orellana*	...	Quantity	...	..	,,
Mango	*Mangifera indica*	...	,,	...	...	December.
Sweet Sop	*Anona squamosa*	...	,,	...	...	Now.
Jack Fruit	*Artocarpus integrifolia*	...	...	Quantity	...	,,

REPORT OF THE CHEMIST, SUGAR EXPERIMENT STATION, MACKAY.

Sir,—I have the honour to submit herewith a short Report of the work and duties performed by me since my appointment to the Sugar Experiment Station, Mackay.

The erection of the laboratory and chemist's residence was commenced in August, 1898, and the buildings were completed on 19th October. The interior of the laboratory was finished on 7th November, and the supply of water from the well laid on at same date. The Müller's gas machine ordered from home arrived here and was erected on 7th December.

The laboratory is situated on the east side of Alexandra street, and adjoins the State Nursery. The building contains a working laboratory situated in north-west corner. This room is fitted with the necessary sinks, shelving, draught cupboard, work benches, water and gas supply. The room in the south-west corner is used as an office and balance-room. This room is 15 feet by 17 feet 6 inches. In the north-east corner of the building is a photographic dark room 8 feet 3 inches by 7 feet 6 inches, fitted with necessary dishes and chemicals, gas and water. Adjoining this is a polariscope-room 7 feet 6 inches by 9 feet 6 inches. The south-east corner is occupied as storeroom 7 feet 6 inches by 15 feet. Two 1,000-gallon tanks are erected at back of laboratory, one containing rain water and the other well water. About 16 yards from the main building is a shed 12 feet by 15 feet, divided into two portions by a lattice-work partition. One contains the gas plant and store of gasoline, and the other the chaff-cutter and cane-splitter used in preparing cane samples for analysis.

The major portion of the chemical apparatus, &c., ordered from home arrived here at the end of February, 1899, and the testing of graduated instruments and preparation of the necessary solutions was proceeded with.

Analysis of all ten to twelve month old cane in the nursery have now been made, and these will be repeated at intervals. The examination of Palmyra soils and all fertilisers used there is in hand at present. It is most gratifying to record that during the short time that has elapsed since this laboratory was ready to undertake analytical work six samples of fertilisers and dairy produce have been received for analysis from the public.

In September last I was instructed to draw out a plan of the proposed drainage scheme at the State Nursery here. This was forwarded to you on 30th September.

A plan of the whole of the State Nursery to scale has also been prepared.

For three weeks in December I was giving instruction to a student in the arranging and recording of the necessary data for the chemical control of a sugar mill.

On the 21st March I received instructions to proceed to the Herbert to procure cane plants for a central mill in Mackay. I had to go on to the Johnstone, when I procured striped Singapore, Mauritius yellow, and Malabar cane. These were forwarded to Mackay, and I returned here on 13th April.

A block of cane at east side of the nursery ($1\frac{1}{4}$ acres) was divided into six plots, and variously manured on 15th September. The growth of the cane, however, has been so uneven, and so many canes died (from gumming) that I do not anticipate much reliable information from this experiment. Manuring experiments are being carried out on a farm near Homebush, and on a larger scale at Palmyra Estate. In these experiments the manurial effect of various artificial fertilisers and also green manure is being studied, the results of which will not be available for some time yet. These experiments will also include a study of the benefits derived from irrigation with and without manure.

A collection of all the principal sugar-canes grown is being made, and is being added to from time to time. Notes on the growth of these will be made and analysis of same when the cane matures.

The only literary work I did was on "Determining the Density of Sugar Cane," written for the *Agricultural Journal*.

A. ALEXANDER RAMSAY.

REPORT OF THE CURATOR, BOTANIC GARDENS.

Sir,—I have the honour to submit the following Report upon the condition and progress of the Botanic Gardens during the past year.

Ways and Means.—As the amount of work which can be carried out in a place like this bears a direct ratio to the means at command, it may be stated at the outset that the other State Botanic Gardens in the metropolitan cities of Australia are much

more generously endowed than ours. Ten years ago I pointed out that the staff was barely necessary to carry out the daily routine work. To-day the staff is less by two men than it was then, and a very large amount of extra work has been placed upon it, quite irrespective of the natural increase of work resultant from improvements effected, the expansion of the resources of the colony, the growing taste of the people, and the enormous increase in the numbers of persons who have taken advantage of the facilities for the pursuit of pleasure, health, and instruction afforded by the Gardens. Not only has it been necessary to do work for which in former times special votes were available, but the services of the men have been largely requisitioned for duties outside of their ordinary work. The propagator has to go away daily for the purpose of examining seeds, &c., received by the public through the parcels post, before these are delivered to the addressees. This necessitates his absence from his duties for one quarter of his working hours, and often for longer periods up to five hours. This break in the work has, of course, a most prejudicial effect upon the bush-house and other matters which lie within the scope of his duties, besides the great inconvenience which arises from his absence often when most required. The services of the men are also often requisitioned for the purpose of destroying weeds on pieces of land belonging to the Government. The quadrangle of the Government offices has also to be kept in order. Parcels of plants sent out at the request of the Department to public institutions require the frequent services of a man and cart to take them to rail; and in this connection also a good deal of packing requires to be done, causing a break in the continuity of work, besides the time occupied. These works, of course, being officially requisitioned by you, take precedence of all garden work proper, no matter what the season or what other work may be in progress. No doubt the Department requires this work to be done, and it ought to be provided for, but the ordinary visitor is always under the impression that the whole services of the staff are available for the work of the Gardens as formerly, and, in estimating improvements and progress, naturally does not take into account that any reductions have been made, or attribute any falling off which might be observable in directions where manual labour is most required, to the right cause.

The vastly increased attention now paid to the tennis courts also accounts for some labour, the results of which are not apparent to the general public.

While the extra labour of the "unemployed" was available, these drafts upon the labour of the staff were not so evident, and did not militate so seriously against the work.

Visitors.—According to the figures of the Registrar-General, 107,840 persons lived within five miles of the Gardens on the first day of the present year (1899), and 118,193 within ten miles, so that they are within easy reach of one-fourth of the population of the colony. The numbers of visitors steadily increase from year to year. It is noticeable that when excursions from other parts of the colony are in the city a very large proportion of the excursionists find their way here. On Saturday and Sunday afternoons particularly, thousands of people who have no other opportunity of similar enjoyment from year's end to year's end, come here to enjoy the pleasure of meeting their friends amid beautiful surroundings, and to enjoy the promenades beneath the trees and through the tropical shade garden, and the sight of the beautiful flowers and foliage so abundantly produced. I have heard several well-known public men declare that the vote for the Gardens is the best spent money in the yearly expenditure. Without wishing to go so far as this, I cannot help regretting that where there is the power of giving such elevating and refining pleasure, and where such a small increase of means would enable so much good to be done upon the foundation already laid, the increase is not available

The popularity of the Gardens is greater than ever. The way in which they have recovered from the effects of the overwhelming floods of 1893 is a wonderful example of the generous character of our climate. Strangers are ever loud in their praises of our Gardens. We can grow plants which in the other colonies will only exist with the most expensive care, and more money is spent in growing them in hot-houses than our whole Gardens cost. There is no more convincing object lesson of the superiority of our climate than the sight of so many plants of different countries growing so luxuriantly side by side. The cost of the Gardens to the colony is £2,300 per annum, or one and one-tenth penny per head. In no part of the world is local self-government carried out so fully as it now is in Great Britain, and yet the £137,000 odd expended on Kew Gardens (£29,000) and the principal London parks (£108,000) is contributed to by every peasant in Great Britain and Ireland, and there is probably no item of expenditure to which less exception is taken.

Bandstand.—I have very often urged in annual reports and elsewhere the necessity for a bandstand here, and have submitted proposals for bandstands to cost various sums. A design for a very good stand has been handed to you recently.

Asphalting.—The asphalting of several walks sadly needs attention. It is not a work which can be done out of the ordinary vote. Asphalt walks out of repair make the place look poverty-stricken. The following requires to be done:—Top-dressing, 244 square yards; breaking-up and re-laying, 1,127 square yards; new work, 268 square yards.

Improvements.—The Gardens generally have improved, despite the paucity of labour and means. An area of 4 acres, never before cultivated, and a great eyesore, has been repeatedly ploughed and subsoiled to bring it to a proper tilth. It has been undulated in a picturesque manner, and arranged with groups of typical plants, the idea of mowing and, as far as possible, cultivation by machines being kept in view. The land was most difficult to bring into cultivation, possessing a subsoil of the consistency of pipeclay, but it has nevertheless been reduced to good arable land. This is practically a new garden, above flood level, and will be devoted to such plants as are likely to be injured by possible floods.

Palms.—The palms planted here a few years ago have grown into very fine specimens, and the large number of these beautiful and stately plants distributed in various parts of the grounds are all doing splendidly and forming a distinctive feature in the landscape. The climate of Brisbane is so suitable for those lovely plants, and some of the finest species grow so rapidly and well, that it seems a great pity that they are not more widely planted. We have raised recently in the Gardens quite enough young palms to change the face of the district, if planted by divisional boards and other public bodies. Planting of such specimens as will add to the public enjoyment and instruction is being continued.

Plants for Distribution and Exchange.—A list is appended of plants and seeds at present available for exchange. There are available—trees 3,000, shrubs 4,000, useful plants 7,000, creepers 800, palms 2,500. It must be understood that these are only species commonly asked for and kept in stock, and that a large number of other species can be supplied in small quantities. The list of seeds in stock constantly changes. Those which come in from abroad are registered, sown, and carefully watched with a view to their acclimatisation in the colony. I am greatly in want of seeds of Queensland and other Australian plants, and any person residing or travelling in the bush can render good service by posting any ripe seeds he may be able to procure, together with a twig of the plant from which he collects them.

Office Work.—In my Annual Report for 1896-7 I gave you an outline of the duties of my office assistant. There is much more of this kind of work to be done than would be thought at first sight. It is not strictly clerical work, though there is a good deal of that, but is of a very multifarious nature. In the other colonial Gardens more than one clerical assistant are kept in each office, besides label writers. The mere work in connection with the nomenclature of Gardens of this size would keep a man as busy as he could possibly be, if he were to do nothing else from morning till night. A great deal of my own time is occupied in superintendence, correspondence, and the thousand things which have to be done in such a place. The assistant which I then referred to has been replaced by a youth who, though necessarily new to the work, shows up to the present great interest in it, and evinces every disposition to prove of good service in the near future. I have been instructed by the Department to render all possible service in connection with the *Agricultural Journal* issued monthly, and this is cheerfully done. I have written a number of articles descriptive of the Gardens, under the heading "Popular Botany," and these are being continued. I am now writing a series of horticultural notes monthly at your request, by means of which the work being done here is described, and that for the ensuing month forecasted. Nobody at all conversant with the subject requires to be told that any technical writing needs the consultation of many works of reference, as indeed does the general work of a Botanic Garden. These works, to the number of about 300 volumes up to the present, I have had to purchase out of my own pocket, and to enable me to do my work in the best way I have also purchased at my own expense theodolite level and staff, typewriter, drawing instruments, &c. I have not yet been able to replace the miscroscope detroyed in the flood of 1893, along with my books, furniture, and personal effects.

Quarters for Curator.—To enable me to carry out my duties satisfactorily and with credit, it is most necessary that my quarters should be situate here. I have laboured under great disadvantage from this cause, quite independently of the fact that in my original agreement quarters were specified, and the sum of £60 per annum allowed me in lieu thereof for a considerable time.

Lectures.—I propose, if it meets with the approval of the Department, to deliver a course of eight lectures on "Land Selection and the Practical Determination of Soil Values," at an early date, such lectures to be free to the public.

Guide to Gardens.—A small guide to the Gardens is in hand, and I hope to have it ready for the printer shortly. This is much wanted here, and such a guide is often inquired for. It will be kept so concise as to be sold for 1d. or 2d.

Horticultural Examinations.—Great efforts have been made of recent years in Great Britain to foster a more exact knowledge of horticulture; to increase its scientific, and to eliminate its empirical, element. These efforts have been crowned with very great success. The horticultural colleges which have been established and the lectures delivered by lecturers engaged by the various county councils have done much to this end, and the examinations which have been held by the Royal Horticultural Society have enabled any man who understands the principles of horticulture to get an authoritative "hall mark" placed upon such knowledge. This tends to the public and national benefit, and in countries which are pushing Britain hard in the matter of the excellence of their products—such as Belgium, Denmark, France, Germany, and other States—these examinations, in the technical and scientific aspects of "le petite culture" have much to do with their extraordinary success. These examinations were very simple at first, but there is a greater desire now to understand the why and wherefore of the operations used in controlling and assisting plant life. I have had the honour to submit some time ago a scheme founded on the lines of that of the Royal Horticultural Society, and offered to organise it and carry it through.

Water Supply.—This is not sufficient for the purposes required. The experiment of the introduction of the Gourami fish has not been succesful owing to the want of a constant supply of fresh water.

Water Fowl, Aviaries, &c.—The collections in the aviaries have not received many additions, owing to the lack of funds for this purpose. We are dependent on the generosity of donors. A pair of fine emus were presented by the sergeant of police at Longreach, and a separate enclosure made for them. Dwellers in the bush could greatly assist us by sending birds. The old aviary is devoted solely to birds of prey and the smaller marsupials. Separate enclosures will shortly be made for these. The old aviary can then be used as a shelter, as it is of little use for its present purpose. Nine mandarin ducks were purchased. These beautiful birds were so rare some few years ago that the greatest difficulty was experienced in procuring them in China, where they are highly esteemed, though they are now tolerably plentiful. They prove a great attraction.

Economic Plants.—Wherever and whenever possible, plants likely to prove of benefit to the colony, either as medicine for fodder, human food, or any other economic purposes, are procured, propagated, and acclimatised. It would be quite easy to furnish a long and formidable list of names and descriptions. They are all registered, and can be traced very quickly—a work which, as can be easily imagined, involves no small degree of care. I received some time ago from the rainless region of the Kalihara Desert, in South Africa, a gourd which is said to render that country habitable, and to be largely used by man and beast in lieu of water. Of the five seeds received only one survived, and from this a large quantity of seeds were produced. So many introductions of this "come in like a lion and go out like a lamb" that one is taught caution in describing them. It may prove very useful in arid Australian country. We will try. Meanwhile I am sending some of the seeds back to the place from which I procured it, to guard against any possible mistake.

Weeds, Nut-grass, &c.—In this matter "one year's seeding has been nine years' weeding," but the practice of never allowing weeds to seed, and constantly keeping the cultivator going, has left this place comparatively clear of weeds. I do not think it a bad thing that weeds should grow. They are only plants in the wrong place, and the cultivation, which their presence makes imperative, is the proper treatment for the land in which they are found. At the time last summer when nut-grass was at its height everywhere, an old inhabitant wrote me:—"In walking through your Gardens the other day I was surprised to see so little nut-grass, as I recalled the place was very much overrun with it. Kindly let me know how you keep it down." I am answering this question fully in the *Journal*, but briefly the answer is, "Cultivate early and often."

It was interesting to note that at the Agricultural Conference held recently at Mackay, under the presidency of the Hon. the Minister for Agriculture, such an experienced and successful cultivator as Mr. W. Gibson, of Bingera, spoke of this weed in exactly the terms used by me in my reports of 1895-6 and 1896-7. He said,

"Where you can get an implement in amongst the grass and keep it constantly going, I do not think it will do much harm to your crop." This is exactly the position. He might have added that the cultivation will do much good. The very tool that is required, and which another speaker at this Conference suggested that a prize should be offered for, is the hand tool recommended by me in the *Journal* for August, 1898. If the method of using this tool were properly mastered and diligently carried out, it would save the cultivators of this colony a good deal of hard cash.

PHILIP MAC MAHON.

APPENDIX A.

Plants Available for Exchange and Distribution.

Trees.—Acacia Baileyana, A. podalyriæfolia, Agathis robusta, Albizzia Lebbek, A molucana, Andira inermis, Araucaria Bidwilli, A. Cunninghamii, A. excelsa, Baphia racemosa, Barklya syringifolia, Bambusa arundinacea, B. siamensis, Bauhinia acuminata, B. alba, B. Hookeri, B. marandra, B. purpurea, B. splendens, B. triandra, Buckinghamia celsissima, Butea frondosa, Calodendron capensis, Callitris Parlatorii, C. robusta, Cassia elata, C. fulgens, C. glauca, Cassia pistaciæfolia, Castanos perma australe, Cedrela odorata, Celtis sinensis, C. Turnefortii, Chrysophyllum olivæforme, Cryptocarya australis, Cupressus africana, C. Corneyana, C. Goveniana, C. guadelupensis, C. Macnabiana, C. sempervirens, C. Torreyiana, C. torulosa, C. Uhdeana, Elæodendron glaucum, Endiandra virens, Enterolobium cyclocarpum, Erythrina indica, E. insignis, E. speciosa, Eucalyptus corynocalyx, Eugenia Ventenatti, Ficus aurea, F. Benjaminea, F. comosa, F. gracilipes, F. hispida, F. macrophylla, F. nitida, F. Pinkiana, F. rubiginosa, Gleditschia triocanthus, Guaicum officinale, Harpullia pendula, Heritiera macrophylla, Jacaranda mimosifolia, Maba natalensis, Melia sempervirens, Ormosia dasycarpa, Pittosporum ferruginea, P. undulatum, Persea carolinensis, Phytolacca dioica, Pinus Coulterii, P. insignis, P. papilis, Pithecolabium pruinosum, Poinciana regia, Poinciana Sunketti, Populus alba, P. dilatata, Putrayuvia Roxburghii, Quercus lusitanica, Q. pedunculatus, Q. valonia, Ravenela madagascariensis, Rhus parviflora, Spondius graveolens, Sterculia acerifolia, S. diversifolia, S. quadrifida, Taxus baccata fastigiata, Terminalia arjuna, T. catappa, Thuya Biottia, T. gigantea, T. pendula, Wellingtonia gigantea.

Shrubs.—Abutilon longicuspe, A. rosea, A. Thomsonii. Acalypha discolor, A. Keffardii, A. marginata, A. neriifolia, A. reticulata, A. Wilkesiana, Allamanda nerifolia, Alocasia (various), Alpinia nutans, Alternanthera amæna, A. aurea, A. versicolor, Amorpha fruticosa, Angelonia floribunda, Ardisia crenulata, Arundo donax, Aster Nova Angiliæ, Asystasia Mackayi, Atalantia buxifolia, Azalea indica, Barleria cristata, B. cristata var. alba, Bauhinia Galpinii, B. tomentosa, Bilbergia (various), Brunfelsia latifolia, Cæsalpinia Gilliesii, C. pulcherrima, Calla æthiopica, C. dioscorioides, Calycantha præox, Cannas (various), Carissa grandiflora, Cestrum aurantiacum, C. diurnum, C. elegans, C. nocturnum, Caleodendron floribunda, C. fragrans, Clerodendron nutans, Convolvulus arborescens, Crotons (various), Cuphea jorullensis, Cuphea platycentra, Danthonia californica, Datura conigera, Desmodium cephalotis, Duetzia scabra, Dianthera secunda, Dodonæa viscosa, Dombeya natalensis, Dracæna (various), Duranta Ellisii, Eranthemum azurea, E. grandiflora, E. reticulata, E. rosea, Erythrina crista-galli, Eulalia japonica var. zebrina, Eupatorium ianthinum, Euphorbia pulcherrima, Gardenia florida, Gynerium argenteum, Hamelia patens, Heiria rosea, Hedychium coronarium, H. flavosum, Heliotropium peruvianum, Heteromellis arbutifolia, Heuchera sanguinea, Hibiscus abelmoschus, H. molle, H. rosa-sinensis, H. sinensis fl-pl., H. schizopetalus, Holmskioldia sanguinea, Hypericum floribunda, Hydrangea pubescens, Ixora coccinea, I. Timorensis, Jacobinia floribunda, Jasminum grandiflorum, Kleinia (sp.), Kydia calcyina, Lagerstrœmia alba (seedlings), L. Archeriana, L. indica, L. indica novea, L. parviflora, Leea sambucina, Leptospermum scoparium, Ligustrum Ibota, L. japonicum, L. javanicum, L. ovalifolium, L. vulgare, Maranta cannæfolia, Melianthus major, Murraya exotica, Nandina domestica, Nauclea Cadamba, Nerium oleander, Oncoba Kraussiana, Oxyanthus natalensis, Pandanus (various), Pleroma Fontainesii, P. heteromalla, Plumbago capensis, Randia Fitzalani, Rhaphiolepis indica, R. ovata, Rondeletia speciosa, Russellia juncea, Salvia azurea, S. coccinea, Sanchezia nobilis, Sanseveria (various), Sida corylifolia, Sophora tetraptera, S. tomentosa, Spiræa calosa, Strobilanthus Dyeriana, Tabernæmontana coronaria fl-pl., Tecoma stans, Thunbergia erecta, Veronica saxatilis, Vitex trifolia variegata, Willemetia capensis.

Economic Plants.—Aberia caffra, Acacia arabica, A. farnesiana, A. Suma, Achillea millefolium, Adenanthera pavonia, Adhotoda vasica, Ægle marmelos, Agave americana, Agave americana var. variegata, Albizzia procera, Anona cherimolia, A. reticulata, Artemesia abrotanum, A. absinthium, Artocarpus integrifolia, Bixa Orellana, Bœhmeria nivea, Bombax malabaricum, Cæsalpinia coriaria, C. minax var. Burmanica, Carica papaya, Carya olivæformis, Cassia fistula, Cedrela Toona, Cinnamomum camphora, Coffea arabica, Croton tiglium, Dendracalamus stricta, Dillenia indica, Diospyros ebenaster, D. (sp), Duranta Plumieri Edible bean, South Sea Islands, Erythroxylon coca, Eugenia uniflora, Ficus capri, F. indica, Flacourtia cataphracta, Fourcroya gigantea, F. longæva, Grevillea robusta, Hæmatoxylon campechianum, Hibiscus elatus, Hovenia dulcis, Juniperus Bermudiana, Laurus nobilis, Lippia citriodora, Macadamia ternifolia, Mangifera (sps., various), Mentha variegata, Morus nigra, Mimusops Elenghii, Musa ensete, M. sumatrana, M. zanzibarensis, Myrospermum pereiræ, Nephelium Litchii, Olea Europæa, Panicum crus-galli, P. muticum (Para-grass), P. platyaule, Passiflora edulis, Photinia japonica, Pimenta communis, Piscidia erythrina, Plumeria acuminata, Punica granatum, Psidium Cattleyanum, P. guava, P. pomiferum, P. pyriferum, Pyrus nivales, Quercus suber, Rubus flavum, Ruta graveolens, Saccharum officinarum (various), Schinus molle, Schotia latifolia, Semacarpus anacardium, Spondius pleiogyne, Stenotaphrum americanum (Buffalo-grass), Taxodum distichum, Tectona grandis, Terminalia Bellerica, Thea hybrida (Assam), Thespesia populnea, Vangueri edulis.

Creepers.—Allamanda Schottii, Antigonon leptopus, Aristolochia elegans, A. ornithocephala, Asparagus plumosus var. nana, A. racemosus, Beaumontia grandiflora, Bignonia capensis, B. picta, B. Tweediana, B. venusta, Bougainvillæa glabra, B. magnifica, Buddleia madagascariensis, Clerodendron Thompsonii, Clitoria ternatea, Cryptostegia grandiflora, Derris scandens, Gouania domingensis, Hedera (emerald-green), Hedera Helix, H. variegata, Hoya viridiflora, Lonicera caprifolium, L. rosea, Mandevillea suaveolens, Medeola asparagoides, Quisqualis indica, Serginia ferruginea, Thunbergia fragrans, T. laurifolia, Vitis lebrusca, Vitus (sp.), Wistaria chicnensis.

Palms.—Brahea filamentosa, Caryota rumphiana, Caryota urens, Chamœrops arborescens, C. elegans, C. excelsa, C. gracilis, C. robusta, Cocus plumosa, Kentia Belmoreana, Kentia Canterburyana, Kentia Fosteriana, Latania borbonica, Livistona australis, Oreodoxa oleracea, O. regia, Phœnix canariensis, P. dactylifera, P. reclinata, Ptychosperma Alexandræ, P. elegans, Pritchardia pacifica, Rhapis flabelliformis, Sabal acaulis, S. Adansonii, S. Blackburniana, S. mauritiiformis, S. minor, S. palmetto, Washingtonia filifera, W. robusta.

Bulbs.—Amaryllis (various), Clivia miniata, C. nobilis, Moræa (various), Pancratium calathina.

Aquatics.—Cyperus alternifolius, C. papyrus, Nelumbium speciosum, N. speciosum var. alba, Nymphœa alba, N. gigantea.

APPENDIX B.

SEEDS FOR EXCHANGE.

Areca sapida, A. alba, Albizzia lebbek, A. moluccana, A. odoratissima, A. (sp.), Acacia Baileyana, A. pycnantha, A. decurrens, A. pendula, A. binervata, A. penninervis, A. podalyriæfolia, A. Oswaldi, A. acinacea, A. Cunninghamii, Alphitonia excelsa, Aristolochia elegans, A. ornithocephala, Araucaria Rulei, A. Bidwilli, Allamanda neriifolia, Andropogon sericeus, Acer platanoides, Antigonon leptopus, Aralia papyrifera, Antidesma Dallachyanum, Atalantia buxifolia, Barklya syringifolia, Bauhinia purpurea, B. Hookeri, B. alba, Bignonia tweediana, Buckinghamia celsissima. Bixa orellana, Cupressus Lawsoniana, C. sempervirens, C. sempervirens var. stricta. C. (sp.), C. (sp.), C. (sp.), C glauca, Casuarina suberosa, C. glauca, Chrysophyllum olivæforme, Cassai fistula, C. odoratissima, Carya sulcata, Cupania (sp.), C (sp.), Calliandra pulcherrima, Cocos plumosa, Caryota rumphiana, Coriander (sp.), C drela Toona, Cinnamomum camphora, Callitris robusta, Coix lachryma, Cassia pistaciæfolia, Cryptocarya australis, Cotoneaster microphylla, Coffea Arabica, Duranta Ellisii, Dombeya mollis, Desmodium gyrans, D. tortuosum, Diplothemium maritimum, Diploglottis Cunninghamii, Erythrina indica, E. cristagalli Erythroxylon coca, Excæcaria subifera, Eucalyptus pilularis var. acmenioides, E. virgata, E. redunca, E. citriodora, E. diversicolor, E. Stuartiana, E. platyphylla, E. eugenioides, E. microcorys, E. creba, E. corynocalyx, E. piperita, E. melanophloia, E. fibrosa, E. hœmastoma, E. saligna, E. tereticornis, E.

trachyphloia, E. maculata, E. resinifera, E. corymbosa, E hemiphloia, E. paniculata, E. propinqua, E. acmenioides, E. pilularis, E. leucoxylon, E. goniocalyx E. calophylla, E. marginata, E. capitellata, E. siderophloia, E. robusta, E. amygdalina, E. melliodora, E. globulus, E. rostrata, E. Planchoniana, Ficus Cunninghamii, F. macrophylla, F. religiosa, Fraxinus excelsior, Gossypium hirsutum, Hibiscus tiliaceus, H. schizopetalus, Hæmatoxylon campechianum, Hymenæa courbaril, Gardenia florida, Gleditschia triacanthos, Ilex paraguayensis, Lagerstrœmia flos-reginæ, L. indica, Ligustrum lucidum, L. pubescens, Liquidambar styraciflua, Lafoensia punicæfolia, Lathyrus odoratus, Macadamia ternifolia, Melia sempervirens, M. azedarach, Medicago lupulina, Mimosa pudica, Melilotus leucantha, Murraya exotica, Myrospermum pereiræ, Melianthus major, Nerium oleander, Onobrychis sativa, Pittosporum undulatum, P. eugenoides, Poinciana regia, Panax elegans, Pseudosuga, Douglasii, Pereskia bleo, Plantanus orientalis, Ptychosperma elegans, Panicum teneriffæ var. rosea, P. crus-galli, P. maximum, Quisqualis indica, Quercus (sp.), Rumex hymenocephalus, Ricinus communis, Rhaphiolepis indica, Schotia latifolia, Saltbush (various), Spondias pleiogyna, Sambucus nigra, Sophora tetraptera, Schotia speciosa, Solanum giganteum, Sesbania aculeata, Strychnos nux vomica, Stenocarpus salignus, Sterculia diversifolia, S. acerifolia, Thuja Lobbii, Trachycarpus excelsa, Trifolium pratense, Tricholœna rosea, Tristania conferta, Tectona grandis, T. (sp.), Terminalia arjuna, Thuya pendula, Tecoma stans, Vangueria edulis, Vicia sativa.

REPORT OF MANAGER OF STATE FARM, WESTBROOK.

I have the honour to hand you herewith an Annual Report of the various trials of seeds and experiments carried on at the above farm during the season from 1st July, 1898, to 30th June, 1899. The prolonged dry season in 1898 was very trying to plant life, but the system of deep and thorough cultivation pursued had marked effect.

My duties began on 8th August, 1898. Since then the object aimed at has been to carry out experiments with crops, based on a system calculated to benefit the farming community in this part of the Darling Downs.

ORCHARD.—Area, 20 acres (aprox.) All work in this department has been under the supervision of A. H. Benson. During the past year, 1st of July, 1898, to 30th of June, 1899, the above has been ploughed three times, and cultivated ten times, the former cost being at the rate of 6s. 3d. per acre, and the latter at the rate of 1s. 6d. per acre. Hand hoed along rows. During August, 1898, a number of young trees were planted and watered. These have received another watering before starting into growth, and since then have made good headway.

All superfluous roots and side shoots have been kept down.

With the exception of black aphis on the peaches, and black scale on the olives, the orchard has been remarkably free from disease. Sprayings for these have been given from their first appearance, and subsequently at intervals with successful results.

Preventive sprayings for San José Scale have been given as directed with marked success.

All varieties of fruit trees, with the exception of pears, have made good growth.

VINEYARD.—Area, 7 acres. All work in this department has been under the supervision of E. H. Rainford.

During the past year, 1st July, 1898, to 30th June, 1899, the above has been ploughed twice and cultivated nine times.

The former at a cost of 7s. an acre, and the latter at 1s. 9d. per acre.

Hand hoeing has been resorted to in order to clean up any weeds close to vines.

The vineyard has been staked.

Draining and trellising is progressing satisfactorily.

WHEATS.—Preparation of land: ploughed 8 inches deep, cross harrowed, ploughed, harrowed, drilled, and rolled. Seed pickled; "Jensen" hot-water method.

Belatourka.—Area, $6\frac{3}{4}$ acres; sown, 26th April, 1899, at rate of half-bushel to acre; depth of planting, 3 inches; germinated, 4th May.

Marshall's No. 3.—Area, $6\frac{3}{4}$ acres; sown, 27th April, 1899, at rate of half-bushel to acre; depth of planting, 3 inches; germinated 4th May.

Marshall's No. 8.—Area, $6\frac{3}{4}$ acres; sown, 27th April, 1899, at rate of half-bushel to acre; depth of planting, 3 inches; germinated, 4th May.

Budd's Early.—Area, $6\frac{3}{4}$ acres sown, 28th April, 1899, at rate of half-bushel to acre; depth of planting, 3 inches; germinated, 5th May.

Allora Spring (Cobb's Improved).—Area, $6\frac{3}{4}$ acres; sown, 16th May, 1899; depth of planting, 3 inches; germinated, 24th May.

Nomenclature Wheats.—A report of these wheats for season 1898 attached.

All those which have not already adapted themselves to this soil and climate, as well as those possessing undesirable qualities, are being gradually culled out.

On the other hand, a system of the selection of the fittest has been adopted, and larger quantities of seed sown, so that field trials and comparison of results may eventually be made.

The combination of the best qualities of different varieties of rust-resisting wheats is anticipated by cross fertilisation.

All varieties of wheat detailed in report have been sown on 14th June and the following two days, with the exception of the following numbers, which have been discarded for reasons stated:—

Nos.—21, 34, 35, 36, 40, 47, 48, 51, 59, 61, 68, 88, 89, 107, 113, 116, 150, 151, 152, 154, 155, 156, 159, 170, 172, 181, 185, 197, 217, 227, 241, 243, 270, 271, 273, 280, 281, 282, 284, 286, 288, 289, 290, 293, 294, 295, 296, 322, 324.

An additional 100 varieties of Farrer's hybrid wheats were sown on 15th June.

Appended are the names of wheats selected for further trial, larger quantities of seed having been sown on 16th June:—

Selected Varieties.

Banater
Cretan
Early Japanese
Hindustan
Early Baart
Dutoits
Tardent's Blue
Indian Early
Early Para
Pride of Barossa
Steinwedel
Rattling Jack
The Blount
Northern Champion
Tuscan Purple Straw
Farmer's Friend
Fillbag
Rattling Tom
Hudson's Early Purple Straw
Jacinth
Australian Glory
Battlefield
White Tuscan
Red Tuscan
Purple Straw Tuscan
Oakshott's Champion
Lake Bathurst
White Lammas
Australian Talavera
Snowball
Prope
Port McDonald
White Essex
Little Club
Summer Cluo
Sardinia
Manitoba
Buckley's R.R.
Pictet
Blount's R.R.
Fultz
Anderson's R.R.
King's R.R.
Saskatchewan
Amethyst
Hornblende
White Fife
Adamant
Beryl
Thomas R.R.
Pringle's Defiance
Murray River
Defiance
Bega
A.1.
Blount's Lambrigg
Goldsmith's Pedigree
Emerald
Indian D.
Marshall's No. 10
Marshall's No. 2
Ward's Prolific
Hercules
Red Clawson
Ward's White
Marshall's No. 5
Robbin's R.R.
Currel
Odessa
Pool
Red Province.

In addition to the above some 23 varieties of Farrer's wheats have been sown in larger quantities.

Wheats.

Series A.—Monthly Sowings.

This series embraces six 4-acre blocks of Marshall's No. 3 wheat, drilled in at the rate of half a bushel to the acre, at intervals of a month.

Preparation: Ploughed and cross-ploughed to a depth of 8 inches; harrowed; drilled in 3 inches deep; rolled. Seed previously pickled by the Jensen hot-water method.

Block 1.—Sown 21st February; spring rust on flag 15th April; stooling well, in some cases 80 separate stems from single seed; germinated 28th February.

Block 2.—Sown 24th March; germinated 2nd April; stooling well; spring rust on flag 20th May.

Block 3.—Sown 21st April; germinated 27th April; spring rust on flag 26th June.

Block 4.—Sown 20th May; germinated 29th May.

Block 5.—Sown 21st June; germinated 30th June.

Block 6.—To be sown to complete series.

Records as to temperature, rainfall, diseases, and results are being kept from time to time.

Series B.—Experiments with Fertilisers.

Embraces seven ½-acre blocks of land. Marshall's No. 3 drilled in at the rate of half a bushel to the acre, with different fertilisers deposited in same drill as grain, using at the rate of 2 cwt. to the acre. For blocks 5, 6, and 7, half of the fertilisers were reserved for a top dressing before coming into ear.

Seed previously pickled by the Jensen hot-water method; depth of sowing, 3 inches; sown 2nd June; germinated 11th June.

Block 1.—Unmanured.
Block 2.—Blood.
Block 3.—Bonedust.
Block 4.—Superphosphate.
Block 5.—Nitrate of soda.
Block 6.—Sulphate of ammonia.
Block 7.—Kainit.

The preparation of the land: Ploughed 8 inches deep once; harrowed; cross-harrowed; rolled with light roller; drilled; rolled with Cambridge roller; previous crop, cow peas.

Series C.—Various Depths of Sowing.

Preparation of seed and land the same as Series B. Seed drilled in at the rate of half a bushel to the acre.

Block 1.—Half acre, 1 inch deep. Sown 8th June; germinated 19th June.
Block 2.— „ 2 „ „ „
Block 3.— „ 3 „ „ „
Block 4.— „ 4 „ „ „
Block 5.— „ 5 „ „ „

Germination was delayed one day for every inch deeper the seed was sown.

Series D.—Different Quantities of Seed.

Preparation of seed and land the same as Series B. Seed drilled in 3 inches deep, 8th June; germinated 20th June.

Block 1.—Half acre, at rate of ½ bushel per acre.
Block 2 — „ „ ¾ „
Block 3.— „ „ 1 „
Block 4.— „ „ 1¼ „

Barley: *Sea of Azov.*—Area, three-quarters of an acre. Preparation of land, &c., as for wheats. Drilled in at rate of half-bushel to acre, 14th June; germinated, 24th.

Hallet's Improved Pedigree Chevalier.—A small area of land was sown for trial and an increase in quantity of seed.

Chevalier.—An area of 6¾ acres of land was sown with this variety, being drilled in at the rate of half a bushel per acre. Seed pickled by Jensen hot-water method. Land ploughed 8 inches deep; cross-harrowed, cross-ploughed and harrowed, drilled and rolled. Sown 17th May, germinated 26th May.

Nepaul.—Preparation of land area, &c., as Chevalier.

Wheats.—The undermentioned wheats were sown by Mr. Tardent during May, 1898, but the drought was so prolonged that the results were seriously diminished:—

	Area.	Amount Sown.	Bushels Reaped.	Remarks.
	Acres.	Bushels.		
Marshall's No. 3	21	16	152	2 acres cut for hay
Marshall's No. 8	9	9	Cut for hay ...	Very short straw
Allora Spring ...	15½	10	36 bushels from 10 acres, balance cut for hay	Ripened unevenly; some seed germinated August
Indian Pearl ...	10	7	Cut for hay	Rusty
Belotourka ...	5	4	21	Longest straw matured fairly good grain
Barleys—				
Chevalier ...	14	12 Lb.	44	The straw was too short to cut with binder
Sea of Azov ...	1½	50	4	
Nepaul	2	100	5	

MELONS.—Varieties sown :—

Volga.—Small, round, creamy-coloured skin, with indistinct stripes. A firm and solid variety, good keeper.

Cuban Queen.—One of the best for market.

Kolb's Gem.—Similar to above, but more elongated, with darker stripes.

Duke Jones.—Round, with flat ends, dark-green, very sweet. A good marketable variety, but requires careful handling.

The Dixie.—Elongated, oval ; firm flesh; good keeper.

PUMPKINS: *Crown.*—A good table variety, prominent crown. Does not keep as well as ironbark or button.

Ironbark.—Heavy, firm, and good keeper, ribbed, and flat. About the most serviceable to grow.

Button.—Round, with conical taper, flesh shallow and dry. A good "garden" variety.

Japanese.—Similar to Grammas in shape. Not a good keeper flesh soft.

Cattle.—Indispensable for winter food for stock.

Calhoun.—Boils soft. Not a good keeper.

SORGHUMS AND MILLETS.—Preparation of land for the above group was similar to maize, but all varieties of seeds were drilled in 3 feet 6 inches apart with Massey-Harris machine, using at the rate of 6 lb. of seed per acre ; depth, 1 to 1½ inches. Date of sowing, 3rd November, 1898. Germination took place in eight days. Scuffled twice and thinned out.

Method of Harvesting.—Cut with Columbia corn-harvester, an extra tie being made below heads for convenience in handling and threshing. Sheaves stooked in field till thoroughly cured. Carted in and stacked, being topped off with grass.

Amber Cane.—Area, 2½ acres. A very heavy yielder of both stalk and grain. Notwithstanding dry weather the seed is remarkably plump. Date of harvesting, 15th March, 1899 ; 8 feet high. Fodder high class and appreciated by stock ; 7½ tons chaff ; 60 bushels of grain.

Early Orange Cane.—Quarter acre. Did well ; 8 feet in height.

Sorghum Saccharatum.—Quarter acre. A very heavy yield of rich juicy fodder ; height, 10 feet.

Planter's Friend.—Quarter acre. One of the best ; 8 to 9 feet.

Brown Dhowra.—Quarter acre. Early, but a light yield. Gave a good second crop ; 4 feet.

Broom Millet.—Quarter acre. A ready market for well-grown and straight "brooms." Did well.

Red Kafir Corn.—Area, ¼ acre ; 5 feet to 7 feet 6 inches. Yields a large quantity of good fodder, although somewhat dwarfed in habit of growth. Heavy yield of grain.

White Kafir Corn.—Area, ¼ acre ; similar to above, but grain makes an excellent meal for making porridge.

Egyptian Corn.—Area, ¼ acre ; 4 to 5 feet in height ; light yield of fodder and grain. Did not do well.

TOBACCO.—Three varieties of seed were received from Mr. Nevill, the Tobacco Expert, and sown in a specially prepared bed under his direction.

Small areas afterwards planted out. Owing to a severe hailstorm, all our Blue Pryor plants were destroyed. The subsequent care and harvesting has been carried out under Mr. Nevill's instructions, with the result of some nicely cured leaf

Varieties ; Burley, Blue Pryor, Yellow Pryor.

Prickly Pear.—The eradication of this pest has occupied our attention during the past year. A contract was let in November to clear 200 acres in the creek paddock at a cost of 15s. per acre, giving the contractor the option of burning or burying the pear in holes made with plough and scoop, and covering with 2 feet of soil, top of pear to be 1 foot below surface of ground.

This method of burying has proved successful, and is more economical than burning.

Experiments with Dixon's Prickly Pear Exterminator, 19th May, 1899.

	Area.	Strength.	Quantity.	How Applied.	Results, 30th June, 1899.
Block I. ..	$\frac{1}{10}$ of acre	Strength, 2 oz. to 1 gallon water	7½ gallons to block	Knapsack spray pump	All parts touched by spray, dead.
Block II....	$\frac{1}{20}$ of acre	1 oz. to 1 gallon of water	2½ gallons to block	,,	,,
Block III.	Strong plants	Pure ...	Sufficient to cover blade of pocket-knife thinly	Leaves split and "stuff" put in	Portion of plants surrounding cut quite dead.
Block IV.	,,	,, ...	,,	Stem split applied as in leaves	So far the most successful method; roots rotting as well as leaves.
No. 5 ...	,,	,, ...	1 oz.	Applied in cut made in bark of gum tree	Half of leaves on tree dead.

Remarks.—This chemical is apparently very destructive to plant life, but requires more time than amount intervening between application and date of this Report, in order to thoroughly test the merits or otherwise.

Grasses and Clovers.—An area of 5 acres has been broken up, and is in course of preparation for the reception of a number of native and exotic grasses and clovers. This portion of the Downs is being divided up into small holdings, on which the necessity of having suitable pasture is an all-important one, especially as the dairying industry promises to be one of the foremost.

Maize.—Preparation of land: Ploughed once lengthways 5 inches deep; ploughed twice crossways 8 inches deep, at intervals, to allow for germination of amber-cane seed from previous crop, a quantity having shed out from excessive heat and strong winds. Multiple furrow ploughs being used, except in stony land, where a heavy "English" single furrow was resorted to. Harrowed once, immediately after final ploughing, which was done in strips of convenient size in order to be able to sow grain, and be ahead of probable weed growth.

Land marked out in rows 4 feet apart. Marker made of three 6-inch by 2-inch hardwood runners, 4 feet long, to the top of which are bolted two 12-inch by 1½-inch pieces of pine (adjustable). A pole is attached in front, and a convenient box on top for the driver, who can accomplish marking out an area of 16 acres a day. Seed drilled in by Moline corn-drill, with single horse following marks, to a depth of 3 to 4 inches, dropping single grains every 16 inches, using 10 lb. of seed per acre. Date of sowing, 12th October. Area sown, 6 acres per diem. Germination took place in seven days. Scuffled 8th November, 9th December, 7th January. Suckered and hand-hoed along rows.

Varieties: *Golden King.*—Eight acres grain. A deep gold tip, broad flat and deep.

Hawkesbury Champion.—Eight acres. Similar to above. Both these varieties possess like characteristics.

Macleay River.—An amber and gold-colour grain, narrow and deep, with slight taper, thin pith. The prolonged dry weather before and after "tasselling" seriously diminished the yield, estimated at 12 bushels per acre.

All early sown crops in this district failed to make good returns except in specially favoured spots, the ears being irregularly filled.

Varieties of Maize.

—	Condition of Grain.	Matured.	Shape.	Colour.	Depth of Grain.	Remarks.
Striped Pop	fairly hard	early ...	conical ...	red and white striped	shallow	Light yield
Black Sweet	soft ...	early ...	round ...	dark blue ...	shallow	Shrivelled appearance
White Pop	fairly hard	early ...	conical ...	white	small, shallow	Light yield
Early French	hard ...	early ...	round ...	bright amber...	shallow	Thick pith
Adams' White Dent ...	soft ...	medium	flat ...	white	medium	Dent in top
Adams' Early Mastodon ...	heavy ...	early ...	brick shaped	amber	deep ...	Shrivelled yellow top. good style of grain
Sibley's Pride of the North	heavy ...	medium	long square	yellow top, amber body	deep ...	One of the best
Ninety Day	hard ...	early ...	round ...	bright amber...	shallow	Resists attacks of weevi. well
Yellow Flint	hard ...	early ...	oval round	bright amber...	shallow	Similar to Ninety Day but larger
King Philip	hard ...	medium	oval round	reddish brown	shallow	Similar characteristics to Ninety Day
Hickory King	fairly soft	medium	flat (large)	white tip, light amber	deep ...	Good type, dent
Waterloo	fairly hard	medium	irregular flat	yellow tip, amber body	deep ...	Tip shrivelled, dent
Golden Drop	fairly soft	late ...	large flat...	yellow tip, bright amber body	deep ...	Dent
Golden King	fairly soft	late ...	large flat...	yellow tip, bright amber body	deep ...	Same characteristics as Hawkesbury Champion
Hawkesbury Champion ...	fairly soft	late ...	large flat...	bright yellow tip, bright amber	deep ...	One of the best dents
Deham Red	fairly hard	medium	round top, tapering to point	dark red ...	shallow	Very slight dent
King of the Earlies ...	fairly hard	early ...	long, with elongated tip	yellow	medium	Shrivelled tip
Chester County Mammoth	falrly soft	medium	narrow ...	pale yellow ...	deep ...	Shrivelled dented tip
Hawkesbury	fairly soft	late ...	brick-shaped	yellow tip, amber body	deep ...	Shrivelled tip, similar in other respects to Hawkesbury Champion
Large Red	fairly soft	late ...	broad and thick	reddish amber	medium	Shrivelled dented tip
Big Yellow	fairly hard	late ...	broad and thick	yellow tip, amber body	medium	Deep dent
Pedrick's Perfected Golden Beauty	fairly hard	late ...	round ...	amber body ...	shallow	Conical dent
Conqueror	fairly hard	late ...	very broad and thick	light red, pale yellow tip	deep ...	Very deep dent
Iowa Silver Mine	soft ...	medium	flat square top	white	medium	Shrivelled dent
Thousandfold	soft ...	medium	flat ...	cream	medium	Dent

Beetroot: *Vilmorin's Improved White Sugar Beet.*—This variety has grown to an immense size. Seed sown on subsoil land on 21st February. Roots have penetrated to a depth of 18 inches, with a diameter of 5 to 6 inches. Samples will be forwarded for analysis when sufficiently matured. Scuffled twice during growing period.

Klein Wanzleben White Sugar Beet.—Treatment as above; has made good growth, but not attained such proportions.

Round Beetroot from Greece.—Mr. Finucane's seed. This promises to be a valuable addition to present known varieties. Flesh firm, light red, shape round tapering to point.

Turnip Rooted Beet.—Has done well; 6 to 7 inches in diameter.

Mangel Wurzel: *Mammoth Long Red.*—Seed sown 21st February on subsoil land; germinated in sixteen days; thriving well; scuffled twice.

Champion Yellow Globe.—Similar to above.

This class of crop adapts itself to our soil when deeply worked, and should come into favour with farmers as a bulk feed for pigs and milch cows when pumpkins have ceased to keep—at the latter end of the winter.

Potatoes : *Mammoth White Sweet.*—An area of a quarter of an acre was planted out on 24th October, 1898, using shoots raised in hot-bed. Land previously ploughed 9 inches deep. Lines made with marker and shoots dibbled in.

Treatment : Scuffled once.

Dug 1st June. Although some plants missed on account of dry weather, thirty bags of extra large potatoes was the result. Average weight of bags, 1½ cwt., some attaining 18 lb. in weight.

Sweet Red-skinned.—A small quantity of this variety were grown, and yielded well.

Voller's Sweet.—Tubers received and planted late ; moderate yield of even white potatoes ; delicate flavour.

Yam—Dwarf. Yams were sprouted in hot-bed and planted out on 4th October, 1898. Fair yield, flavour excellent.

English.—Magnum Bonum.—Oval, smooth pale yellow skin and flesh; heavy cropper.

Bliss Triumph.—Round, smooth red skin, pink eyes, slightly sunken ; medium cropper.

Satisfaction.—Flat and oval, pale pink skin, and eyes slightly sunken ; medium cropper.

Irish Flounder.—Long oval, similar to Magnum Bonum.

Harbinger.—Round, flat crown, brownish-red skin and eyes ; early, medium cropper.

Early Vermont.—Similar shape to Early Rose, but darker skin ; medium cropper.

Breese's Peerless.—Round, flat crown, pale yellow skin ; poor cropper.

Imperator.—White skin, pale yellow flesh, late ; medium cropper.

Federation.—Red skin and eyes, round, late ; poor cropper.

Cambridge Kidney.—Oval, smooth, pale yellow ; light cropper.

Peas : Preparation of land same as for beans. Seed sown with moline corn drill ; single grain every 7 inches.

The dry weather, although diminishing the yield somewhat, did not have the disastrous effect as on beans.

This class of crop can safely be recommended to farmers and pig-raisers on the Downs. The cost of sowing (barring price of seed) is the same as maize when grown in rows the same distance apart, and the after cultivation is cheaper. Where there are a number in a family the cost of picking green peas for market is so reduced that a considerable source of income can be derived. The dried peas make one of the most valuable additions to a complete ration for fattening pigs, and can be handled with profit if the pigs are allowed to do their own threshing.

Heroine.—Heavy cropper, pods very even, long and pointed, peas wrinkled ; height, about 2 feet.

Daisy.—Moderate cropper, but bearing extra large pods ; average length, 4 to 5 inches. A dwarf variety.

Echo.—Heavy cropper ; pods short, but well filled ; medium height.

Perfect Gem.—Heavy cropper ; pods short, but well filled ; medium height.

Stanley.—A dwarf variety and heavy cropper ; comes early into bearing.

Little Gem.—A dwarf variety and heavy cropper, but somewhat later than Stanley.

Bliss Abundance.—A heavy cropper ; peas short but plump.

Vetches.—An area of one-tenth of an acre was sown with this useful fodder. When sown with barley during February and March forms a supply of delicate flavoured fodder, the succulence of which assisting to increase the flow of milk when fed to cows.

Egyptian Lentils.—The dry weather proved too much for this class of crop, not having become established.

WHIP-POOR-WILL COW PEA.—An area of quarter of an acre was sown with the Moline corn drill. This cow pea does not run and spread to such an extent as the clay-coloured and black. A moderate yielder; dun, with dark stripes.

BLACK-EYE COW PEA.—Area and treatment as above. Habit of growth more erect than other varieties; suitable for garden cultivation; a good yielder.

CLAY-COLOURED COW PEA.—An area of 9 acres was sown with the Moline corn drill on 2nd November, 1898, following a marker, using at the rate of 10 lb. of seed per acre; depth of sowing, $2\frac{1}{2}$ inches. Germination took place in six days. Scuffled 5th December with Planet Jr. When once established, the drought had very little effect except to diminish the yield. Harvested 31st April, with scythes. Put into heaps till cured, then carted to stack. Makes a valuable chaff. Will keep horses in good working condition with a very light grain ration. As an illustration of the mechanical effect on soils, we are able to plough 6 inches deep with a three-furrow New Deal plough with three horses. Roots of peas have extended 8 and 9 feet on each side of the stem. Owing to threshing machine being unavailable, the yield of peas and chaff cannot be given. Estimated yield of chaff, 30 cwt. per acre.

LUCERNE.—An area of 6 acres of land has been prepared by subsoiling to a depth of 20 inches. Ploughed three times at different periods in order to thoroughly clean land. Harrowed crossways to ploughing. Seed sown with Massey-Harris drill, with "broadcaster" attached, at the rate of 8 lb. of seed to acre. Covered by a harrowing with "Ajax" lever harrows, with tines set to run as light as possible. Land was in such tilth that a light roller would not work. Date of sowing, 20th February, 1899. Germination took place in nine days. Nine weeks after seed was sown the crop averaged 2 feet in height with an average rainfall. At the present time the winter growth after numerous frosts is some 10 inches in height, and apparently will make an average growth.

RED PERENNIAL CLOVER.—An area of 1 acre has been sown, having received the same preparation as for lucerne, but the amount of seed was increased to 10 lb. Germinated in twelve days, and continued growing slowly as cool weather set in. Has stooled well and made good root growth. Should prove a valuable rotation crop for the Downs.

RAPE.—An area of half-an-acre of the broad leaf Essex variety has been drilled in, using at the rate of 2 lb. of seed per acre. Land ploughed 8 inches deep, cross ploughed same depth; harrowed; rolled after drill. This crop is not sufficiently advanced to report upon results, but is apparently thriving well.

ONIONS: *Brown Spanish.*—An area of three-quarters of an acre was sown on 15th April. Germinated in fourteen days. Scuffled 14th June. Making satisfactory progress.

CABBAGE: *Red Pickling.*—An area of quarter of an acre was planted out on 29th May, 3 inches by 3 inches. Seed previously sown in frame.

St. John's Day.—An area equal to above was planted out as above. Land ploughed 8 inches deep; previously occupied by beans. Harrowed and rolled.

SWEDES: *Purple Top Mammoth.*—An area of three-quarters of an acre was sown on 13th April, using at the rate of $\frac{1}{2}$ lb. to acre. Land ploughed 9 inches deep. Harrowed twice. Rolled. Marked out and sown with Planet Jr. drill and hand sower. The latter is easily made by denting in the side of small tin and attaching it to a stick some 2 feet long. Perforate the lid from the inside with two or three holes, large enough to allow seed to slip through. When used with a jerking motion along marks made by "marker," and covered with brush or light harrows, a large area can be sown at a small cost. At time of writing this crop is making good headway, having been thinned out and scuffled.

The following varieties of beans have been grown, but owing to the prolonged dry weather a comparison of results was not obtainable, as some of the varieties died out when coming into flower:—

Black Wax-pod.—Area sown, half an acre. Treatment of land: Ploughed 8 inches deep, harrowed and cross-harrowed, marked out in lines 3 feet apart with "marker," drilled in with Moline corn planter, dropping a single seed every 7 inches; depth of planting, 3 inches. Result was nil.; plants thrived well, but failed to mature seed; cultivated once with Planet Jr.

Improved Wax-pod.—Similar treatment and result as above.

Canadian Wonder.—Similar treatment and result as above.

California Tree Bean.—Preparation of land and method of sowing as above. Area, one-sixteenth of acre. Result: This bean, although dwarfed through want of moisture, matured a fair crop of undersized beans. Should prove a valuable addition to diet during the winter, after being dried.

Lion House Kidney.—Preparation of land and method of sowing as above. Area, one-sixteenth of acre. Did not mature; young pods shrivelled.

Mohawk.—Same as above.

Mont D'Or.—Similar treatment. Yielded a fair crop, but shrivelled.

Waxdale Butter Bean.—Similar treatment. Failure; young pods shrivelled.

Packets of the following were tried in the field, single seeds 4 feet apart:—

Poor Man's Bean (*Dolichos lablab, var. purpurea*).—Result: Seed germinated well, and vines made an enormous growth. When trained on trellises is a strong climber. Fair yielder.

Dolichos lablab.—"Ponga," or Madagascar. A strong and handsome climber. When grown on well-tilled lands the roots ramify to a distance of 14 feet from the stem, and attain a diameter of an inch. Result: A remarkably heavy yielder. Thrives well in dry weather.

Small Mauritius.—A climber, but too late during the recent season.

Black Mauritius.—A climber; light cropper.

Velvet Bean (*Mucuna pruriens var. utilis*).—A climber. Grew a large proportion of vine but did not flower till too late in season; frost cut down the vines.

MARROWS AND SQUASHES: *Hubbard.*—Dark green, solid flesh, dark yellow in colour; one of the best varieties.

Fordhook.—Did not do well; bright yellow, pale flesh.

Summer Crookneck.—A poor yield.

Perfect Gem.—Early, but small; good keeper, striped.

Silver Custard.—Compact habit of growth; early, large yellow, serrated edges; good keeper.

Duke's Peak.—Similar to above, but smooth edged.

Marblehead.—One of the best, deep orange when ripe; good keeper.

Metcalfa.—Large, orange coloured; good keeper; firm flesh.

Turban.—Similar in shape to Hubbard, but deep orange in colour; good yielder and keeper.

Boston Marrow.—Round with flat top, orange shaped; does not keep as well as Turban.

ROCK MELONS: *Delmonica.*—Large, smooth skin; heavy yielder.

Sutton's Monarch.—Did not do well; late.
Suttons A1.— " " "
Winter Pineapple.— " " "
} These varieties did not ripen; sun scorched plants.

Earl's Favourite.—Small, round; did not do well.

The Banquet.—Small, netted, very rich; too small for field culture.

New Mammoth.—Ribbed, fawn, deep firm flesh; grows very large; orange shaped.

Shamam.—Dark green and yellow; very rich; shape elongated oval.

H. C. QUODLING.

Number.	Name.	Harvested.	Length of Straw.	Length of Ear.	Bald.	Bearded.	Conformation of Ear, &c.	Degree of Rust.	Straw.	Remarks.
	Group Poulard, 1-31.		In.	In.						
1	Egyptian E	8 Dec.	16	2	...	Bearded	...	6	...	Stooled very little
2	Sicilian Baart	27 „	18	2½–3	...	do.	...	5	...	do. grain poor
3	Forella	1 „	16	3	...	do.	Close glumes	4	...	do. do. fair, flaggy
4	Mica	1 „	20	2½–3	...	do.	Dark awns and close glumes	5	...	do. do. pinched
5	Medeah	8 „	30	3	...	do.	do. do.	4	...	do. strong straw, grain large
6	Egyptian C 1	8 „	18	2	...	do.	do. do.	7	...	Stooled very little, thin straw, grain poor
7	Do. C 2	8 „	18	2	...	do.	do. do.	8	...	Stooled very little, thin straw, grain poor
8	Do. D	8 „	18	2	...	do.	do. do.	6	...	Stooled very little, thin straw, grain poor
9	Do. A 1	8 „	16	2	...	do.	...	5	...	Stooled very little, thin straw, grain pinched
10	Do. A 2	8 „	18	2	...	do.	...	6	...	Stooled very little, thin straw (at neck), grain pinched
11	Young's Bearded ...	8 „	20	4	...	do.	Branching	5	...	Stooled very little, strong, stout straw, grain large, pinched
12	Paros	8 „	20	3—4	...	do.	Close glumes	4	...	Stooled very little, grain fair
13	Atlanti	8 „	30	3—4	...	do.	...	7	...	Stooled very little, strong, stout straw, grain large, pinched
14	Banater	8 „	26	2½-3	...	do.	Close pointed glumes, striped grey	4	...	Stooled very little, medium, stout straw, grain fair
15	Cretan	8 „	27	2—3	...	do.	Close striped glumes	3	...	Stooled very little (easily threshed), grain good
16	Belotourka	8 „	27	2—3½	...	do.	Close	6	...	Stooled very little, medium, strong straw, grain fair
17	Missogen	23 „	24	1½–2½	...	do.	Close, inclined to club ...	4	...	Stooled very little, purple straw, grain fair
18	Bearded Club	8 „	27	1½-2	...	do.	Close clubbed	3	...	Stooled very little, grain fair
19	Pugh's RR	23 „	26	2—3	...	do.	Close dark-purple awns ...	6	...	do. hard straw, grain fair
20	Salvator	30 „	28	3—4	...	do.	Close	7	...	Stooled very little, coarse straw, flaggy, grain poor
21	Hebron	30 „	20	2—3	...	do.	Close glumes in centre ...	9	...	Stooled very little, failure, coarse, flaggy straw
22	Hunter's White ...	27 „	20	3—4	...	do.	Close glumes, dark awns, striped	6	...	Stooled very little, fine straw
23	Algerian	27 „	20	3—4½	...	do.	Fairly close, good head ...	5	...	do. grain fair, but pinched
24	White-eared Mummy ...	8 „	24	3—4	...	do.	Branching and close	8	...	Stooled very little, strong straw, grain pinched
25	Brown-eared Mummy...	1 „	24	3—4	...	do.	Very branching and close ...	7	...	Stooled very little, strong straw, flaggy, grain pinched
26	Egyptian B	1 „	12	1	...	do.	Dark awns, hairy glumes ...	7	...	Stooled very little, thin straw
27	Do. F	1 „	12	1	...	do.	do. do. ...	6	...	do. do.
28	Australian Poulard ...	27 „	24	3—4	...	do.	Very dark and long awns, glumes close	4	...	Stooled very little, stout straw, an ornamental wheat
29	Bancroft	27 „	24	2—3½	...	do.	Close hairy glumes	6	...	Stooled very little, long-berried grain, narrow
30	Egyptian H	30 „	20	2½–3	...	do.	Pointed hairy glumes ...	7	...	Stooled very little, grain very pinched
31	Laidley	30 „	22	2—2½	...	do.	Broad ear, very close glumes	5	...	do. grain pinched
	Group Poland, 32.									
32	Poland	23 Dec.	24	4—5	...	do.	Extra long glumes	6	Strong, flaggy	Long narrow grain, ornamenta

CATALOGUE OF WHEATS, STATE FARM, WESTBROOK, 1898—*continued.*

Number.	Name.	Harvested.	Length of Straw.	Length of Ear.	Bald.	Bearded.	Conformation of Ear, &c.	Degree of Rust.	Straw.	Remarks.
	Group Heron, 33.									
33	Blue Heron	...	...	...	...	...	...	...	...	Failure (none sown)
	Group Bailey, 34.									
34	Bailey	...	...	...	...	...	...	...	...	Failure
	Group Riete Ladoga, 35-49.									
35	Robert's	...	...	...	...	...	...	...	...	do. (none sown)
36	Rural New Yorker (rye wheat)	...	...	...	...	...	...	...	...	do.
37	Diche Mediterranean ...	30 Dec.	22	3	...	Bearded	Lower half open, top clubbed	7	Thick	Twisted awns
38	Ladoga	30 ,,	22	3—3½	...	do.	Open	3	Bright, thin	Easily shed, fair grain
39	Hindustan	30 ,,	23	5—6	...	do.	Very open, flat	5	Flaggy	do.
40	Tasmanian Red ...	...	...	...	...	...	...	...	...	Failure (none planted)
41	Lehigh	30 Dec.	24	5—7	...	Bearded	Very open	4	Thick, flaggy	Pinched grain
42	Brogan's Red and White	28 ,,	24	3—4	...	do.	Slightly open	5	Flaggy	Easily shed
43	Gharap	8 ,,	24	3—4	...	do.	do. flat	5	do.	Fair grain
44	Anglo-Australian ...	27 ,,	22	4—4½	...	do.	do. do.	5	Medium flaggy	Easily shed, pinched
45	Ironclad	27 ,,	22	4—4½	...	do.	do. do.	6	do.	do. do.
46	Rieti	27 ,,	24	5—6	...	do.	Very open	5	...	Large grain, but not filled
47	Ultuna Red Beard ...	30 ,,	20	2½–3½	...	do.	Slightly red, flaggy	8	Thin	Failure
48	Bearded Red Autumn	...	...	...	...	...	...	...	...	None planted
49	Champlain	30 Dec.	20	5—6	...	Bearded	Slightly open, thin	8	...	Pinched
	Group Australian Bearded.									
50	Port Germain	27 ,,	24	3—4	...	do.	do. do.	3	Medium	Good grain
	Japanese Group, 51-52.									
51	F 1	...	...	...	...	do.	...	...	...	Failure
52	Early Japanese ...	8 Dec.	20	3—4	...	do.	Slightly open	6	Medium little flag ...	Grain fair
	Group Herrison, 53-54.									
53	Sherman	27 ,,	20	3—4	...	do.	Lower half open, close at top	8	Coarse, flaggy	Curled awns, poor grain
54	Bearded Herrison ...	30 ,,	24	1½–2½	...	do.	Close clubbed at top	6	Thin	
	Group Winter Nigger, 55-57.									
55	Winter Nigger	27 ,,	24	5—5½	...	do.	Very open, slightly clubbed at top	7	Coarse, flaggy	Poor grain

56	Ruby	27 „	22	3—4	...	do.	Slightly open, slightly clubbed at top		Flaggy	do.
57	Bearded Champion ...	27 „	18	3—3½	...	do.	Open	8	do.	Failure
	Lazistan Group, 58-80.									
58	Lazistan	8 „	18	2—3½	...	do.	Slightly open, thin	6	Medium, flaggy	Long narrow grain
59	Reliable	... ...	...	...	...	...	...	...	...	None sown
60	Penguin Island ...	8 Dec.	18	2--3	...	Bearded	Slightly open, thin	5	Medium	Fair grain (white)
6	Pringle's No. 3	... ...	...	...	...	...	...	...	...	None sown
62	Shelton's Russian ...	27 Dec.	24	3—4	...	Bearded	Open	6	Medium	Easily shed
63	Frumente Ferrascense	27 „	24	3—4½	...	do.	Flat open	5	do.	do. fair grain
64	Bearded Monarch ...	30 „	22	4—4½	...	do.	do.	7	Stout, flaggy	do.
65	Thuiss	27 „	22	3—3½	...	do.	do.	6	Medium, flaggy	do.
66	Deitz	27 „	20	3—3½	...	do.	do.	6	do.	do.
67	Fulcaster	27 „	22	3—3½	...	do.	Slightly open	5	do.	do fair grain
68	Miami Valley	... ...	...	...	...	...	...	...	...	None sown
69	New Red Wonder ...	27 Dec.	22	3—3½	...	Bearded	Flat thick glumes	5	Slightly coarse	Easily shed, fair grain
70	Crate	27 „	18	2—2½	...	do.	Flat, open and thin glumes ...	7	Slight, flaggy	Easily shed, tapered ear
71	Jasper	27 „	24	3—4	...	do.	Flat and open glumes ...	4	Medium	Very easily shed, tapered ear
72	Saratow	27 „	22	4—5	...	do.	do. do.	5	do.	Easily shed, tapered ear
73	Rio Grande	27 „	20	3—4½	...	do.	do. do.	5	do.	do. do.
74	Mediterranean	27 „	18	3—4½	...	do.	do. do.	5	do.	Very easily shed, tapered ear
75	Australian Amber ...	27 „	24	3—4½	...	do.	Slightly open glumes	4	do.	Easily shed, tapered ear
76	Soft Portuguese ...	27 „	22	2—3	...	do.	Close glumes	7	Thin, flaggy	
77	Darblay's Hungarian ...	27 „	22	2½-3	...	do.	Slightly open glumes	7	Medium, flaggy	Easily shed
78	Andriola Amber ...	27 „	24	3—4½	...	do.	Thin, fairly close glumes ...	6	do.	do. poor grain
79	Barbua Gros Grain ...	27 „	20	3	...	do.	Slightly open, flat glumes ...	7	do.	do. do.
80	China Tea	27 „	22	4—5	...	do.	Close, good	4	Coarse, flaggy	do. fair grain
	Beal Group.									
81	Beal	27 „	24	3—4	...	do.	Close, thick glumes	8	do.	Poor grain
	Early Baart Group.									
82	Early Baart	8 „	20	3—4	...	do.	Good, short awns	6	Stiff and stout, hard ...	Fair grain
83	Dufoits	8 „	20	3—4	...	do.	do. do.	6	do. do.	do,
84	Quartz	8 „	20	3—4	...	do.	Flat, slightly open	7	Medium, flaggy	Poor grain
85	Early Bearded	8 „	20	3—4	...	do.	Open at bottom, close at top	6	Coarse	do.
86	African	8 „	20	2—3	...	do.	Slightly open glumes ...	6	Thin, weak	Long narrow grain
87	Archer's Prolific ...	8 „	20	2—3½	...	do.	Slightly open, close at top ...	7	Medium	Very pinched grain
88	Johnson	... ...	...	...	...	...	...	...	...	None sown
89	Democrat	... ...	...	...	...	...	...	...	...	do.
90	Champlain's Hybrid ...	8 Dec.	20	3—4	...	Bearded	Slightly open, even	6	Medium	Long narrow grain
91	Uncle Tommy	8 „	22	3—4	...	do.	Elongated, thin at top ...	7	Weak	do. do.
92	Soft Algerian	8 „	20	2½-3½	...	do.	Fairly close thin glumes ...	8	Very weak	Very pinched grain
93	Californian Genesse ...	8 „	20	3—4½	...	do.	Slightly open hairy glumes ...	8	Very weak	Velvet wheat (?), pinched grain
94	Tall Bearded Neapolitan	9 „	23	4—5	...	do.	Slightly open flat glumes ...	8	Thick	Long awns, fair grain
95	Cythere White	9 „	22	3—4	...	do.	Slightly open	6	Medium weak	do. pinched grai
	Bearded Indian Group.									
96	Canning Downs ...	9 „	16	2—3	...	do.	Fairly close	7	Weak and thin	Grain fair
97	Gore's Indian No. 2 ...	9 „	14	2—2½	...	do.	Slightly open	7	do. do.	Grain poor
98	Do. do. No. 1 ...	9 „	14	2—2½	...	do.	do. do.	6	do. do.	
99	Indian Club	9 „	14	2—2½	...	do.	Slightly open, thin	6	do. do.	Head not clubbed

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Number.	Name.	Harvested.	Length of Straw.	Length of Ear.	Bald.	Bearded.	Conformation of Ear, &c.	Degree of Rust.	Straw.	Remarks.
	Bearded Velvet Group.		In.	In.						
100	Bearded Velvet ...	9 Dec.	24	4—5	...	Bearded	Slightly open	8	Coarse and flaggy ...	Grain poor
101	Andros	9 ,,	20	3—4	...	do.	Fairly open, flat	8	Medium, flaggy	do.
102	Pride of Butte	9 ,,	20	3—4	...	do.	Fairly close, thin	8	do. do.	do.
103	Cone Rivet	30 ,,	20	3—4	...	do.	Close dark glumes and awns	7	Thin, flaggy	do.
	White Velvet Group.									
104	Velvet Chaff, Red Grain	30 ,,	21	2½-3	Bald	...	Close glumes	8	Weak, flaggy	Stooled well
105	Old French Velvet ...	30 ,,	20	2½-3	do.	...	Open flat glumes	8	Medium, flaggy	do.
106	White Velvet	30 ,,	21	2½-3	do.	...	Close flat glumes	7	...	Fair grain
107	Carter's 87	...	...	...	...	...	...	...	...	None sown
108	Carter's F	30 Dec.	22	4—5	Bald	...	Elongated thin ear	6	Medium	Stooled well
109	Tardent's Blue	30 ,,	22	3—4½	do.	...	Thick glumes	6	Medium, flaggy	do fair grain
110	Carter's D	30 ,,	20	2—3	do.	...	Flat glumes	6	do. do.	Late
111	Canadian Wheat Chaff	30 ,,	24	3—4	do.	..	Close	6	Medium	Poor grain
112	Brigg's RR	30 ,,	22	3—3½	do.	...	Close at top, open at lower ...	6	do.	do.
113	Jones's Winter Fife ...	...	...	...	...	...	...	...	...	None sown
114	Velvet, New Zealand ...	30 Dec.	24	3—4	Bald	...	Close compact at top	6	Medium, brittle	Poor grain
115	Basalt	30 ,,	24	3—4½	do.	...	Thin, open at base, close at top	5	Medium	Stooled well
116	Langfeldts	...	...	...	...	...	...	...	...	None sown
	Velvet Pearl Group.									
117	Velvet Pearl	9 Dec.	18	2—3	Bald	...	Thin, open at base, close at top	6	Thin	Poor pinched grain
118	Indian Fife	9 ,,	16	2—3	do.	...	Thin, slight open	5	Very thin, weak	Few awns
119	Carter's 43	9 ,,	18	3—3½	do.	...	Close, short, pointed glumes	6	Thin	
120	Rye Wheat	9 ,,	16	4—5	do.	...	Close, widening out two-thirds of way up	7	Coarse, thick, weak ...	Pinched grain
	Indian Group.									
121	Indian Early	...	16	1½-2½	do.	...	Fairly close, grey striped ...	5	Thin	Few short awns
122	Do. F	...	18	2—3½	do.	...	do. do. ...	4	Medium to thin	Few short awns, good grain
123	Do. Z	...	18	1½-2	do.	...	do. do. ...	4	Very thin straw	Awns ¾ in. long, good grain
124	Carter's 81	...	24	3—4½	do.	...	Thin, slightly open	7	Coarse	
125	Early Para	...	22	2½-3	do.	...	Thin, fair head	4	Thin	Fair grain
126	King's Jubilee	...	24	3—4	do.	...	Elongated glumes	4	do.	Fair grain, short awns
	Steinwedel Group.									
127	Bride of Barossa ...	...	24	3—4½	do.	...	Good type	5	do.	Fair grain
128	Steinwedel	...	24	3—3½	do.	...	Flat, slightly open glumes ...	5	Thin, strong	do.
	Purple Straw Group.									
129	Rattling Jack	...	20	2—3	do.	...	Very close centre of ear ...	5	Medium, strong	Few awns
130	Fountain	...	24	3—4	do.	...	Slightly open	6	do. do.	do.
131	The Blount	...	22	2—3	do.	...	Fairly close	5	do. do.	Good type of ear
132	Northern Champion ...	...	22	3—4	do.	...	Flat spreading glumes ...	7	Coarse	Type varying

133	*Italian Tuscan P.S.* ...	9 Dec.	22	3—4	do.	...	*Fairly close, thin*	5	Medium strength ...	Few short awns, pinched grai
134	Farmer's Friend ...	9 ,,	22	2—3½	do.	...	Fairly close	5	do. do. ...	do. do.
135	Fillbag	9 ,,	24	3—4½	do.	...	Flat, open	5	Stout, strong	Few short awns
136	Rattling Tom	9 ,,	24	2—3½	do.	...	do.	5	Medium strength	Few short awns, fair grain
137	Red Straw	9 ,,	20	2—3½	do.	...	Close, slightly clubbed ...	5	Coarse, flaggy	Few short awns
138	Hudson's Early P.S. ...	9 ,,	22	2—3½	do.	...	do. do. ...	6	Coarse	do. do.
139	Jacinth	9 ,,	24	2—3½	do.	...	Fairly close	5	Bright, medium	do. do.
140	Australian Glory ...	9 ,,	24	3—4½	do.	...	Close, good type	6	Medium	do. do.
141	Steer's Early P.S. ...	9 ,,	22	2—3½	do.	...	Open at base, close and slightly clubbed at top	5	Bright, medium	do. do.
	Tuscan Group.									
142	Battlefield	9 Dec.	22	3—4½	do.	...	Slightly open, close towards top	5	Strong	Few short awns
143	White Tuscan	9 ,,	22	3—4½	do.	...	Elongated, close towards top	5	do.	do. do.
144	Frame's Early	9 ,,	22	2½—3½	do.	...	Thin, open	7	Weak, flaggy	do. do.
145	Red Tuscan	9 ,,	24	2½—3½	do.	...	Close	6	Slight	do. do.
146	Purple Shaw Tuscan ...	9 ,,	22	2½—3½	do.	...	Slightly open	6	do.	Few short awns, fair grain
147	Californian Chili ...	9 ,,	22	3—4½	do.	...	Close, thin	7	Medium strength ...	do. do. pinched grain
148	Oakshott's Champion	9 ,,	24	3—4½	do.	...	Close, good type	5	do. do. ...	do. do. good grain
149	Blue Straw	9 ,,	24	2½—3	do.	...	Flat, open	7	Thick, flaggy	do. do.
150	District	9 ,,	...	2½—3	do.	...	...	8	...	No grain matured
151	Agate	...	...	...	...	...	...	8	...	do. do.
152	American Purple Straw	...	...	...	...	...	...	...	...	None sown
153	Carter's E	9 Dec.	20	3—5	Bald	...	Flat, open	7	Coarse, flaggy	Very pinched grain
154	,, B	...	...	...	...	...	...	...	...	None sown
	Lammas Group.									
155	Bordier	...	...	...	...	...	...	...	...	None sown
156	Hunter's White ...	...	...	...	...	...	...	...	...	do.
157	Lake Bathurst	10 Dec.	26	3—5	Bald	...	Flat, open, grey striped ...	6	Strong	Fair grain
158	White Naples	10 ,,	26	3—4	do.	...	Slightly open, striped	6	Medium strength	do.
159	White Flanders ...	...	...	...	...	...	...	...	...	None sown
160	Chiddam	10 Dec.	24	3—5	Bald	...	Flat, open, striped	7	Coarse, flaggy	Fair grain
161	White Essex	10 ,,	24	3—5	do.	...	do. do.	5	do. do.	do.
162	Landreth's Hard Winter	10 ,,	22	2—3	do.	...	Flat, open	6	do. do.	Poor grain
163	Green Mountain ...	10 ,,	24	3—4½	do.	...	Slightly open	5	do.	Fair grain
164	Dallas	10 ,,	24	3—4½	do.	...	do.	4	Medium	Elongated, fair grain
165	Leak's RR	10 ,,	24	2—3	do.	...	Slightly open, grey striped ...	4	Thin	
166	White Lammas from Young	10 ,,	26	3—4	do.	...	do. do. ...	4	Clean, bright	Fair grain
167	Australian Talavera ...	10 ,,	26	3—4½	do.	...	Flat, open, grey striped ...	4	Stout, flaggy	do.
168	Snowball	10 ,,	24	3—4½	do.	...	do. do.	5	Medium, flaggy	do.
169	Talavera de Bellevue ...	10 ,,	24	4—5	do.	...	Thin, open, grey striped ...	7	do. do.	Pinched grain
170	Zealand	...	...	...	...	...	...	...	...	None sown
171	Mammoth	10 Dec.	22	3—4	Bald	...	Open, grey striped	6	Coarse	Fair grain
172	Carter's 103	...	...	...	...	...	...	...	...	None sown
173	Pringle's Vermont ...	10 Dec.	24	3—4	Bald	...	Flat, slightly open, grey striped	5	Medium	Few awns, air grain
174	Prope	10 ,,	20	4—5	do.	...	Good, slightly open, grey striped	5	do.	Few awns, rain pinched
175	Chrysolite	10 ,,	22	3—4½	do.	...	Slightly open, grey striped ...	6	Thin, medium strength	
	Essex Group.									
176	Port McDonald	10 ,,	24	3—4	do.	...	Slightly open, grey striped ...	6	Stout	Fair grain
177	White Essex	10 ,,	24	3—4	do.	...	Open, grey striped	5	Medium, flaggy	do.
178	Tuscan Essex	10 ,,	26	3—4	do.	..	Close, grey striped	6	do. do.	Pinched grain.
179	Frampton	10 ,,	24	3—4½	do.	...	Very open, flat, grey striped ...	4	Coarse, flaggy	Fair.

Number.	Name.	Harvested.	Length of Straw.	Length of Ear.	Bald.	Bearded.	Conformation of Ear, &c.	Degree of Rust.	Straw.	Remarks.
	Essex Group—continued.		In.	In.						
180	Chiddam's White Spring	10 Dec.	24	3—4½	Bald	...	Fairly close	5	Medium, flaggy	Fair grain.
181	Martin's Amber ...	...	...	...	...	...	...	...	...	None sown
182	Soft Australian... ...	10 Dec.	26	3—4	Bald	...	Open	7	Medium, not much flag...	Grain very pinched
183	Gneiss	10 ,,	26	3—4	do.	...	Fairly close	7	Medium, flaggy	do. do.
	White Club Group.									
184	Schelf	10 ,,	24	3—4	do.	...	Clubbed, thick glumes ...	7	Coarse	
185	Fort Collins	10 ,,	24	2—3½	do.	...	do. do.	8	Coarse, flaggy	Very pinched grain
186	Oregon Big White C ...	10 ,,	22	1½—3	do.	...	Clubbed, thick, grey striped	7	Thin...	Grain pinched
187	Hedgerow	10 ,,	20	1—2½	do.	...	do. do.	7	Weak	Pinched grain
188	Little Club	10 ,,	26	1—2½	do.	...	Even clubbed, grey striped ...	6	Medium strength... ...	do. do.
	Noe Group.									
189	Limmerman	29 ,,	24	3	do.	...	Good, but thin	6	Bright	Late; creeping habit
190	Sardins	29 ,,	26	2½—4	do.	...	do.	5	Thin	Fair grain
191	Summer Club	29 ,,	24	3—3½	do.	...	Flat, open	4	Stout	Good grain
192	High Grade	29 ,,	24	2—2½	do.	...	Clubbed at top...	7	do.	Pinched grain
193	Manitoba	29 ,,	28	3—3½	do.	...	Slightly open, thin	4	Strong straw	Easily threshed, fair grain
194	Long Berry	29 ,,	26	3—5	do.	...	Open, flat	5	Strong, stout	Easily shed
195	Prince Edward Island	29 ,,	22	2½—4	do.	...	Fairly close	5	Stout	Fair grain
196	German March Beardless	29 ,,	24	3—3½	do.	...	Coarse, open, thick glumes ...	6	Strong, coarse	do.
197	Monton	...	...	...	...	...	...	...	...	None sown
198	China Spring	29 Dec.	26	3	Bald	...	Thin, elongated	5	Medium	Fair grain
199	Buckley's RR	29 ,,	26	2½—4	do.	...	Close, good type	5	do.	do.
200	Blount's Fife	29 ,,	28	3—4	do.	...	Slightly open, grey striped ...	6	Stout, flaggy	Pinched grain
201	Uttoba	29 ,,	28	3	do.	...	do. do. ...	7	Medium, flaggy	do.
202	Picket	29 ,,	24	3—3½	do.	...	do. ...	4	Strong, bright	Good grain
203	Ret Nott	29 ,,	21	3	do.	...	Open at bottom, close at top	5	Medium flaggy	Fair grain
204	Blount's RR	29 ,,	24	2½—4	do.	...	Very flat and open	3	Stout, fairly clean ...	Good grain
205	Fulty	29 ,,	20	3—4½	do.	...	Open at base, close at top ...	6	Medium	Fair grain
206	Noe	29 ,,	24	3—4	do.	...	Open, spreading glumes ...	7	Coarse	Pinched grain
207	Crepi	29 ,,	22	2½—3	do.	...	Tapering from centre... ...	7	Very flaggy	Creeping habit, pinched grain
208	Bladett's Paylaurense	29 ,,	24	2½—3	do.	...	Fairly close towards top ...	7	Slight	Pinched grain
209	Saumur de Mars ...	10 ,,	24	2½—3½	do.	...	Slightly open	6	Medium	Fair grain
210	North Carolina ...	29 ,,	21	2½—3½	do.	...	Elongated, fairly close ...	6	Thin	do.
211	Autumn Saumur ...	29 ,,	24	2½—3	do.	...	Fairly close	7	Flaggy	Pinched grain
	Fife Group.									
212	Small's O.K.	29 ,,	24	2½—3½	do.	...	Thin, slightly open	6	Flaggy	do.
213	Anderson's RR ...	10 ,,	26	3—4	do.	...	Fairly open	4	do.	Good grain
214	King's RR	10 ,,	26	3—4½	do.	...	do.	4	Strong, bright	do.
215	Niagara	10 ,,	20	3—4	do.	...	Thin, fairly open	5	do.	Fair grain
216	Sorrel	10 ,,	24	3—4	do.	...	Flat, open	5	do.	do.

217	*White Chaff Red*	...	...	...	...	...	...	...	...	...	...	*Failure*
218	Improved Rice	...	29 Dec.	28	2—3	Bald	...	Thin, fairly close	...	6	Thin	... Grain pinched
219	Scotch Red	...	29 ,,	24	2½–3½	do.	...	Fairly close	...	8	Medium	... Reddish tinge on glumes
220	Russian	...	29 ,,	26	4—5	do.	...	Very open, flat	...	5	Stout, hard	... Grain fair
221	Ontario Wonder	...	29 ,,	22	2½–3½	do.	...	Close	...	8	Weak	... Few awns, grain very pinched
222	Smooth Red Spring	...	29 ,,	24	3—3½	do.	...	Fairly close	...	7	Thin	... Easily shed
223	Saskatchewan	...	29 ,,	22	3—4½	do.	...	Open, flat, reddish tinge	...	3	Bright, hard	... do.
224	Scotch Fife	...	29 ,,	20	2½–3½	do.	...	Fairly close, thin	...	5	Medium	... Fair grain
225	Finley	...	10 ,,	22	3—4	do.	...	do. do.	...	6	Thin	... Pinched grain
226	Inglis's RR	...	29 ,,	20	2½–3½	do.	...	Fairly close, thickening towards top	...	7	Thin, weak	... Few awns, pinched grain
227	Count Waldersdorff	...	29 ,,	22	2½–3½	do.	...	Thick in centre	...	9	Thin, flaggy	... Failure
228	Nimity Belle	...	10 ,,	22	2½–3½	do.	...	Clubbed at top	...	7	Coarse, flaggy	... Pinched grain
229	Canadian Club	...	29 ,,	22	2—3	do.	...	Thin, fairly close	...	6	Medium	... Few awns, fair grain
230	Carter's B	...	29 ,,	18	2½–3½	do.	...	do. do.	...	7	Thin, flaggy	... Pinched grain
231	Amethyst	...	29 ,,	24	2½–3½	do.	...	Thick, slightly clubbed at top		5	Medium	... Few awns, fair grain
232	Gallician Saumur	...	29 ,,	24	2—3	do.	...	Thin, close glumes	...	5	Thin	... do. do.
233	Dominion	...	29 ,,	22	2—3	do.	...	Fairly close (red tinge)	...	4	do.	... Fair grain
234	Red Lorrain	...	29 ,,	22	2—2½	do.	...	Thin, fairly close (red tinge)	...	8	do.	... Pinched grain
235	Sardonyx	...	29 ,,	22	3—4	do.	...	Slightly open	...	7	Thin, flaggy	... do.
236	Kaiser	...	29 ,,	22	2½–3½	do.	...	Thick in centre	...	6	Medium	... do.
237	Sapphire	...	10 ,,	22	3—4½	do.	...	Slightly open, glumes spreading		4	do.	... Few awns, easily shed, fair grain
238	Indian Y	...	29 ,,	24	2½–3½	do.	...	Slightly open, glumes tapering		5	Stout	... Fair grain
239	Do. D	...	29 ,,	24	2—3	do.	...	Clubbed at top	...	6	Medium	... Pinched grain
240	Webb's Challenge	...	29 ,,	24	3—4	do.	...	Glumes close at top	...	6	do.	... do.
241	Eclipse	...	29 ,,	20	2—3	do.	...	Clubbed	...	8	Thin, flaggy	... Failure
242	Horneblende	...	29 ,,	24	3—4	do.	...	Fairly close	...	5	Strong, hard	... Fair grain
243	Jock	...	...	...	...	...	...	...	...	...	...	None sown
244	Porcelain	...	29 Dec.	24	2½–3½	Bald	...	Thin, tapering	...	9	Weak, flaggy	... Very pinched grain
245	Trap	...	29 ,,	24	3—3½	do.	...	Thick glumes	...	7	Thick, do.	... Pinched grain
246	Ruby	...	29 ,,	24	3—4½	do.	...	Flat, spreading glumes	...	6	Medium	... Fair grain
247	Wright's RR	...	29 ,,	24	3—4	do.	...	Fairly close	...	5	do.	... Easily shed, fair grain
248	Feldspar	...	10 ,,	24	2—3½	do.	...	do. clubbed	...	6	do.	... Fair grain
249	White Russian	...	29 ,,	22	2—3½	do.	...	Open at base, close at top	...	6	do.	... Striped glumes, pinched grain
250	White Fife	...	29 ,,	24	3—4	do.	...	Thin, slightly open	...	5	Thin	... Easily shed
251	Adamant	...	29 ,,	24	3—4	do.	...	Fairly close, thin	...	5	do.	... Grain fairly good
252	Fluorspar	...	29 ,,	24	3—4	do.	...	Fairly open	...	5	Stout	... do. do.
253	Improved Fife	...	29 ,,	24	2½–3½	do.	...	Fairly close, thin	...	6	Thin	... Grain pinched
	Defiance Group.											
254	Clarke's RR	...	29 Dec.	26	3—4	Bald	...	Fairly close	...	6	Stout, flaggy	... Grain pinched
255	Beryl	...	10 ,,	20	2—3½	do.	...	Broad flat glumes	...	5	Hard	Grain fair
256	Pringle's No. 5	...	29 ,,	26	3½–4½	do.	...	Clubbed at top	...	6	Thick, flaggy	... Grain pinched
257	Australian RR	...	29 ,,	24	3—4	do.	...	do. square	...	5	do.	... do.
258	Thomas's RR	...	29 ,,	24	3—4	do.	...	Thick close glumes	...	4	Medium, flaggy	... Few awns, grain fair
259	Leak's Defiance	...	29 ,,	22	3—3½	do.	...	Glumes close at top	...	5	Thick, flaggy	... Grain pinched
260	Pringle's do.	...	29 ,,	30	3½–4½	do.	...	do. do.	...	5	Stout, flaggy	... Grain good
261	Russian	...	29 ,,	30	3—4	do.	...	Close	...	5	Medium	... Few awns, grain fair
262	Pearl or Velvet	...	29 ,,	22	2—3	do.	...	Close clubbed	...	8	Weak, thin, flaggy	... Grain pinched
263	Murray River	...	29 ,,	24	2—3½	do.	...	Close at top	...	5	Stout, bright	... do.
264	Defiance	...	29 ,,	22	3—4	do.	...	Close at top, broad glumes	...	5	do.	... Grain good
265	Bega	...	29 ,,	22	3—4	do.	...	do. do.	...	6	Stout, flaggy	... Few awns, grain fair
266	A 1	...	10 ,,	22	3—4	do.	...	Slightly open, grey glumes	...	5	Medium	... Grain fair
267	Little Wonder	...	10 ,,	22	3—3½	do.	...	Slightly open, clubbed at top		5	do.	... do.
268	Inglis's Success	...	29 ,,	22	3—4¼	do.	...	do. do.	...	7	Medium, flaggy	... Grain pinched
269	Blount's Lambrigg	...	29 ,,	22	3—4	do.	...	Slightly open bottom, clubbed at top		5	do.	... Grain good

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Number.	Name.	Harvested.	Length of Straw.	Length of Ear.	Bald.	Bearded.	Conformation of Ear, &c.	Degree of Rust.	Straw.	Remarks.
	Golden Drop Group.		In.	In.						
270	Trump	29 Dec.	20	2½–4	Bald	...	Slightly open, thin	8	Thin, flaggy	Failure, grain pinched
271	Carter's K	29 ,,	20	2½–3½	do.	...	Clubbed in centre	9	do.	do. do.
272	Do. H	29 ,,	20	2½–3	do.	...	Clubbed at top	7	Medium, flaggy	Grain pinched
273	Do. 107	29 ,,	20	2—3	do.	...	Thick in centre	9	Coarse, flaggy	Failure
274	Pringle's No. 6	12 ,,	20	2—3½	do.	...	Close glumes at top	8	do.	Grain pinched
275	Opal	12 ,,	20	2—3½	do.	...	Clubbed at top	8	Medium, flaggy	do.
276	Hallet's Pedigree ...	29 ,,	20	2—2½	do.	...	Thin, striped	8	Thin	Late creeping, grain pinched
277	Goldsmith's Pedigree ...	12 ,,	20	3—4½	do.	...	Slightly close, clubbed at top	7	Stout, flaggy	Fair grain
278	Carter's New Hybrid ...	12 ,,	20	3—4	do.	...	do. do.	8	do.	Pinched grain
279	Golden Drop	29 ,,	22	3—4	do.	...	do. do.	8	Medium, flaggy	do.
	Square Head Group.									
280	Bersler's Club	30 ,,	18	1—2	do.	...	Square clubbed, irregular ...	9	Coarse, do.	Failure
281	Scholey's Square Head	30 ,,	16	1—2	do.	...	do. do.	9	do. do.	do.
282	Besthorn's Dividend ...	30 ,,	18	1—2½	do.	...	do. do.	9	do. do.	do.
283	Emerald	30 ,,	26	3—5	do.	...	Open, flat, tapering	6	Thin	Fair grain
284	Red Altkirche	30 ,,	20	3—4	do.	...	Square, clubbed	9	do. flaggy	Failure
285	Marjorica Carisa ...	30 ,,	24	3—4	do.	...	Slightly open to close, tapering	5	do.	Fair grain
286	Webb's King Red ...	30 ,,	22	2—3	do.	...	...	9	do. flaggy	Failure, late creeping
287	Carter's A	30 ,,	22	2—3	do.	...	Close, square, red tinge, type varying	8	do. do.	Grain very pinched
288	Do. C	30 ,,	22	2—3½	do.	...	...	9	...	Failure
289	Dwarf Humboldt's ...	...	...	...	...	...	...	...	...	do. (did not mature)
290	Blé a epi carre ...	30 Dec.	18	1—2½	Bald	...	Close, square, taper	8	Thin, flaggy	do.
291	Redchaff Square Head	30 ,,	18	1—2½	do.	...	do.	8	Stout do.	Very pinched
292	Sicilian Square-headed Red	30 ,,	22	1—2	do.	...	do.	6	Medium do.	Fair grain
293	Four-rowed Sheriff ...	30 ,,	22	1—2	do.	...	do.	9	Thin do.	Failure; not four-rowed
294	Rimpan	30 ,,	20	2—3	do.	...	do.	9	do. do.	do.
295	Carter's G	30 ,,	18	2—3	do.	...	...	9	do. do.	do.
296	Mould's Red	30 ,,	18	1½–2	do.	...	Close, clubbed	9	do. do.	do.
	Allora Spring Group.									
297	Clubbed Indian ...	12 ,,	20	1½–2½	do.	...	Close, clubbed at top	5	do. erect, flaggy ...	Grain fair
298	Indian D	12 ,,	20	1½–2½	do.	...	do. do.	5	do. do.	Grain pinched
299	Budd's Early	12 ,,	22	2—3½	do.	...	Slightly open, reddish tinge ...	3	Bright, medium, strong	Few awns, good grain
300	Allora Spring	12 ,,	22	2—3½	do.	...	Flat, open, reddish tinge ...	3	do. do. ...	do. do.
301	Odessa Sans Barbe ...	12 ,,	22	3—4	do.	...	Fairly close	3	Medium, strong	do. fair grain
	Ward's Prolific Group.									
302	Golden Prolific	12 ,,	20	3½–4½	do.	...	Close, elongated, reddish ...	6	Strong	Fair grain

303	Australian Wonder ...	12 ,,	24	3—4	do.	...	Thin, tapering, reddish ...	4	Thin	do.
304	Marshall's No. 3 ...	12 ,,	24	3—4	do.	...	Good, tapering, reddish ...	4	Medium	Good grain
305	Marshall's No. 8 ...	12 ,,	24	3—5	do.	...	Slightly open, thin, tapering to point	4	Medium, strong	Reddish tinge
306	Do. No. 12 ...	12 ,,	24	3—5	do.	...	Very open, few awns	4	Stout, strong	Pale reddish tinge
307	Do. No. 2 ...	12 ,,	24	3—4½	do.	...	do.	4	Medium	do. do.
308	Ward's Prolific	12 ,,	24	4—5	do.	...	Open, reddish tinge	3	Medium, strong	Good grain
309	Hercules	12 ,,	24	3—4½	do.	...	Open, flat glumes, reddish tinge	3	Coarse	Fair grain, few awns
310	Red Clawson	12 ,,	26	3—4½	do.	...	Open, flat glumes, reddish tinge	4	Medium, strong	Fair grain
311	Ward's White	12 ,,	24	3—4½	do.	...	Slightly open, tapering ...	4	Thin	Fair grain, pale reddish tinge on glumes
312	Marshall's No. 5 ...	12 ,,	24	3—4	do.	..	do. do.	5	do.	Few awns, fair grain, pale reddish tinge on glumes
313	Roussillon	12 ,,	26	2—4½	do.	...	Open, flat glumes	6	Medium, flaggy	Dark-red glumes, pinched grain
314	Robbin's RR	12 ,,	24	4—5	do.	...	Open, flat glumes, tapering ...	4	Coarse, flaggy	Reddish glumes, good grain
315	Currell	30 ,,	22	4—4½	do.	...	Close, thin ear	7	do.	Late
	Red Province Group.									
316	Odessa	12 ,,	26	4—5	do.	...	Thin, tapering, reddish ...	7	Thin, flaggy	Few awns
317	Red Bordeaux	12 ,,	24	4—5	do.	...	Flat, thick, and open, reddish	8	Very coarse, flaggy ...	Pinched
318	Pool	12 ,,	24	4—5	do.	...	Slightly open, pale reddish tinge	7	Medium	Few awns
319	Clawson	12 ,,	22	4—4½	do.	...	Slightly open, dark redddish tinge	8	Thin, flaggy	Did badly
320	Prince Albert	12 ,,	24	3—4	do.	...	Slightly open, dark tinge ...	9	do.	Very poor
321	Red Province	12 ,,	24	3—4	do.	...	Open, flat, dark tinge	5	Medium, hard	Fair grain
322	Willett's	12 ,,	20	2—3½	do.	...	Clubbed	9	Thin, flaggy	Poor, few awns
323	Spaulding's Prolific ...	30 ,,	20	4—5	do.	...	Fairly close, grey striped ...	8	Medium, flaggy..... ...	Poor, late
324	Banham's Borwick ...	30 ,,	18	2—3	do.	...	do. do. ...	9	Thin, flaggy	do.
325	Red Russian	30 ,,	22	3—4½	do.	...	Fairly close, reddish tinge ...	9	do.	Failure.
326	McGhee's White ...	12 ,,	22	3—4	do.	...	Fairly close, reddish tinge, close at top	7	Medium	Fair grain.
	Rye Wheat Group.									
327	Rural New Yorker ...	30 ,,	22	3—4½	...	Bearded	Close, reddish tinge	8	Thick, flaggy	Poor grain
328	German Emperor ...	30 ,,	26	3—4½	Bald	...	Flat, open, reddish, clubbed at top	9	Very coarse, flaggy ...	Failure
329	Bye Wheat	30 ,,	22	3—4½	do.	...	Flat, open, reddish, clubbed at top	7	do. do. ...	
330	Early Genesee	30 ,,	20	2—3½	...	Bearded	Close and clubbed	9	do. do. ...	
331	Stewart	30 ,,	20	2—3½	Bald	...	do. do.	8	do. do. ...	
332	Rye Wheat	30 ,,	20	3—4	do.	...	Close, thin and clubbed ...	9	do. do. ...	
	Tuscan Island Group.									
333	Tuscan Island	30 ,,	24	3—4½	...	Bearded	Slightly open, spreading glumes	6	Medium	Easily she
	Shelton's Group.									
334	Minnesota	30 ,,	22	3—4½	Bald	...	Flat, open, tapering	7	Medium, flaggy	A velvet wheat
335	Red Tenterfield ...	30 ,,	20	3—4	do.	...	Slightly open, reddish tinge...	5	Thin	Pinched grain
336	White Tenterfield ...	30 ,,	22	3—4	do.	...	do. grey	6	Medium, flaggy	do.
337	Power's Fife	21 Nov.	20	2—3	...	Bearded	Very close, dark awns ...	7	Thin	do.
338	F 1 (Cobb 51)	21 ,,	22	2½-3½	Bald	...	Elongated, slightly open ...	7	do.	Few awns
339	Gayndah	21 ,,	24	3—4	do.	...	do. grey striped ...	4	do. bright	do. best of group
340	do. B	21 ,,	26	3—4½	do.	...	Red, open, flat	5	Coarse, flaggy	
341	Yandilla	21 ,,	24	4—5	do.	...	Red, slightly open	4	Strong	Fairly good grain

CATALOGUE OF WHEATS, STATE FARM, WESTBROOK, 1898—*continued.*

Number.	Name.	Harrested.	Length of Straw.	Length of Ear.	Bald.	Bearded.	Conformation of Ear, &c.	Degree of Rust.	Straw.	Remarks.
	*Farrer's Group.**		In.	In.						
391	Yandilla Improved Indian	21 Nov.	20	3—3½	Bald	...	Thin, reddish tinge, close ...	4	Medium	Grain pinched
368	Yandilla No. 1	21 „	24	3—4½	do.	...	Stout smooth glumes	3	Flaggy, coarse, strong	
367	Moultan Hard 2 ...	21 „	22	2—3	...	Bearded	Very dark red glumes, close	7	do. thin	Awns very long
365	Moultan Hard	21 „	22	3—3½	Bald	...	Flat glumes, reddish tinge ...	5	Thin, hard	
363	Petsi Exdam	21 „	20	2—2½	...	Bearded	do. open, smooth ...	6	do. wiry	White glumes
362	Bald Terozopore White	21 „	24	3—4½	Bald	...	do. fairly close, reddish	4	do. clean	
361	Do. do.	21 „	22	3—3½	do.	...	Rounded glumes, open light reddish	5	do. bright	
360	Nagar Red	21 „	20	2—3	...	Bearded	Flat glumes, fairly close, light reddish	6	do.	
359	Buxar Soft White ...	21 „	22	2—4	...	do.	Flat glumes, fairly open, red	5	Thick	
358	Bald Canning Downs ...	21 „	20	3—4	Bald	...	Rounded glumes, fairly close, grey striped	3	Thin, bright	Plump grain
357	84 (C1D)	21 „	24	3—4½	do.	...	Flat glumes, fairly open, red striped	3	Medium, bright	
355	85 D2	21 „	20	3—4	do.	...	do. do.	3	Thin, bright	
354	86 Y	21 „	18	2—3	do.	...	do. do.	3	do.	Few awns
349	84 BY	21 „	22	3—4	do.	...	do. do.	3	Medium	Short plump grain
353	85 AB	21 „	22	3—4	do.	...	do. do.	3	do.	
352	85 A1, B1	21 „	20	3—4½	do.	...	do. do.	4	do. flaggy	
351	85 B2, 86 A1	21 „	20	2—3½	do.	...	do. do.	4	do. do	
350	85 BY, 86 A1	21 „	18	2—2¾	do.	...	do. do.	4	Thin, bright	Glumes close at top
347	Best Strain	21 „	24	3—4½	do.	...	do. do.	4	Medium, bright	do. do.
346	R 1	21 „	22	3—4	do.	...	Flat glumes, fairly open, reddish	3	Medium and strong	
345	R	21 „	24	3—4½	do.	...	Flat glumes, fairly open, reddish	3	Stout, strong	
344	Ibis	21 „	20	2—2½	...	Bearded	Rounded glumes, fairly close, reddish	2	Thin, hard	Very long awns.
342	140 GY	21 „	18	2—3	...	do.	Rounded glumes, fairly close, reddish	2	do do	

*Names as per numbers on list of Hermitage wheats.

REPORT OF MANAGER, STATE FARM, HERMITAGE.

Sir,—I have the honour to furnish you with a report concerning the operations on this farm for the year ending 30th June, 1899. In this *résumé* I desire to set forth—

1. Defects through insufficient rainfall and insufficient water supply ;
2. The growth of cereal crops, fodder crops, root crops, garden crops, and other field crops ;
3. The orchard, progress in ;
4. Suggested improvements ;
5. Conclusion.

The Rainfall and Water Supply.—My remarks must necessarily have a preliminary reference to these important matters, since upon these factors depends the whole of the success of my operations. I cannot emphasise the fact too much that the deficiency of rainfall and the excessively hot weather experienced during the past summer have to a large extent nullified the efforts put forth with regard to some of the field crops (notably maize) and to experimental work. The rainfall averaged less than 2 inches per month since 16th September, the date Mr. Wragge established a climatological station here, or 18·135 inches for the nine and a-half months ending 30th June, which is a much lower record than that registered at Warwick (4 miles to the west) and Swan Creek (3 miles east of the farm). No water being available except that which had to be carted from Swan Creek, a mile away, mulching was largely resorted to, the results of which were highly satisfactory, especially on such crops as pumpkins, melons, cabbage, tomatoes, beans, peas, and rhubarb.

CEREALS.—MAIN CROPS.

Before entering upon a description I would point out the conditions under which they were grown. This farm is by no means typical wheat land, but rather the reverse. There are several patches of alkaline soil throughout the area covering the farm where it is impossible to germinate a grain of maize or wheat, in fact, even weeds are entirely absent. To counteract the effects of these alkali belts, careful experiments will be carried out with simple chemical compounds, and records of the results will be kept.

Wheat.—Under this heading are such varieties as were sown in the largest areas with the object of harvesting sufficient pure seed-grain for distribution. The fields were systematically gone over several times during the periods of flowering and ripening, to watch for any chance ears of other varieties that might have found their way into the crop, with a view to weeding out. The extent of these areas was from 2 to 20 acres, and comprised the following varieties :—Marshall's Nos. 3 and 8, Belatourka, Budd's Early, and Improved Allora Spring. All were sown broadcast on new ground, with clean home-saved seed at the rate of $\frac{3}{4}$ bushel to the acre, and resulted in a yield of 1,218 bushels in all, averaging between four and five bags to the acre.

Stud Wheats.—These are small areas of grain sown in rows, the seed being hand-selected from the previous year's crop. In hand selection every care is exercised that only pure seed is gathered so that pure seed can be depended upon from the sowing. The seed of these was originally obtained from Wagga Experimental Farm, New South Wales, and some hand-selected by Mr. A. H. Benson. Thirty-eight plots were sown and harvested, ranging in size from a few rows up to half an acre each. This experiment was highly instructive, to a considerable extent indicating those varieties which are practically rust-free, such as some of the Marshalls, the Poulards, Gayndah, and others ; also those which have the power to resist the ravages of rust (rust-resistant) ; sorts which being attacked, nevertheless yielded a well-filled grain. Some of the Indians, purple straws, lammas, and Baarts' are of this character.

Nomenclature Collection.—This collection, described in the issue of the *Queensland Agricultural Journal* for February, 1899, part 2 of vol. IV., consists of 403 varieties, classified into 36 groups, was sown in single rows 1 chain long and each row 15 inches apart, allowing 12 inches between each plant in the rows. By this method every characteristic of the plant can be detailed perfectly. Many of these Wheats, being hybrids, are not what is termed fixed ; they are therefore liable to revert back to either one or the other parent. This is more noticeable in recent cross-breds. When this occurs such plants are carefully culled out, and all weedy growths are also discarded, and seed gathered only from healthy plants showing a level mass of heads

true to character in every particular—stool, flag, straw, ear, and grain. Quite a number of farmers have visited the farm and shown great interest in these trials, some calling periodically and noting their growth all through the season.

Barley: *Chevalier Malting.*—Over 500 bushels of a clean, bright grain of this crop were harvested, nearly all of which (as well as the wheats) have been delivered to applicants for seed purposes. Other varieties experimented with are Old-fashioned English (a very fine improved sample), Archer's Chevalier, Chilian (used in England for quickly ripening ales), Sea of Azof, and Nepaul. The latter is a beardless, skinless grain, yielding heavily and very early. As a green crop it cannot be surpassed; it also makes a splendid hay.

Sowings.—The cereals put in this season have all been sown with the drill, except two plots, which are broadcasted for comparison. All are doing well, with the exception of a part of the No. 3 plot, which has been nearly destroyed by cut-worms. They are as follow, viz:—

Marshall's No. 3	22 acres
„ No. 3A	2 „
„ No. 8	17 „
Belatourka	4 „
Budd's Early	4 „
Improved Allora Spring	4 „

The following Stud Wheats are sown in plots ranging from quarter of an acre up to 1½ acres each, and cover an area altogether of 14 acres. Early Para, Clubbed Indian, Steere's R.R., Early Baart, Indian Early, Indian D, Farmer's Friend, Hudson's R.R., King's Jubilee, Talavera de Belvue, Australian Talavera, Battlefield, Rattling Jack, Yandilla, White Tuscan, White Essex, Australian Wonder, Red Straw, White Lammas, White Fife, White Naples, Indian Fife, Indian Z, Indian F, Steinwedel, Fillbag, Zealand, Leak's R.R., Algerian, Selected Armstrong, 85 A1., B1., 84 BY., Yandilla Improved Indian, R., Aspen, Best Strain, The Blount, Allora Spring, Improved Allora Spring, Budd's Early, Gayndah, F1 (Japanese), Marshall's No. 3, and Marshall's No. 8. The nomenclature collection has been largely increased, and now numbers 520 varieties. Over 20 acres are sown with five varieties of barley and 5 acres of rye, and 2 acres of spring wheat for hay and thatch.

Other Field Crops.—Mangolds and carrots do well here, 3 acres were sown last August, and although the seed (owing to the absence of sufficient moisture) germinated badly, what did grow yielded heavily. Three sowings of maize were made (15 acres) that were quite a failure. Cow peas were only a partial success. The crop did very well until podding commenced, in spite of the dry weather, but the pods did not fill, consequently I do not expect even a quarter crop of seed, but a nice lot of dry fodder—about 6 or 7 tons. A few drills each of Jerusalem, Red Kafir, and White Kafir Corn, Planter's Friend, Sorghum, and Amber Cane, took the whole summer to mature, with the exception of the Jerusalem corn, which was fully a month earlier. The heads have only been gathered this month An acre of setaria was mown for hay.

Pumpkins.—Twenty varieties af this crop were grown, principally to determine the best general farm sorts to grow. As a result of my observations, I recommend the following as cattle pumpkins:—Calhoun, bearing four to six medium-sized, hard-skinned fruits, on a very small, compact, and sturdy vine, and the earliest of all; should be fed to animals early in autumn as it will not keep. The large Orange or Premium, a very heavy cropper, yielding as many as nine large fruits on a plant; bears well in dry weather when others will fail; best for whole raw feeding but will not keep over July. Mammoth Tower, a variety introduced by the Under Secretary for Agriculture, is a very large, thick-fleshed, deeply-ribbed oblong fruit, and a good keeper. Of eating varieties—the Crown, Button, and Ironbark have done the best. The value of mulching was here very evident, quite a common remark by visitors being, "How do you get such foliage and pumpkins without water?" (and the same with melons and squashes). The result of this crop is between 20 and 30 tons. Eight varieties each of rock and water melons were tried. The finest in every way of the former were Hackensack and Banquet; of the latter Cole's Early, Kobb's Gem, and Ironclad. Out of the ten squashes tried Little Gem, Delmonico, and Moore's Vegetable Cream are the best worth growing.

Lucerne.—Eight acres of this crop are well established. It had a long struggle, and only two light cuttings have yet been obtained. Another 6 acres have been laid down recently, and ground is now being prepared for more. A small plot of a variety from Samarkand (Central Asia) is being tried, and is at present looking well.

Onions.—Last winter several sowings of onions failed altogether; the seed did not germinate. Another trial is being made this season.

Potatoes.—The following varieties were planted last August, and are named in the order of ripening :—

	No.	Name.	Quantity Planted.	Size.	Yield.
			Lb.		Lb.
First Earlies...	1.	Danish Kidney ...	2	... Medium ...	11
	2.	Extra Early Vermont ...	2	... Large	21
	3.	Harbinger	2	... Medium ...	17¼
	4.	Flounder (Irish) ...	3	... Large	22½
Second Earlies	5.	Cambridge Kidney ...	4	... Medium ...	24½
	6.	Myatt's Prolific Ashleaf	2	... Small	6½
	7.	Breere's Peerless ...	4	... Medium to large	20½
	8.	Snowdrop	4	... Medium ...	30¾
	9.	Magnum Bonum ...	4	... Medium to large	32¼
Main Crop ...	10.	Imperator	4	... Very large ...	26
	11.	The Bruce	4	... Medium ...	28½
	12.	Bliss' Triumph	3	... Large	17
	13.	Freeman	3	... Small	¾
	14.	Snowflake	4	... Medium ...	4
	15.	Centennial	4	... Large	26¾
	16.	Satisfaction	4	... Medium large ...	20¾
	17.	Federation	3	... Medium ...	12½
	18.	Circular Head	4	... Medium ...	13½
	19.	Manhattan	4	... Small	12¼

Nos. 6, 13, and 19 were the quickest to succumb to the hot dry weather, and the most drought-resisting sorts were Nos. 2, 10, 15, and 17. All the above varieties were planted on a larger scale in February, results of which are not quite perfected yet, but will be available shortly. They have been grown on an easily worked but rather stiff loam, without the aid of any artificial means other than plenty of cultivating and horse-hoeing. I hope to be more successful with future plantings of sweet potatoes. The red Maltese variety has failed to produce tubers for two seasons; but a white sort, received from Mr. Quodling, of the Experiment Farm, Westbrook, has done moderately well.

Grasses, Etc.—Trial sowings of grasses, Italian and perennial rye, fescue, cocksfoot, and other fodder plants, including Sulla (*Hedysarum*) and Egyptian clover or "Barsin" (*Trifolium Alexandrinum*) have done well. Barsin, introduced by Mr. Finucane, is said to be the great winter fodder of Egypt, but last winter was too severe for a small plot I had growing here. I have great hopes of sulla becoming a very useful spring and early summer feeding crop. The farm horses were exceedingly fond of the little I had growing here last spring. Three varieties of saltbush were sown, out of which one only—Old Man (*Atriplex Nummularia*)—did really well Tagosasté, the so-called "tree lucerne" (*Cytissus triflorum*), has made very rapid growth, but is grown here more as a breakwind than a fodder.

Garden Crops.—All under this heading have been successfully grown, having been heavily mulched with refuse from old stack bottoms They include asparagus 2 varieties, artichokes 3, rhubarb 2, peas 12, beans 23, beets 3, swedes 6, white turnip 4, lentils 2, cauliflower 4, cabbage 4, cucumbers 3, capsicums and chillies 8, tomatoes 12, parsnip, salsafy, and salading, and a very interesting collection of novelties and vegetable curiosities.

Shade Trees and Plants.—In the nursery small quantities of the following trees, &c., have been raised from seeds and cuttings received from the Department of Agriculture, and those of my own collecting, viz.:—Camphors, pepperinas, phytolaccas, eucalyptus, pines, cypress, Lagerstrœmia, oaks, celtis, bunyas, willows (osiers), walnuts, almonds, pistachio nuts, hedge plants, roses, and many other garden, bush-house, and veranda plants. All the above will be planted out permanently from time to time. Over 100 ornamental and economic trees are at present well established in clumps, avenues, &c., which will serve as breakwinds and shade for stock in addition to beautifying the landscape.

The Orchard.—The fruit trees have done very well on the whole; the most robust growths being amongst the apricots, peaches, and some of the apples, plums, pears, olives, and figs. All these trees were pruned and dressed last winter by Messrs. A. H. Benson and Voller, and have decidedly shown the benefit of the treatment they received. The vineyard, taking it altogether, has been by no means a complete success. Individual plants have done well, but the majority of the cuttings put in dwindled and died away. I give as my reasons for this:—1st. The ground was rather too wet when subsoiled. 2nd. The cuttings when put in were weak and the buds were already started, and followed by a very dry time.

Improvements Suggested.—One of the greatest drawbacks to the many operations required to be perfected is the want of artificial means of applying water. This, however, to some extent has been modified by the erection of a hand pump at the creek, the addition of several iron tanks, and the excavation of an earth tank, 1½ chains long by ½-chain wide, in the grass paddock for watering stock. Two wells have been sunk, with the result that no water of any consequence has been obtained.

A fine piece of road has been formed in the lane, 8 chains long, with gravel obtained from a pit within the farm boundary, but a good deal more of this work is required. Twenty chains of open drain, running through a very bad alkali patch, has been further improved, and 30 chains of permanent fencing completed. Commodious men's quarters, an office in connection with the manager's residence, additional accommodation for horses, farm implements, machinery, storage for fodder, blacksmith's forge, and workshop, &c., have also been erected. The further requirements most urgently needed, besides "power" for lifting and serving an adequate supply of water (the same "power," if portable, might also do in place of horsework for the thresher, chaffcutter, grain-cracker, sawbench, and other machines) are a barn for stacking, threshing, and storing stud wheats and other experimental crops; a supply of bush or sawn timber for building stack bottoms: the lining of the present grainery to check the ravages of mice; also an up-to-date winnower.

Conclusion.—During the year the products of the farm have been largely represented at eight shows—viz., two in Brisbane, two in Warwick, and one each in Toowoomba and Allora. A very unique collection of the wheats, grown on the farm was mounted on suitably designed panels by Mr. W. Soutter, Inspector of State Farms, and forwarded to the departmental headquarters, and transmitted to London for exhibition at Earl's Court. A duplicate set was also mounted and retained by the Department for exhibition in the colony.

In concluding my Report, the following statement of distribution and sales tends to show the far-reaching influence these State farms are likely to exercise in the future:—There have been despatched 362 parcels of seed wheats and barleys to various agricultural districts of Queensland and other parts of Australasia, besides India, Argentina, Paraguay, &c.; and 70 parcels of other (small) seeds. These parcels consisted in some cases of a few packets for experimenting with, and in others of all sizes, some reaching over 100 bushels.

C. ROSS.

ANNUAL REPORT OF THE MANAGER OF THE STATE FARM, GINDIE.

Sir,—I have the honour to submit herewith a Report of the proceedings at the State Farm at Gindie since my appointment as manager, which began on 5th August, 1898.

Buildings.—Previous to my appointment the manager's cottage had been erected. This is a substantial building, containing six rooms with a semi-detached kitchen. A substantial ten-stall stable and machinery-shed have been erected under one roof, and are built of cypress pine and sawn hardwood, with iron roof. Since my appointment a part of the machinery-shed has been converted into a harness-room.

There has also been erected a substantial hayshed 60 feet by 40 feet, the posts of which are of cypress pine. The wallplates, tiebeams, rafters, battens, and collarties are of sawn hardwood. The roof is of 24-gauge iron. The plates are securely fastened to the posts by a 2 x 3 angle strap, which extends 15 inches down the post and the same distance along the tiebeam, and is securely fastened with seven-eighth bolts. The other buildings are a blacksmith's shop with hardwood frame, walls and roof of iron, and men's quarters built of sawn hardwood. This building is also roofed with 24-gauge iron.

A horseyard and small stockyard has been built of bloodwood posts 12 inches in diameter, 3 feet 6 inches in the ground, with round brigalow rails morticed 4 inches into the posts. It is capped with 6-inch ironbark caps and fitted with batten gates, making a substantial and handy yard.

Fencing.—There are about 18 miles erected, consisting of brigalow posts placed ½-chain apart, 2 feet 6 inches in the ground, and posts 6 inches in diameter. Straining-posts of ironbark or bloodwood are placed 5 chains apart and 3 feet in the ground, and stayed with ironbark or brigalow stays. Fifteen miles of this fence consists of a plain galvanised No. 8 wire top and bottom, with a middle wire of close-set barb with three Lochrin droppers to the ½ chain, and is strained up with patent strainers.

Two horse-paddocks have also been enclosed and subdivided. This fence, of which there is about 3 miles, is similar to the boundary fence, with the exception that it has two plain and two barbed wires.

Water Supply.—A well 30 feet deep has been sunk, in which a limited supply of water of excellent quality was obtained, but, as the quantity of water will be below the requirements of the farm, boring operations will be gone on with as soon as possible to endeavour to strike a heavier supply at a lower depth.

The area under cultivation and crops experimented with since my appointment on 5th August, 1898, are as under :—

Ten and a-half acres of maize were planted on 1st September. This crop was a failure owing to dry weather.

Panicum.—Six acres sown on 4th October, which failed owing to want of rain.

Cow Peas.—Three acres. This crop failed owing to the same cause.

A further planting of maize was made on 13th October, 30th December, and 24th January (about 21 acres in all). These three sowings have yielded a fair crop, which has just been harvested.

I may mention that a considerable quantity of this maize has been ordered for seed at a satisfactory price.

Millets.—Nine varieties were planted in October, all of which did well.

The amber cane and broom millet was an exceedingly fine crop. The seeds of these millets have been saved for next season's operations.

Lucerne.—A trial crop of 7 acres was sown on 10th February, but did not come up until 2nd March, at which time there was a sufficient fall of rain to germinate the seed. After it was well up it made remarkable growth. On 22nd April a cutting of about 5 tons was taken off, which I consider was very satisfactory.

Wheat.—I commenced to sow on 15th March, and continued to sow at intervals, as weather permitted, until June. There are 63 acres of wheat and barley planted. This includes 22 varieties of stud wheat. So far the wheat is looking as well as possible, especially about 30 acres of the earlier plots that were drilled in.

Acting on your instructions I made an exhibit at the Rockhampton Show, and, though the exhibits were not very numerous, they were of good quality, and excited a good deal of interest and favourable comment. In conclusion, I may state that during the last six months we have had a large number of visitors from all parts of the surrounding districts, and it is gratifying to know that they appear to take a keen interest in all the experiments that are being carried on here.

ROBERT JARROTT.

ANNUAL REPORT OF THE MANAGER OF THE STATE FARM, BIGGENDEN.

Dear Sir,—I have the honour to lay before you the following Report on the work of this recently established farm :—

The farm covers about 100 acres of suburban land, sloping gently in every direction, somewhat in the shape of the half of an eggshell cut lengthwise. The soil is sedimentary, passing from dark basaltic to sticky cement, and varies in thickness from 6 to 18 inches. Part of it rests on a good marly subsoil and part on sticky clay. In various places the solid rock emerged on the surface, and had to be blasted with dynamite before it could be made fit for the plough. It was thickly timbered with ironbark, bloodwood, Moreton Bay ash and blue gum. It is considered a fair average of the forest lands of this district, whilst the alluvial flats along the creeks

and the scrub lands of the neighbourhood are considered superior in many respects. The farm, which is nearly triangular in shape, is all fenced in by a substantial fence composed of five plain and one barbed wire, passed through strong ironbark posts 9 feet apart, with strong strainers every 5 chains. It is also divided into four paddocks by lighter fences composed of two plain and two barbed wires resting on posts half a chain apart, with three Lochrin droppers in each panel. This secures us a constant supply of fresh grass for the farm animals, and prevents the deterioration of the paddocks. In the cultivation paddock 22 acres have been cleared and stumped by contract at £5 per acre. The clearing was finished in December, 1898, but the breaking up, which was also done by contract, was finished only at the end of January last owing to protracted dry weather, which interfered considerably with the work. Eight acres are now being subsoiled, and will be ready for planting as an orchard and a vineyard this season, if I am supplied in time with suitable trees and vines.

Seven varieties of maize were tried, of which the Early Yellow Flint and the Golden King did best. This last variety seems to be well adapted for the soil and climate. Its well-shaped cobs and beautiful seeds attracted to a degree the attention of farmers and others visiting the farm. It is leafy and its stems juicy, consequently a good variety to grow for feeding green to stock and for ensilage purposes. It is undoubtedly a good cropper. From 6 acres of new not yet sweetened forest land we got a crop of fairly even and well-grown cobs estimated to produce from 60 to 80 bags.

Our 14 varieties of sorghums and millets all did well except the Yellow Millet, for which either the land was too new or the heat too trying. The Red and the White Kafir corns, the Early Orange cane, the Planters' Friend, &c., were amongst the best. So was also the broom millet, which grew here to great perfection, and an American variety of the amber cane (the Undendibule), which did as well here as last year at Westbrook, and promises to be a capital stand-by to dairymen in a great part of the colony.

The cow pea, of which we have five varieties, was a marked success, the black and clay-coloured being the best to plough in as green manure and to turn into chaff, whilst the large and the small white (Will o' the Wisp) are superior for culinary purposes. As they were sown just before the rainy season (last week in December) the crop of pods turned out to be much more even than when the seeds are sown in the early spring. The average was 20 bushels of seeds per acre. As the price now varies between 10s. and 15s. per bushel (a bushel = 36 lb.), it is not difficult to see what a profitable crop this will be to the farmer. For a long time yet the demand is likely to exceed the supply. The principal market is the North, where it is required to restore fertility to soils exhausted by sugar and banana growing. There the plant grows luxuriantly, and when ploughed in it gives to the soil an abundant and cheap supply of nitrogenous manure. But it is there difficult to save the seeds, which I am informed get often mouldy in the pod on account of the moist climate; and here lays now the opportunity for the farmer of South Queensland, especially west of the Range. Instead of giving free play to weeds, let him grow a crop of cow pea in rotation with his wheat crop. The cow pea will keep his land free from weeds, friable, and fertile, give him a remunerative money crop of beans, and an abundant supply of excellent chaff for his stock. Wherever tried the cow pea has entirely justified the sanguine expectations expressed on its merits in my article on the cow pea, published in the September number, 1897, of the *Queensland Agricultural Journal*, to which I refer those desirous of information on its value and cultivation.

Most of the seeds of the Curcubitaceæ family came, unfortunately, too late to be of any use for this season. Besides, some of the plants were badly attacked during the rainy season by a sort of oidium (the *Oidium crysophoides*). According to an interesting and exhaustive report sent to me on the subject by Mr. H. Tryon, the disease, when in its incipient stage, can be successfully checked by means similar to those in use against the grape vine oidium (*Oidium Tuckeri*), viz.—flower of sulphur, to which is added just before using 10 per cent. of finely-powdered bluestone (sulphate of copper). Mr. Tryon recommends also a solution of sulphide of potassium (1 oz. to $3\frac{1}{2}$ gallons[1], to which is added a little molasses to make it adhesive.

Notwithstanding that disease we had excellent specimens of table pumpkins such as buttons, crowns, ironbarks (not pure), and a large crop of mammoth cattle pumpkins, some turning the scale at nearly 100 lb., and measuring 7 feet in circumference. We had also in small quantities good specimens of rock melons, such as Perfected Delmonico, Schauzer's Russian, New Mammoth, Persian, &c. Of water melons we had fine specimens of the Cuban Queen, the Kobb's Gem, the Ice Cream, &c. Amongst the squashes and marrows the most resistant proved to be the Marblehead (called also Cocoanuts) the Berton Marrow, and a new variety which I imported a few years ago

from Europe. It is of a beautiful pearshaped form; is very hardy and prolific, has a delicate flesh surrounded by a hard leather-like rind, which makes it a good carrying and market variety. For the same reason it keeps well, remaining often good till the next season's crop. So far nobody could tell me its exact name. Out West where I have this last five or six years sold tons of it grown on my own farm, it is in great demand under the name of Tardent's Marrow. We have now here a good supply of seeds of it for distribution. It stands dry weather well.

Another plant of which we got already two crops is the Buckwheat. It did well here, and I have inquiries for it from various parts of the colony.

Amongst our twelve varieties of beans, which all did well, the following are the favourites:—Dwarf Lima, Sugar, Californian Tree Bean, the Mungo, White Advance, &c.

Peas, ten varieties, all doing well, the Little Advance being the earliest, and the Old Yorkshire New the surest cropper.

Of Swedes, turnips, beets, carrots, parsnips, lettuce, &c., we have numerous varieties, all doing well. The European varieties of spinach dry up and wither, whilst the New Zealand spinach seems to delight in heat like a Salamander in fire, and is to be recommended on account of its heat and drought resisting qualities. A few herbs all doing well.

Although sown as late as the 10th of February our twenty-two varieties of tomatoes are all doing well, showing how well this district is adapted for the profitable cultivation of that perfect esculent. The All-the-Year-Round, the Yellow and the Pink Peach, &c., attracted the attention as table varieties, whilst for size and weight the Golden Trophy, the Crimson Cushion, the Ponderosa, and especially the Democrat, were prominent. Some specimens of the Democrat weighed over 1 lb., and measured as much as 13 inches in circumference.

Of cabbages and other Brassicæ we have over twenty varieties growing. As I have so far used no manure whatever and no irrigation, the plants experimented with must take their chance and make the best of our virgin soil, and of our climate, supplemented only by careful cultivation. This results, of course, in many varieties being stunted and ill-grown, especially in this family, where a condition of success is to keep the plant constantly growing. But it illustrates only the better which are the hardy varieties suitable to grow where water is not available. In that respect our cabbage plot is a most interesting object lesson. The Improved St. John, the Cannon Ball, the Winningstead, the Succession, the Sweinfurt, and the Brunswick put all nice heads notwithstanding the adverse circumstances. So did also the Red Erfust, the Dwarf, Curled Savoy, and the Large Asiatic Cauliflower. A straggling Mammoth cattle cabbage reached 6 feet in diameter under similar circumstances.

We had also six varieties of sweet potatoes which did well although they were planted as late as January. The White Maltese remains the favourite market variety, while for delicacy of taste and savouriness, it is superseded by the newly-introduced Yellow Spanish, with its beautiful pinkish streaked flesh. The Vineless (*Batata ypomea*) is very good, too, but does not seem to be so far a profitable cropper.

Of our twenty-two varieties of English potato, the best results were obtained from the Early Vermont, the Blue Brownells, the Duke of Maloi Champion, and the Imperator. The Imperator is of a fine yellow colour, of beautiful shape, and firm texture. It is the richest of all potatoes in starch and other solid matters, and seems to be here, as well as in France and Switzerland, well adapted to grow on forest lands. I would advise our farmers to give it a trial on a small scale.

Of the six grasses we tried, the saltbush did not come up, perhaps on account of our soil being so different from its indigenous habitat, but we had good results from the White Dutch Clover, the Red Perennial Clover, the Mitchell Grass, and especially the *Paspalum dilatatum*, which promises to become an important fodder plant for the district. I anticipate that it will do as well here as in the South Coast district of New South Wales, where it yields up to 18 and 20 tons of greenstuff per acre. I respectfully recommend that for the ensuing year a plat be broken up and fenced in far away from the other cultivation, and that there careful comparative experiments be carried out with both indigenous and imported grasses, due care being taken not to introduce or spread any pest. Experiments should also be carried out there with plants likely to be of use in medicine and in the production of scents, &c.

There is on the farm a complete climatological station, with dry and wet bulb thermometers, maximum and minimum terrestrial and solar radiation thermometers, also earth tubes, 1, 2, 4, and 5 feet deep, and a Wragge's tropic rain-gauge. After a few years of careful observation we should be able to supply farmers with most complete data about the climate of this district and its relation to farming operations and crops.

Although dairying appears to me to have a great future in this district, we have so far no cattle and no pigs on the farm. There is, however, a growing desire amongst our farmers to see some scheme devised by means of which at least sires of draught horses, dairy cattle, and pigs could be kept on the farm.

We have also a hive of bees, kept merely for inoculating purposes, and to them we attribute to a large extent our good crop of pumpkins. At the same time they did remarkably well as honey-producers, showing thus how well the district is adapted for profitable bee-keeping. This is a branch of farming which is so far too much neglected by our farmers, but there might be a change ere long in that direction, as great interest is being taken in our pretty complete collection of bee-keeping appliances and in our modern method of managing bees.

I also respectfully suggest that the State farms be supplied with coloured plates of fungoid and other parasitic diseases of both animals and plants; also with standard books and periodicals on agriculture and sciences connected with it, as at present the managers who desire to keep themselves posted up in their profession have to provide those tools of the brain out of their already ultra modest salary. I respectfully submit that if the above suggestion were adopted the experiment farms would become in every district a rallying centre for farmers—a place where the accumulated knowledge of the world would be so to say focussed to hence irradiate again on the surrounding settlers for the greatest benefit of the whole community.

The example of the travelling dairies which have promoted the establishment of scientific dairying all over the colony and other necessary facts of more recent date, all tend to prove that, contrary to an erroneous opinion on the subject, the Queensland farmer is, taken as a whole, most eager for information on all matters connected with his calling.

In addition to the direct action exercised in the district, I have, according with your instructions, tried to contribute, as regularly as possible, articles to the *Queensland Agricultural Journal*. That excellent medium has kept me in contact with farmers from all parts of the colony, with whom I make it a duty and pleasure to correspond on all matters pertaining to agriculture. I had even, about those articles, letters from as far as Hamburg, in Germany, and from Russia, whence I had inquiries about the cow pea and—*mirabile dictu*—a demand for prickly-pear seeds!

HENRY A. TARDENT, Manager.

ANNUAL REPORT OF CHIEF INSPECTOR OF STOCK AND REGISTRAR OF BRANDS FOR 1898.

Sir,—I have the honour to submit the following report on this work of this branch of the Department for the year 1898.

DISEASES IN SHEEP ACTS.

The numbers of sheep in the colony as at 31st December last, adapted to the various pastoral districts of the colony from the returns under "*The Stock Returns Act of* 1893," with the increase or decrease in each district on the previous year are given in the following table:—

Districts.	1898.	1897.	Increase.	Decrease.
Burke	1,852,459	1,780,801	71,658	...
Burnett	30,232	31,913	...	1,681
Cook	511	408	103	...
Darling Downs	1,819,148	1,967,768	...	148,620
Gregory North	1,757,172	1,559,783	197,389	...
Gregory South	391,971	347,715	44,256	...
Kennedy	655,303	644,414	10,889	...
Leichhardt	307,863	314,230	...	6,367
Maranoa	1,779,764	1,772,810	6,954	...
Mitchell	5,927,038	6,120,624	...	193,586
Moreton	7,277	7,064	213	...
Port Curtis	11,669	21,352	...	9,683
Warrego	3,008,109	3,225,495	...	217,386
Wide Bay	4,092	3,506	586	...
Total	17,552,608	17,797,883	332,048	577,323

Showing a decrease of 245,275, equal to 1·3 per cent. Out of the total number appearing in the decrease column, 60 per cent. may safely be attributed to drought. The increases in the Burke and Gregory North districts are largely due to the stocking up of grazing farms, and to starving sheep travelling for food; and this accounts to a certain extent for the decreases in the Mitchell and Warrego districts, the flocks in which were drawn upon for grazing farms in the North. The decrease in sheep during the two years amounted to 2,041,088.

The numbers of sheep imported from the southern colonies were—

	No.	Value.
By sea	10,845 ...	£43,551
By the borders	147,818 ...	62,967
	158,763 ...	£106,518

The numbers of sheep exported during the year were—

	No.	Value.
By sea	235 ...	£108
By the borders	641,177 ...	161,590
	641,412 ...	£161,698

The numbers of sheep put through the various meatworks were—

Frozen—		
Lake's Creek		26,225
Redbank		22,049
Geddes, Birt, and Co.		12,649
Eagle Farm		1,297
		62,220
Canned—		
Lake's Creek		52,149
Queensport		49,572
Eagle Farm		8,413
		110,134
Extract—		
Longreach		55,706
Broadsound		1,170
		56,876
Boiled—		
Westbourne	27,033	
Torrens Creek	16,820	
Lake's Creek	13,804	
Blythdale	3,481	
Selma	3,100	
Oakey Creek	2,306	
Broadsound	1,758	
Raceview	556	
Redbank	23	
Eagle Farm	12	
		68,893
Total		298,123
Exported as above		641,177
Total output		939,300

No disease of any description has been reported in the sheep stock of the colony. The losses have been solely due to protracted drought, either from deaths or absence of increase by lambs.

The clip was somewhat light but clean; and the wool sales have shown that the general clip of Queensland held its own against the clips of other colonies.

DISEASES IN STOCK ACTS.

The numbers of cattle at 31st December last, arranged from the returns under "*The Stock Returns Act of* 1893," adapted to the pastoral districts are given in the following table:—

Districts.	1898.	1897.	Increase.	Decrease.
Burke	985,699	1,104,215	...	118,516
Burnett	448,797	440,301	8,496	...
Cook	236,062	259,804	...	23,742
Darling Downs	280,406	294,256	...	13,850
Gregory North	559,684	589,752	...	30,068
Gregory South	253,896	304,445	...	50,549
Kennedy	662,365	752,417	...	90,052
Leichhardt	679,435	726,233	...	46,798
Maranoa	275,300	275,844	...	544
Mitchell	168,610	167,894	716	...
Moreton	360,401	344,536	15,865	...
Port Curtis	290,616	354,014	...	63,398
Warrego	237,477	346,065	...	108,588
Wide Bay	132,544	129,237	3,307	...
Total	5,571,292	6,089,013	28,384	546,105

This shows a decrease of 517,721, equal to 8·5 per cent. It will be seen that in only four districts have there been small increases. The large decrease must, in a measure, be attributed to drought, ticks, and the small increase in calves in tick-infested districts. The decrease in the tick-infested districts amounts to 295,708, but it has to be remembered that in three of those districts—Burke, Kennedy, and Port Curtis—the herds were very heavily drawn upon for supplies for the various meat companies during the year.

The numbers of cattle imported during the year were:—

	No.	Value.
By sea	13	... £701
By the borders	13,833	... 40,884
	13,846	... 41,585

The numbers of cattle exported during the year were—

	No.	Value.
By sea	*Nil.*	... *Nil.*
By the borders	194,648	... £615,217

The numbers operated on at the various meat establishments were—

Frozen—

Eagle Farm	37,786	
Bowen	21,635	
Ross River	17,122	
Geddes, Birt, and Co.	12,302	
Lake's Creek	10,853	
Gladstone	8,945	
Redbank	4,934	
		113,577

Canned—

Lake's Creek	35,383	
Queensport	20,123	
Ross River	7,920	
Gladstone	6,465	
Oakey Creek	2,142	
Eagle Farm	1,804	
		73,837

Extracted—			
Alligator Creek	54,494		
Mackay	20,116		
Burdekin	18,878		
Broadsound	12,796		
Bowen	11,818		
Longreach	10,009		
Torrens Creek	8,723		
Ramornie	3,476		
Gavial Park	3,107		
Ross River	2,209		
Oakey Creek	23		
		145,649	
Boiled—			
Gladstone	4,176		
Lake's Creek	1,910		
Raceview	1,550		
Selma	1,190		
Ross River	954		
Blythdale	816		
Bowen	543		
Torrens Creek	541		
Isbell, J. H. (Bowen)	320		
Gavial Park	288		
Broadsound	276		
Redbank	36		
Oakey Creek	28		
Eagle Farm	20		
		12,648	
Total		345,711	
Exported during the year ...		194,648	
Total output		540,359	

Pleuro-pneumonia.—This disease has been somewhat more prevalent than of late years, particularly among travelling cattle, but the death rate from the disease is now small.

Tuberculosis.—Stockowners are now fully alive to the value of tuberculin as a diagnostic of this widely spread disease, and applications for the test have been very numerous at the Stock Institute during the year. Mr. Pound deals with this question in his report. But it may be stated, as evidence of the salubrity of the climate of Western Queensland, that the statistics of the meat-curing establishments show that very few cases of tuberculosis are found in cattle from those districts.

Symptomatic Anthrax (Blackleg). - Cases of this disease continue to occur annually in the coast districts. The press of work in connection with the visitation of the tick has delayed the intended experiments to test the value of Arloing's method of securing immunity of the disease, reported to have been fairly effective in France.

Zamia Paralysis, popularly (but improperly) termed "Rickets."—Dr. Hunt, who undertook an inquiry into this diseased condition of cattle, which has caused and is still occasioning so many losses over a very large area of Central and Northern coastal districts, furnishes a progress report on the subject, given as an Appendix, which will be read with interest.

Tick or Texas Fever.—Both Mr. Pound and Dr. Hunt's reports on this subject appear in the Appendices. One of the most interesting problems yet to be solved in connection with the cattle ticks is as to how and when the ticks

acquire their disease-producing powers ; and whether they would permanently remain non-pathogenic if conditions prevented their getting in contact with cattle suffering from or that had passed through the fever, acquired either naturally or by inoculation. The continued absence of fever in the Boolburra district and the recent appearance of tick fever in a herd in the Muttaburra district after the introduction of inoculated cattle into the herd seem an evidence of the contention that ticks remain non-pathogenic unless the female tick, previous to oviposition, had been in contact with cattle suffering from, or that had recovered from, the fever contracted either naturally or imparted by the inoculation needle. The case of the Boolburra district has shown that grossly tick-infested cattle may remain free from the fever for a period of three years, while in the case of a portion of a herd in Muttaburra district, above referred to, in which ticks had been present since early in 1896, tick fever only recently appeared in a paddock closely following the inoculation of a few cattle in that paddock. The question, however, appears to have been finally set at rest by two experiments conducted by Dr. Hunt and Mr. Pound in favour of the contention that the ticks contract the micro-organism of the fever from inoculated cattle—the practical lesson from which is that if inoculation is adopted the whole herd must be so treated.

The Department had great difficulty in inducing owners in the South coastal districts to adopt inoculation, and it was not until permission had been given to carry out the operation free of charge by employees of the Department that it was generally adopted. The evidences of the efficacy of inoculation when the animals have reacted have been so many and so convincing that it must now be deemed to have completely passed out of the experimental stage.

In this connection, it is due to Mr. A. W. Barnes, veterinary surgeon, Rockhampton, to state that he was the first to demonstrate the fact that blood for inoculation can be carried long distances ; and this discovery, slight as it may appear, has greatly facilitated the work of inoculation, dispensing with the necessity of transferring calves to set up fresh centres of blood.

It is now clear that in certain localities cattle succumb to gross tick infection, even after having successfully passed through the inoculation fever, dying from sheer inanition, the result of anæmia. In such cases dipping, when resorted to, has unquestionably saved the lives of the cattle ; and if dipped at short intervals, so as to prevent the full development of the female ticks, gross infestation will be prevented, and the pest minimised to a considerable extent. Unfortunately, although very many dips have been, and are now being, tested, both by Mr. Pound and Dr. Hunt, no dip has yet been discovered that will completely destroy all ticks without at the same time occasioning great injury to the cattle. The latest experiment with such a dip has resulted in the death of 20 per cent. of the cattle immersed in it. In this, we are only repeating the experience of America. However, a fairly effective dip is that known as Christian's, the ingredients of which consist of :—

23 lb. soda ash
8 lb. arsenic
7½ gallons Stockholm tar, to
400 gallons of water.

Mr. R. S Archer, of Gracemere, has found a dip composed of the following medicaments to be effective in so far as it cleanses the cattle, for the time being, of most of the ticks:—

1½ lb. arsenic
3 lb. soda
3 lb. soap, to
100 gallons of water.

Mr. Christian estimates his dip to cost about ¼d. per head for large numbers ; and Mr. Archer estimates the cost of his specific at about 1s. per 50 head. Neither of these dips, however, prevent the cattle from reinfestation.

It has, unfortunately, happened that the east and west tick line, intended to prevent the spread of ticks to Southern Queensland, has been directly responsible for the extension of the ticks southward over a much larger area than would otherwise have been the case. By depriving cattleowners immediately north of the line of access to Southern markets, thereby compelling them to avail themselves of a market at the Northern meat establishments, cattle from mobs so travelled have accidentally been dropped on the journey in tick-infested country; and following their usual instinct have made their way back to their former beats,and in this way the pest has been taken many miles southward in advance of the previously infested country.

It is also matter for regret that the large expenditure incurred in maintaining an extra staff of inspectors, in addition to a number of patrols on the main roads and routes, has not had the effect of preventing the progress of the pest. At most, they have only been able to temporarily check the advance of the ticks, and it is now evident that nothing short of complete prohibition will check its progress on the coast; and that would practically be impossible, so far as horse traffic is concerned, in the absence of substantial fencing, and would mean total paralysis of commerce in tick-infested districts. So far, however, the staff has been able to maintain a pretty rigid barrier to a westward extension of the pest.

It is now evident that the services of inspectors in the centres of infested districts are of no further use in connection with the tick trouble; and it has been decided to remove those, and rearrange the staff so as to devote special energies to the circumference instead of the centre of tick-infested areas.

It may not be considered out of place for me to here refer to the fact that we are battling with a disease and state of things which did not originate in this colony; and that Queensland has had to fight the disease single-handed at great cost to the Government and very severe loss to the cattleowners through interference with their legitimate markets. Especially is this felt where severe restrictions have been placed on the movement of our stock by the Government of the colony from which the disease and ticks were extended to this colony.

The total outlay by this Government in connection with the tick trouble has up to date been £44,017 1s. 4d., and the details of which are as follow:—

Salaries of Inspectors, Patrols, Assistants to Experiments, &c.			£21,846 18 11
Tanks, dips, yards, &c. ...	£4,076 17 6		
Expended in oils	4,967 0 1		
		9,043 17 7	
Stock Board		416 17 0	
Dr. Hunt and Mr. Collins, expenses to America		1,541 11 0	
Dr. Hunt's experiments to date		8,129 5 2	
Moiety of Stock Institute outlay		3,038 11 8	
			£44,017 1 4

HORSES.

The number of horses in the colony, as at 31st December, was 480,469, distributed into the various pastoral districts as under:—

Burke	41,893	Leichhardt	44,836
Burnett	27,471	Maranoa	25,322
Cook	25,878	Mitchell	32,140
Darling Downs ...	51,089	Moreton	62,217
Gregory North ...	28,599	Port Curtis	26,892
Gregory South ...	9,607	Warrego	23,284
Kennedy	63,090	Wide Bay	18,151

The number at the end of 1897 was 479,282, and thus there has been an increase on the year of 1,189, or 0·25 per cent.

BRANDS ACT.

The number of brands registered during 1898 was 818, and the total number up to the 31st December was 39,193. Of this number, 6,716 have changed ownership by transfer; and a large number have been cancelled by death of owners and other causes. Power has been taken in the Act of last session to reissue cancelled brands after the expiry of five years from the date of cancellation.

The passage of an amending Act last session provides for the registration of cheek brands so as to avoid the deterioration of hides occasioned by the use of our present three-piece brands. That Act provides that cheek brands consisting either of two letters or symbols or devices may be used, but only in conjunction with a system of ear marking representing two letters of the alphabet and a numeral corresponding with the fire brand. The system of earmarks, as arranged with the assistance of the framer of the Act is ingenious, and, if generally adopted, there would be no difficulty in administering the Act; but a large proportion of those who have already signified a desire to adopt symbol brands have expressed a very decided objection to the use of the earmarks on the plea that the system is too complicated to be workable in ordinary bush herds, and will retain their present distinctive marks instead, which the saving clause of the Act will permit them to do. Under the principal Act a brand is *primâ facie* evidence of ownership for the purpose of actions and prosecutions under the Act; but under the amending Act cheek or symbol brands will not afford *primâ facie* evidence except on horses, unless where they are used in conjunction with the prescribed earmarks. Section 14 provides that any owner may use a registered earmark or a registered cheek brand separately, so that neither one nor other of these by itself will be *primâ facie* evidence. This proviso is, therefore, subversive of one of the most valuable principles underlying the Brands Act, and can only be rectified by the passage of an amendment providing that cheek brands be made *primâ facie* evidence of ownership of the brand and of the stock on which it has been imprinted.

A mode of imprinting brands by means of a chemical fluid known as Gibson's patent was introduced here in February last by Mr. J. G. Ward, of New Zealand, and for which it is claimed that it removes the hair without deteriorating the hide. If this should prove the success claimed for it, the use of symbol or cheek brands will be rendered unnecessary, as cattle-owners, without any exception, would prefer to continue the use of their present brands, provided they did not injure the hides. I submitted this branding liquid to a severe test on some cattle in the experimental paddock, Indooroopilly, in February, and the results seem most promising. The brand is imprinted by the destruction of the hair, so that when healed the impression is plainer than even the fire brand. It is my intention to slaughter one of the animals branded and have the hide tanned, so as to ascertain the effect of the brand on the leather, and will submit a special report on the matter.

It is to be regretted that the arduous duties devolving on the inspectors in connection with the restrictions imposed on travelling stock in consequence of the ticks, have prevented a vigorous patrol under the Brands Act; and, taking advantage of this, many irregularities have taken place. As the work under the Diseases in Stock Act has eased off, inspectors have had more time to devote to the duties under the Brands Act, with the result that many glaring breaches of the Act have been punished by the infliction of heavy penalties.

"*THE MARSUPIAL BOARDS ACT*, 1897."

Under this Act the financial year having been made to terminate on the 30th June in each year, instead of 31st December, as was the case under the former Act, only six months' work is reviewed in this report. Excellent progress has, however, been made, and, in spite of the fact that little or no work was done by several of the Boards consequent upon alterations of the boundaries of the districts, the figures for the half-year bear good comparison with the previous return, which was a year's work.

The Warrego Board again takes first place, showing a total of 183,357 scalps destroyed from January to June, 1898.

With the new Act, the minimum rate of bonus on kangaroo scalps has been fixed at 6d.; and the maximum on dingo scalps has been raised from 5s. to 10s. In view, however, of the high prices obtained for the skins of the former, several Boards have recommended that should the Act, which expires on the 1st January, 1900, be re-enacted, the bonus on kangaroo scalps be reduced.

A statement of each Board's operations is appended hereto :—

STATEMENT OF OPERATIONS for the HALF-YEAR ending 30th June, 1898.

Board.	Scalps Destroyed.				Total.
	Kangaroo and Wallaroo.	Wallaby.	Paddymelon, Bandicoot, and Kangaroo Rat.	Dingo.	
Aramac	13,465	1,433	75	76	15,049
Barcoo	43,888	27,728	192	623	72,431
Belyando	8,661	1,514	...	...	10,175
Booringa	4,238	31,573	2,130	337	38,278
Boulia	73	...	...	446	519
Bowen	3,054	1,180	42	202	4,478
Bulloo	17,940	735	6	723	19,404
Bungil	98	20,597	218	287	21,200
Burnett	1,704	9,191	128	664	11,687
Camooweal	27	...	...	81	108
Clermont	...	2,837	...	...	2,837
Cloncurry	105	...	1	265	371
Condamine	...	...	...	...	..
Dalrymple	1,529	2,299	7	105	3,940
Darling Downs	...	107	212	18	337
Dawson	926	7,747	106	..	8,779
Diamantina	...	..	...	269	269
Gogango	809	6,416	396	417	8,038
Gregory	11,205	123	3	23	11,354
Hughenden	5,360	59	66	94	5,579
Leichhardt East	936	2,560	11	...	3,507
Leichhardt South	3,753	22,397	1,443	1,230	28,823
Mitchell West	52,180	298	2	...	52,480
Paroo	46,141	...	514	237	46,892
St. George	3,713	11,833	193	1,063	16,802
Waggamba	1,350	11,634	31	385	13,400
Warrego	50,383	130,133	247	2,594	183,357
Western Downs	...	...	...	...	...
West Moreton	322	5,630	482	117	6,551
Windorah	18,303	54	...	834	19,191
Total	290,163	298,078	6,505	11,090	605,836

"*THE LIVE STOCK AND MEAT EXPORT ACT OF* 1895."

Appended are the reports of the various Veterinary Inspectors on the working of this Act. It has been asserted by some that veterinary certificates given for meat exported are valueless. An instance occurred during the year to show that the certificates are of commercial value, and that the usual advance on meat consigned to a foreign market was refused without the attachment of the veterinary certificate to the consignment note. The Act, as a whole, has been self-supporting; but it is found that the fees received from the larger companies have had to be drawn upon to make up the shortage in fees of the smaller ones. Further experience in the working of the Act will enable us to adopt a system of fees which shall be more equitable.

I have, &c.,

P. R. GORDON, Chief Inspector of Stock.

APPENDICES.

REPORT OF STAFF INSPECTOR.

Having now visited almost every officer on the staff, and inspected the work performed by each, I have the honour to submit the following general report:—

Diseases in Stock Act.

Inspectors in coastal districts have experienced the greatest difficulty in protecting small areas of clean country without imposing harassing restrictions on the movements of stock. Especially has this been the case in the closely settled districts of East and West Moreton and Rockhampton. The difficulty has been accentuated by the unwillingness of owners to admit that their holdings are infested. It is questionable whether small areas of country surrounded by ticks should not be assumed to be infested without actually finding ticks upon them.

Much valuable aid has been rendered to owners in the form of practical instruction in inoculation by members of the staff.

The attempt to prevent the spread of ticks by the employment of stationary guards has proved a failure. Unless a very large number of men could be employed both day and night, it must be impossible to control the movement of horses in actual work by this method.

An immense amount of work has been caused by enforcing the smearing and dipping of horses leaving infested for clean areas. Smearing has been proved quite useless even when most carefully performed, and unless horses are trucked or driven to clean country immediately after immersion, it seems doubtful whether dipping has much practical value.

West and south of the quarantine line the inspection of stock has been well carried out, and the system of compulsory notice of intention to travel has not only delayed the spread of the ticks, but has proved a valuable check on stock stealing.

Brands Act.

The pressure of work under the Diseases in Stock Act has prevented inspectors from performing systematic patrol under the Brands Act, and a certain laxity has resulted.

To this state of things the stringency of the conditions under which stock from clean country are admitted to New South Wales has materially contributed since inspectors are compelled to devote almost their whole time to the inspection of cattle destined for that colony.

The re-arrangement of districts will to some extent prove a remedy.

The use of pliers for earmarking cattle is fast becoming general, as it is found that marks so made have a direct value as evidence of ownership.

Diseases in Sheep Act.

Practically there is no "disease" as defined by the Act in Queensland; and the duties of inspectors are confined to regulating the branding, marking, and travelling of sheep—duties which have on the whole been satisfactorily performed.

F. H. SHEPHERD, Staff Inspector.

REPORT OF THE DIRECTOR OF THE STOCK INSTITUTE.

References to Correspondence.

The inquiries and replies upon various subjects appertaining to stock diseases and other matters of importance have increased during the past year in a most significant manner.

I find the number of recorded references made to this Institute for advice upon such subjects as pleuro-pneumonia, tuberculosis, the tuberculin test, tick fever, specifics for dipping cattle for ticks, &c., &c., are as follows:—

Inward, general	1,483
Inward, pleuro-pneumonia	451
Total	1,934
Outward, general, including pleuro	1,616

There has been a marked increase of foreign correspondence, more particularly with America, where the scientists attached to the various agricultural colleges and research institutions in the United States, also numbers of veterinary practitioners, stock-raisers, and ranch-holders in Texas, Kansas, Missouri, Louisiana, Carolina, and California have made inquiries relating to details of the "Method of Preventive Inoculation for Tick Fever," and information on the practical working of the method in Queensland; also numerous inquiries asking for special information *re* the inoculation of stud and herd bulls and dairy cattle. The requests in each case have been fully complied with, and in return I have received periodically the official reports relating to experiments in connection with inoculation and dipping in the Southern States; also every week several of the principal Texas Stock Journals, all of which contain much valuable information on Texas fever.

Lectures, Addresses, and Demonstrations.

Since my last Annual Report I have kept up the work of delivering lectures and addresses on Tick Fever and its prevention, and also upon subjects appertaining to diseases in stock.

Practical demonstrations on inoculation and lectures have been given at the following places:—Gympie, Kilkivan, Curra, Gin Gin, Bundaberg, Nanango, Esk, Bulimba, Coorparoo, Ipswich, Toowoomba, Warwick, Childers, Tairo, Boonah, Nundah, Sandgate, Oxley, Burpengary, Beenleigh, Gatton, Corinda, Toolburra, &c.

At present I am engaged in preparing a unique set of lantern photographs illustrating as completely as possible the whole subject of tuberculosis in the various domesticated animals.

These slides I propose to use in connection with lectures on "Tuberculosis and the Tuberculin Test," which, in my opinion, is of far greater importance to stockowners and the public generally than the subject of "Ticks and Tick Fever."

Pathological and General Specimens Received for Examination.

Not a single day passes without one or more pathological and other specimens being submitted to this Institute for examination and report.

During the past twelve months, upwards of 400 specimens have been received. The results of the examination, with special recommendations to the sender, have, in every instance, been forwarded with as little delay as possible.

The specimens submitted comprised, as usual, a large number of different specimens of ticks; also various internal and external parasites, such as varieties of Acari, Pediculide, Diptera, Taenia, Nematodes, Echinococci, &c, and various morbid growths, including Sarcoma, Carcinoma, Actinomycosis, Tuberculosis, Spiropteric Tumours, &c.

The laboratory and its appliances have been also freely used by numerous medical practitioners, who have submitted specimens from doubtful cases of tetanus, diphtheria, erysipelas, septicæma, tuberculosis, and various specimens of malignant growths.

In addition to the above, I have been requested by the Home Secretary's Department to make a bacteriological examination and report on all cases of suspected leprosy.

Pleuro-pneumonia and the Supply of Departmental Lymph.

Although no very serious outbreak of this disease has occurred during the past year, hardly a week passes, more especially during and just after the rainy season, but what some typical isolated cases are brought under notice, and these are principally confined to the eastern side of the coastal ranges.

The only explanation that can be offered why epidemics of this disease do not occur now, or even why pleuro-pneumonia does not increase, is on account of the unmistakable efficacy of Willem's method of preventive inoculation.

Supply of Pleuro-pneumonia Virus.—A most important branch of work in connection with this Institute is the supply of pleuro-pneumonia virus, which, as I stated in a previous Report, does not leave the laboratory unless guaranteed (as far as crucial examinations by modern bacteriological appliances will prove) free from all traces of tubercular taint; moreover, no virus is despatched unless it can be used within twenty-one days after being taken from the animal. Last year, I mentioned, was a

record for the supply of pleuro virus, viz.:—over 54,000 head, but this year the demand has been still greater, and is steadily increasing. During the past twelve months virus has been supplied, in accordance with applications received, to inoculate upwards of 120,000 head of cattle in various parts of this and the neighbouring colonies, which is more than double the quantity supplied last year, while in New South Wales alone the supply was more than three times as great as last year.

It is highly satisfactory and should be of special interest to stockowners to know that the whole of this virus has been obtained from natural cases of pleuro-pneumonia.

TABLE SHOWING the NUMBER of APPLICATIONS and the QUANTITY of VIRUS SUPPLIED during the Last TWELVE MONTHS.

Months.	Applications.	Quantity (No. of Cattle).
1898.		
June	21	7,830
July	11	5,950
August	9	6,780
September	14	4,700
October	13	8,010
November	26	17,500
December	18	9,600
1899.		
January	20	7,000
February	22	11,450
March	28	12,230
April	33	20,330
May	22	9,500
Total	237	120,880

The above quantity of virus was distributed in the various colonies as follows :—

	Head.
Queensland, virus to inoculate	97,880
New South Wales, virus to inoculate	20,730
South Australia, virus to inoculate	2,220
Western Australia, virus to inoculate...	50
Total	120,880

The above figures are conclusive evidence that the number of persons who prefer to use the untested virus, as collected by themselves, must be getting less every day; consequently, if the supply of departmental virus continues to increase in the same ratio as above recorded, there should be a noticeable diminution in the number of cattle, more especially bullocks, condemned for tuberculosis at the various meat export works and local slaughter yards. Stockowners and the public generally will admit that work of this description must very materially assist in checking the dissemination of tuberculosis.

TICK FEVER AND PROTECTIVE INOCULATION.

With the steady advance of the ticks into fresh country, the year has not been allowed to pass without losses from tick fever occurring amongst the infested cattle. In the majority of cases, the deaths were among the uninoculated cattle, while, in exceptional instances, mortality has taken place amongst cattle presumably protected by means of inoculation.

With reference to deaths among inoculated cattle, in many instances the animals were not inoculated until the fever was well established in the herd; while in others, there was not sufficient trouble and energy bestowed in proving, in the first instance, whether the blood possessed its true protective properties; in other words, the official instructions have not been carefully observed, and there has been also a lack in the use of the veterinary clinical thermometer.

Protective inoculation for tick fever (although a very simple process) should be carried out in a thoroughly systematic manner, in accordance with the printed instructions, otherwise failure will ensue.

It is a significant fact that many thousands of cattle have travelled from the permanently tick-infested districts in North Queensland to the meatworks at Bowen and Townsville, without apparent losses, while among cattle from clean districts, after travelling over infested country, the mortality has in some cases been exceptionally heavy. This goes to prove that in the permanently tick-infested country the cattle are more or less immune, while in the clean districts, which may be congenial or otherwise to tick life, the cattle should be protectively inoculated if they have to travel into the fever-producing country.

The practical value of protective inoculation for tick fever has long passed its experimental stage. Outside the official investigations the process has been proved by stockowners to be a success.

No better proof of this need be cited than the fact that there has been and still is a strong demand by the stockbreeders in Northern tick-infested districts for inoculated bulls; also from the dairy farmers at Rockhampton, Mackay, Bowen, Townsville, and as far north as Thursday Island, there has been a demand for pure-bred Jerseys and Ayrshires, and in all instances the purchaser stipulated that he must have a guarantee that the animals have been successfully inoculated before being shipped from Brisbane.

Supply of Immune Blood for General Inoculation Purposes.—With a very few exceptions all the blood supplied to stockbreeders, grazing and dairy farmers, and others, from the Stock Institute has been taken from the original Inkermann steer or other steers and heifers inoculated with his blood, either directly or indirectly, up to the twenty-third generation, the exceptions being two naturally immune experimental animals, viz., a heifer from Rockhampton and a cow from Mackay.

No blood is collected and used unless from animals that have passed the tuberculin test.

At the present time, at the Indooroopilly Experiment Station, there are 38 immune steers and heifers from which blood is continually being drawn.

During the last thirteen months 28 of these animals have supplied over 6,000 oz. (*i.e.*, 37½ gallons) of blood, which is sufficient to inoculate 30,000 head of cattle.

Careful records are kept as to the exact amount of blood drawn from each animal at each operation, to whom it is supplied, how many animals (what kind and condition) are inoculated, and finally, as far as practicable, the results obtained, the whole forming a valuable volume of information.

In going over these records, I find the following:—

Inkermann steer ...	...	has supplied	420	oz.	of blood.	
No. 7 Rathdowney steer	,,	,,	400	,,	,,	
No. 1 ,,	,,	,,	,,	370	,,	,,
No. 7 Bally heifer ...		,,	,,	220	,,	,,

The largest quantity of blood drawn at one time from any one animal was 120 oz., which was from Rathdowney steer No 1, but at this time the animal was in excellent condition. This large quantity of blood was used for inoculating some 600 head of cattle, and in all instances where temperatures were recorded, a pronounced reaction was noticeable. It may be of interest to stockowners to know that another lot of blood taken from the same animal a few weeks later, also brought about the desired result.

The above was simply an experiment, but it is inadvisable to take more than 60 oz. of blood at one operation, after which the animal should have at least three weeks' rest before another supply of blood is taken.

Whenever any new system is introduced for the prevention of disease, either in man or the lower animals, no matter what success attends its use, there is always the usual army of opponents, who by their letters and actions do a vast amount of good in stimulating those engaged in scientific research, to leave no stone unturned in prosecuting their investigations.

In connection with preventive inoculation for tick fever, the opposition to the system usually comes from persons who have no experience, or those whose results during their primary endeavours to adopt the method have been disastrous through not carefully observing the instructions for the successful working of the method. It is, however, gratifying to know that numbers of stockowners, who for some time were opposed to the system of preventive inoculation being brought into general

practice, are now among its most ardent supporters. The value of inoculation is being more and more appreciated, as shown in the following table, giving only a few of the many who have made preventive inoculation for tick fever a success during the past twelve months :—

Name.	Address.	Number of Cattle.	Percentage of Deaths.
H. J. Bryant	Baffle Creek, Rosedale ...	8,000	2·5
F. Gostling	Gin Gin	6,000	5
H. Mullett	Monduran	6,000	3
Geo. Mant	Gigoomgan, Tiaro ...	4,466	1
R. Briggs	Tenningering, Mount Perry	4,350	3
D'Arcy and Skyring ...	Bundaberg	4,032	2
K. S. Peile	Coonambula, Gayndah ...	3,500	1
E. K. Tidswell	Walla, Gin Gin	3,500	2
W. Blomfield	Miriam Vale	2,000	2
W. Elliott	Yenda, Mount Perry ...	1,600	3
C. W. Sabine	Jimboomba	1,269	2
J. Hodgson	Knapp's Creek, Beaudesert	900	2
Farmers' Association ...	Gooburrum District ...	900	1
H. S. Bere	Southport	700	2
J. Collman	Eight-mile Plains ...	600	1·5
J. Gibson	Bingera and Thornhill ...	2,109	2
W. H. G. Marshall	Grampian Hills, Purga ...	370	3
E. Harding	Ipswich	1,000	0·5
J. R. S. McLellan	St. Lawrence	330	1
F. S. Reile	Cania	1,100	2
G. Linley	Curra	2,500	1
F. C. Shaw	Brisbane	4,720	0·5
A. Laver	Rocklea	3,018	0·5
C. C. Pickering	Brisbane	3,000	1
		65,964	

Twenty-seven thousand of the above cattle have been tick-infested (in some instances grossly) more or less since they were inoculated ; further, in many of the tick-infested districts numbers of unprotected cattle have died from acute tick fever, while it has been an exceptionally rare occurrence for animals after they have completely recovered from the reaction fever produced by inoculation to succumb to the effects of tick fever naturally contracted.

Of over 30,000 head of mixed cattle operated on by trained officers of the Stock Institute, the total losses from the induced fever were considerably under 1 per cent., notwithstanding the frequent disadvantages under which the operators laboured.

This result, as I have previously stated, is not altogether due to the skill of the operator or to the antiseptic condition of the instruments employed, but to the fact that the owners of the cattle have paid special attention in accepting the advice and following closely the instructions of the officials.

In November last, Dr. Tidswell and Veterinary-Surgeon Stewart, of the Board of Health and Stock Department, respectively, of New South Wales, paid a visit to the laboratory, where they devoted some time to gaining information on the nature of the various pathological specimens from cases of tick fever and the collection of ticks from cattle and other animals, illustrating the complete life history of the different species.

I placed before these gentlemen all my note-books containing the results of exhaustive experiments relating to ticks, tick fever, and preventive inoculation, and explained the whole details of the improved inoculating apparatus, and how the process of inoculation was conducted on a large scale with bush cattle

Mr. Stewart accompanied me on several occasions to Indooroopilly Experiment Station, where I gave him practical demonstrations on the method of drawing and defibrinating the immune blood and its subsequent injection into animals to be protected.

From Brisbane Mr. Stewart proceeded to the Tweed River district, where I supplied him with a quantity of tuberculin for testing calves which were to be inoculated for supplying blood for general inoculation purposes.

The first supply of blood I forwarded to Mr. Stewart was taken from No. 7 Rathdowney steer, which was second remove from the original Inkermann steer, and on the 1st December I forwarded a further supply taken from No. 1 Rathdowney steer. From information received I understand that he has now formed several centres for the distribution of immune blood on the Tweed and Clarence Rivers, having inoculated over 1,000 cattle.

In accordance with instructions, I forwarded Dr Tidswell (Government Bacteriologist, Sydney) a quantity of immune blood taken from No. 9 Rathdowney, which was the second remove from the original Inkermann steer.

With this blood a number of milking cows were inoculated, and all gave a pronounced reaction. Two months later (21st September) I forwarded a quantity of virulent blood from an animal suffering from acute fever. This blood was injected into the previously inoculated cows, but as no reaction followed, the animals were shown to have acquired immunity from the first inoculation.

It is satisfactory to know that the results of Dr. Tidswell's carefully conducted experiments are confirmatory of the Mundoolun experiments conducted over two and a-half years ago.

Inoculation of Bulls.

During the last twelve months the demand for inoculated stud and herd bulls for Northern Queensland has steadily increased.

It is significant that, in nearly every instance where more than the usual percentage of deaths have occurred after inoculation, there has been some ready explanation forthcoming, as shown by the following:—

Case 1.—Of 26 Devon bulls inoculated the first time with recovered blood, 6 died; and on inquiry it was ascertained that during the height of fever the bulls were rounded up on two occasions and placed in fresh paddocks, which fact needs no further explanation. The remaining 20 bulls were inoculated some three weeks later with virulent blood, but not one showed symptoms of sickness. Since then they have been resident over eight months in the very worst tick-infested and, for all unprotected animals, fatal fever-stricken country in North Queensland.

Notwithstanding the loss of 6 valuable bulls, the owner was so well satisfied with the protective value of inoculation that he purchased another lot of 42 pure-bred Devon bulls, which, after the first inoculation, were not molested in any way, with the result that, although a number showed signs of sickness, none died. Some three weeks later they were inoculated a second time with virulent blood, and still none died, and all are now in a healthy condition on their way to the tick country.

Case 2.—Three hundred and ten pure-bred Devons were inoculated. About fourteen days afterwards, just when the fever, produced by inoculation, was at its highest, the bulls were all mustered for the inspection of an intending purchaser. The owner wrote that within a few days over 50 bulls were found dead, but it was gratifying to me when he stated that, in his opinion, the deaths were due to the mustering of the animals during sickness. This opinion I fully endorse. One hundred and seventy of these bulls (some three months later) were inoculated again with a large dose of virulent or fevered blood, resulting in the death of only one beast. At present they are on the road through the tick-infested country for the Northern districts.

Case 3.—The following is particularly interesting:—258 bulls (Devons, Shorthorns, and Herefords) were inoculated the first time with blood taken from two steers that had been inoculated, but whose temperatures had never been recorded. One of these animal's blood must have been effective, as a number of the bulls got very sick, and 4 died, but the others' blood could not have possessed any protective properties, as on the second inoculation of the bulls with virulent blood over 20 died, while a number became exceedingly sick. This serves to illustrate how necessary it is to keep careful daily records, after inoculation, of the temperature of any animals which are intended to be used to supply blood for general inoculation purposes; and it is always advisable, after obtaining the desired reaction, to test the protective value of the animal's blood, in a small way, on several head of less valuable animals before commencing to inoculate in a general way.

Case 4.—Forty Devon bulls were inoculated from a cow whose blood had previously never failed to produce the most acute fever and occasionally a death. Only about two-thirds of the bulls showed a reaction and became sick. After an interval of about seven weeks they were all inoculated again, when those that were insusceptible to the first inoculation became very sick and showed a pronounced reaction, but none died.

Case 5.—Mr. R. S. Archer writes me that of 100 bulls inoculated twice all have arrived in good condition at Bowen, after travelling through 400 miles of tick-fevered country, while three head of uninoculated bulls that accompanied them all suffered severely from acute fever, and one died.

Remarks on Successful Inoculation.

The actual success in protective inoculation for tick fever, providing that proper blood is used, depends not only on the care exerted during the operation, but very largely upon the treatment and welfare of the animals after inoculation.

All animals, more particularly bulls, should not be disturbed or molested in any way for at least three weeks after the inoculation.

Cattle should have a liberal supply of fresh water and green food, and, during the hot summer months, should be kept in a paddock having good shade trees to protect them from the direct sun's rays. Experience has shown that it is inadvisable to inoculate cows between the third and eighth months of pregnancy, as during this period they are liable to abort. Patience and kindness are necessities in attending to milking cows after inoculation. Undue excitement caused by the assistance of dogs and noisy boys when bringing cows up to be milked must have an unfavourable influence on the fever produced by inoculation. In the case of bulls, dairy cows, and quiet cattle, when they become very sick during the fever period, it has proved advantageous to give them an occasional drench of castor or linseed oil; in fact, for at least three weeks after inoculation, the diet should be of a laxative nature.

Where ticks are making progress and threatening invasion of fresh country, the cattle in such country should be all inoculated and completely recovered from the operation at least several months before the ticks make their appearance. Through not strictly observing this rule, several stockowners have preferred to wait until the ticks made their appearance, and, because no sickness accompanied the first arrival of the tick, they waited on again until the fever appeared, and then suddenly rushed into inoculation, endeavouring to get the whole herd done in as short a space of time as possible, with the result "heavy losses."

When inoculation is left too late, it simply means adding insult to injury, as has been clearly shown to be the case in the Bundaberg and Gin Gin districts.

Cases of Temporary Insusceptibility, with Special Reference to Bulls.

A peculiarly interesting fact in connection with preventive inoculation for tick fever is that in some cases, after the injection of recovered blood, no reaction followed, as demonstrated by the continued use of those three invaluable instruments—the thermometer, hæmocytometer, and the microscope. It is only natural to suppose that, if the owners were asked why the inoculation did not take effect, they would reply that the blood was no good.

Although this answer may be quite correct in some cases, it cannot be so in others. I refer specially to the blood of any one of the 38 immune animals kept at the Indooroopilly Experiment Station. Blood from these animals has been supplied to hundreds of stockowners between Gladstone and New South Wales, which blood has repeatedly been proved to give most pronounced reactions, and yet occasionally it has been found (more especially with stud animals) that the injection of absolutely proved blood, in various doses of from $\frac{1}{2}$ to 10 cubic centimetres, has taken no effect whatever, as indicated by means of taking the animals' temperature regularly for over two months, and repeated examinations of the blood with the hæmocytometer.

Notable Cases where more than One Inoculation was Necessary.

Case I.—In May, 1898, Mr. Robert Archer purchased at Indooroopilly, near Brisbane, a pure-bred Jersey bull, and requested that I should inoculate him and see that he received proper attention afterwards. This bull was a rather excitable animal, and no one dare approach him on foot; consequently it was thought that, considering that his temperature had to be recorded regularly, the inoculation would be somewhat risky; however, he was inoculated (and also 4 other young bulls and 4 heifers of the same breed) with blood from a specially selected animal. One of the young bulls became very sick, and the 3 young bulls and each of the heifers exhibited drowsiness and had a high fever temperature, but the adult bull never showed the slightest deviation from a normal temperature (101-102 degrees) during the whole six weeks the thermometer was used. Within two months from the first inoculation, the bull was again inoculated, together with two steers, with blood from another animal, with the result that all three animals became very sick, the bull particularly so, his temperature rising to 106·6 on the sixteenth day after inoculation.

Case II.—In this case a Northern dairy-farmer purchased a five-year-old bull, and requested that I should see him through the inoculation process. The bull, with two control steers, were inoculated with 5 c.c. of recovered blood; the controls showed pronounced reactions, whilst the bull's temperature was not disturbed in the least. After an interval of six weeks, the bull and one clean heifer calf were inoculated with the same blood a second time, with the result that only the calf reacted. Another

six weeks were allowed to elapse, and the bull was inoculated for the third time with 4 control cows, which was followed by a typical reaction in each animal, the bull becoming extremely sick, with a maximum temperature of 107·6 F. He lay down for nearly three days and refused his feed; however, without any medicinal treatment he eventually recovered and picked up in condition in a short space of time.

Case III.—A two-year-old Shorthorn bull gave no reaction whatever to three successive inoculations (four weeks intervening between each operation), although controls in each case gave a distinct fever temperature. The same quantity of blood was used for each inoculation.

Case IV.—Mr. R. S. Archer, of Gracemere, recently informed me that he also has a stud bull which has failed to react to three successive injections of absolutely proved blood, the last inoculation being with blood from an animal that had only just recovered from a severe attack of natural fever with redwater.

Hereditary Immunity and Susceptibility.

An opinion generally held among stockowners resident in the permanently infested districts is that calves, the progeny of immune cows, are born immune, the reason being that in the now immune areas, when the disease first appeared in an epidemic form, it was most exceptional to find a calf dead of tick fever; but, although it was true that many young calves did die at this period, their deaths were invariably caused by starvation through being unable to forage for themselves after their mothers had succumbed to the disease. Subsequently, when all the remaining members of the herd had acquired immunity, no deaths occurred amongst the rising generation of young stock.

Every stockowner who has experience in the system of protective inoculation must admit that not only does he rarely lose any calves from the operation but that very few calves indeed show even symptoms of sickness or fever, unless their temperatures are recorded daily, although the blood of the same animal which was used for inoculating the calves, when injected into adult animals, caused a very severe acute form of fever, which evidence, although going to prove the, practically speaking, insusceptibility of calves to a fatal form of tick fever, still leaves unsolved the question, "Is immunity hereditary?"

The following experiments, however, throw much light on this all-important subject:—

During the initiation experiments in connection with preventive inoculation for tick fever at Mundoolun in April, 1897, several heifers were pregnant when operated upon. Fourteen days later, one of these heifers (a half-bred Devon) died from the inoculation.

The most scrupulous care was exercised in making a *post-mortem* examination, and special precaution taken in the microscopical examination of the blood from the various organs of the fœtus, which was found to contain precisely the same specific micro-organisms as existed in the paternal blood, and which tended to prove that the placenta had not freed the blood, as it passed from mother to fœtus, from the tick-fever germs.

It was therefore presumed that, had the mother recovered from the effects of the inoculation fever, the calf would in all probability have been born a refractory subject to tick fever.

In view of this discovery 3 other pregnant heifers inoculated at the same time, and all of which showed a pronounced reaction temperature, and then completely recovered, were kept under special observation. In due course, these heifers calved, and each one of the calves, when over a year old, was injected intravenously with 8 c.c. of recovered blood. Judging by the facts revealed in the previous case, it was naturally expected that these calves would remain immune, instead of which, however, each one became very sick and developed a high fever, as indicated in the following list of temperatures, which were kindly recorded for me by Mr. George Collins, of Mundoolun:—

No of Calf.	Days after Inoculation.						
	Ten.	Eleven.	Twelve.	Thirteen	Fourteen.	Fifteen.	Sixteen.
1	105·2	104·4	104·3	106·0	103·3	102·3	102·2
2	104·2	104·0	106·3	106·1	105·2	102·2	101·2
3	105·0	105·3	104·1	105·2	105·2	104·3	103·3

To continue this interesting subject still further, I selected a one-day-old calf, born of a heifer which had been inoculated from the Inkermann steer over two years previously.

The blood of this calf was injected into 6 healthy cows, resulting in an elevation of each animal's temperature to between 105·6 degrees and 107·1 degrees, about the sixteenth day after inoculation, and also a very considerable diminution in their yield of milk.

At a subsequent date, the hereditary immune calf was tested by injecting it with a large quantity of virulent blood from an animal just dead of acute tick fever with "redwater" symptoms. At the same time a young steer was also inoculated with "redwater" blood, with the result that the control animal sickened severely and died, but the calf remained perfectly refractory, thereby proving that the immunity was transmitted to the calf by its mother.

It may be of interest to know that the mother of this immune calf was not suffering from the inoculation fever during the period of gestation, as was the case of the Mundoolun heifers.

Quite recently, a careful observer, Mr. O. E. Steiglitz, of Bedowrie Station, near Taroom (a district which is situated at least 100 miles from any tick-infested area), has been injecting the blood of young calves, born of immune (inoculated) cows, into healthy susceptible cattle, and has suceeeded, in a great number of cases, in producing the most pronounced reactions.

These observations show that calves of immune mothers, in the permanently tick-infested country, are not always borne insusceptible, but acquire their immunity gradually by virtue of their being continuously inoculated by the ticks. Therefore, considering that calves are rarely attacked by the disease in a fatal form, we have a satisfactory explanation why one never hears of "redwater" and tick-fever disease in the Gulf districts and Northern Territory, where, only a few years ago, the disease existed in its very severest form, carrying off some thousands of cattle. This subject, apart from its scientific interest, is, in my opinion, of very great importance to stockowners, as it clearly proves that, in order to reduce to a minimum the losses resulting from inoculation, the animals operated on should be very young; hence my reason for urging stockowners, in districts that are threatened by tick invasion, to at once inoculate all their young stock; and further demonstrates the necessity of inoculating all the progeny of immune (inoculated) mothers in the clean districts, as the younger the animals are when inoculated the less susceptible they will be to a fatal form of fever. I have in progress several equally interesting experiments on similar lines, which must necessarily take some time before completion; however, sufficient reliable information has been gathered to show that, under natural conditions of tick fever and by means of protective inoculation, calves of immune mothers, either residents of or recently introduced into the permanently tick-infested districts, are in some instances born immune.

Duration of Immunity.

The period of protection from natural tick fever afforded to cattle that have successfully reacted and recovered after an injection of blood from an immune animal is a matter of vital importance to stockowners, especially those whose inoculated cattle are not likely to become tick-infested for some considerable time.

It is a well-established fact that, with diseases which affect the whole system, particularly those of an epidemic nature, the protection which the disease conveys to the recovered individual is, as a rule, of a very lasting character, and years of close observation and experience have shown that with tick fever in cattle we have no exception to this rule, for it must be admitted that, in pre-inoculation times, in the permanently and long tick-infested districts, after the epidemic form of the disease had passed away, the remaining members of the herd had to acquire their immunity by voluntary means. That such acquired immunity is of long duration can be illustrated by the fact that during the last two years thousands of fat cattle have travelled from these immune areas, in the Gulf country, along the main Flinders River stock route to Hughenden, from whence they are trucked either direct to the Ross River Meat Works at Townsville or to the Reid River, where they are detrucked and travelled (on foot) to the freezing works at Bowen, and on arrival at these respective freezing establishments they are in good condition, and in some instances scarcely an animal missing out of the entire mob. On the other hand, with mobs of susceptible cattle from clean districts, if travelled over this same tick-infested and redwater stock route, the losses often amount to 50 per cent. of the entire mob, while the balance are only fit for boiling-down purposes. It may be argued that this information does not convey a correct answer to the question, "What is the duration of immunity

in inoculated non-tick-infested cattle?" it being assumed, and rightly so, that the cattle in these immune areas are being continuously reinoculated by the ticks with which they are infested. What appears to be nothing short of marvellous in connection with tick fever is the fact that when an animal recovers from the disease, is freed from ticks, and is removed to perfectly clean districts, a number of the micro-organisms, which are the essential cause of the disease, remain in the animal's circulatory system for a number of years afterwards, and in all probability so long as the animal remains alive.

The latest reports from the Department of Agriculture, United States of America, show that the blood of a South Carolina cow, which was removed to Washington some eight years ago, still contains the micro-organisms of tick fever; and its blood invariably causes fever when injected into susceptible animals.

Inspector Hancock, in his report on "Tick Fever in Western Australia," gives the following interesting case:—"An old and healthy milking cow, belonging to a Mr. Guilfoyle, had the organisms in her blood. Her history reveals these facts: Calved in Queensland nearly fifteen years ago, and was travelled over to the Kimberley district with the original cattle that stocked his (Mr. Guilfoyle's) run; was frequently tick-infested during the first part of the journey; landed at Rosewood clean, and has remained clean ever since." Mr. Hancock remarks that this is extremely interesting in showing how long the micro-organisms of tick fever will remain in the blood of a recovered animal.

The blood of the original Inkermann steer is just as potent now as it was when the steer first arrived at the Indooroopilly Experiment Station from North Queensland, over two years ago (February, 1897), as shown by the following experiments:—

On the 25th March last, I inoculated at Nanango, with the steer's blood, 25 calves. Each of these gave a reaction, and the blood of 10 of these calves injected into adult cattle produced a typical reaction fever in every instance.

At Woolooga, on a later date, I inoculated 25 calves, also with blood from the Inkermann steer, and 20 of these animals' temperatures rose to over 106 degrees, while in the remaining 5 the temperature rose to 107 degrees.

In another series of experiments I have shown that the protective property of the blood of the original Inkermann steer is transmittable from animal to animal by means of effectual inoculation through over 20 successive generations, without deteriorating in the slightest degree.

As the first experiment in protective inoculation for tick fever was only commenced in February, 1897, the question of duration of immunity in inoculated animals can only be answered by the results obtained from the two and a-half years' experimental evidence at our disposal.

Some of the first animals successfully inoculated have been tested (after remaining free from ticks up to date) by the injection of large doses of virulent blood, which had no effect on them whatever, although the control animals suffered severely

The following experiment is interesting in throwing light on the duration of immunity both naturally acquired and artificially induced:—

2 steers	recovered	from	natural	tick	fever	...	...	... $2\frac{1}{2}$ years
2 heifers	,,	,,	,,	,,		...	...	... 2 ,,
2 heifers	,,	,,	inoculation		fever	...	...	... $2\frac{1}{2}$,,
1 heifer	,,	,,	,,	,,		...	...	... 2 ,,
1 bull	,,	,,	,,	,,		...	...	... $1\frac{1}{2}$,,
3 steers	,,	,,	,,	,,		...	...	... 2 ,,
2 cows	,,	,,	,,	,,		...	...	... 1 ,,

All the above animals and 1 healthy control steer each received simultaneously two subcutaneous injections of 10 *c.c.* of blood taken from an animal which had just died of natural tick fever with "redwater" symptoms.

Temperatures of each of the protected animals were carefully recorded night and day for over four weeks, and gave not the slightest indication of a reaction. The control or previously inoculated steer died from acute fever on the sixteenth day.

Inoculation with Virulent Blood.

Although a few individuals have apparently met with some success by the use of blood taken from an animal in a high state of fever, such an eminently risky and foolish practice is to be very strongly condemned. I can give numerous instances from my own experimental observations, and which have unfortunately been confirmed by several stockowners, where the inoculation of cattle with virulent blood has met with extremely disastrous results.

It naturally stands to reason if one injects blood from an animal in a high state of fever into a healthy susceptible animal serious consequences must necessarily follow.

As a rule, the fever produced by the injection of virulent or fevered blood commences on the sixth day, and reaches its maximum on the tenth day after inoculation, while with recovered blood the temperature of the inoculated animal invariably remains normal until the tenth day, when it commences to rise steadily, reaching its maximum about the sixteenth day after inoculation.

Effects of Virulent Blood Injected into Susceptible Animals.

Case I.—Twenty-five young bulls were each inoculated with 3 c.c. of virulent blood taken from a heifer very bad with the fever and that died next day. By the ninth day they were extremely sick, with high fever, and within the next few days 9 of them were dead. On the seventeenth day the remaining 16 bulls were safely over the fever and on the road to recovery.

Case II.—Three cows and two steers were inoculated with 5 c c. of blood taken from an animal suffering from fever produced by artificial means. Result: Each of the inoculated animals became sick by the eighth day, and obviously so by the tenth day. One of the cows died on the twelfth day, another cow on the fourteenth day, and one steer and a cow on the seventeenth day, while the remaining steer gradually recovered from acute fever by the twenty-second day.

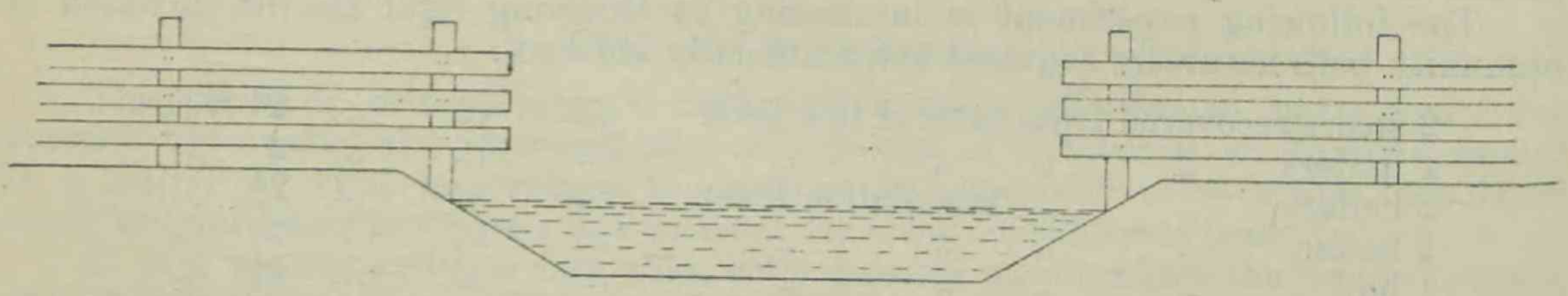
Case III.—Recently a large number of bulls, all of which were supposed to have been previously inoculated with recovered blood, were tested, in order to prove their immunity, by injecting into each animal 8 c.c. of virulent blood. Subsequently it was discovered that through some misunderstanding several of the bulls had not previously been inoculated. It was pointed out by the owner, that these unprotected bulls all died of acute fever, while those which were previously inoculated all remained alive.

Dips and Dipping.

The experimental observations, both here and in the United States, have shown that dipping is valueless in stamping out ticks when once they have become established in any new centre; and dipping or smearing of tick-infested cattle affords very little protection to the clean country to which they are removed.

In view of the above facts, it must be apparent that it is unnecessary to make dipping the dangerous operation that it was two years ago, when cattle were frequently injured—and sometimes fatally—through being tumbled into the dip head first, either by means of a board working on an axle or the entrance to the dip being in the perpendicular.

If dipping is again to be resorted to, I recommend that the dips should be so constructed that the cattle can walk gradually down an incline, and then swim, say, 40 feet, and walk up a cross-battened incline to the draining-yard. (See Sketch.)



Several stockowners to whom I have stated my views have suggested that such a dip should be placed either in the centre of one or between two paddocks, so that the cattle can go in and out of the dips as they wish, in which case the draining-yards would be dispensed with.

I question whether cattle would go into the dip without being driven, more especially during winter months; if the method was found applicable there would be a considerable amount of extra expense incurred through large quantities of the dipping fluid being taken away by the cattle, thereby necessitating a continual replenishment of the tick-destroying agent.

Specifics for the Destruction of Ticks on Cattle.

To discover some cheap and effective remedy for the destruction of ticks upon the hide, without causing any apparent injury to the animal, might at first sight appear to be a very simple matter; such, however, is not the case. Many reagents that will effectively destroy ticks in all stages of their existence will injure the cattle. Nevertheless, some specifics have been discovered that have proved highly satisfactory in destroying a very large majority of the ticks.

Consequently, by repeated washing or dipping, the cattle can be relieved to a very great extent of the irritation and inconvenience caused by the primary gross tick-infestations.

A very large number of different kinds of specifics for the destruction of ticks on cattle, either by dipping or smearing, have been submitted to this Institute for examination These specifics included various mineral, vegetable, and animal oils, extract of tobacco leaf, different derivatives of coal and wood tar products, such as creolin, creosote, crude forms of carbolic acid, &c., and various mixtures and emulsions containing one or several of the following:—Soap, soda, tar, arsenic, sulphur, kerosene, fat, &c. Another agent that has been largely used in South America, submitted for examination, is Erkenbracher's Hide Poison.

The effects of various strengths of each one of these different specifics have been carefully tested in the laboratory on mature or larval ticks, and also the eggs; and at the Indooroopilly Experiment Station the specifics have been tried on tick-infested cattle.

Notwithstanding the fact that the method of inoculation, as adopted in this colony, is a preventive against tick fever, it has been frequently pointed out that some cattle, although immune to the fever, die from what is believed to be sheer inanition and anæmia following gross tick-infestment. On the other hand, some of the immunised cattle in the grossly infested districts are in no way inconvenienced by tick-infestment, while others become gradually inured to the irritation and annoyance caused by the ticks, more particularly during their larval stage; hence it will be found advantageous, under certain conditions, to free the cattle from ticks by some artificial means.

This is best accomplished by occasionally dipping or smearing the cattle with some reliable tick-destroying agent during the periods when they are liable to become very grossly infested. The process need only be carriedon until such time as the cattle become strong and gain their normal condition, so that they may gradually become insusceptible to the irritation caused by the ticks during the early stages of their parasitic existence.

Of the very large number of specifics and mixtures I have tested during the last three years, I have failed to find a single remedy that fulfilled the following indispensable conditions, viz.:—

1. Absolutely destroying the ticks in all stages of their parasitic existence on the cattle.
2. Does not injure or poison the cattle in any way by the free application of such specific.
3. Prevents a fresh number of ticks for at least four weeks after each application.

Numerous suggested remedies have been found to fulfil one, and even two, but certainly never three conditions.

However, I am of opinion that, for all practical purposes, Mr. Christian's mixture (omitting the arsenic) is one of the best and cheapest all-round dips. By the proper application of this mixture to infested cattle, very few ticks remain alive. It is strongly antiseptic; consequently it has a decided healing effect upon all wounds and sores which are often caused by the cattle continually rubbing themselves against fences and trees; and it is not injurious or poisonous to the cattle; further, it will prevent cattle after dipping from becoming reinfested with ticks for several weeks; and, lastly, the ingredients of the mixture are cheap, and may be obtained in nearly every town throughout the colony.

The Use of Arsenic in Destroying Ticks.

During the past two years several stockowners in the Central and Northern districts have been using arsenic, in combination with tar, soap, soda, water, &c., to form a dip for the destruction of ticks on cattle—more especially dairy cattle. The use of arsenic, I may point out, is an exceedingly dangerous practice. When applied externally, in the form of a dip, it is readily absorbed from the mucous membrane or skin-abraded surface of thebody, and may give rise in some instances to acute arsenical poisoning (especially when the dipping fluid is taken internally, which is by no means improbable), accompanied by the usual symptoms of dullness, nausea, frothing at the mouth, bloodshot eyes, cramping pains of the intestines, difficulty in breathing, hair falling off in patches, and in some cases the urine being distinctly red or black.

Repeated and constant dippings in even a weak solution of arsenic may cause chronic arsenical poisoning with symptoms of indigestion, extreme thirst, wasting, and chronic disease of the bones and joints. When cattle are passed through an

arsenical dip, they may be turned out to feed after imperfect draining; the remaining drippings fall on the grass, which may be still further contaminated by rain freely washing the poisonous solution out of the coats of the cattle on to the pastures; moreover, the danger must be much accelerated during the winter months by reason of the scarcity of feed and the long woolly coats of the animals, which remove from the dip large quantities of the poisonous material.

It is an error to suppose that cattle, or, in fact, any other graminivorous animals, refuse to eat food over which arsenical dipping mixtures, with their nauseous soft soap, soda, tar, &c., have fallen.

It has been proved, experimentally and in practice, that animals will eat grass over which such poisonous mixtures have been dispersed, and repeatedly die from the effects.

The most serious matter in connection with arsenical mixtures is the dipping of dairy cattle. After the cattle have been dipped the poisonous fluid naturally gravitates, and a quantity will drain over the udder to the extremity of the teats, when the arsenic may be absorbed into the milk ducts, or, if the animal should be or has been grossly infested with ticks on the udder the arsenic will be absorbed through the abrasion of the skin made by the rostrum of the ticks. The trouble does not end here; the cow will be milked, and the arsenic eventually finds its way into the general milk supply.

Therefore, when we consider how extremely susceptible the principal consumers of milk (infants and invalids), are to the poisonous effects of arsenic, I maintain that there is a just cause for bringing prominently under notice the necessity for some action to be taken to prevent arsenic being used in connection with the destruction of ticks on cattle.

Experiments conducted with ticks (in various stages) in the laboratory, and also with numerous tick-infested cattle at the Indooroopilly Experiment Station, have shown that the mixture, as recommended by Mr. Christian of Willangi, and detailed below, is equally efficient for the destruction of ticks when the arsenic is omitted:—Stockholm tar, 8 gallons; washing-soda, 3 lb.; arsenic, 10 lb.; water, 400 gallons.

Observations on Ticks Kept at Low Temperatures.

A question very frequently asked by visitors to the Stock Institute is, "For how long a period will ticks retain their vitality if kept at a temperature below freezing point?" the principal object being to obtain definitely some idea as to whether or not the climatic conditions of the coastal country of New South Wales are favourable to the requirements of the cattle tick. With this object in view, the following experiments were conducted with larval and adult female ticks.

Experiment 1.—Over 300 fully-developed female cattle ticks were placed in a glass capsule, and kept at a uniform temperature (3 degrees below freezing point) between two large blocks of ice.

Every twenty-four hours forty ticks were removed and kept in glass capsules at room temperature.

All those that were removed up to the fifth day remained alive, and each laid their full complement of eggs. After six days' freezing, a number were found dead, while after the seventh day the vitality in every tick was completely destroyed.

Experiment 2.—The entire progeny of five adult ticks (numbering 10,000 larvæ) were placed in a well-corked tube, which was kept between blocks of ice, as in the previous experiment, for seven days, and examined every twenty-four hours. They all remained alive until the third day. On the fourth day about half of them were dead, on the fifth day very few remained alive, while on the sixth day it was observed that the prolonged exposure to a temperature below freezing point had killed every larval tick.

General Remarks on Bovine Tuberculosis.

The time has arrived when stockbreeders and dairy-farmers are beginning to recognise that some active steps should be taken in attempting to eradicate this most terrible of all bovine diseases.

In view of the increasing demand for tuberculin, and the fact that in numerous instances its application has been carried out with the utmost care (principally by my assistants), there is every reason to believe that some owners are desirous of stamping out tuberculosis from their herds, and prevent its further introduction by only purchasing animals that have been tested with tuberculin, and shown no reaction.

The numerous practical demonstrations by officers of this Institute, in various centres, have been the means of convincing numbers of stockowners on the following points in connection with tuberculosis in cattle and the tuberculin test :—

(1) That the disease (tuberculosis) is extremely prevalent.
(2) The impossibility of detecting the disease in the earlier stages by outward signs.
(3) That contagion is the principal means by which the disease is spread.
(4) That heredity does not exert the amount of influence that is generally supposed.
(5) That the disease is preventable.
(6) In protective inoculation for pleuro-pneumonia, only Departmental virus should be used, or that which has been examined and found free from tubercular taint.
(7) That although the tuberculin test is not absolutely infallible, it is marvellously trustworthy for all practical purposes.
(8) The application of the tuberculin test has revealed a greater percentage of the disease among dairy herds than general station cattle.

Recommendations for the Suppression of Tuberculosis.

Generally speaking, the results of curative treatment for tuberculosis in cattle has proved unsuccessful; therefore, with such an invaluable agent as tuberculin at our disposal as a means of diagnosing the disease in its most incipient form, the knowledge of the various manifestations of the tubercular disease in man and animals, and the various natural processes which are in existence for its dissemination, we should direct our special attention to the very best possible means available in conducting a crusade against the disease. This could be more readily carried out in the first instance by educating the general public on the nature, origin, distribution, and prevention of the disease; and, in my opinion, the only satisfactory and comprehensive method of effecting this is by delivering lectures on tuberculosis, illustrating the subject by an extensive series of lantern photographs, and giving practical demonstrations on the nature, use, and abuse of the tuberculin test in the presence of farmers, stockbreeders, and others interested, also conducting *post-mortem* examinations on the animals that are killed after reacting to the test.

The rules I have laid down for the eradication of tuberculosis from the dairy herd of St. Helena are detailed in my pamphlet on "Tuberculin, Its History, Preparation, and Use." By following these rules stockbreeders, and dairy-farmers especially, would be amply repaid by the general improvement in the health and constitution of their animals, and at the same time indirectly confer an incalculable benefit upon the public generally.

Tuberculosis in Various Animals and Birds.

Pigs.—Tuberculosis in pigs is by no means a rare disease, as evidenced by the inspectors' returns at the various bacon factories, and the specimens submitted to this Institute for examination. In almost every instance these cases of tuberculosis can be directly traced to the pigs being fed upon offal at various slaughter-yards, or upon milk which is given to the pigs in an uncooked state.

Repeated experiments have shown that young pigs are always susceptible to ingesting any form of tubercular material.

The disease usually starts in the digestive tract, forming ulcerations of the mucous membrane of the intestine, and the formation of tubercles in the mesenteric lymphatic glands. A very frequent manifestation of the disease is to be found in the tonsil, submaxillary and retropharangeal glands. Generalised tuberculosis is also common in pigs, in which case, as the disease advances, the tubercular deposits in the lungs, liver, and glands are always of an extremely hard calcareous or gritty nature.

A very striking feature of the bacteriological examination of the tubercular lesions of a pig is that, although some dozens of preparations may be crucially examined, the tubercle bacilli are so scarce that they can be detected only with great difficulty. The fact that the disease is more often found in the intestinal canal and their accompanying lymphatic glands goes to prove indirectly that at the various slaughter-yards a number of cattle, which must be obviously tubercular, are killed for human consumption; and at the dairying establishments cows with tubercular udders are kept, whose milk goes into the general supply for public use, which, as I pointed out in my previous Report, clearly demonstrated the necessity of placing all slaughtering establishments and dairy farms under strict Government supervision,* for it must be admitted by all that the most effectual work in the suppression of contagious diseases

* Since the above was written, the Slaughtering Act has come into operation.

in our domestic animals is that done by the State, for the simple reason that there is every possible opportunity offered for the work to be done in a systematic and thorough manner.

Sheep.—Tuberculosis is rarely met with in sheep. In Berlin, where the veterinary inspection at the public abattoirs is almost perfect, the greatest number of sheep condemned for tuberculosis was only five out of 340,000 slaughtered.

Recently a case of suspected tuberculosis in the liver of a sheep was submitted for examination. Sections stained and examined microscopically were found to contain numerous tubercle bacilli. In six years the only other case that I met with in the sheep was one of generalised milliary tuberculosis.

Goats.—It has been proved experimentally that goats are susceptible to tuberculosis; moreover, in nature, quite a number of cases of tuberculosis in goats have been recorded during the last few years. Recently the lungs of a well-nourished goat were submitted to this Institute for examination. Studded throughout the lung tissue were a number of peculiar grey-coloured milliary tubercles; on microscopical examination, these tubercles contained tubercle bacilli.

This discovery must appeal to those persons who prefer to use goat's milk instead of cow's milk, because it is generally supposed that goats are immune to tuberculosis; moreover, goat's milk is frequently and specially recommended for the use of infants and invalids. Considering that such individuals are extremely liable to contract mesenteric tuberculosis through the ingestion of tubercular milk, I strongly recommend that all goats supplying milk for home consumption should be periodically tested with tuberculin, and all animals that react be at once destroyed.

Birds.—Specimens, for examination, of different kinds of birds, including fowls, pigeons, and varieties of caged birds, have been forwarded to this Institute. The causes of death are various, but a microscopical examination, after staining the specimens by special methods, has not unfrequently demonstrated the presence of the masses of tubercle bacilli in the caseous deposits of the liver, lungs, and along the intestines.

The tubercle bacilli found in fowls and other birds, although they behave in precisely the same manner to different staining reagents, and refuse to give up the fuchsine stain in the presence of mineral acids, are morphologically different from those found in human and bovine tuberculosis; consequently there exists a difference of opinion as to whether the variations between the two forms of tubercle bacilli are only produced by differences in their respective condition of environment. It is a remarkable fact that the pure cultures of bacilli of fowl tubercle and human tubercle, which I have carried on through successive generations for the past eight years, have still retained their original respective cultural characters as colonies on the surface of the artificial nutrient media; also the same differences exist on microscopieal examination of the individual bacilli. Perhaps the most unique specimen of avian tubercolosis in the Stock Institute is that of one of our largest native birds, the emu. The specimen in question is that of an emu's liver, which is infiltrated with irregular-shaped pieces of brown horn-like material, around the periphery of which are countless numbers of tubercle bacilli.

The Supply of Specially Prepared Laboratory Tuberculin.

It is gratifying to note that the demand for tuberculin, as prepared under my supervision, has considerably increased during the past twelve months.

It has been proved so reliable that applications for large quantities of this material have been received not only from various parts of this colony, but from New South Wales, Victoria, and South and West Australia.

In my last Annual Report I stated that 280 animals were tested with tuberculin supplied by this Institute. It is satisfactory to know that during the past year over 1,500 animals have been tested. About 300 of these were dairy cattle at different Government institutions, and the remaining 1,200 doses were supplied to private individuals.

I have endeavoured to obtain, whenever possible, the results of the testing, but, with the exception of a very few cases, find it very difficult; in fact, until such time as the supply of tuberculin and the application of the test is under absolute Government control it will be impossible to obtain reliable information and statistics concerning this disease.

Every day brings forth fresh evidence of the extraordinary prevalence of tuberculosis among the dairy stock, which shows the extreme necessity for some legislative action in connection with the supervision of dairies, in order that the public may obtain a healthy milk supply.

Results of the Tuberculin Test on the Dairy Cattle at various Government Institutions.

In accordance with my recommendation, and with the approval of the Home Secretary, the whole of the cattle on the Island of St. Helena and at the asylums at Goodna, Toowoomba, and Ipswich have been subjected to the tuberculin test, with the following results :—

St. Helena.—The herd comprised 21 cows in milk, 12 dry cows, 27 heifers from four months to two years, 1 bull six years old, and 6 bull calves under twelve months. Of this number, 7 cows, 1 heifer, and a young bull all reacted to the test, and were found tuberculous.

Four of the best-conditioned Ayrshire cows which reacted to the test, being in calf, were immediately transferred to the Indooroopilly Experiment Station, in order to test the question of the hereditary tendency or transmission of the disease from mother to offspring.

It is interesting to know that each cow has calved, and that the calves on being tested were found to be free from the disease ; consequently they were returned to the healthy herd. In order to carry on these investigations a stage further, the 4 cows were mated with an obviously tubercular bull, and 2 of them are now in calf.

Goodna Asylum.—In the testing of the entire herd of 168 mixed cattle, the majority of which were milking cows, 14 animals gave positive reactions to the test, were killed, and on *post-mortem* examination were found tuberculous. A number of animals which were tested under somewhat unfavourable conditions gave reactions which were of a doubtful nature. On my recommendation, however, it has been decided to have these doubtful cases tested again.

Of the animals that were found to be tuberculous, 13 were cows ranging in age from three to ten years, and 1 heifer calf about six months old.

Tuberculosis existed in family groups—viz., in three cases mother and daughter were affected ; but in these cases no tubercular lesions were discernible in the generative organs or the mammary glands of the dam.

It was therefore presumed that all 6 animals had derived the disease from some common source.

The other interesting case was that of a calf, its mother, and grandmother, all of which reacted and were found tuberculous. In each animal the disease was generalised, but in the mother and grandmother the wall of the uterus was seriously involved in tubercular deposits.

Toowoomba Asylum.—This herd was comprised of 20 milking cows and 10 dry cows, from three to twelve years old ; 24 young animals under two and a-half years old.

The tuberculin test only revealed reactions in two aged cows which, after slaughtering, were found tuberculous.

Ipswich Asylum.—The tuberculin test was applied to 12 milking cows ; 14 dry cows ; 10 young animals ; and 1 bull, five years old ; and resulted in one of the old cows and the bull showing a decided reaction to the test.

The cow was killed and found tuberculous ; but, as the bull (an Ayrshire) is a very valuable pedigreed animal, it has been decided to test him again before he is destroyed.

At each of the above institutions it is my intention to test the entire herd every six months, and remove every animal that shows a reaction—those that show obvious clinical symptoms of the disease will be immediately destroyed ; while the others, although showing a reaction to the test, but still physically in good condition, will be isolated and used for experimental purposes, principally for studying the subject of hereditary susceptibility, &c.

Recently, Mr. James Irving, M.R.C.V.S.L., who uses only the Stock Institute tuberculin, has applied the test to 63 milking cows and 2 bulls. Eleven of the cows responded to the test, 10 of which were destroyed and showed tubercular lesions on *post-mortem* examination.

The Application of the Tuberculin Test on the near Relations of Tubercular Stud Bulls and Dairy Cows.

Case I.—About three years ago I tested a very fine six-year-old stud Shorthorn bull, which, after a typical reaction, was killed and found to be affected with generalised tuberculosis.

At a subsequent day, seven purebred Shorthorn bulls, ranging from two to four years old, and all sired by the above tubercular bull during his diseased condition, were tested with tuberculin, but not one showed the slightest reaction.

Case II.—Two very young Shorthorn bulls (full brothers), reared up side by side, and intended for the tick country, were tested, and one was found tubercular, while the other has remained free from the disease for over two years.

Case III.— A stud Shorthorn bull, in a fine healthy-looking condition, was tested with tuberculin and reacted. On *post-mortem* examination, it was found that there were a few small tubercles on the right lung, and several tubercular abscesses on the liver and mesenteric glands. The left testicle was also slightly affected, and, on microscopical examination of this organ, tubercle bacilli were demonstrated.

About three years later eight bulls 4 years of age, that were sired by this bull, were carefully tested with tuberculin, but the results were negative.

Case IV.—A pure-bred 4-year-old Ayrshire bull (that was sired by a bull that had succumbed to generalised tuberculosis) gave no reaction whatever on two applications, at different periods of the test.

It is worthy of mention that the animals in each of these cases which showed no reaction to the test were, immediately after birth, removed from all possible sources of infection; and, moreover, were never rugged or housed.

Notes on the Testing of Cattle for Dairy Farmers.

During the past year several dairy herds have been tested with tuberculin, and so keen are the owners in some cases in supplying milk from only healthy cows that all animals that reacted were at once destroyed. Notwithstanding this, I regret in having to report that, in some instances, where the test has been carefully carried out, and a large number of animals have been discovered to be suffering from various manifestations of tuberculosis, the owners have refused to destroy any of the reacting animals.

In one case the owner had forty-two milking cows tested. Of this number fourteen cows (equal to over 33 per cent.) gave a pronounced reaction, while in eight other cows the temperatures after the injection of the tuberculin indicated very grave suspicion.

Recently I visited this farm for the purpose of inoculating the cattle for tick fever, and was surprised to find that the presence of the reacting tubercular cows was most conspicuous through their chronic cough. From these animals' nostrils an excessive amount of mucous (a distinct indication of tuberculosis) was dropping about in the mangers and water-troughs. The diseased animals were mixing freely with the healthy cattle and continually licking one another; in fact, every possible means was afforded for the distribution of tuberculosis throughout the entire herd.

Not one of the tubercular animals had been destroyed; all were being milked, and their milk mixed with the general supply.

It is unnecessary to go into details concerning the sanitary arrangements of the premises. It is sufficient to state that they were in a filthy condition.

From personal knowledge, I can state that there are very many such dairy farms around Brisbane and other towns that I have visited in different parts of this colony, and where there also exists a similarly large percentage of tuberculosis among the milking cows.

It is a noteworthy fact that the tuberculin test, as applied by the officers of the Stock Institute, revealed an exceptionally large percentage of diseased animals among the dairy cattle on the coastal watershed, whereas on the western side of the Main Range, more particularly on the open downs country, the number of milking cows found to be affected was extremely small; in fact, in several cases the testing of entire milking herds, numbering from 20 to 60 cows, not a single case of tuberculosis was discovered.

Remarks on Hereditary and Acquired Susceptibility.

Throughout the colonies there is a general impression among the breeders of stud cattle to regard tuberculosis as an hereditary disease. The accumulative evidence, however, of the results obtained by the tuberculin test proves that cases of congenital tuberculosis in cattle are of an exceptional occurrence, although at the same time there can be little doubt that the sire may transmit, through the dam to her progeny, an hereditary susceptibility to the disease; and further, knowing that the tubercle bacillus is the essential cause of tuberculosis, it should be pointed out that there are many factors in connection with an animal's environment which may give rise to a constitutional susceptibility to the disease.

Among the various conditions may be mentioned, imperfect housing, unwholesome surroundings, indifferent feeding, breeding too early or too late in life.

Blackleg in Cattle.

This disease has been somewhat prevalent during the last year, more particularly after the wet season in the districts of Wide Bay, Burnett, Burrum, Moreton, Fassifern, Logan, and Albert.

From each of the above districts, morbid specimens have been received, which on microscopical examination and by means of inoculating guinea-pigs with juices of the affected tissue, proved to be from animals that had died of symptomatic anthrax or "blackleg."

I have commenced a series of experiments in attenuating the micro-organisms of this disease, and the results so far in working out an effective vaccine are extremely encouraging, but handicapped as I have been with our present inadequate laboratory accommodation and the indifferent facilities for keeping experimental animals, the investigations cannot be completed until after removal into the new Stock Institute.

In the meantime, the following information is worthy of the consideration of all stockowners who have cattle in localities where the disease is more or less prevalent:—

The disease blackleg, sometimes spoken of as "blackquarter," "quarter evil," and "symptomatic anthrax," is a wound-infection disease, that is to say, an infective disease due to the absorption of the specific "blackleg bacillus" into the body tissues by an abrasion of the skin or mucous membrane of the digestive tract (mouth, stomach, and intestines).

These injuries are inflicted especially on the legs and mouth while the animal is grazing, and that they come in contact with the contagion (the spores of the bacilli) which is present in the soil.

The blackleg bacilli and their spores are found in two places—in the bodies of animals dead or diseased blackleg victims, and in certain low-lying and damp or swampy country. In both places these germs grow and multiply.

Infected soil, or fodder plants grown on such soil, serve as a means to carry germs into the animal's system.

Wounds and bruises in the animals' skin or mucous membranes, no matter how slight, serve as ports of entrance for the bacillus.

The hoofs of animals and their coats of hair, even their droppings and carelessness of their attendants, serve to carry the germs from place to place.

The blackleg bacillus is very tenacious of life and extremely resistant to external influences.

I have had in my possession, for several years, portions of dried leg muscle, from an animal dead of blackleg, which still retains its infective properties. Hence, dried flesh remains dangerous for a very long time. Burying the dead body does not destroy the contagion.

The bacillus of blackleg is in no way influenced by the bacteria of putrefaction or even by severe cold, and the spores in the bacillus of dried finely-powdered flesh of animals that have died of blackleg can resist steam even at boiling point.

These remarks point out two possible methods of prevention:—

1. Changing animals from infected paddocks (usually low places with rich soil) to non-infected places (high and dry country).

The spread of the disease can be further prevented by burning the dead bodies of animals that die of blackleg, and avoiding the practice of burying such carcasses, which amounts practically to planting the disease germs for future harvest.

Under no consideration whatever should the skin of a diseased animal be removed or utilised in any way.

2. The disease can in a measure be prevented by proper feeding, more especially among stud and dairy cattle. Feeding with digestible grasses and root crops; avoiding rough cornstalks and other coarse, hard food, which are capable of producing small internal and external wounds and abrasions, and thus provide a port of entrance for the disease germs.

It should be remembered that the germs always enter the body through a wound. Sucking calves do not have these opportunities for wounding their mucous membranes, hence the well-established fact that they are rarely afflicted with this disease.

Economic and Useful Micro-Organisms.

There are two kinds of micro-organisms which have long been known to be of useful service and of economic value in the arts and industries of mankind, viz.:—

(1.) Those which are particularly serviceable, as pointed out by Pasteur, for the destruction of noxious animals and insect pests, the most familiar being:—

(*a*) The bacteria of chicken cholera for the destruction of rabbits;

(*b*) Bacillus typhi murium, which has been found efficacious for the eradication of mice in grainfields, cornstacks, and granaries;
(*c*) A specific micro-fungus, which has recently been used with great success in South Africa for the destruction of locusts and grasshoppers.

(2.) The other useful micro-organisms are intimately associated in connection with some of our fermentative industries, such as—
(*a*) Lactic bacteria in the manufacture of butter and cheese;
(*b*) Specific bacteria used in the fermentation and manufacture of wines, beer, and vinegar;
(*c*) Micro-organisms concerned in the process of nitrification of the soil, which are of special interest to the agriculturist.

Bacteria of Chicken Cholera.

Up to the time of their suspension, Messrs. Cheeseman and Dudgeon (instructors in the process of destruction of rabbits by means of chicken cholera) were kept constantly supplied with cultures of the bacillus of chicken cholera, but I regret to state that there has been a gradual falling-off in the demand by stockowners in the rabbit-infested districts for cultures of this specific bacillus.

Generally speaking, there appears to be a prejudice against the use of Pasteur's original method in favour of the more universally adopted process of destroying rabbits with phosphorus.

Without wishing to decry in the slightest degree the method of using phosphorus, I maintain that, in order to cope with this steadily-increasing pest, it is absolutely necessary to adopt a combination of schemes for the prevention of the incursion of rabbits and their destruction, and in my opinion the method of destroying rabbits with the bacteria of chicken cholera should certainly find a prominent place, especially when we consider the very many advantages it possesses that cannot be attributed to the poisoning of rabbits with strychnine or phosphorus—viz., it is not dangerous to stock or any domestic animals except poultry, and harmless to human beings; moreover, as I have frequently stated, the method of the application of this bacteria is extremely simple.

Recent reports from New Zealand and South Australia show that the method in question is still being adopted in several places somewhat extensively. In the laboratory the bacteria of chicken cholera in culture tubes are always kept up to the standard degree of virulence, in the event of there being another demand for the specific bacteria.

Bacillus Typhi Murium.

This pathogenic bacillus, which I have had under cultivation and observation for some considerable time, has been brought somewhat prominently under notice during the last few years, principally by Loeffler, who recommended that the bacillus might be of use for the destruction of field mice.

In Italy, Greece, and the South of Russia the results attending its use have been highly satisfactory. Loeffler has succeeded in ridding fields (so infested as to be useless for agricultural purposes) by saturating some bread with broth cultures of the bacillus and distributing it near the holes inhabited by the mice.

The bacilli that were eaten by the mice not only killed them, but also infected others which ate the dead bodies of the first victims, and so the extermination progressed until scarcely a mouse remained in the fields.

The bacilli are not pathogenic for animals such as cats, dogs, ferrets, &c., that feed on mice, and they (the bacilli) do not affect man in any way; consequently, this micro-organism should occupy a useful place in agriculture by destroying those small, yet extremely prolific rodents, which not only destroy some of the grain by gnawing, but taint considerable quantities with that odour which is peculiar to mice.

Some time ago exhaustive experiments were carried out to test the effects of this micro-organism upon flying-foxes, but in consequence of the difficulty of infecting the natural food of these animals, the results did not come up to expectations, although the bacillus was proved to be virulent and fatal to each animal that was specially fed with even the merest trace of an active growing cultivation.

Experiments with Laboratory Mice.—In view of the frequent applications from various farming centres on the Darling Downs and from different agricultural districts in New South Wales for some method for the destruction of mice in granaries and wheat stacks, I have been experimenting with the bacillus typhi murium on mice, first by inoculation, and then by feeding, afterwards placing healthy or control mice with experimentally infected ones.

Just as Loeffler pointed out, when the specially fed or inoculated mice died they were eaten by their companions, which also contracted the disease and in due course died, notwithstanding that an ample supply of various kinds of food was always kept in the cages.

Mice that are inoculated subcutaneously usually die in from seven to twenty-one days, while those which are fed upon the material containing the baccillus succumb as a rule between the twelfth and twentieth day.

The bacilli multiply fairly rapidly within the blood vessels and cause death from general septicemia or blood poisoning.

Micro-Fungus for the Destruction of Locusts.

Several applications have been received for the pure cultivation of this specific fungus from sugar-growers in the Bundaberg and Ayr districts. Considering, however, that the use of this fungus for the destruction of locusts, grasshoppers, and other insects, is only in its initiative stage, I have been unable so far to obtain anything like complete reports as to its efficacy, but in view of the success that has attended the distribution of this fungus by Dr. Eddington, of the Grahamstown (South Africa) Bacteriological Institute, among the agriculturists there during the past two years, it is to be hoped that during the coming spring there will be every means afforded for testing the efficacy and applicability of this micro-fungus as an insect-destroyer in the sugar and agricultural districts of the colony.

Bacteria in Relation to the Dairying Industry.

Except in a very small way, no person in this colony has attempted to use pure cultivations of the bacteria of lactic ferment for the ripening of cream in the manufacture of butter, whilst the best authorities willingly admit that the success of the butter industry in Denmark, and the reason why the Danes command the British market, is solely due to the fact that the whole of their exported butter is made in accordance with strictly scientific principles; and the reason why it is so seldom faulty in flavour is almost exclusively the result of using special ferments in its manufacture. Therefore, if we in Queensland are to compete with Denmark in the export of butter, we shall be compelled to study very closely the reason why the butter made in Denmark dairies is so excellent and uniform in quality.

In view of these facts, I have devoted some considerable time in preparing cultures of several of these special ferments, and propose, when the laboratories of the new Institute are completed, to carry this work on still further, in order that our dairy farmers and managers of the butter factories may be supplied with pure cultures of these specific and necessary micro-organisms.

C. J. POUND, Director, Stock Institute.

Report of Various Investigations Carried out by Dr. J. Sidney Hunt, Government Pathologist.

Texas Fever.

Attention during the past year has been chiefly devoted to the further study of various problems connected with the tick plague, which still remains the most important matter affecting our stock.

Progress reports of various experiments which have been made have from time to time been submitted, and have for the most part been published by the Department for general information.

The investigations of the year in connection with this subject may be briefly summarised under the following heads:—

(1.) *How Ticks Acquire Virulence.*—In a report submitted to the International Conference of Ministers of Agriculture, held in Brisbane in May, 1898, a detailed account was given of the experiments by which it was shown that, in some localities, the ticks and the cattle infested by them are free from Texas fever contamination; that the blood parasite is absent both from the tick and the bullock. The object of the present inquiry was to ascertain how such non-pathogenic ticks become possessed of the specific Texas fever contagium, and with it the power of communicating the disease.

Two hypotheses only seemed possible: the first, that ticks pick up the fever parasite from external nature in certain localities, just as the malaria parasite is believed to be picked up by mosquitoes. The second, that ticks acquire their virulent contamination by maturing on animals in whose blood the microparasite is already present.

To test the first hypothesis, thirteen head of clean cattle were placed, in July last, on a small clean island near Gladstone, known as Garden Island. The island was then thickly infested with non-pathogenic ticks forwarded from Boolburra. These ticks have now increased and multiplied upon the cattle on the island for the past nine months, the cattle having been many times quite thickly infested. Nevertheless, no sign of Texas fever has, as yet, ppeared amongst them. It may safely be

asserted, therefore, that the Boolburra ticks have failed, from their new location, to become contaminated with the *pyrosoma* parasite. Considering that they have now been breeding for a good many generations, under the presumably favourable climatic conditions of a low-lying coastal island, surrounded by mangroves, and provided with abundant shade and moisture, the experiment, so far as it has gone, must be held to negative the idea that ticks acquire the association of the Texas fever parasite from their surroundings in external nature.

To test the second hypothesis—that ticks acquire virulence by maturing upon previously contaminated cattle—a piece of clean country near Westwood, was, in July last, enclosed with a double ring fence; the inner fence being placed at a minimum distance of half a chain from the outer. Nine susceptible, tick infested Boolburra bullocks were then placed in the paddock. Large numbers of Boolburra ticks were also forwarded, from time to time, and deposited there. The entrances of the inner and outer paddocks were kept securely locked, so that all possibility of contact between the cattle in the inner enclosure and any local cattle outside the outer fence was absolutely prevented. No entrance or exit of stock was, of course, permitted through either fence. When the ticks had become plentiful in the paddock, one of the bullocks was inoculated from a recovered cow. When reaction took place, the blood of this first bullock was used to inoculate a second, and when he reacted a third, and so on, till all the cattle in the paddock had been inoculated. Each animal reacted strongly to the inoculation, thus showing incidentally, that though these cattle had been for nearly three years tick infested—and at times very grossly infested—at Boolburra, they were still as susceptible to Texas fever as if they had never had a tick upon them. When the last of the animals operated on had fully recovered, and time had elapsed for at least one generation of ticks to mature upon those most recently inoculated, and several generations upon those done earlier, some fresh, clean cows, railed from beyond the infested area, were introduced. Some of these were employed for other experiments and need not be here considered. One, however, was left untreated: she promptly developed acute Texas fever, and succumbed to that disease on the twenty-first day of exposure in the paddock. On *post-mortem* examination, she was found to be thickly infested by ticks, none of which had yet come to maturity; her internal organs presented the characteristic lesions of Texas fever. Though the fate of this one cow affords unequivocal evidence that the previously non-pathogenic ticks brought from Boolburra have somehow acquired the fever producing contamination in the Westwood paddock, and so become virulent, it was still thought desirable, in a matter of such importance, to obtain a larger bulk of evidence. Ten perfectly clean cows were therefore obtained from beyond the infested area, and placed in the paddock. They were carefully observed twice a day, but were otherwise left quite undisturbed. On the twelfth day of exposure, two were seen to be sick. On the thirteenth day they were killed and submitted to *post-mortem* examination. The condition of the internal organs, and the microscopical appearances of the blood showed unmistakably that they were suffering from acute Texas fever. They were thickly infested with quite small ticks, many of them just shedding the outer membrane, *i.e.*, undergoing the second "moult." On the fifteenth day of exposure another cow aborted and died three days after. On the eighteenth day another cow died. In the night following the nineteenth day of exposure three more cows died. On the twenty-second day yet another was down, and being unable to rise was killed. All were carefully examined after death, and found to be suffering from acute Texas fever. The surviving two also suffered from the disease. Hence, of the ten cows placed in the paddock, all had acute Texas fever, five died, and three were killed in a dying state.

When it is remembered that the ticks at Boolburra have remained non-virulent to the present time, and that those transported to Garden Island have not acquired virulence, and that the only respect in which the ticks in the Westwood paddock differ from those at Boolburra and Garden Island is in the fact that they have matured upon inoculated cattle, the conclusion becomes irresistible that the inoculated cattle in the Westwood paddock were the source from which the ticks acquired pathogenic powers. The conclusion that ticks become virulent by maturing upon contaminated animals is also borne out by the results of actual experience. For, in more than one well authenticated instance, the ticks have been present for months or years without communicating any Texas fever until contaminated animals—that is to say, animals having the micro-organism of Texas fever in their blood—have been introduced amongst them.

The chief practical lesson to be learned from these observations would seem to be that when some members of a tick-infested herd are inoculated, or when recovered animals are introduced for inoculation purposes, all the rest of the herd should be inoculated as soon as possible; that contaminated cattle—that is to say, "immune,"

"recovered," or "inoculated" animals—are, in fact, a source of danger to tick-infested, but still susceptible herds. This circumstance does not, however, appear to justify the somewhat antagonistic attitude in regard to inoculation which some owners of infested but fever-free herds have adopted. Ticks were fever-laden from their first appearance in the Gulf, and sooner or later, for the most part, communicated the disease as they spread, and this long before any inoculations were done. In the absence of all inoculation, therefore, it is pretty certain that sooner or later the same thing would happen—the ticks would acquire virulence from some previously contaminated animal. For it is obviously a practical impossibility to prevent all intermingling of cattle which might carry the micro-organisms in their blood with such as though tick-infested are still susceptible. Recognising these facts, there can be little doubt that the owners of infested but not immune herds would, in the long run, better conserve their interests by adopting, betimes, the comparatively harmless process of inoculation than await the chance introduction of the more deadly form of the fever in the natural course.

Since the ticks in some localities have been shown to be non-virulent, and virulence to be acquired in the way indicated, it becomes interesting—and perhaps important—to consider the collateral question of how ticks lose virulence. The existence of non-pathogenic ticks, in any spot in Queensland, affords intrinsic evidence that the ticks there must have lost their virulence For all the ticks in the country are descendants of those brought out of the Gulf, which were certainly pathogenic. Unless, therefore, there had been some break in the chain of hereditary transmission of virulence, all the ticks in Queensland must have remained virulent. It was some time ago suggested that development upon insusceptible hosts, such as sheep and horses, might afford a means by which ticks become cleansed of their fever-producing contamination. This was put forward only as a seemingly probable and rational explanation. It has not been scientifically proved. That can, for obvious reasons, be done only in clean country. The suggestion is, however, supported by the fact that, in America, no outbreak of Texas fever has ever been traced to ticks carried by such animals. It is necessary, however, to suspend judgment in this matter till unimpeachable experimental evidence has been brought to bear upon it.

(Since the foregoing was written, a copy of a letter from Dr. Salmon to the Chief Inspector of Stock has been received, from which it appears that the views here expressed are in harmony with the results of American researches.)

(2.) *Concerning Inoculation.*—Though inoculation, as generally practised, with blood of an animal recovered from Texas fever, gives, broadly speaking, satisfactory results, it cannot be regarded as a perfect method. The results, as regards the production of reaction, are neither quite certain nor quite uniform. Nor is the reaction when produced at all under control; in some cases no reaction is produced, in others the reaction runs to dangerous excess. Various experiments have accordingly been made with the view of removing or reducing these defects. Without entering into the details of these experiments, it may be said that the results have tended to show—

(*a.*) That inoculation, when not followed by reaction, is unreliable as a protection against Texas fever.

(*b.*) That blood taken from an animal during the fever is more uniformly reliable in producing reaction than blood taken after recovery.

(*c.*) That the difference in the danger of using "fevered" and "recovered" blood has been overestimated. *Where recovered blood produces adequate reaction* its use is attended with practically the same danger as fevered blood. The greater apparent safety of recovered blood is largely due to the fact that a certain considerable proportion of animals treated with it do not react. The use of fevered blood, such as was employed in the first inoculations done in Queensland (*i.e.*, those done at Hughenden in the end of 1895 and beginning of 1896) is therefore, on the whole, to be recommended in preference to recovered blood Even allowing a somewhat greater risk with fevered blood, that increased risk is, in the long run, more than compensated for by the more certainly efficient protection afforded.

(*d.*) No definite evidence has been obtained that the reactionary fever produced by injection of recovered blood has any relation to the quantity injected. Expermental results have been quite conflicting. On the one hand, all manner of doses from ½ to 300 c.c., have occasionally caused death; on the other hand, all manner of doses up to 800 c.c. have been borne with impunity.

(*e.*) The existence of an anti-toxin in the blood of recovered animals has not been satisfactorily proved. Methods of treatment based on this assumption have not yielded the results that were hoped. The essential nature of the condition which underlies "immunity" to Texas fever remains, therefore, unknown.

The general results of inoculation, however, in spite of the imperfections in our methods, have been very satisfactory. Proofs of its efficacy have continued to accumulate, and confidence in its comparative safety, and in its protective power, have become pretty generally established.

In some cases it is true inoculation has been reported to have failed. A critical examination of such cases has, however, uniformly revealed one of two causes—either the cattle were not properly inoculated in the first instance or the disease to which they succumbed was not genuine Texas fever. The first cause of failure has been only too common and too disastrous. Herds have been inoculated with the greatest care as regards the mechanical part of the process, but the essential conditions underlying it have been lost sight of, or have at least not received adequate attention. Such mechanical inoculations have, in many instances, been regarded as "successful," because no immediate losses have attended them. Carefully considered, however, a total absence of fatalities when dealing with large numbers is, in itself, calculated to raise a suspicion as to the efficacy of the operation. These successful failures should serve to impress upon those who have not yet inoculated their cattle the paramount importance of ascertaining by direct trial the power of the blood proposed to be used. They should also emphasise the fact, which appears to be sometimes overlooked, that the essential element of inoculation consists, not in the squirting some blood into a beast, but in the communicating to it of such a distinct attack of Texas fever as shall protect from subsequent attacks.

(3.) "*Tick Poverty*," "*Tick Anæmia*," "*Tick Worry*."—That ticks kill cattle, apart from Texas fever, has long been insisted upon. It is now generally recognised by owners who have had opportunities of studying the matter. And it is even admitted that, in some places, the losses from the direct effect of ticks have been as serious as those caused by the fever itself. Ticks destroy cattle by producing intense anæmia, poverty, and exhaustion. This condition of "tick poverty" is brought about only when the ticks are numerous; therein differing markedly from Texas fever, which, as most people are aware, is frequently communicated by ticks that are so few as to be hardly discoverable. *How* ticks produce this poverty is not so clear. The mechanical abstraction of blood is by some thought sufficient explanation. The introduction of some specific tick poison has probably more to do with it. Cattle that have been made immune to Texas fever are by no means safe from "tick poverty;" clean animals that have been effectually inoculated on clean country suffer severely from this condition when first removed to a badly infested locality. The anæmia produced in such animals is not necessarily accompanied by fever. A cow inoculated in clean country and some months afterwards transported to a thickly infested place was very carefully observed after her arrival. She was found to become very anæmic; her blood corpuscles fell from 6,320,000 per cubic millimetres on arrival, to 3,980,000 per cubic millimetres, on the twenty-first day (by which time she was literally covered by mature ticks). Nevertheless, this cow's temperature remained normal throughout. More usually a certain amount of fever accompanies the intense irritation to which such cattle are exposed, and this, no doubt, contributes largely to their rapid loss of strength and condition. This kind of "irritative fever" must not, however, be confused with true Texas fever, for it is due to another cause, runs a different course, presents other symptoms, and differs widely in its *post-mortem* appearances. Indeed, it appears to bear no relation to any form of Texas fever whatever. Immunity to that disease is, as already stated, no protection against it. Neither, on the other hand, does the comparative immunity to tick irritation which comes of habituation necessarily afford any protection against Texas fever; the Boolburra cattle, for instance, have become practically "tick proof," but are still susceptible to Texas fever. And instances would not be difficult to cite where herds have suffered severely from "tick poverty," and having recovered from that condition, have been subsequently invaded by Texas fever.

Two things only appear effective against "tick poverty," habituation and dipping. By use and wont cattle become to a great extent tick proof, and by dipping they may be relieved from time to time till this "tick proof" condition is established.

Hereditary Immunity.

The question has often been asked, are the progeny of immune animals born immune? No definite answer has, however, been forthcoming. It was thought probable in America that calves born in infested areas become immune from inoculation by the ticks in early life rather than they inherit the condition from their parents. In support of the same view an experiment was recorded from Hughenden, where 20 c.c. of the blood of a fœtal calf, taken from a cow killed during an attack of Texas fever, produced no reaction, and conferred no immunity, whilst 2 c.c. of the cow's blood produced very severe reaction. There was in this case evidence that the fever germs had not passed from the blood of the cow into the system of her offspring.

The supposed discovery of the micro-parasite in the blood of fœtal calves, or of calves born of immune cows in clean country, cannot be regarded as having any weight as against such definite evidence, especially in the absence of any satisfactory demonstration of the specific micro-organisms in the blood.

An experimental observation, carried out by Mr. W. Collins, at Mundoolun, has, however, practically settled the question of hereditary immunity in a much more direct and decisive way. Certain pregnant cows were inoculated in April, 1897. The calves born of these cows were in March last injected with 8 c.c. of recovered blood in the jugular vein The result was that all reacted, their maximum temperature reaching 105·2 degrees, 106 degrees, and 106·2 degrees Fahrenheit, respectively. In the face of a result so decisive it is difficult to see how the theory of hereditary immunity can be longer maintained. Fortunately, its importance in permanently infested country is minimised by the fact that the stock are known to become immune very early in life through the operations of the ticks, and practically without loss.

Dipping.

The experience of the past year has served to indicate more precisely the value of dips, and the place they are destined to occupy in our warfare against the ticks. No dip has yet been discovered which is at once harmless to the cattle and reliable in destroying all the ticks upon them at one dipping. And no substance, used as a dip, has been found to protect cattle for more than a very short time from reinfestment. From these facts it might be inferred that dips are practically useless *as a means of protecting susceptible cattle from Texas fever ;* and this has been found, in practical experiments, to be the case. Some of the more generally approved and widely used dips have proved quite ineffective for this purpose. Clean cattle, dipped on their arrival in fever country, and regularly, at short intervals, afterwards, have still become infested by sufficient ticks to communicate the fever in a fatal form. On the other hand, it has been conclusively shown that for the purpose of relieving cattle of the gross infestment, by which they are sometimes worried and worn down, dips of various kinds are of the greatest possible service. In a general way it may, therefore, be said that while dipping is of no practical value as a preventive against Texas fever, and is of very limited utility for controlling the spread of the ticks, it is still of great and unquestionable assistance in combating the poverty of gross infestment—a condition which has, as already stated, in not a few instances, proved as destructive as Texas fever itself.

Turning from the general question of dips and dipping to the practical experiments that have, at the desire of the Stock Board, been carried out to discover a safe and efficient dip, it may be stated that a great deal of time and labour has been devoted to this subject ; an immense number of substances have been tested, and a good deal of expense has been entailed upon the Department. Nevertheless, it has to be admitted that none of the dipping materials tested have been found to completely fulfil the necessary conditions (*a*) of being perfectly effective in killing every tick on a beast at one dipping, (*b*) of not injuring or endangering the cattle treated, (*c*) of protecting them for some time after from reinfestment, and (*d*) of being cheap.

All dips are presumably intended to fulfil these conditions. But they are designed to achieve the results in different ways. Some are operative through their poisonous or caustic properties, others by their mechanical action. The great bulk of the patent or proprietary dips which have been submitted for trial belong to the former class : the oils, fats, resins, and probably tars, to the latter. With reference to the poisonous class of dips, it appears, as a result of the experiments that have been made, that a radical error underlies the idea that cattle can be absolutely cleansed by dipping them in solutions of this kind ; for the tick is, on the whole, more tolerant of such treatment than the bullock, and in certain of the earlier stages of its development can withstand prolonged immersion in caustic or poisonous solutions that would be extremely dangerous to its host. The same difficulty confronts us here as is encountered in the treatment of internal microbic maladies with antiseptic remedies ; the parasites are more resistant to the action of antiseptics than the host. In both cases the safety limit for the host is reached before the parasite is in any way injured.

From these considerations, as well as from practical experiments, it has been concluded that the greatest measure of success is to be obtained from the employment of dips, of the second class mentioned—namely, those which act more by their mechanical properties than by their poisonous nature. Oils of all kinds appear to act chiefly in this way. They do not poison the ticks, but plug up, or obstruct the "spiracles" or external orifices of their breathing tubes (tracheæ). These tubes have no connection with the mouth parts, which are firmly embedded in the skin, but have

their opening immediately beneath the legs, where they are necessarily exposed to the mechanical action of oily or tarry applications: partly grown ticks, however, that are still invested in the outer skin or envelope, which shields them prior to their second moult, are comparatively little affected by such agents. The differences observed in the efficacy of various simple oils have not been great. A "paraffin" oil—somewhat lighter than the black "vacuum oil"—that has been used in Queensland, is recommended by Dr. Salmon. The whole dip, to within a foot of the bottom, is to be filled with the oil. Sulphur dissolved in this "paraffin" oil, with the help of heat, is said to increase its efficacy as a tick destroyer. The published records of the dipping thus carried out in the States suggest, however, that the method will require still further study and development before it can be recommended to cattle-owners as a perfectly safe and satisfactory procedure. For the somewhat different purposes for which dips are chiefly required in Queensland, a less severe method of dipping than is required to meet the exigencies of the American cattle transport trade will generally suffice. In using all oil dips, however, certain precautions have to be observed. For instance, oils left floating on dipping vats for any length of time become inspissated, and cattle put through when the oil is in this state carry out upon them a pellicle or mantle of half-dried oil, which frequently causes their death.

Cattle dipped in oil dips should, as far as possible, be protected from heating from within by excitement or exertion, or from without by the midday sun. Oil dips have, however, the disadvantage of being comparatively expensive. They are also ill-adapted for occasional use on account of the mechanical alteration in consistence just mentioned. Many of the solutions in common use in Queensland — consisting generally of Stockholm tar, arsenic, soda, and sometimes soap in various proportions—fulfil fairly well the purpose for which they are used: they cleanse the cattle up to a certain point, with a minimum of risk and at a nominal cost. Stockholm tar, made miscible with water by means of soda, appears a most valuable ingredient, as it has a decidedly destructive action on the ticks, is cheap, non-poisonous, and remains with its characteristic odour upon the hair for a considerable time. A great advantage of such solutions over oil dips is that they do not deteriorate in the vat, which is therefore always available for use from time to time as required.

Rickets.

Investigations have been carried on with a view of determining more precisely the nature and causes of that form of paralysis in cattle commonly known in Queensland as "rickets," in order, if possible, to discover means of prevention or cure. A detailed account of this, necessarily somewhat technical, work will be submitted as soon as it is complete. The following, however, is a brief summary of the points which have so far been definitely established in the course of the present inquiry:—

(1) The term "ricket" is, as has already been pointed out by several observers, a misnomer. The condition has absolutely no relation to, or analogy with, the disease known as "rickets" or "rachitis" in man. The latter is largely an affection of the osseous system, and is characterised by bony deformities; "rickets" in cattle, on the other hand, is essentially a disease of the nervous system, and is characterised by loss of nerve power, amounting, in some cases, to complete paralysis. The only point in which even a distant resemblance is apparent between the two diseases is in the frequent dropping, or falling downwards, of the horns in "rickety" cattle. This is apparently due to softening and erosion of the bony attachments of the horns themselves to the skull, not to any loosening or other affection of the horny shells, as has been stated. The condition is probably referable to failure of nutrition of nervous origin, such as is not uncommon in various diseases of the nervous system, rather than to any process akin to the bony softening seen in bony "rickets." The view held by some owners that this falling of the horns in "rickety" cattle is due to injuries sustained by reason of their instability is discountenanced by the fact that the horns are often observed to droop gradually and symmetrically. There is also a peculiar and characteristic appearance about them which serves to distinguish the affection from the diversified results of accidental injury.

(2.) "Rickets" in cattle is unquestionably caused by their eating zamia leaves. This was first clearly proved by Dr. W. Tilley, of Warwick (formerly of Milton Station, near Gladstone), and is now generally admitted. Cattle experimentally fed upon the macrozamia—whether upon the leaves, leaf-stems, bulbs, or young male or female fruit—become affected. The first signs of the paralytic condition generally appear after about fourteen days' zamia-feeding—when 2 to 4 lb. of any part of the plant are consumed per day. If the forced zamia-feeding is continued the animals become completely paralysed, so that they are unable to rise or even to lift their heads

from the ground. Cattle removed from contact with zamia after having become, even slightly, affected with "rickets," show little or no tendency to spontaneous recovery, neither is their malady progressive. They remain permanent invalids, with little or no alteration in their condition. This paralysis is only known to be produced by feeding on zamias (the *Macrozamia miquelli*, and a cycas palm were the two species experimented with). The name of *Zamia paralysis*, as suggested by Dr. T. L. Bancroft, in the report of his researches carried on in 1892, seems therefore eminently appropriate. Attempts to communicate the disease to healthy cattle by injections of blood, emulsion of spinal cord, cerebro spinal fluid, or synovia, either from recent acute cases or from old standing chronic ones, have completely failed. It may be safely affirmed therefore that the paralysis is due to something intrinsic in the zamia, and not, as has been suggested, to anything, such as a micro-organism, casually associated with it. The isolation of the poisonous principle of the zamia has occupied the attention of many excellent chemists—notably the late Baron von Mueller, and the late Dr. Smith, one time Professor of Chemistry in the Sydney University, and more recently Dr. Joseph Lauterer, of Brisbane. It has, however, to be admitted that, in spite of their labours, the chemical nature and precise physiological action of the zamia poison remain, for the present, shrouded in mystery. No case of the disease has so far been produced by hypodermic injection or internal dosing with any substance extracted or isolated from the zamia, but only by feeding with the plant itself. In one case, certainly, paralysis was induced in a calf by causing it for some weeks to drink only water in which zamia had been stewed. The theory that an excessive quantity of oxalic acid in the zamia is responsible for its poisonous effects has been disproved by the fact that two calves dosed with large quantities of this substance for many weeks failed to develop any symptoms of the disease; a like negative result attended the daily administration of 1,000 grains to a medium-sized steer. No symptoms like those observed in cattle have been produced in other animals by zamia-feeding. Horses and sheep will not eat it. Ducks, fed on the fruit, die rather suddenly after about ten days from gastro-enteritis. Pigeons fed in the same way also die, apparently from the same cause.

The difficulties of the subject from the standpoints of analytical chemistry and toxicology are thus seen to be very considerable, and it cannot be said that its clinical and pathological aspects are more simple. The long persistence, or practical permanence, of the symptoms after removal of affected animals from the exciting cause (the zamia), indicates that the paralysis is dependent upon some *structural* damage of the nervous mechanism, rather than on any toxic action of the zamia poison itself. If it were due to the latter, it might be expected to disappear more or less rapidly on the elimination of the zamia poison, as do various other special paralyses temporarily produced by the direct action of such drugs as cinchona, curara, belladonna, &c.

The persistent paralysis of zamia-poisoning more nearly resembles the forms of paralysis in man which attend poisoning by various metals, such as lead, arsenic, and mercury, or that which attends poisoning by the diphtheria toxin, and still more commonly by alcohol. In all these cases there are to be found in the nerves, or in the more central parts of the nervous system, traces of structural alteration in the way of degeneration. This is probably always consecutive to inflammation, though the inflammatory stage may not always be recognisable. The causation, mode of onset, course, and symptoms of zamia paralysis are quite compatible with the view that it likewise is due, primarily, to inflammation of the nerves (*peripheral neuritis*), with consecutive degeneration of greater or less extent. This view is directly supported by many of the clinical features of the disease, and indirectly by the absence of any other discoverable lesion that would account for the symptoms. Further research is now going forward with the view of obtaining more definite and precise evidence on this question. The tendency of zamia to produce gastro-enteritis would, doubtless, favour the absorption of its active principle, just as that condition is known to favour the absorption of the heavy metals above referred to.

It may be here stated that the work done during the past year has not altogether confirmed the observations of Mr. H. Edwards, Veterinary Surgeon of Western Australia, as to the gross naked-eye lesions of the disease. The conditions of the spinal cord and its membranes which he describes in his excellent report have not so far been encountered. The hypodermic treatment with the alkaloids of jaborandi and calabar bean, recommended by Mr. Edwards, in common with a great number of other kinds of treatment that have been tried, has proved quite unsatisfactory.

Specific remedies are, however, extremely rare, and pathological knowledge has, in many cases, outrun the limits of therapeutic resource; even where, as is often the case, it indicates clearly enough the means of prevention. This is eminently the case in zamia paralysis. Knowing the cause, the obvious and natural way of prevention is

to remove it by getting rid of the zamia. The only difficulty about this is the very practical one—the expense. The prospect of finding a cure for the developed paralysis cannot, in view of the ascertained facts already mentioned, be regarded as very encouraging; and the prospect of preventing its development by artificial means, in spite of the continued operation of its known cause, is scarcely more satisfactory. The immense importance of the subject however, renders it imperative that no stone should be left unturned even in this unpromising direction.

General.

In addition to the special studies above referred to, attention has been devoted to supplying stockowners with all available information in connection with these subjects, as well as in reference to other kindred matters on which they have sought information or advice.

Addresses and demonstrations in connection with ticks and Texas fever questions have also been given in several of the Northern and Central districts. By these means it is hoped a more general knowledge of the natural history of the disease, and of the means of coping with it, have been disseminated. Assistance has been afforded to many cattle-owners in procuring blood or recovered animals suitable for inoculating purposes, and in inaugurating the process. Visits to various places and stations have been made—some under direction of the Honourable the Minister of Agriculture, some at the invitation of the residents, and some spontaneously. They have in all cases been kindly received, and their objects cordially forwarded by the stockowners.

The time absorbed by this diffusion of information, personally, by correspondence, and by the travelling involved, has not, it is confidently hoped, been wasted; it has, however, necessarily encroached somewhat upon the time available for more purely experimental and research work. The recent establishment of a station for experimental work at Tungamull, near Rockhampton, has afforded much greater facilities for the prosecution of such studies, and will, it is anticipated, be found of considerable service to pastoralists in matters affecting the health of their stock. Already several morbid specimens, as well as animals suffering from various forms of disease, have been forwarded for investigation and report.

Special acknowledgments are due to Drs. T. L. Bancroft, W. Tilley, and Joseph Lauterer, who have freely contributed to the present inquiry concerning "rickets" the results of their respective investigations on the same subject, and have given helpful suggestions for further work; to Drs. Lockhart Gibson, Tidswell, and Halford for kind assistance in the way of scientific instruments; to the Agricultural Department of Western Australia for kindly forwarding reports of experiments on "rickets" carried out in that colony; and to Messrs. W. P. Bayne, of Gladstone, W. Broome, of Rockhampton, H. Norton, W. Tucker, and W. Vaughan, of Yeppoon, for assistance in connection with the same investigation; to Stock Inspectors Geo. Hooper and Geo. Markham for consecutively superintending matters in connection with the experiment at Garden Island; to Inspector H. A. Maclean and Assistant Inspector James Smith for much assistance in relation to various experiments at Westwood; and to Mr. John D. Clay for the careful and efficient way in which he has carried out the work entrusted to him in connection with the same experiments; and last, but by no means least, to the many pastoralists who have, in one way or another, by their kind co-operation and assistance, forwarded the work of investigation.

MEAT INSPECTION REPORT OF THE BRISBANE DISTRICT.

(Inspector Quinnell.)

EAGLE FARM WORKS.

(Queensland Meat Export and Agency Company, Limited.)

Stock.	Slaughtered.	Condemned for—	Bodies.	Quarters.	Per cent.
Bullocks ...	42,256	Tuberculosis ...	140	394 fores from 325 bodies	0·564
		Other diseases ...	4	4 hinds	0·011
Cows ...	4,824	Tuberculosis ...	118	105 fores from 92 bodies	2·990
		Other diseases ...	9	5 fores; 8 hinds ...	0·253
Sheep ...	19,052	Abscesses, &c. ...	2	4 hinds...	0·015

QUEENSPORT WORKS.

(Messrs. Baynes Bros.)

Stock.	Slaughtered.	Condemned for—	Bodies.	Quarters.	Per cent.
Bullocks ...	30,279	Tuberculosis ...	72	232 fores from 4[8]6 bodies	0·429
		Other diseases ...	6	3 fores; 5 hinds ...	0·026
Cows ...	5,318	Tuberculosis ...	46	54 fores from 123 bodies	1·119
		Other diseases ...	17	8 fores; 7 hinds ...	0·390
Sheep ...	64,141	Abscesses, &c. ...	5	...	0·007
Pigs ...	1,325	Tuberculosis ...	6	...	0·452
		Other diseases ...	1	2 fores from 2 bodies...	0·113
Calves ...	439	Unfitness... ...	2	...	0·455

This table includes stock slaughtered and inspected for the Company's town supply.

REDBANK WORKS.

(Queensland Chilling and Extract Company, Limited.)

Stock.	Slaughtered.	Condemned for—	Bodies.	Quarters.	Per cent.
Bullocks ...	3,988	Tuberculosis ...	22	62 fores from 49 bodies...	0·940
		Other disea-es ...	2	4 fores; 2 hinds ...	0·087
Cows ...	1,473	Tuberculosis ...	25	48 fores from 38 bodies...	2·511
		Other diseases ...	7	4 hinds	0·543
Sheep ...	1,158	Abscesses, &c. ...	4	3 hinds	0·410

During October and November the works were closed down, and again from 9th April, 1899.

OAKEY CREEK WORKS.

(Hogarth Australian Meat Preserving Company, Limited.)

Stock.	Slaughtered.	Condemned for—	Bodies.	Quarters.	Per cent.
Bullocks ...	1,997	Tuberculosis ...	19	53 fores from 42 bodies...	1·614
Cows ...	1,640	Tuberculosis ...	51	8 fores from 5 bodies ...	3·231
Sheep ...	2,306	Other diseases ...	2	7 fores; 2 hinds ...	0·259

The works closed down in August, 1898, and, after extensive alterations, reopened 24th April, 1899.

MOORAREE WORKS.

(Messrs. Uhlmann Brothers.)

Stock.	Slaughtered.	Condemned for—	Bodies.	Quarters.	Per cent.
Bullocks ...	1,145	Tuberculosis ...	2	4 fores from 3 bodies	0·262
Calves	169				
Sheep	4,776				
Pigs	232	Tuberculosis ...	1	...	0·430

The above firm registered under "*The Live Stock and Meat Export Act of* 1895," and inspection commenced at these works from 16th October, 1898. The stock slaughtered were nearly all for their shops.

ZILLMERE BACON FACTORY.

(J. C. Hutton.)

Pigs Slaughtered.	Condemned for—	Bodies.	Quarters.	Per cent.
43,523	Tuberculosis ...	52	49 fores from 36 bodies ...	0·147
	Other diseases ...	5	16 hinds from 24 bodies ...	0·020

As in the past, the manager submitted for our inspection all the pigs slaughtered, whether for export or local trade.

OXLEY BACON FACTORY.

(Messrs. Howes Brothers.)

Pigs Slaughtered.	Condemned for—	Bodies.	Quarters.	Per cent.
5,537	Tuberculosis ...	20	3 fores from 3 bodies ...	0·374
	Other diseases ...	...	3 hinds from 3 bodies ...	0·005

The above number of pigs slaughtered merely constitute Messrs. Howes Bros.' export trade.

CHARLEVILLE WORKS.

(Messrs. Geddes, Birt, and Co., Limited.)

The number of sheep slaughtered during the months of October and November, 1898, at these works was 19,163; they were treated as "boilers," their tongues only being utilised for preserving.

GENERAL NOTES.

INSPECTION.

I desire to direct attention to the tables given hereunder:—

Cattle Rejected and Tongues Condemned.

Works.	Bullocks.	Cows.	Tongues.
Eagle Farm	667	64	939
Queensport	272	257	1,320
Redbank	29	...	318
Oakey Creek	...	...	189
Mooraree	...	...	5

Note.—All cattle treated at Oakey Creek were "preservers," and Mooraree having no preserving plant all rejects went to the pots.

Pigs' Heads Condemned.

Works	Heads.
Zillmere	1,689
Oxley	203
Queensport	23
Mooraree	4

The above figures of bodies rejected for local diseases, and of ox tongues and pigs' heads condemned, have been obtained from daily returns, which I initiated over a year ago, and which are supplied me by my assistants. These returns afford reliable information as to the prevalence of disease among the stock operated upon at the various meatworks under my supervision.

Tongues and pigs' heads were condemned for tubercular, actinomycotic, and ordinary abscesses.

Rejects constitute stock not absolutely sound, though fit for human food. For example, in a case of localised tuberculosis affecting one or more of the viscera, or if the lesions are confined to the carcass itself, such a body is immediately rejected for freezing or shop; then when on a careful examination of the glands and other parts the carcass is found to be quite healthy, the diseased portions are removed and destroyed, and the rest of the carcass is permitted to be utilised for preserving only, thus insuring thorough cooking and sterilisation.

REPORTS.

1. In July last I brought under the notice of the Department an important discovery of tuberculosis in a mob of cows directly attributable to the operation of spaying A full report on this matter was published in the *Queensland Agricultural Journal* of October, 1898.

2. On the 24th September I received instructions to investigate, in company with Mr. F. M. Bailey, Colonial Botanist, the suspected poisoning of stock at Nerang. We paid a visit to the locality on the 5th October, and the results of our investigations were given in my report dated 8th October, and subsequently an extract appeared in the *Queensland Agricultural Journal* (November, 1898), in Mr. Bailey's article dealing with the Noogoora burr.

3. According to instructions, I visited the Quarantine Grounds at Lytton on 21st October, and duly inspected the kennels, and investigated the general management of dogs whilst undergoing quarantine there, and reported on same 22nd October, 1898.

4. On the 5th November I furnished a report on the result of the *post-mortems* held on the cattle that had reacted to the tuberculin test and condemned out of the Gatton College dairy herd.

5. During December and January, Mr. S. O'Boyle, M.R.C.V.S., and myself inspected the various slaughter-houses in and around Brisbane. We reported on each individual establishment; and then on 13th January we submitted a general report with suggestions to remedy the unsatisfactory conditions existing at these slaughtering-places.

LECTURES.

1. *Gatton College.*—Since November last I have delivered a series of lectures on veterinary science relating to animals of the farms, supplementing same with practical demonstrations.

An examination was held on 25th May, the result of which, and report thereon, has been forwarded to the Principal.

2. *Brisbane Technical College.*—By arrangement with and at the suggestion of the Hon. Minister for Agriculture, the Technical College Committee decided to hold veterinary lectures in "Animal Anatomy and Physiology," for the preparation of candidates for inspectorships under the Slaughtering, Diseases in Stock, and Dairies Acts.

The committee, with the consent of the Minister, appointed me as lecturer. The course extended from 10th January to 30th April, and 75 students were enrolled.

Easter and other holidays were taken advantage of for practical demonstrations at Redbank and Mooraree Meat Works.

W. C. QUINNELL, M.R.C.V.S.

LAKE'S CREEK.

(INSPECTOR BARNES.)

Number of Cattle Killed at Lake's Creek Meat Works for the year ended 31st December, 1898, and percentage of Cattle condemned :—

Total No. of Cattle Killed.	Diseases.	Percentage of Whole Carcasses Boiled.	Percentage in which Disease was Localised.	Total Percentage of Diseased Cattle.
48,137	Generalised—			
	Tubercle	0·47		
	Abscesses	0·01		
	Tumour			
	Cancer			
	Tick Fever	0·16		
	Pneumonia	0·06		
	Jaundice	0·01		
				0·71
	Localised—			
	Tubercle	...	2·54	
	Tumours	...	0·03	
	Pleurisy	...	0·57	
	Emaciation	...	0·02	
				3·21
	Total percentage diseased			3·92

Number of Sheep Killed at Lake's Creek for year ended 31st December, 1898, and percentage condemned and boiled for disease :—

Total Number of Sheep Killed.	Disease.	Percentage Boiled.
92,178	Tumours	0·04
	Tubercle and Lymphadenoma	0·02
	Total percentage of disease	0·06

Number of Pigs Killed at Lake's Creek for year ended 31st December, 1898, and percentage condemned to be boiled for disease :—

Total Number of Pigs Killed.	Disease.	Percentage Boiled.
1,135	Tubercle	2·71
	Abscesses	0·30
	Skin Disease	0·30
	Total percentage diseased	3·31

Summary of Cattle Killed at the Gavial Park Meat Works.

(Inspector Barnes.)

Number of Cattle Killed.	Number of Cattle Extracted.	Condemned for—			
		Tubercular.	Redwater.	Hydatids.	Cancer.
3,378	3,087	188	98	2	2
Percentage condemned—					
Tubercle		5·59			
Redwater		2·90			
Hydatids		0·06			
Cancer		0·06	8·61		
Percentage extracted		91 39			

A. W. BARNES, M.R.C.V.S.

ROSS RIVER WORKS.

(Inspector Calvert.)

Out of 28,206 head of cattle slaughtered at the above works during the season 1898, the following is an average percentage of all cattle condemned as unfit for human food, viz., 2·53 per cent.; of these 1·68 per cent. were rejected for tuberculosis, and 0·85 per cent. for other diseases, such as actinomycosis, pleuro-pneumonia, cancer, tick fever. pregnancy, abscesses, and bad bruises.

No sheep were killed at these works during the past year.

C. A. CALVERT, F.R.C.V.S.

BOWEN MEAT WORKS.

(Inspector Meek.)

During the season of 1898 there has been slaughtered at the above works 33,996 head of cattle, being about 4,000 more than for the season of 1897.

It will be noticed that in the actual diseases the percentage is somewhat less than last year—viz, tuberculosis being 2·68 as against 2·75 for 1897; redwater or Texas fever being ·82 as against 1·2 fo· 1897; but owing to a number of cattle being passed on for extract, the condemnation for poverty, pleurisy, old pleuro, and general unfitness for freezing, the percentage is somewhat increased on the whole.

RETURN SHOWING CATTLE CONDEMNED.

Disease.	Carcass.	Halves.	Quarters.	Percentage.
Tuberculosis	732	260	204	2·68
Texas Fever	279	...	...	0·826
Poverty, Bruises, Pleurisy, Old Pleuro, Unfitness	1,054	119	96	3·34
Other Diseases	85	...	...	0·025
Total	...	...	...	6·871

During the year great improvements and enlargements have been made by the management, and I am glad to report that everything is up to the latest improvements.

BEN. O. MEEK, M.R.C.V.S.

GLADSTONE MEAT WORKS.

(INSPECTOR STANDEN.)

The total number of cattle treated at these works during 1898 was 19,586.
The number and percentage condemned for disease are as follows :—

Disease.	Number.	Percentage.
Tuberculosis	221	1·39
Ill-conditioned and Bruised	198	1·25
Hepatites	4	0·025
Pleurisy and Pneumonia	3	0·002
Pregnancy	3	0·002
Nephritis	1	0·0006

J. STANDEN, M.R.C.V.S.

BROADSOUND MEAT WORKS.

(INSPECTOR HOLT.)

These works commenced on 3rd March, and since then 13,171 head of cattle and 1,170 sheep have been put through for extract, the tongues alone being canned.
1,758 sheep were boiled down during the season.

Stock Slaughtered.	Condemned for.	Bodies.	Quarters.	Per Cent.
8,751 Bullocks	Tuberculosis ...	70	13	0·882
	Cancer	4	...	0·004
	Pleuro	4	...	0·004
	Unfit	28	...	0·321
4,389 Cows	Tuberculosis ...	117	15	2·870
	Cancer	8	...	0·018
	Pleuro	2	...	0·004
	Unfit	17	...	0·038
Bulls	Unfit	31	...	100

G. R. HOLT,
Inspector of Meat.

SELLHEIM MEAT WORKS.

(Inspector Croft.)

Eighteen thousand eight hundred and seventy-eight head of cattle were treated at these works during the season of 1898, and 1,267 bodies were condemned, as under:—

	Per Cent.		Per Cent.
Tick Fever	29	Tuberculosis	9·5
Pregnant	21	Poverty, Abscess, Cancer ...	13·5
Actinomycosis	27		

MACKAY MEAT WORKS.

(Inspector Austin.)

The Company started killing for extract and tongues on the 27th October, 1897, and from which date to the 10th December, 1898, slaughtered 22,961 head of cattle.

Inspection under the Act commenced on the 14th March, 1898, and from then to the 10th December, 1898, 15,735 bullocks and 4,541 cows have been slaughtered.

The attached schedule shows in detail the number condemned, and the principal diseases on account of which they were condemned:—

Number.	Disease.	Bodies.	Quarters.	Per Cent.
15,735 bullocks ...	Tuberculosis ...	182	337	2·408
	Abscess	...	8	0·0317
	Tuberculosis ...	...	759 tongues	4·82
	Actinomycosis ...	...	118 „	0·075
	Unfit	...	15 „	...
4,521 cows	Tuberculosis ...	70	122	3·149
	Abscess	...	12	0·026
	Cancer	2	...	0·004
	Unfit	7	...	...
	Tuberculosis ...	...	210 tongues	4·62
	Actinomycosis ...	...	42 „	0·924
	Unfit	...	11 „	...

COLIN AUSTIN,
Inspector.

By Authority: Edmund Gregory, Government Printer, William street, Brisbane.