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ISSUED BY DIRECTION OF

THE HON. A. J. THYNNE, M.L.C.,

SECRETARY FOR AGRICULTURE.

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Exhibit of Agricultural Department at Exhibition, Bowen Park, 1897.—Botanical Section.

TO OUR READERS.

To all those who have the welfare of Queensland at heart, and who therefore watch with interest the industrial progress of the colony, it must be a subject of the greatest gratification to note the steady advance of the agricultural interests throughout almost the whole of this vast and fertile territory.

A retrospect of the operations of the settlers in the agricultural and grazing districts during the past decade, and especially during the latter half thereof, must convince even the most sceptical and most pessimistic amongst our community that the tillers of the soil, and all who gain their living by industries connected directly and indirectly with farming and grazing, have at last awakened to an intelligent sense of the magnificent inheritance which is theirs in the soil, the forests, the plains, and the climate of this gem of the Australian colonies, this vast country with its illimitable resources, so long lying dormant, so long awaiting the advent of those who to-day are bringing all their energies to bear on developing these resources, and who have already succeeded in showing that the plough and the voice and the pen of the scientist are mighty levers which are operating to bring the great agricultural industries of Queensland to the front, and are making them what they should be—the most important and wealth-producing of all our industries.

It has ever been the aim of the Agricultural Department of Queensland to afford every possible aid to those engaged in agricultural pursuits.

In times past, with the limited resources at the command of those entrusted with the working of the Department, much was accomplished in the way of importing new varieties of fruits, cereals, seeds, plants, implements, &c., and by the publication of useful pamphlets bearing on matters of interest to farmers and fruit-growers. These were widely distributed, and effected their purpose fairly well.

But it remained for the Government to recognise the great importance of the industry, and to set practically to work to raise it to a high standard of efficiency. Experts have been engaged to carry their technical and practical knowledge to the very doors of the settlers. Thus all agricultural interests are being promoted and fostered by practical instruction from men of high attainments in their several vocations, and by the establishment of an Agricultural College and Experimental Farms from which it will, it is hoped, be found that much interesting and practical information will be periodically distributed throughout the colony. These institutions, especially the College, will to a great extent practically settle the question how to make country life attractive to the youth of the colony.

In order still further to assist the agriculturists, it has been determined by the Minister for Agriculture to issue this Journal, which will supersede the late spasmodic publication of special Bulletins.

Essentially of a utilitarian character, the *Queensland Agricultural Journal* will be devoted mainly to the publication and wide dissemination of articles of a popular educatory nature. It is not intended that it shall take the place of an agricultural newspaper, nor that it shall in any way interfere with the peculiar work of such journals.

This first number will afford a fair idea of the nature and partly of the scope of the publication, which will be issued on the first day of each month, and will be posted gratis to the addresses of members of agricultural, pastoral, and kindred societies.

Some Things we Need.

WITH the publication of this, the first number of the *Queensland Agricultural Journal*, the Department enters upon a work which, it is hoped, will prove of great assistance to all those engaged in production from the soil. The occasion seems a fitting one for a short review of the present position of agriculture in Queensland, a sketch of the aims and objects of the Department, and some reference to the means by which the fulfilment of these aims and objects may be promoted.

In such branches as sugar and bananas, we are exporters to other colonies, where we have to meet the competition of other countries. The output of sugar has not yet quite reached Australasian consumption. Bananas are still imported to the southern colonies from Fiji and other places in the Pacific. In both those products we have had to meet a fall in prices, which are now very much lower than growers were receiving when they had only sufficient, or less than sufficient, for local requirements. In sugar especially, the competition is now very keen, and in order to exclude Javanese sugar from Australia, the prices offered for Queensland sugar have been depressed to a point which makes the future of that industry, under present conditions, a matter of some anxiety, and the time has certainly come when the strictest economy will have to be enforced in every direction in order to secure the safety of the industry.

In most other farm products we are, or have until very recently been, importers to a considerable extent. The local market, aided by Customs duties, is generally favourable to the producer. But to make this a great agricultural country, such as its soil, climate, and other advantages have fitted it to become, producers must ere long prepare to face competition with other countries in the markets of the world, and they must also regard present local prices as unsafe guides for calculating probable returns in the near future. In wheat, for instance, in spite of the high average yield per acre, and of the high price realised as compared with the yield and price obtained in other countries, we are far from meeting our own requirements. There is now an influx of experienced farmers from elsewhere, and the volume of wheat production bids fair to increase greatly. And the time is not far off when the growers of wheat, as well as of many other products, will have to carefully study questions of very strict economy indeed in order to secure for themselves a margin of profit as remuneration for their work.

In all products which we now only partially supply to ourselves, agriculture is in a transition stage, or on the eve of it; and it behoves us to look well ahead, and prepare now for the completion of the process of change which will assuredly test to the utmost the capacity of the country and its people to resist strong competition.

If we take stock of our materials, we have nothing to fear in point of soil or climate. On the contrary, these two important factors are as favourable to us as can be desired, and they are of extreme value. There is no better soil anywhere than we have lying at our hands largely unoccupied, and under our favourable climate two good crops each year can generally be obtained.

The full utilisation of these advantages depends upon our farmers and on the means they employ.

But there are farmers and farmers. It would be invidious here to single out any individuals as representatives of the type of skilled and successful farmers. The skilled farmer who studies his surroundings, and by means of his skill and experience overcomes all difficulties in the way of his success, is

happily to be found in every farming district in the colony, and skill with industry generally spells success. But, on the other hand, there are farmers who have settled on our lands without adequate previous training, and who frequently are discouraged by failure in the face of hard work and earnest endeavour.

If the skilled and successful farmer has need to prepare for the coming struggle for a place in the markets of the world, how much more so is it necessary for the comparatively inexperienced farmer to sit down and think out the problem of the early future?

It is at this stage that the Department of Agriculture has come into existence, and such is the condition of affairs that it has to cope with. Its creation is a clear intimation that the people of Queensland desire it to become a great agricultural country, able to sustain a successful struggle with all other countries whose competition it has to meet. That is concisely the aim and object of all Queenslanders who have faith in the enduring prosperity of the country.

The first duty of such a department is to take the initiative in agricultural education. To provide it for the young people growing up, is only part of the work. If the education is confined to the young, the process of improvement of agriculture will be very slow in producing good results. But for them it is of extreme importance, and should be of the best possible character. Provision must also be made for spreading knowledge amongst those older in life. There is no agriculturist living that has not something more to learn, and with us the varying degrees of skill and knowledge possessed by our existing farmers open a wide field for the labours of the specialists and instructors of the Department. And then comes a new class of settlers from other countries and colonies. They have had no previous local experience, and without the early guidance of competent men they would be liable to make mistakes involving serious loss. For immediate purposes the supply to these men, as well as of a large proportion of our older settlers, of reliable information as to the best crops to grow and the best way to treat them, is an urgent necessity. The Department must lend its energies to meet the requirements of all classes, young and old.

It is not proposed to make any special reference here to the teaching of the principles of agriculture in our common schools, though much might be done in that way. Beyond advising the Department of Public Instruction, the field of operation of the Department of Agriculture is necessarily somewhat limited at present. By-and-by it may be feasible to give some of the State school teachers in agricultural districts courses of practical instruction, which would aid them in imparting to their pupils at least a desire to learn the principles of agriculture.

For the present, however, there is some provision for the training in both practical and scientific agriculture of youths at the Gatton College. The Department is prepared to make ample provision for accommodating all suitable candidates for admission to it. The best teachers obtainable have been engaged, and the course of study is wide enough for all purposes. Students who complete the course will have a sound general knowledge, and they may be expected in their turn by example, if not by precept, to aid in the dissemination of their own acquired knowledge. They will be able to fill, when required, positions of trust in the Department as overseers of State farms, and otherwise, and when they commence farming on their own accounts their farms will be, it is hoped, only a degree less useful object lessons to their neighbours than State farms would be.

After the College, which will serve many useful purposes for experimenting as well as teaching, come the State farms, some of which are already in existence in preparatory stages, and others in early contemplation. At these, every obtainable variety of seed and crop likely to be suitable for successful culture in each district will be tried and rigidly tested, and the results made known by ocular demonstration to visitors and by the publication periodically of the

results achieved. The rearing and feeding of stock and the manufacture of general farm and dairy produce will not be overlooked. Experience has amply shown that in agriculture especially "seeing is believing," and that "an ounce of practice is worth a pound of theory" in relation to the effect in bringing conviction to the mind. But it is not only to the neighbouring farmer that a State farm will prove useful. Each State farm will naturally become more or less specialised for the particular products found most suitable for its district. Students who have gone through a general course at the College will have the opportunity of entering a State farm or a sugar experiment station for a course of special experience in some particular line of agriculture. And it may be possible, until such time as such students are ready to enter the State farms, to admit a limited number of youths as assistants to gain some practical experience in the particular classes of cultivation to which they are mainly devoted.

A competent chemist has been engaged by the Department for the conduct of necessary analyses and to supervise the teaching of the important study of agricultural chemistry at the College. As required, further chemical assistance will be secured. A complete laboratory is being provided at Gatton for the purposes of general departmental work, and a separate outfit for the teaching purposes is under way. Promising students in chemistry will have an opportunity of devoting themselves specially to that subject.

Specialists in several branches of agriculture are available as travelling instructors in farming districts, and others are to be added. The Department has in its staff a body of specialists in the practical fruit-growing and dairying and in the sciences of botany, entomology, and bacteriology, which is not surpassed by any similar body of men in any colony of Australasia; and when the specialists in tobacco and coffee-growing and wine-making now in contemplation are added, great and enduring results from their work may confidently be anticipated.

But however excellent the teaching power or arrangements of the Department may be, however ready the people of the country, both young and old, to acquire the knowledge offered to them, no grand results can be achieved without the help of the farmers themselves. They must be taught as their first lesson that if they desire the help of the Department they must as a body set to themselves the task of helping themselves and helping it. To do so effectively, they need to combine together much more than heretofore. It is not possible to have high-class specialists in such numbers as to provide for individual visits to every farm in the colony. Local wants and local questions are best made known by associations of local people, who are thereby enabled to give united expression to them. If the general body of farmers in any locality are unable for any reason to meet and give united expression to their wants or opinions, or if they are divided amongst themselves, their influence for the good of their district must necessarily be lessened, and to no section of people should the adage "United we stand, divided we fall" more strongly appeal. At a few places in Queensland the combination of local farmers has been productive of great benefit, but as a rule there is no section in the community more disorganised. The associations for show purposes are of some benefit; they are general throughout the colony, but as a rule their efforts begin and end with their annual shows, which are held quite as much in the interests of the townspeople as of the farmers. The holding of shows ought to have only a secondary place in the objects of farmers' societies. Useful as these shows may be in the opportunities they offer for mutual intercourse, inspection of new machines, comparison of products, and in providing a well appreciated annual holiday, the benefits they confer on the farmer are but small compared with those derivable from union for objects of greater importance.

At every meeting-place of farmers, complaints are heard of the difficulty of disposal of their produce, the delays and expense of transport, the high interest on borrowed money, the expense and difficulty of getting good implements, and the high price of such necessaries as they cannot themselves produce, and

many other similar matters. Many are inclined to look upon the Government as a sort of providence from whom all good things ought to come, and who should step into those fields of occupation which rightfully belong to individual enterprise. Some even urge that the Government should undertake the agency of the sale of their produce, the lending of money, and all the other functions which they think are not now satisfactorily discharged by individual enterprise. In the adoption of any such ideas by a Government, there lurks untold danger, and no section of the community would be exposed to greater danger than the farmers themselves. It speaks well for past administration of State affairs when people seek to add to them the discharge of such functions. It is not long since any attempt by Government to extend its tentacles into the private affairs of individuals would have been regarded as a deep design against the liberty of the subject, or a scheme by which it might acquire the power to crush or oppress them; and there is no saying when a state of affairs might arise when the temptation to use such a force might be too strong for resistance.

The remedy for any such evils as really exist is mainly in the hands of the farmers themselves. Those who need their products must buy them; those who have money to lend to them or goods to sell must come into the market to lend or sell. Without practical or effective union on the part of the farmers, they are individually so weak that they cannot protect themselves. With union, they can become so strong as to be able to control within reasonable limits the markets in which they deal; without union, they are unfitted for taking part in a successful struggle for the capture of foreign markets. With union, they can equip themselves with all the means by which they may exclude foreign competition with their own products in their own markets; without union, their voices sound as discordant as those of Babel in the ears of a deafened and distracted Agricultural Department. With union, they can readily convey their sentiments to the intelligence of a sympathetic Minister or officer of his Department, and secure the removal of obstructions to progress, the adoption of improvements, the passing of good laws, and finally, the raising up of agriculture as a pursuit, to the very high level to which it naturally ought to belong.

By whatever term this necessary union may be called, its general effect upon the individuals comprising it is of immense good. Its direct material advantages are great, and its moral effect in the development of a spirit of independence and self-help, and at the same time of mutual support to each other, is none the less great.

Local farmers uniting for these objects, having representatives upon larger district associations, which in their turn have representatives in a periodical gathering of the leading agriculturists of the colony, would give greater help to the development of the agricultural interests of Queensland than can ever be possible under present conditions. And they would also furnish a more suitable and effective channel for the spread of the collected information of the departmental staff than all their lectures or bulletins heretofore in vogue could possibly be.

To sum up the whole matter, the objects the Department now chiefly desires to promote are:—The education of both young and old in the technical knowledge of agriculture, and the formation of associations or bodies of farmers both for the attainment of objects of material importance to their welfare, and for providing an adequate means of giving expression to the general sense of that important section of the community.

Organisation amongst Farmers.

"UNION is strength." In other words—"United we stand, divided we fall." The truth of these aphorisms has been demonstrated over and over again. By union, be it remarked, we do not imply combinations of men of any particular calling which bring them into antagonism with other men, which impel them to defy authority and set themselves up as the arbiters of the destinies of a country.

The union we advocate is that which binds men of different trades and callings to work together not only for their own benefit but for the common welfare of the community at large. Such unions are productive of great blessings to a country, and amongst no classes of workers is a union more desirable than amongst the tillers of the soil.

In this colony there are, and have been for the past thirty years, associations of farmers, graziers, fruit-growers, and others whose object at the outset has been to benefit their members by effecting as a body what would be impossible to, or at least difficult of attainment by, each individual separately.

Of the many associations of former years, the East Moreton Farmers' Association approached nearest to the ideal union. Farmers met regularly once a month, papers were read and discussed, exhibits of various kinds of produce were laid before the meetings, and emulation was stimulated by the successes of individual members. Ploughing matches were regularly held, and the interest taken in the meetings was such as to create a bond of real union, which resulted in raising the status of the farmers, and instilling into their minds ideas calculated to bring agriculture to its proper level amongst the industries of Queensland. Of late years, although we find unions under the name of societies in all the agricultural centres, it is regrettable to observe that the work of these societies tends mainly to one end—a show.

Now, agricultural shows are very excellent things in their way; but surely this is not the only object for which societies should exist. We hold that there are greater issues involved in an agricultural union than the mere holding of a show.

The Agricultural Department has laid itself out to obtain the services of the best experts in the various fields of agriculture, in which term we include all the branches of the science (for agriculture is to-day recognised as a true science).

The labours of these scientists, especially of the chemist, the entomologist, and the bacteriologist, could be made productive of the highest results if the farmers were regularly organised into unions, with a regular meeting-place at each centre, with an efficient secretary, through whom meetings with the farmers might be readily arranged.

To-day, when so many diseases, fungoid and parasitic, have to be contended with, the Government Entomologist is invited to visit a district. He finds himself under the necessity of visiting individual farmers and of obtaining from each the data upon which to found his subsequent investigations. If this work could be done for him by a society in the district, his labours would be simplified, his deductions could be placed before the society as a body, and thence disseminated by leaflet and pamphlet throughout the district. The society, union, or association—call it by what name we please—becomes a body, as the *Mackay Sugar Journal* says, "speaking for hundreds of farmers." And, to again quote that journal, "The farmer who to-day does not belong to a union is an isolated unit, who has forgotten to insure himself against adversity; and the district without a union is one that offers few attractions to the newcomers or to the men already in it."

We should like to see all the farmers in every agricultural district form themselves into unions which, although separated by geographical conditions, would, by their combined action, become a powerful element in the dissemination of sound views of the real needs of their high calling, and help materially in the removal of obstacles to progress and generally in the promotion of their common benefit.

Each local union would study the requirements of its district, and at the meetings of representatives, such as that of June last at Gatton (and which it is hoped will be held at least once in each year), the discussion by competent men of specially considered subjects could scarcely fail to make due impression upon the opinions of members of the Government and of the Legislature and upon the people of the colony generally.

We trust that ere long we shall be able to record a large increase in the membership as well as a general extension of the field of work of these associations throughout the whole of Queensland.

A Paying Crop for the West:

A CHAT WITH WESTERN FARMERS.

By HENRY A. TARDENT,

Manager Westbrook Experimental Farm.

A few years ago it was generally admitted that agriculture could be carried on successfully only on the coast. The West was the Never-Never country—a barren desert, hardly fit to rear sheep on. Those prejudices were not seldom shared by some farmers of the West themselves, who wrongly tried to grow in that country crops not adapted either to the soil or to the climate. Maize, for instance, is being planted year after year in thousands of acres, although it is there a most unreliable crop. It cannot be denied that here and there fair crops of excellent corn have been gathered, but taken on an average it does not pay. It requires from 15 to 20 inches of rain annually to grow a crop of corn to perfection. That amount of rain is never obtained within the three or four months wanted to bring a crop of corn to maturity. Cultivators of maize seldom get even the few showers which are absolutely necessary at flowering time for the flowers to set. Hence too many cobs badly shaped and imperfectly filled.

Similar drawbacks exist for many other crops.

What then is to be grown in the West?

We may produce a good many crops which pay very well indeed and grow there much better than on the coast land; amongst others, wheat and grapes and a great variety of fruit-trees. But these may be some day spoken of more in detail in subsequent numbers. To-day the writer would like to draw attention to the very crop wanted in order to enable farmers to become *successful* farmers. It is not difficult to grow. It can be planted from September to December inclusive, and can be gathered as required from Christmas to September, during eight months. It is a most wholesome and acceptable food for man, for pigs, for poultry, for horses, and for cattle. It gives on an average from 6 to 8 tons of product per acre, worth for any of the above uses at least £5 per ton, which means a return of from £30 to £50 per acre.

From official statistics it would appear that the average crop of sweet potatoes is, west of the Range, 1¾ tons per acre. The figures must no doubt be accepted as correct, but experience shows that this weight can be enormously increased by the exercise of a little science and a great deal of common sense. At Roma, a typical Western district some 320 miles west from Brisbane, the writer has grown, year after year, rows upon rows of sweet potatoes, giving on an average half-a-stone in weight per plant. With some 8,000 plants to the acre, this means 25 tons per acre. Of course on a large scale it never comes to that, there being always misses and some weaker plants. But the writer is well assured of having reached 15 and 16 tons, and has often filled many bags with tubers varying between 5 and 15 lb. each. At the 1894 show he exhibited one tuber weighing 29 lb., which is the record for the West, if not for the whole colony.

This has, however, not been the general experience of Western farmers, for the reason that they adopted unskilled methods of cultivation.

The only thing required in order to grow sweet potatoes to perfection in the West is a *hotbed*.

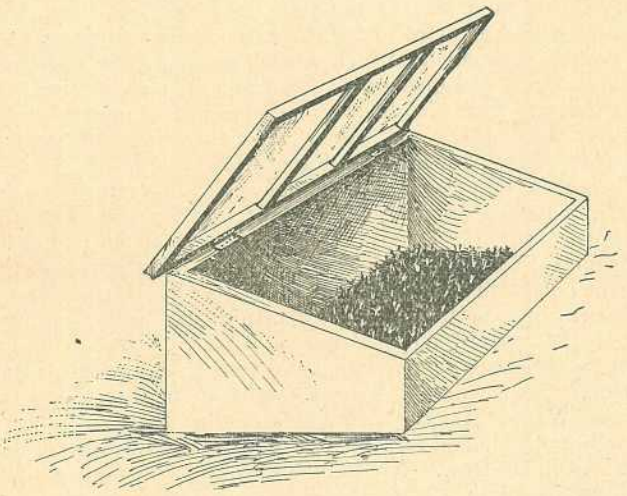
Farmers, of course, know that sweet potatoes are not planted like the English potatoes, for which whole tubers or simply eyes are put in the ground. For sweet potatoes it is the *shoots* from the tubers which have to be cut off

and transplanted one by one into the ground. Now, the sweet potato is exceedingly sensitive to cold. The slightest frost will destroy the vine (as the stem is called). Consequently if in order to get shoots the tubers are simply put into the ground, they will remain dormant until the frost is over. Then the shoots will grow *slowly*, and only become long enough to be transplanted after six or eight weeks. This brings the planter right into the middle of summer—a bad time to transplant anything. Unless there occur abundant showers, seldom to be had at that time of the year, the transplanted shoots will have great difficulty in setting roots. They will either die out or remain weak and sickly, and, in fact, never get strong enough to give good healthy tubers. But with a supply of strong, vigorous shoots, from 8 to 12 inches long, ready to be transplanted in the open field as soon as the frosts are over, then these will set roots at once. Being well rooted and provided with a bushy, luxuriant vine, when the November storm-rains come, they will then start swelling, bursting the ground in every direction. And when the time is come to dig them out the crop does not consist of small potatoes, but at every plant are found potatoes the size of footballs.

The only way to get your shoots in time is to put your tubers in a *hotbed*.

Over 4,000 years ago, the ancient Egyptians knew how to make *manure hotbeds*, not only for raising early plants, but also for hatching chickens artificially, as we of the present day do in our incubators. And those hotbeds are not difficult to build.

Select a small piece of well-drained land, if possible sheltered in some way against southern and westerly winds. Dig there a ditch or trench from east to west, 3 or 4 feet wide, 1 foot deep, and as long as is required, taking into consideration that a square yard of it will give you at least 2,000 shoots for transplanting. Now take 1-inch boards or sawn slabs and build over the ditch a sort of box 1 foot high on the northern side (in Australia) and at least 18 inches on the southern side, joining them at both ends with slanting boards as shown in the accompanying diagram.



Shovel back the excavated earth towards the box. Over the box fit a kind of frame of the same dimensions; fix it with *hinges* to the top of the 18-inch board, so that it can be opened and shut easily. As glass frames are expensive it will suffice to simply nail ordinary tent calico on to the frame.

Next obtain a quantity of stable manure, mix it well with nearly the same quantity of chaffed straw; this is necessary to avoid an *excessive heat* and to maintain a *warm* temperature much longer. Now shovel it into the ditch

and box in the bed in 6-inch layers as evenly as possible, trampling it well down at the same time. Give a good watering with the watering-can. Add new layers in the same way until the whole is from 18 to 20 inches thick, and water again. Over this put a couple of inches of *light soil* and on it *spread evenly* the middle-sized or even small tubers, leaving only from ½ to 1 inch space between them (there will be from 100 to 150 tubers to the square yard). Cover them with 2 or 3 inches of light sandy loam and shut the lid.

The preliminary work is now done. All that remains is to await the results. They are simply marvellous. In His wisdom and kindness, the Great Author of Nature has, invisible to the eye, myriads of little helpers which, being now placed in condition favourable for their development, come into life, multiplying with an incredible rapidity. Those tiny organisms are as useful on a farm as herds of domestic animals. They set to work at once, transforming entirely the substance in which they are born. The transformation (or fermentation as it is called) is, like all chemical processes, accompanied by the disengagement of various gases and the production of a considerable quantity of *heat*. This heat will at once waken up the germinative power dormant in the tubers and keep them growing. In the middle of the day, when the temperature is warm, lift, at first slightly and then entirely, the cover (lid) to let the plants get accustomed to the ordinary outdoor air; but great care must be taken to keep the hotbed covered at night, otherwise the shoots will surely get frozen and the whole work will be wasted.

Now about transplanting.

The best soil to grow sweet potatoes in is a rich, well-drained, friable, alluvial soil, and next best a rich, friable, well-drained scrub loam. If the soil is not naturally like the above it must be made so by the use of ploughs, scarifiers, manures, and fertilisers. Nothing less than a 12-inch depth of the above soils in a perfectly pulverised state will satisfy the gross appetite and greedy propensities of the sweet potato. The land must not be laid in ridges, as is done—for good reasons—on the coast, but must lie as flat as possible.

When the last frost is over—in the greater part of the West this is usually about the middle of September—and when the shoots are no less than from 8 to 12 inches long, then is the time to transplant them. If the shoots are pulled out or broken close to the tubers no more will grow, but if they are cut with a curved knife about 2 inches underground, the part left in the soil will continue to grow and give a new shoot in a very short time. By adopting this plan as many as four shoots may be obtained in succession from a single eye, and thus transplanting may go on from the middle of September till the middle of December. It pays—and the work is quickly done—to strip off from the shoots the side leaves and branches, leaving only a few leaves on the top end. Then make a dibble—not a blunt, clumsy one, but a light one, as sharp as a spear. An old buggy-wheel spoke cut to 14 inches long makes a fine easily penetrating dibble, especially if it is well sharpened, the end being slightly burnt on the fire and well greased. Select if possible a cloudy day. If there are none, it is better to do the planting towards the evening. If there is moisture in the ground no watering is required. But if the ground is dry it is absolutely necessary to give from one pint to one quart of water to every plant. The distance between the rows ought to be 3 feet, and in the row 18 inches for the White Maltese and kinds similar to it. But for the Rosella with long rampant vine and scattered tubers it ought to be 4 feet between the rows and 2 feet in the row. No planting is good enough which is not done along a well-strained line. Plant the shoots, or cuttings as they are called, one by one along the line, taking care to plant the dibble in a slanting way in the direction of the line. Lift it a bit, then with the left hand set under it the greater part of your shoot, leaving no more of it than 2 or 3 inches above ground. Pull back the dibble, plant it a second time 1 or 2 inches further, and with it press firmly the ground all along the cutting, beginning from bottom up. It is a little bit tedious work. Still, when one has got the knack one can plant in that way frome one-third to half-an-acre per day.

Planting them with the plough results in failure, and the non-success may be attributed to the fact that the soil cannot be pressed firmly enough around the cuttings.

If the work is well done and the weather favourable, in twenty-four hours the cuttings will have set rootlets from ¼ to ½ inch long, and in less than a week they will be well rooted.

The first implement to use a few days after planting is the single-horse Ajax lever harrows, with the teeth *slightly* reversed. Then when the rows are easily seen, keep the Planet junior's scarifier at work, at first as deep set as possible, then gradually shallower. Supplement its work close to the rows with the hand Planet junior's hoe (especially with the two curved knives and the two little rakes), an implement indispensable to the farmer who intends to succeed on the land. In short, keep the land perfectly free from weeds until the vines are bushy enough to cover it entirely, then let well alone.

With favourable weather, in less than three months the field will appear like an uninterrupted ocean of green, with here and there a few bluish flower-bells. By digging carefully at this time a few tubers may be obtained here and there. Break them off cautiously, and carefully cover up again the denuded roots.

For the main crop wait till the fall. Cut away the vines, say, with a reaping-hook; let them dry, and store away. They make a fair hay, and will be relished by both horses and cattle during the cold frosty winter. For digging by hand, the best implement is a mattock or a very strong double-pronged hoe. With them dig *on the side* of the row until the tubers are well denuded. Then pull out the whole of the tubers, which, in the White Maltese, hang like a bunch of carrots all round the collar of the plant. Shake the earth off and let them dry up a bit before bagging and marketing. A strong plough able to pass under the tubers and drawn by two horses, one on each side of the row, saves a good deal of labour.

No disease of any kind has yet, to the writer's knowledge, attacked the sweet potato in the West. Still there are in its cultivation at least two serious drawbacks to contend against. The first consists in the fact that many plants do not give any tubers—remain bare, without any apparent reason for doing so. This can be to a certain extent accounted for by the frequent changes of tubers for raising shoots. It is probably also the result of the propagation of the *Batata* for centuries *by cuttings only*, which means that the same plant has lived for centuries. This cannot result in anything but the gradual exhaustion of the fruiting, or rather *tubering* power. The remedy must apparently be looked for in the raising of new varieties from *seeds*. If Mr. Soutter, of the Acclimatisation Gardens, who is possessed of the necessary knowledge, the hot-houses, bush-houses, &c., would kindly do for the sweet potato-grower what he did for the sugar-cane and pineapple growers, he would confer a great boon on the whole colony.

The second drawback is found in *caterpillars*. They seem to appear at any time during the summer—sometimes once, sometimes twice in a season. Not seldom they appear in millions, eating away acres in a single day as bare as could be done by a flock of goats. This last season they have been especially bad on the writer's 5-acre block, a considerable part of which they destroyed in two or three days. Paris green mixed with powdered lime or ashes, and shaken in the early morning or after a shower on the plants from a thinly-woven bag, is sure to kill them; but it is decidedly objectionable and dangerous to have acres of poisonous powder on a place where animals, people, and especially children live. In that case the only way is to put a pair of scissors in every available hand on the farm, and to go along the row cutting in two every caterpillar. This is laborious work, but with the assistance of birds is effective.

The best variety of sweet potato to grow is undoubtedly, so far as is known at present, the *White Maltese*. Its flesh is white, mealy, and savoury. The tubers, being elongated, sink deep in the ground, which enables the plant to stand the drought remarkably well. During the last terrible season, the

author kept them for four months growing and prospering without a single drop of rain on them. The next best is the *Rosella*, which appears to the taste sweeter than the former, but is less mealy. The objections to it are that the largest tubers grow not seldom a few feet from the main stem, to which they are united by a very thin root indeed, whilst a number of small tubers grow here and there where the adventitious roots have struck into the ground, which causes a great many tubers to be injured by implements when being dug out. The writer recently introduced in the West a few new varieties, like the General Grant, the Spanish Giant, the vineless *Batata Ypomea*, &c.; but his experience of them is too limited as yet to permit him to express any opinion on their respective merits.

There is no plant which can be put to such a variety of uses as the sweet potato. The tender shoots form a very palatable vegetable when treated exactly like asparagus. The young leaves, first boiled, then chopped down and fried in butter, and served with boiled eggs cut into halves, form an excellent substitute for spinach. Those two dishes, being digestible and slightly laxative, are especially to be recommended to people affected with liver diseases. As a green fodder, the sweet potato vines are greatly relished by pigs, by horses (although in moderation), by cows (whose flow of milk they greatly increase), and by sheep. The sheep-farmers of the West would provide their sheep with an excellent green fodder all the summer through by planting with the plough small tubers, or even roots, in their sandy (now nearly useless) patches. The *Batata* vines make also a good hay, but they are of no use for ensilage, the fermentation turning them into a kind of slimy, unpalatable substance.

Horses do not take very easily to the tubers, but once they have tasted them they will eat them greedily. They get fat on them and put on a nice shining coat. Sweet potatoes are unsurpassed for increasing the flow of milk in cows and for fattening bullocks. Fed to pigs, raw or boiled, they produce the finest of bacon. Even the eggs of the hens fed on sweet potatoes seem to have an especially delicate flavour imparted to them. As for man, they are a food nutritious and healthy in every possible form. Children not seldom eat them raw as in the old country they eat chestnuts, which last they greatly resemble in taste.

There is still another use of the sweet potato, of which the writer claims to be the discoverer. It is the best-known substitute for coffee-beans, if cut into small pieces about a quarter of an inch square, dried on trays in the sun, then roasted on fire like the ordinary coffee-beans.

It may be asked, Why should horse-manure and no other be used to make a hotbed? Because it is the manure of a herbivorous but non-ruminant animal. It appears to be richer in certain components than other manures, and has the remarkable property of being set into fermentation at any time by the use on it of the watering-can.

It may further be asked, What were the advantages of growing sweet potatoes *on the flat*, and not on *ridges*, as is done on the coast? The reason is that on the coast provision has to be made against excess of rain, whilst in the West every bit of moisture must be carefully husbanded. This is best secured by the flat system, there being no hilling necessary, except the little which is done naturally by the frequent use of the Planet junior.

Sweet potatoes in the West have brought as much as 18s. per bag, when early and of good quality, and seldom do they bring less than 2d. per lb.

At that time the same product from the east was being sold in town for 4s. and 5s. per bag. The sweet potato grown in the West is more mealy, keeps better and longer than that grown on the coast. This induces the belief that in years to come the West will get as great a name for its sweet potatoes as it has already got for its grapes.

One farmer declared that it could never pay because there was too much *bother* about it. But *bother* is the only thing which makes farming pay, whilst laziness, sluggishness, and carelessness will never make any crop pay.

Coffee-Growing at Cairns.

FROM the *Cairns Post* we reprint the following extracts from a private letter written by a well-known resident to a friend in England in reply to queries *re* coffee and sugar growing in the district:—"On the low-lying lands between the sea-coast and the foot of the Cairns ranges, the climate from about September to March is more or less damp and steamy, of course, perfectly suitable for tropical agriculture, such as sugar, which is fast becoming a very large industry. There is plenty of scope for sugar-planters; the soil is rich and well watered; rainfall very good; remaining months of the year are cool and pleasant. Ascending the range by railway, a sort of hilly tableland occurs, which extends inland, but which, for some miles around the vicinity of Kuranda and extending in each direction about parallel with the coast, is covered with dense tropical scrub. The soil is exceedingly rich in many places, and this portion of the tableland is from 1,100 to 1,600 feet above sea-level, and averages about six miles from the coast. This prevents frost in the cool months; and the sea breezes in the warm months, being above the influence of evaporation, are very cool and pleasant. The thermometer goes down to about 36 degrees in winter, and averages about 83 degrees in summer. Further inland again, at Atherton, about fifty miles from Cairns, lies an immense belt of agricultural country covered with very heavy scrub full of valuable timbers. The land about Atherton is about 2,500 feet above sea-level.

"Frosts occur in the cold months, and the climate, with the exception of about three months out of the year, is probably as near perfection as it is possible to be. The soil about Atherton is generally considered to be amongst the richest in Australia. The rainfall is also good. The average rainfall at Cairns and on the adjoining ranges is about 80 to 100 inches per annum, well distributed. It is generally considered that along the top of the range or tableland, where the soil is good and no frost occurs, is the best place for growing coffee. There is no doubt, as has been proved, that at any rate up to about six years the coffee-trees grow exceptionally well and bear heavily when properly planted, but a lot yet remains to be proved before the industry can be called a perfect success, although enough has been proved to warrant anyone going in for it with an exceptionally good chance of success. With regard to labour, there is a moderate supply of kanaka labour available, which is good labour. Wages are from £16 to £18 per annum and find them in food. Children (who pick well) are available to cope with it for some years to come. From the crops already picked, it is generally expected that, with 430 trees to the acre, about half a ton of dried beans to the acre may be relied on when the tree is five years old; the trees generally commence to bear when three years old, and the dried beans are worth about £90 per ton. The price of land is £4 per acre, varying in different localities. Anyone going in for coffee, by looking well around, might possibly pick up good bargains. The approximate cost of purchasing and preparing uncleared scrub land per acre for coffee would be about as follows:—

Purchase of land, say	£4
Clearing and burning off scrub	4
Grubbing up stumps	8
Digging holes for plants	5
Etc.	1
	£22

"To put, therefore, say 20 acres under coffee would cost approximately as follows:—

	£	s.	d.
Purchase of land, preparing same and planting coffee, 20 acres at £22 per acre	440	0	0
Fencing, say	60	0	0
Dwelling-house, say	150	0	0
Farming implements and horses, about	100	0	0
Cultivating plantation for, say, three years until trees bear, allow	150	0	0
Contingencies, allow	50	0	0
	£950	0	0

"Add to this the cost of living, say, for three years. When trees are three years old you could expect a small return, which would increase to full returns when the trees are five years old. Half a ton of dried beans would be worth £45, and the profit per acre could be estimated at £20, according to present prices, which are considered lasting. That is: By an expenditure of, say, £950, and cost of living for three years, you should expect a return from 20 acres of coffee of about £400 per annum in five years from sowing the seed; allow about profit of £200 the fourth year. I may mention also that there are many other things that can be grown with more or less profit besides coffee and sugar, such as oranges, lemons, limes, citrons, mangoes, cocoanuts, bananas, maize, rice, ginger, pineapples, and many other things. Going further inland, there are immense tracts of rich mineral and pastoral country, producing gold, copper, tin, and silver, and carrying thousands of cattle. For anyone with a moderate amount of capital, and a fair stock of health and energy, especially young fellows with the best part of their lives before them, I think there are few better places than this for them to make a start and expect a good return for their outlay.

"It must be noted that the above approximate estimate of outlay and profit refers to men who are not used to manual labour themselves, and would have to employ all the labour required. Of course, any man used to manual labour, or if married, or if he has children, could do, say with the help of a few kanakas, all the necessary work, and could put smaller areas under coffee at a much less outlay, and expect a larger profit per acre. This would apply in particular to married men with families."

The Dairying Industry in Queensland.

By JOHN MAHON,
Government Dairy Expert

In writing on this very important industry, reference must first be made to the marked success which has attended the first shipment of butter of any importance from this colony to the London market. The first experiment in the export trade about two and a-half years ago was brought about by a small consignment of 9 tons, which arrived at its destination in excellent condition. This year a larger shipment (over 63 tons) was sent away per s.s. "Jumna," and the reports on its quality on landing have given ample assurance that Queensland can hold its own in the world's market for dairy produce. This should be extremely encouraging to every person connected with dairy farming, and the marked success of both experiments must undoubtedly give a great impetus to the industry. No one could feel more pleased at the results than the writer, although it was no more than he anticipated. When doubt was expressed by some of those contributing to the shipment, that the Queensland butter would suffer in comparison with that exported from other colonies, they were assured that unless this colony had to compete against a better article than that made in the southern colonies, there was nothing to fear. In making the necessary arrangements for the last shipment, the Under Secretary for Agriculture gave a free hand in the matter, merely advising that special precaution be taken with regard to refrigerating space, and that the Government brand be placed upon nothing but an article of the best grade. In carrying out this duty it is but just to remark that special thanks are due to Messrs. E. Bland and J. E. Leresche, joint managers of the B.I.S.N. Company, for the completeness of the arrangements made for storing the butter on the voyage, a room being specially constructed for the purpose. Mr. McInduer, chief engineer, is also deserving of every praise for affording every facility to ensure success. The butter was packed with space between each layer of boxes, thus allowing a free circulation of air. This involved an extra amount of space and labour, which in future can be avoided by using the patent "glacier" butter-box. Had the butter been packed in the ordinary way, without an air-space between, the cold air would not have reached the boxes in the centre. At the writer's suggestion, with permission from the Under Secretary for Agriculture, samples of butter and cheese were procured, paid for by the Department, apart from the main consignment. These were given in charge of the chief engineer, who kindly consented to make experiments during the voyage, and the result of these has already been published. With regard to the temperature at which the butter should be carried, but one opinion was held by the writer—that is, that a temperature of as near 35 degrees Fahr. as possible should be maintained, and instructions to the chief engineer were given accordingly. The tendency towards freezing, as is the case with some shippers, is erroneous. Experience shows that freezing gives the article a tallowy appearance, destroys its texture and flavour, and impairs its keeping qualities. As a check against the temperature at which the butter would probably be kept during the voyage, a sample box from each consignment was placed in the railway refrigerating stores at Roma street, all of which when opened on the 17th May, about fifteen weeks subsequent to the departure of the "Jumna," were found to be in excellent condition. The importance of this practical test cannot be overestimated, and to those concerned it will be gratifying to know that, though

starting late in the race, with a little perseverance Queensland may yet hold a prominent position in the London market. Another matter on which the farmers and dairymen of Queensland are to be congratulated is that a number of samples of farm and dairy produce were exhibited by the writer at a large influential gathering of merchants and experts in Victoria, all of whom pronounced them of excellent quality. The butter, after undergoing a severe test during the voyage, was stored for eight weeks in Melbourne, and when opened was found to be in excellent condition. The cheese was considered exceptionally good, in fact almost equal to the best brands of New Zealand. The samples of farm produce also were considered very good. Many of those present were astonished to find that such excellent products could be produced in a colony which was considered by a number of Victorians as only fit for cattle-raising and sheep-farming.

EXPORT TRADE.

Although the recent shipment of butter from Queensland has proved such a success, and to a certain extent has established a reputation in the London market, yet optimists must not be led away by the belief that the acme of perfection has been reached, or that there is nothing more to be done or learnt. It behoves manufacturers to avail themselves of every opportunity to improve their conditions and methods by putting into practice the scientific and practical knowledge to be obtained from the leading agricultural colleges of America and elsewhere. Science at present plays such an active part in the industry that to ignore it means not being in the race. Some manufacturers who consider themselves on the top step of the ladder of perfection are far from it, and would do well to pay a visit to neighbouring factories, when amongst other things likely to benefit them, they would obtain a knowledge of the different flavours of butter and cheese. The man who is accustomed to handle only the article of his own manufacture, often acquires a taste for that particular flavour, and is apt to consider it better than an article much superior. Others, again, are careless in preparing and churning their cream at the proper stage of ripeness—a most important matter. It also came under notice that amongst consignments shipped to London, in some cases, much neglect was displayed in the packing, handling, and branding of the boxes. These may seem trivial matters at this end, but they detract seriously from the appearance and price of the article when placed on the market. One great defect in the present system, and to which the writer would like to draw special attention, is the irregularity of our supplies. To retain a firm hold of the London market this must be altered, and can only be brought about by adopting a method whereby an equal number of cows are kept in milk during the year round, and by feeding during the winter months. This is the secret of the Danish people's success, and which has done more towards establishing their trade in the London market than their climate, and proximity to that market, than many in Australia are led to believe. Under the present system in Queensland, expensive plants are lying idle for half the year, employees must be paid, and proprietors, if not actually losing money, get but a poor return. Were these factories kept going all the year round, the cost of production would be reduced, and all concerned would profit to a greater extent. The improvements pointed out cannot naturally be brought about in a day, but it is hoped that a move in the direction suggested will ere long be taken.

THE DAIRYING INDUSTRY—PAST, PRESENT, AND FUTURE.

Until within the last five or six years the prevailing opinion was that Queensland would never be in a position to export dairy produce successfully, or compete against the southern colonies. Climatic influence was considered unfavourable, but the idea has exploded, and recent experiments have proved that Queensland dairymen are able to turn out an article equal to that produced where it was claimed that the surroundings were more favourable. At the time mentioned 75 per cent. of the dairy produce consumed in this

colony was imported, but now we can not only supply our own demand, but in the near future, if seasons are favourable and the present progressive spirit prevail, Queensland should be drawing large sums of money annually from England and elsewhere, which must undoubtedly tend towards the prosperity of those gaining their living from the land. About eight years ago, when the Travelling Dairy under the auspices of the Department of Agriculture was first instituted as a means of educating the farmers, the idea was severely criticised by many, but the fact remains that the results exceeded the most sanguine expectations. Factories and creameries have sprung up in nearly every district visited by the Dairy, and many of the managers of these, together with hundreds of farmers, are prepared to testify to the value of that institution. The Travelling Dairies not only turned out proficient factory managers, but imparted a practical knowledge to individual dairymen who were not in a position to join in the factory business, and enabled them to make a creditable article. In fact, it is fully admitted by all but those who are prejudiced that the Travelling Dairies amply justified the purpose for which they were intended. The vast improvement in the quality of our dairy produce, not only from factories but private dairies, as compared with that of some years ago, must be apparent to the most casual observer, and proves conclusively the rapid strides made during that short period. Many predict that the industry will be overdone by the production exceeding the demand, but such will assuredly not be the case, as the increasing demand will always keep pace with the increasing production. One great point in favour of the Queensland dairyman is that milk can be produced here at a less cost than in any other country in the world. The farmers have discovered that they must place at least a portion of their crops on the market in a more condensed form than was the case hitherto, such as in butter, bacon, cheese, &c. It is a well-known axiom that a succession of crops impoverishes the soil, and to avoid this a system of mixed farming should be adopted.

DAIRY CATTLE.

That the quality of his herd is an important factor in the dairyman's success goes without saying, and the present dairy herds in Queensland are in general, to say the least of them, an inferior lot. In building up a good herd, a good milking strain should be aimed at, regardless of breed. Good and bad milkers are to be found among all breeds. Very often the progeny from the best of milkers is destroyed in the rearing, for if the calf is stunted or badly cared for, the animal will never become such a good milker as if it had been treated properly. It is a mistake to think that a good herd can be got together under any other circumstances. One often hears the remark that the calf from a cow of exceptional quality turned out disappointingly, which in many cases is not to be wondered at when no attention has been paid to its rearing. Good breeds in the hands of the careless dairyman will quickly deteriorate. Care and feed are absolutely necessary to produce a good animal, but as the Americans say, "unless it be supplemented with knowledge in breeding, the transmission of that quality will be slow and attainments doubtful." Here is where the trouble lies: quality has been obtained in many individual cows of different breeds, but it has not attained regularity of power to transmit these same qualities to the offspring. An excellent guide in the selection of dairy cattle is to note how the good qualities are first developed. A well-known authority in America says the work begins by exciting the udder to unnatural activity by stripping it continuously of all the milk secreted. Such stripping is a call on Nature for more milk, which leads to a call for more blood, then more food to produce the blood, &c. This course persistently followed leads to the formation, on the part of Nature, of an animal which eats largely, digests, and assimilates well. In the case of a beast with a good constitution, additional force is expended in elaborating the milk from the large quantity of blood produced from the amount of food consumed. Seldom are two men to be found who agree as to what is the best breed for dairy purposes, many being

prejudiced against any breed but their own. While in Victoria a few weeks ago, the writer made particular inquiry as to the breeds most in favour there, and found 75 per cent. in favour of the Ayrshire and shorthorn cross. The champion cow of Victoria at present, "Daisy," is from a shorthorn cow by an Ayrshire bull. She was bred by Mr. John Grant, of Seafield, Victoria, and gave 107¾ lb. of milk in two days which produced 7 lb. 5½ oz. of butter, or 3 lb. 10·3 oz. per day. "Daisy" is a very plain-looking animal, and on her appearance alone, if offered in our auction yards, would sell for about 30s. It is not to be inferred from the foregoing instance that the Victorian dairy herds are perfect, far from it; but it must be admitted that in ninety cases out of 100 they are superior to Queensland herds. The Victorian dairymen have realised the necessity of producing milk at a less cost, and in consequence are endeavouring to improve their herds by procuring the best milking strains. Now that the College is established, an opportunity is afforded to show the dairymen the results obtained from the various breeds, and in the next issue of this journal a few points to be considered in selecting a milk-producing animal will be given.

TREATMENT OF MILK.

It is a pleasing fact, and one which should be appreciated by all who have the welfare of the dairying industry at heart, to learn that it is the intention of the Minister for Agriculture to bring before Parliament next session a Bill making the aeration of milk at the farms compulsory, and also to provide for strict supervision over the sources of milk supply. Under existing circumstances the production of a certain amount of inferior dairy produce cannot be avoided. One dairyman who disregards cleanliness, supplying milk to a factory is quite sufficient to destroy all his neighbours' milk and give the manufacturer no end of trouble. Legislation in the matter is, in the writer's opinion, a step in the right direction, and will enable those engaged in the business to manufacture an article superior to that made under present conditions. The expense incurred by the dairyman in aerating his milk and carrying out a system of cleanliness will be no greater, and his profits will increase, for if the factories are successful the suppliers must participate in the profits. Too much stress cannot be laid on the importance of the treatment of cattle and the careful handling of milk. Cattle that are badly treated cannot produce good milk, and from such milk good butter or cheese cannot be made, consequently the manufacturer is at the mercy of the milk suppliers. It must be borne in mind that no article of food is so absorbent or so susceptible to taints as milk, and unless strictly guarded against, impure bacteria will find their way there. The filthier the condition of the milk, the more favourable the home afforded to these impure germs. Millions of minute organisms are to be found in dirty yards and adhering to the cow's udder, which find their way into the milkpail, with the result that the milk is contaminated, and no longer fit to be converted into a good article. In making a series of experiments, Professor Russell found that when cows were milked in the stable, the average number of bacteria which fell per minute into a pail 10 inches in diameter was 5,300, and when the cow's udder and the hands of the milker were washed before milking the number was reduced to 1,300. When a similar experiment was made in the open air the diminution was 90 per cent. The same authority further states that when cows are fed in a stable with hay just before milking the air is densely charged with dust and spores of bacteria. Under such conditions we are assured that over 160,000 micro-organisms fall into the milkpail per minute, against 2,400 when a thorough system of cleanliness was adhered to. Most people are now aware of the fact that milk contains pure and impure bacteria, and under ordinary circumstances the multiplication of these is so great that it remains to be determined what part they play towards assisting the manufacturer, or otherwise. The most eminent authorities of the present day tell us that the bacteria found in milk can be classed under two groups.

As there are various forms of animal life found only in certain regions and climates, so also are there bacteria, which have become so accustomed to live in milk that they are in some form or other frequently met with in all dairy products. Those of a friendly nature are of the most interest to dairymen, and are the cause of most of the alterations in milk. Then there are others which are termed accidental guests, taking their origin from filth in some shape or other, thus finding their way into the milk, and once there, they multiply rapidly, and often introduce substances of a poisonous nature. In America cases have been known where cream, cheese, milk, &c., have been the cause of poisoning those who partook of them. These germs are termed pathogenic, and from their morbid nature are often the means of spreading diseases. Such profound scientists as Pasteur, Fleischmann, Lazrus, Duclaux, and Bilter have proved beyond a doubt that these pathogenic germs are destroyed by pasteurisation. Bilter, by experiments, has proved conclusively that heating milk for 15 minutes to 154 degrees to 156 degrees Fahr. kills the typhus bacillus with certainty. Cholera and diphtheria bacilli are less heat-resistant than those of either tuberculosis or typhus, so it follows that they too would be destroyed by this treatment. As already pointed out, these diseased germs find their way into the milk from filth or carelessness on the part of the producer before it leaves the farm. In concluding these remarks it may be said that while the person in charge of the creamery receives milk containing dead flies, cow-hair, &c., it cannot be expected that Queensland dairy produce can be brought to the required pitch of excellence.

BUTTER-MAKING.

In Queensland, as in the southern colonies, sufficient care is not being exercised in preparing and ripening the cream for churning, with the result that there are bound to be various grades of butter in each shipment and from each individual factory. To overcome this serious trouble a "starter" (a pure culture of bacteria) must be added to ripen the cream. By doing so the factories will be enabled to turn out a uniform grade of butter, free from "fishiness," so much complained of in the English market. Fishiness in butter is due to no other cause than badly ripened cream. Cream should not be kept too long before churning. A sufficient quantity of ferment (not more than 5 per cent.) should be added to bring the cream to the proper stage of ripeness within twenty hours. Nearly every competent factory manager is or should be aware of the fact that cream kept over for forty-eight to fifty hours becomes stale, and is no longer in a fit stage to be converted into a nice, well-flavoured butter. Instructions for propagating and using the ferment can be found in dairy pamphlet No. 9, issued by the Department of Agriculture in February, 1896. Butter-milk from the previous day was universally used as a "starter," which method is still adhered to in many places, and is not objectionable, provided the butter-milk contains pure lactic ferment, which is capable of producing a rapid development of the lactic acid. As soon, however, as other ferments crowd out the lactic ferment in the butter-milk, which may easily occur in the hot weather, the cream becomes seriously affected. Too much attention cannot be paid to the proper ripening of cream; and however much some of our factory managers may be prejudiced against departing from the old groove, I would certainly advise their adopting the use of a ferment in ripening the cream. In the last shipment of butter from here the writer observed a great want of uniformity in salting, which is due to the same amount of salt being used on a moist butter as that on a dry, and therefore would advise a little more discretion being used in this respect. Every manufacturer knows that if the butter contains excessive moisture more salt should be used, as a great deal of it is carried away in the moisture during the working. A well-made butter should contain about 13 per cent. of moisture, water itself greatly helping decomposition.

CHEESE-MAKING.

Queensland cheese-makers are to be congratulated on having brought the quality to such a high pitch of excellence. The quality is certainly equal to that of some of the best New Zealand factories, and now that an Act of Parliament is likely to be passed making the aeration of milk at the farm compulsory, the quality will reach a higher standard. This industry will most certainly assume very large proportions in the near future. At the same time it must not be forgotten that the matter is in the hands of the farmers themselves, and unless they adopt a better system generally, in the way of improving their herds and paying more attention in the matter of feeding during a time of need, their profits will not be so great as they otherwise would be.

(To be continued.)

Fruit Culture in Queensland.

By ALBERT H. BENSON,
Government Fruit Expert.

The subject to be dealt with under the above title is a somewhat comprehensive one; more comprehensive than most persons imagine, as it embraces the cultivation of practically every fruit of commercial value that can be grown in any part of the world—extreme tropical fruits such as the Durien and Mangostan probably excepted. Few persons realise the magnitude of this colony, or have any idea of the wide range of climate to be met with within its boundaries: climates varying from that of the temperate regions, as at Stanthorpe, to that of the tropics, as at Cairns or Cooktown, with any other kind of climate that can occur within these extremes; climates having a heavy rainfall and a moisture-laden atmosphere to climates with a small and very uncertain rainfall and a dry atmosphere, and climates that come in anywhere between these. This variation of the climate, or, rather, this large number of climates, accounts for the comprehensive nature of fruit culture in Queensland. In the temperate districts all the fruits of the temperate regions can be grown; in the semi-tropical districts, those of the semi-tropics; and in the tropical districts, those of the tropics; and, in addition, we have the medium climate of the tablelands, capable of growing good deciduous fruits, table and wine grapes, and the dry, hot climate of the interior, which, when the rainfall can be supplemented by irrigation from artesian or other sources, will grow fruits that are valuable for drying, oil-making, raisins, wine, or brandy.

When planted in suitable soils and favourable situations, fruit trees of all kinds make a very rapid growth, and attain an early maturity—citrus trees occasionally fruiting in four years from the planting of the seed, and olives in four years from the planting of the truncheon, a rapidity of growth that will hardly be credited by European growers.

Many parts of the colony are so well adapted for fruit culture that several varieties of fruits grow well and produce heavy crops, even though the land is entirely uncultivated and the trees are neglected and uncared for. It is not at all uncommon to come across fruit trees, such as oranges, common lemons, citrons, mangoes, guavas, peaches, &c., in a practically wild state, apparently thriving as well as any of the indigenous trees or plants growing beside them. The ease with which many fruits can be grown, though showing the suitability of the soil and climate for their growth, has not been altogether an advantage, as it has been somewhat of an incentive to carelessness on the part of the fruit-growers, and has resulted in the chance production of a quantity of worthless fruits, which only become a breeding-ground of disease, and consequently a source of trouble to the district in which they are growing. On the other hand, when we find that fruit trees do so well, even when neglected and uncared for, it demonstrates the great possibilities there are for fruit-growing, when carried out on a thoroughly systematic and business basis. In a climate like that of Queensland, especially in the warmer and more tropical parts, fruit is an absolute necessity as an article of diet, in order to keep up the health and vigour of our race. For hot climates, fruit is Nature's food and Nature's medicine, and as long as it is fresh, good and properly ripe, it is highly nutritious and very wholesome. Fruit should be used by every family in the colony at least once a day, and in the warmer parts it should form a portion of every meal. It should be looked upon as a necessity and not as a luxury, and it should be the aim of every fruit-grower to grow good fruit, and to assist in its distribution in such a manner that the consumer may obtain it in good order and at a reasonable rate This will increase the consumption, and consequently benefit both the producer and the consumer.

In this my initial paper on Fruit Culture in Queensland, I wish to point out to all those who are interested in this subject that the object I have in view is twofold, as in the first place I hope to give fruit-growers and all those who intend to go in for fruit culture, information connected with every branch of the fruit industry that there is any chance of carrying out successfully in Queensland; and, in the second place, that this paper shall be the first of a series of articles which may eventually form the basis of a text-book on Fruit Culture for Queensland.

In order to carry out these ideas, it is necessary to start from the beginning; but before dealing with my subject proper I think it will not be out of place if I give a few words of advice and warning to intending fruit-growers, as a little timely advice may be of value to them and save many a failure: "Don't run away with the idea that growing fruit consists mainly in sticking fruit trees of various kinds into the ground and then waiting till the fruit (if any) is ready for gathering, or that it is only of secondary consideration—a business that can be tacked on to general farming, dairying, poultry-raising, or market-gardening; in fact, that it is of little importance, and that it can therefore be left largely to take care of itself. If you have these notions, the sooner you get rid of them the better, as fruit culture under such conditions (and I am sorry to say that these conditions are of very common occurrence) will not be a success. Anyone who thinks that fruit can be grown successfully in such a manner, had better give up all thoughts of becoming a fruit-grower and take up some easier occupation, as fruit culture has now become a science, and the man who wishes to succeed must carry out his work on scientific lines and use his brains as well as his hands. No branch of agronomy requires more careful study than that of fruit culture, and none pays better for extra care and attention to details, as what with the vast army of pests of all kinds that fruit-growers have now to contend against, and the comparatively low prices realised for their produce, which is largely owing to the very imperfect manner in which fruit is distributed or disposed of, it takes a man who knows his business thoroughly, and who conducts it on proper business lines to make a successful fruit-grower. The old slipshod, happy-go-lucky methods of fruit culture are or should be things of the past, as the only way in which we can make fruit-growing a success in Queensland is to carry it out on the most approved lines and on a sound business basis, and the sooner we realise this the better for the fruit-growing industry of this colony."

Having now shown briefly—1. The very wide range of ground that must be gone over in dealing with such a comprehensive subject as fruit culture in Queensland; 2. The adaptability of a large portion of this colony for fruit culture; 3. The reasons why we should grow and why we should use fruit; 4. The manner in which fruit should be grown, and the manner in which it should *not* be grown; and, lastly, the objects of this paper generally—I will now go on to the subject proper, and start with a description of the soils that are suitable for fruit culture in Queensland.

FRUIT SOILS.

Though fruit can be grown in nearly any kind of soil if given the necessary attention, yet there are certain soils that are much better adapted for fruit culture, or for the growth of special fruits, than others. This being so, it is of the first importance to select a suitable soil for the individual fruit or fruits that one wishes to grow. There are several types of soil suitable for fruit culture, but it is essential that they be all alike in one respect; and that is, that they possess good natural drainage, so that there is no possibility of stagnant water lying round the roots of the trees. This question of well-drained soils is of vital importance for fruit-growing in this colony, as, owing to the fact that the latter is subject periodically to very heavy rains in many parts, unless there is a ready escape for the surplus water, the fine fibrous roots of most fruit trees will be scalded, and the trees will be seriously injured, if not killed outright.

Probably the best all-round fruit soils are deep sandy loams, light loams, or loams of medium texture; heavy or clay loams are not, as a rule, suitable. Such soils may be of any colour except pale-yellow or white, which are usually sour and very poor; but grey, reddish, light-brown chocolate, or blackish (if not swampy) soils are all good if deep enough, and if they possess porous subsoils that will not retain stagnant water. Such soils are usually alluvial, or formed by the disintegration of the rocks of one or other of the Sandstone Formations. They are easy to work—retain moisture well when cultivated—trees root well in them; and though in many cases they are not of great natural fertility, still when of good depths there is such a large area for the roots to derive their plant food from, that they are not easily exhausted, even when the trees, or rather the roots of the trees, occupy the whole of the ground. Another point in favour of such soils is the readiness with which they respond to the application of manures, should the trees be showing the want of plant food. Soils of this character are to be met with in most parts of the colony—sometimes in large areas, and sometimes in patches extending in area from a narrow strip along the banks of creeks to small patches of a few acres in extent, and to, in some cases, large areas containing many square miles of country. Land of this character is sometimes covered with scrub and sometimes with forest, usually more or less heavy in the coastal districts; but in the interior it is usually pine, belar, or light box—country usually easy to clear. The timber growing on the land is, as a general rule, a very good indication of the suitability of the soil for fruit culture, and should be carefully noted when selecting the site for an orchard. Land covered with tea-tree, honeysuckle, bloodwood, mahogany, stringy-bark, or with many stunted flowering shrubs of various kinds is, as a rule, a bad fruit soil, as, though often of a sandy loamy nature, it is usually poor, sour, and badly drained, often spuey, with yellowish or whitish clayey subsoil.

Good medium light or sandy loams form the best of soils for the following fruits:—Citrus of all kinds, peaches, Japanese plums, persimmons, figs, grapes, many kinds of olives, apples, almonds, custard apples, mangoes, pineapples, walnuts, and chestnuts. Fruits such as pears, apricots, cherries, plums, or prunes will grow well in such soils; but will produce fruit of finer texture and superior flavour when grown in richer and heavier soils.

Sandy loamy soils of depths varying from 10 to 30 feet are met with in many parts of the colony; and such are the best fruit soils for standing the extremes of the Queensland climate, as they will stand any quantity of rain without injury, and, again, they will resist long periods of drought, owing to their power to retain moisture when kept in a thorough state of cultivation. Trees planted in such soils root deeply, and are not greatly affected by the drying out of the purely surface soil, as would be the case were the soil at all shallow. Again, the fact of fruit trees rooting deeply in such soils allows of thorough cultivation to a depth of six inches or more without any fear of injuring the roots, and the deeper and more thorough the cultivation, the longer the soil will retain moisture during a dry spell. Where such soils are rich in decayed leaf mould or other organic matter, bananas do well, if the district has a heavy rainfall and is free from frost; but, unless heavily manured, bananas will rapidly impoverish them, and they will, therefore, only stand a few years' cropping. In addition to sandy or light loams, medium loams of volcanic origin, especially if rich in organic matter, make the best of fruit soils. Such soils are usually covered with scrub, and are very fertile—fruit trees of all kinds making very heavy growth. Thorough sub-drainage is essential to such soils, and where this exists there is probably no better soil for bananas, pineapples, or any tropical or sub-tropical fruit, excepting the lemon, which grows far too rank and coarse in such soils, and the orange even is apt to be coarse till the trees attain some age. Similar soils, when occurring in colder and drier districts, are adapted for the growth of pears, olives, plums, prunes, apricots, and cherries in the coldest parts, and grapes for table use or for raisin-making, but not so good for wine, though, when such soils are rich in lime, they will probably produce a good brandy.

Heavy volcanic soils, whether red, black, or chocolate, though of extreme fertility, are not as a rule good fruit soils, as in the first place they are often too retentive of moisture—cost too much to cultivate, and if not cultivated, dry out and crack badly during dry weather. Where the climate is suitable, pears, apricots, plums, and prunes are the best fruits to grow on such soils; and when they occur in the tropical parts, bananas will probably do best. In a colony like this, where there are millions of acres of land suitable for growing the various kinds of fruit, I strongly advise that the cultivation of fruit for commercial purposes should be confined to such soils as I have described, for the only case in which it is permissible to use unsuitable soil is where the grower has only a small area of land, and has therefore no choice; and then it is not advisable to grow more fruit than is required for home consumption, as it cannot be grown at a price that will enable it to compete with fruit grown elsewhere under more favourable conditions.

When it is desirable to grow fruit in such soils, then it will always pay to give the land extra preparation either by trenching or sub-soiling combined with sub-draining; and by this means even poor clayey, shaley, or gravelly soils can be made to grow good fruit. The question of the best methods of treating such soils will be dealt with further on, and in the meantime we will take up the question of orchard sites.

ORCHARD SITES.

In dealing with the question of orchard sites, one important consideration is that of locality, as the most suitable site in one district is not always the most suitable site in another, so that, as we have to take locality into consideration, it may be as well to point out what constitutes the most suitable locality before dealing with the question of site. In the first place it is useless to grow fresh fruits commercially in districts that are difficult of access and are far removed from rail or water carriage, as the expense of getting the fruits to market and the knocking about that they receive in transit, prevents any chance of profitable culture. Therefore no matter how suitable the soil or climate of such a district, it should be let alone till there are better means of communication. The most favourable localities are those that have good roads within easy reach of rail or water carriage, and which, when soft fruits are to be grown, should be within easy reach of a populous centre. Firmer fruits, such as apples, pears, oranges, pineapples, mangoes, and bananas, which may be kept for some time after they are gathered, may be carried much longer distances, but even these fruits will not pay if grown too far from a shipping point. Fruits that are grown for drying, however, will pay to grow even at considerable distances from a shipping point, as the bulk to be handled bears the proportion of about one-fifth to one-sixth on an average, to the weight of fresh fruit, and it is not injured by delay in marketing or by rough cartage. In growing drying fruits, the main considerations are suitable soil and suitable climate. The influence of locality on site may be best exemplified as follows:—On the coast it is advisable to protect orchards from south-easterly gales, and on the Downs to protect them from strong westerly winds, hence the lay of the land and the natural shelter should be chosen so as to form the best protection in each case. In selecting the site for an orchard the first consideration is, that the soil be suitable for the fruits that it is desired to grow, as no matter how suitable it may be in other respects, if the soil is bad the orchardist is heavily handicapped from the start. The second consideration is that of aspect or exposure, which should be *towards* and not *from* the sun, a north-easterly aspect being the best. The third consideration is that of shelter, as a good shelter on the side from which the prevailing winds come, or from which heavy storms may be expected, is of very great help to the orchard. The land should not have too steep a slope, as if so it is apt to wash badly during heavy rains; a gentle slope is, however, considered an advantage, though if the soil is

all right and has a thorough sub-drainage, it cannot well be too level, as the more level the land, the easier it is to cultivate, and the better the work that is done by the improved implements used for orchard cultivation.

SHELTER.

The question of shelter is one that is often overlooked by fruit-growers, and yet it is one that has a very considerable influence on the productions of the orchard. Absence of shelter means injury and loss from heavy winds, or from hot winds, and in many districts injury from frost, so that it will pay any grower, when selecting the site of his orchard, to take advantage of any natural shelter that may exist. Such shelter may consist of belts of native timber, belts of scrub, or a background of higher land. Where belts of timber exist, they should be allowed to remain standing on all sides from which damage is likely to come, leaving a good substantial belt and not a mere fringe of trees; and where a belt of scrub is left, it should be of a sufficient width for the wind not to blow through it, otherwise it will soon die out. Where there is no available natural shelter, then it is advisable to provide an artificial one, which should consist of a belt of trees, preferably evergreen, that are adapted to the soil and district; and in the case of open plain country these belts should be of forest trees and of sufficient width to be a thorough windbreak; two or three rows of trees, though of some use, being of comparatively little value when compared with belts two or three chains in width. Such belts of forest trees would, in addition to their value as windbreaks, become eventually of considerable value for their timber, for it is only a question of time when good timber will become a very scarce commodity in many parts of the colony.

(To be continued.)

Entomology.

DESTRUCTIVE INSECTS LIABLE OF INTRODUCTION TO QUEENSLAND.

By HENRY TRYON,
Entomologist.

In studying the animal life occurring in any district or locality, one is led to conclude that it may be grouped in two categories, one of which comprises forms indigenous thereto, and the other such as are of exotic origin. Now, with regard to the latter the derivation of its members from regions in which they are either indigenous, or have previously arrived, is usually accounted for by reference to the absence of natural checks—such as mountain chains, water expanses, climatic extremes, &c.; to spontaneous dissemination; to the simultaneous predominance of those conditions of environment that are favourable to distribution—afforded by suitable land connections, the persistence of aerial or ocean currents of definite trend, &c., the extension of congenial meteorological conditions, the fact that special food requirements are forthcoming in the prospective land of adoption, and, in the case of parasitic or commensal animals, the antecedent existence of suitable hosts. These factors have no doubt exercised great influence in determining both the extent and character of the immigrant forms of animal life in any region, already prior to the portion of mankind dwelling thereon having had any intercourse with outside peoples, and no doubt still operate to some extent in the same direction; but the changes that they induce in local faunæ are but gradually effected. It seems that they are, however, too exclusively regarded by students concerned with the problems of geographical distribution. For one cannot afford to lose sight of the fact that it is to human intervention, to international commerce, and to ordinary trade relations, operating it is true, in conjunction with such congenial natural conditions as are above alluded to, that a country is indebted for many of the forms of life that are most conspicuous in their presence. This is especially so as regards insects, and above all, of such as are injuriously related to the plants engaging the skill of either agriculturist or horticulturist, and which not only impair—or even determine—the vitality of these plants, but are also harmful to the crops that they yield or to the manufactured products that in these originate. This is the explanation of the fact that many species of insects included in the above definition that a few years since were either unknown, or if known had but a limited range of occurrence, are now regarded as being cosmopolitan in their distribution.

But this explanation of the progressive range of occurrence of pernicious insects does not apply to their foes. Insects in their native home are almost without exception to a large extent held in check by natural enemies—such as insectivorous birds, predaceous or parasitic members of their class, fungus organisms, bacteria, and the diseases occasioned by the presence of these living agents. But when such insects have but recently found their way or have been transported to new countries, it is seldom indeed that they are so victimised, and as a rule only so after a considerable period of time has elapsed since their first introduction, and thus they are for a long time more noticeable

for their depredations than are purely native or indigenous species. It is for this reason the introduced insects naturally engage such paramount attention when the pests of vegetation of any country or district come to be coped with, or even considered as a preliminary to that act.

A mere list of the destructive insects for which we are indebted to our commercial relations with other countries, or which other countries may similarly place to our credit, to which has been appended some indication of the manner in which the insects specified comport themselves in the countries of their birth and of their adoption respectively, would serve to fully substantiate these propositions. It is not, however, the purpose of this communication to enter into this phase of the subject, but rather to point out the manner in which injurious insects are wont to find their way hither, and also to indicate some kinds not already occurring in the colony that we may expect to receive.

Pernicious insects such as are alluded to may be distributed into two classes, the first of which comprises those that are injurious to animals, whilst the second embraces those harmful to plants. Each of these groups may, again, be subdivided into—(1) pests that determine chemical and other transformations in living organisms; (2) pests that limit the vitality of, or even kill such organisms; and (3) pests that consume or damage stored products, whether manufactured or not.*

From this consideration, relating to the comprehensive nature of the term "destructive insect," it must be abundantly evident that the subject to be dealt with, as defined in the title of this paper, is a very extensive one. Recognising this, attention is henceforth almost exclusively restricted to those forms of animal life that are injuriously related to cultivated plants yielding marketable products, and whether harmful to the plants as a whole that they attack or exclusively so to their fruit.

As to the probability of our receiving destructive insects from sources beyond the limits of the colony, it may be stated, as the outcome of a review of the plant pests already operating in Queensland, that with the exception of the common Fruit-Fly, cane grubs (Scarabæidæ), and a few other insects, it is almost entirely beholden to foreign lands for their presence. This fact it is proposed to further enlarge upon on some future occasion. And, moreover, there are a large number of varieties of destructive insects, many of them allied to those already introduced into the colony and for which similar favourable conditions for importation and for naturalisation are forthcoming, but which have not yet reached our shores and become established here, or which, if they have already done so, have not been remarked.

With regard to the circumstances that mainly contribute to their introduction, it may be stated that these consist in the unrestricted importation of merchandise yielding them food or shelter, or the latter only, from countries in which they already exist. That traffic in injurious insects is attendant on this form of commercial enterprise will appear from the following incident:—In the State of California, U.S.A., there is a statute creating a State Board of Horticulture, and amongst the regulations framed in accordance with the provisions of that Act are ones that empower that body to either absolutely stay the introduction of insect-infested plants or portions thereof, or to permit it only after certain measures of disinfection have been effectually carried out. These restrictive measures are enforced through the agency of a quarantine officer and entomologist in the person of Alexander Craw, whose special attainments are of the highest order. The report of that officer for the period intervening between 2nd July, 1894, and 29th August, 1895, on "Inspection of

* These groups, it must be remembered, are, however, not altogether mutually exclusive, thus certain insects—*e.g.*, water beetles belonging to the family Hydrophilidæ—consume both living animal and vegetable organisms, deriving their subsistence from the former when in the larva condition, and from the latter when adult; but more remarkable still, there are insects that are, when adult, indifferently animal and vegetable feeders, an instance of which has lately been brought to light through the researches of F. H. Chittenden, of the United States Department of Agriculture, relating to the habits of a dermestid beetle, belonging to the genus Attagenus, and which is exemplified in more than one family of Hymenoptera.

steamers, &c.," contains a list that " comprises the number of plants, trees, &c. (and disposition made of same) inspected," and from this it may be learnt that 232 ships arrived at the State with this class of merchandise aboard, each as a rule conveying but small parcels thereof. In the case of these vessels, on 119 occasions the plants, &c., that they contained were found to be "clean," whereas those carried in the remaining 113 had to be wholly or in part destroyed by reason of the presence of injurious insects upon them, or in those cases in which they were admitted—which was quite exceptional—had to be disinfected by dipping, fumigation, or other process. Amongst those consignments were two parcels of Australian apples, one comprising 326 boxes that was admitted after the fruit in question had been suitably fumigated, and the other 100 boxes that were sent back owing to default of the owner to submit them to this process. The plants brought in the abovementioned 113 vessels harboured no less than *forty-three* different kinds of destructive insects. "Should they (the report states) become established in our State, no one can foretell the misfortune that would be sure to follow." In Western Australia, again, similar events have transpired in the course of the administration of the "Destructive Insects' and Substances Act."

The precise vehicles for the introduction of insect pests are both numerous and varied. Living plants are noteworthy in this connection, and not only since they yield congenial conditions for the continuous subsistence and growth of the insects that are originally upon them, but because as a rule they are transported from the post or place of debarkation to the orchard or garden where they are to be grown with such dispatch that the chances of the natural death of the insects during transit are lessened to a greater extent than would otherwise happen. As will often happen, again, an introduced insect that will manifest its presence in the destruction of a particular kind of tree or growing crop, will arrive upon a plant entirely different in its nature from that which in either of these cases it acquires a taste for. Thus an insect harmful to a fruit-tree may be brought here upon a purely ornamental shrub—rose-trees being especially noticeable in this connection—or, as often happens, upon a fern of one kind or another. Nor is it essential in the case of every insect that the plant being imported, and on which it is borne, should be intact and provided with roots. Serious pests may arrive in a choice bouquet of flowers, and especially upon plant-cuttings. The contents of small packages that enter through the post office may serve also in this capacity equally with the bulky consignments that swell the contents of ships' holds.

Not only may the plant itself bring destructive insects upon it, but the latter may occur in or upon the fruit that it may have yielded and is the exclusive object of commerce. This source of danger is especially to be anticipated in the case of certain scale insects, for these, though imperceptible, it may be, to the unassisted vision when this fruit is dispatched by the consignors, and therefore overlooked, may develop their full proportions during the course of a long voyage, to which they may be subjected, and so on their arrival be already conspicuous objects. Fruits that themselves afford special places of concealment, such as, for example, the eye in the case of the apple, pear, and quince, may, though apparently "clean," on being disembarked harbour destructive insects in connection with them, especially plant-lice, young scale insects, and mites. Fruit, again, that reaches its destination in a rotten or semi-rotten condition should always be regarded with suspicion, as its decay may have been occasioned by the maggot of some fruit fly or by the caterpillar of some tunnelling insect, that may still occur within or adjacent to it.

Vegetables, again, form a highly suitable material for the introduction of insect enemies, even when they form the kitchen refuse, rejected in port from day to day by the cook of some oversea vessel. Doubtless the majority of our cabbage pests—*e.g.*, Diamond Moth and Aphis—have thus originated here.

Boxes, crates, bales, sacks, or the material that may compose the same or other packages will doubtless, as in the past, serve as the means for introducing injurious insects, especially in their egg or chrysalis state, as many of

these are wont, when about to undergo their metamorphoses, to leave the objects that have hitherto afforded them the means of subsistence. Familiar instances of the truth of this are afforded by the codlin moth, the caterpillar of which will spin up in a fold or even on the smooth and uninterrupted surface of brown paper that has contained infested fruit; and so, by reason of the material used in the construction of the cocoon, escape ordinary scrutiny. Bags that have recently held potatoes infested by the *Lita solanella* may, when transported from one place to another, even as the receptacles of other merchandise, serve as the means of disseminating an insect destructive alike to the tobacco plant as well as that which has formerly nourished it, in every stage of their existence.

Soil surrounding the roots of growing plants is again a fruitful source for the introduction of pests. In this way, as in the past, we may expect to receive the eggs and young of both slugs and snails; the larvæ of scarabæids or chafers, as well as of Eumolpidæ, Galerucidæ, and other families of beetles destructive in both grub and perfect conditions. Certain kinds of Coccidæ, or scale insects, may again find their way hither in this way, especially those belonging to the genus Dactylopius, or mealy bug, which frequently attached to roots oviposit in the soil, with the result that their minute young occupy the interstices of this as well as of whatever box or other receptacle that may contain it. Again, in the soil itself may be introduced various aphides, as also nematodes or gall worms.

That which has been stated with regard to fruit also applies to other vegetable products—*e.g.*, tubers, seeds, &c.; even when these be imported without the definite intention of being used for cropping the soil. This contention receives support from what has been experienced in the case of such introduced pests as the potato tuber-worm, or the Bruchidæ—the weevils of pulse; the latter, it is hoped however, not yet naturalised in our cow-pea cultivations. Grain, if already not properly cleaned on arrival, may contain the chrysalises—the so-called "flax-seeds"—of the Hessian Fly.

More than one class of the goods that form part of a grocer's stock in trade may act as the vehicle for the introduction of baneful forms of insect life. These, it is true, are usually assignable to the group defined as domestic pests, since they in great measure restrict their attention to manufactured articles and other commodities affording us raiment or shelter; yet there are no grounds for concluding that with the lesser wax moth of the beehives, that—as has been pointed out by a local resident, H. Hockings—finds its way hither on dried fruit, we have received the last of the pests that travel further afield.

Straw-packing, including hay formed of the stems of timothy, &c., may be expected to serve as the means for the introduction of one or more of the straw-mining insects injurious to cereals—*e.g.*, the Hessian Fly and Joint Worm (*Isosoma*): a remark that especially applies to that covering agricultural implements, since these may be taken, with the packing still attached, direct from the place of debarkation to agricultural holdings where wheat, &c., is being grown.

Yet there are still other ways in which agronomic pests such as are alluded to may gain entrance and establishment here. One of these consists in the importation of insects—*e.g.*, silkworms—yielding or supposed to yield valuable products, and the subsequent liberation of these, either accidentally or intentionally, and in the latter case even regardless, it may be, of all consequences. An instance of this is afforded by what has been experienced in Massachusetts, U.S.A., with respect to the gipsy moth *(Ocneria dispar)* introduced there from Europe as a possible new source for silk by a private enthusiast, whose enterprise has already occasioned an outlay on the part of that State of many thousand pounds sterling.

PROBABLE IMPORTATIONS.

Amongst deleterious insects that it is anticipated will find their way into the colony, the following may be specified in connection with the particular plants they affect. Many plant-enemies have already been introduced from outside, and have become established in our cultivations; and the number of probable new importations will therefore appear small to those who are not apprised of this fact. In some few cases the names of insects already met with here are included, insomuch as their range of occurrence in the colony is quite limited. Such names are distinguished by an asterisk.

INSECTS INJURING PIP-FRUIT TREES.

APPLE.

Codlin Moth (*Carpocapsa pomonella*). In apples, quinces, or pears, or in packages or cases that have contained this fruit. From any of the Australian colonies with the exception of Western Australia, from Europe, and from North America.

False Codlin Moths (*Cacœcia responsoria* and *C. postvittana*). In apples, or in packages or cases that have contained this fruit. These insects injure apples as does the codlin moth. The former of them has been thus referred to: "A pest of the very worst kind, and in many cases its ravages have been of a most serious nature" (C. French). Its arrival may be anticipated from Victoria, whereas *C. postvittana* may arrive from New South Wales.*

Apple-blossom Curculio (*Anthonomus pomorum*, L.). A small weevil, about ¼-inch in length, that undergoes its transformation within the flower-bud. In boxes containing earth and vegetable *débris* that have been derived from orchards infested with this insect. From European countries, including Mediterranean provinces. Introduction not highly probable.

Apple Weevil (*Rhynchites baccus*, L.). A purplish-red beetle with metallic reflections, having a body less than ¼-inch in length. Feeding whilst in the grub condition upon the pulp and ovary of the young fruit (Lunardoni, A.). Injuring pear also. Introduction possible, and in a manner mentioned under *Anthonomus pomorum*. From Europe.

Mussel Scale (*Mytilaspis pomorum*). Especially injurious to the apple, accounted to be in Tasmania even more deleterious than is the codlin moth. On apples, also on apple-trees, or on scions or buds thereof, or on various other plants, *e.g.* Frequently brought here already on fruit from southern colonies, but not yet established in the colony; from other Australian colonies, from Europe, and from America.

*Oleander Round Scale (*Aspidiotus camelliæ*). This scale insect was found on the Sandwich Islands "upon imported apple, pear, and peach trees in such numbers that some of the trees had died." (A. Koebele.)

Pernicious or San José Scale Insect (*Aspidiotus perniciosus*). Attacking apple, pear, quince, peach, apricot, and other deciduous trees. One of the worst scale insects known. On nursery stock, scions, or buds, or even on fruit. From N. S. Wales, Victoria, or California. Its occurrence has been noticed by the writer in five Queensland orchards; in four of them it is already stamped out.

Apple Web Moth (*Hyponomeuta matinella*, Zeller). Feeds gregariously on leaves and flower-buds of apple. The damage occasioned by this pest in France in some years amounted to a million of francs (Girard, A.). On young apple-trees in the egg condition during certain months. From European countries, including those bordering the Mediterranean.

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*An insect congeneric with these has been met with by the writer in the Stanthorpe district, but in its case the caterpillar fed exclusively upon the young foliage.

Pear.

Codlin Moth (*Carpocapsa pomonella, vid.* "Apple").

Pernicious or St. José Scale (*Aspidiotus perniciosus, vid.* "Apple").

Leaf Slug (*Eriocampa cerasi*, Peck). The larva of a small 4-winged fly that is slug-like in appearance, and that adheres to the upper surface of the leaf whilst it devours the spongy tissue thereof. Also attacks both pear and plum in a similar manner. Very injurious at times, quite defoliating the trees. Already introduced to some of the other colonies.* On pear, quince, cherry, or plum nursery stock and in earth in which same are packed, since larvæ hibernate in soil. From the southern colonies including New Zealand; also from Europe and North America.

Pear Midge (*Diplosis pyrivora*, Riley). This insect resembles in appearance the Hessian Fly, lays its eggs in the flower-bud, and the resulting maggots find their way to the centre of the newly-set fruit, that becomes deformed and is retarded in its development. In soil in which midge-infested pears have been growing, and used for protecting roots of nursery stock. From United States of America. Introduction not very probable.

Pear-tree Psylla (*Psylla pyricola*). A small 4-winged sucking insect, occurring often very numerously on foliage of tree, covering same with honey-dew, the presence of which results in a general black discolouration. Also occurs on apple. In cases on nursery stock, especially apple or pear, in or on which perfect insect is hibernating. Formerly introduced from Europe to the United States of America; may come, therefore, from either of these regions, but not very likely to arrive here.

Quince.

Leaf Slug (*Eriocampa cerasi*, Peck, *vid.* "Pear").

Pernicious or St. José Scale (*Aspidiotus perniciosus*).

Quince Scale (*Aspidiotus cydoniæ*, Comstock, *vid.* "Apple"). On garden plants and on nursery stock, especially quince. From Sandwich Islands (A. Kœbele), and from United States of America.

INSECTS INJURING STONE-FRUIT TREES.

Peach.

Pernicious or St. José Scale (*Aspidiotus perniciosus, vid.* "Apple").

Indian Peach Maggot (*Rivellia persicæ*, Bigot). Pest of similar habit to the common fruit maggot of Queensland and New South Wales. In fruit from India. (E. C. Cotes.)

East Indian Fruit Maggot (*Ceratitis capitata*, Wied.). Pest of similar habit to the common fruit maggot of Queensland and New South Wales. In fruit. From East Indies, Western Australia, Cape of Good Hope, &c.

Japanese Peach Fruit-worm (*Carpocapsa*, sp.). Regarding this pest and its depredations in Japan, it has been stated as follows:—"Peach crop rendered almost a complete failure, so far at least as the quality of the fruit is concerned, by the attacks of a small lepidopterous larva which bores the fruit, causes it to decay, prevents it coming to a sound maturity and ripening in a marketable condition." *Insect Life*, vol. i., p. 58. 1888.† In the soil of orchards wherein peaches are grown, used in packing nursery stock. From Japan.

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* The following testimonies are significant:—"I am sorry to say that the cherry-leach is spreading with great rapidity. It is only six years since it first made its appearance from New Zealand, but it is now all over Southern Tasmania."—E. H. Thompson, *Insect Life*, vi., p. 37, Ap. 1893.

"Said to be the worst enemy with which growers of fruit have to contend."—C. French. Second Report, p. 101.

† Further information regarding this insect pest is afforded by an article entitled "The Japanese Peach Fruit-worm." *Insect Life*, ii., No. 3, pp. 66-68, Sept. 1889, wherein are recorded the observations of Professor C. Sasaki.

Florida Round Peach Scale (*Diaspis lanatus*, Morgan and Cockerell). Occurs also on cherry and plum. With regard to its pernicious work in Florida, it was stated in 1893 that it was "destroying a large number of peach and plum trees in this section."* On nursery stock comprising peach, cherry, and plum trees, and on many ornamental and garden plants from Japan, Ceylon, United States of America (Florida, &c.), West Indies (Jamaica, &c.).

APRICOT.

Pernicious or St. José Scale (*Aspidiotus perniciosus, vid.* "Apple").

Brown Soft Scale (*Lecanium armeniacum*, Craw). On nursery stock, especially comprising apricot trees. From the United States of America, &c.

East Indian Fruit Maggot (*Ceratitis capitata*, Wied, *vid.* "Peach").

PLUM.

Pernicious or St. José Scale (*Aspidiotus perniciosus, vid.* "Apple").

Florida Round Peach Scale (*Diaspis lanatus*, M. and C., *vid.* "Peach").

Plum Curculio (*Conotrachelus nenuphar*, Herbst.). A weevil that deposits its eggs in the fruit, several in each, the resulting grubs afterwards feeding on pulp of same. "The Plum curculio has made a crop almost impossible in New Jersey."—J. B. Smith, *Insect Life*, iv. p. 45. In fruit (plums and apples), and in soil containing nursery stock from United States of America, British Columbia, and Victoria.

Plum-Gouger (*Coccotorus scutellaris*). Attacking fruit of plum. In fruit or in soil containing plants. From United States of America.

Plum Borer (*Euzophera semifuneralis*, Walk). In fruit and in excrescences of plum trees (known as "black knobs"). From United States of America.

CHERRY.

Florida Round Peach Scale (*Aspidiotus lanatus*, M. and C., *vid.* "Peach").

Leaf Slug (*Eriocampa cerasi*, Peck, *vid.* "Pear"). Known in Tasmania as the "Cherry Leach."

Fruit Grub† (?) (*Conotrachelus nenuphar*, Herbst., *vid.* "Plum"). Fruit Cherry, &c. From Tasmania.

INSECTS INJURING THE GRAPE VINE.

Phylloxera vastatrix. In addition to the generally recognised methods for the introduction of this pest may be mentioned—first, that which consists in its accidental occurrence on roots or rootlets of plants, derived from soil adjacent to that containing Phylloxera-infested grape vines; and, second, that which consists in its natural occurrence on Phylloxera-resisting American vines, derived from localities in which the pest exists as an indigenous insect has become established.

INSECTS INJURING MORE THAN ONE OF THE FOREGOING PLANTS.

Japan Chafer Beetle (*Adoretus umbrosus*). This insect, that is not commonly met with in its native home, and seldom if ever in gardens there, was first noticed at Hawaii (Sandwich Islands) about six or seven years ago. Already in 1893 it was becoming a serious pest there; the adult beetle being wont to

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*S. S. Harvey, *Insect Life*, vi. p. 39. Alexander Craw writes: "Experiments conducted by the entomological department at Washington, D.C., with the strongest and best known insecticides, demonstrated the fact that this is one of the most difficult to kill, as well as one of most pernicious scales known." A Craw, *Fifth Report State Board of Horticulture*, of California, p. 39. 1896.

† Late in 1889 considerable apprehension was excited by the occurrence of a small grub in the fruit of the cherry about Hobart, especially injuring varieties like the Florence and Bigaroo. Mr. Alexander Morton, F.L.S., after examination, expressed the opinion that the pest was the grub of our Plum curculio, *Conotrachelus nenuphar*.—F. M. Webster, *Insect Life*, iii., 480, 1891. This American insect had not at the time which he wrote reached the Pacific slope on the continent, not appearing at British Columbia till 1892. He therefore added "it might not be a bad idea for our Californian fruit-growers to be on the lookout for its importation.

riddle the leaves of many different trees and plants, including (according to A. Craw) orange, grape, peach, rose, and others. Unlike what occurs in the case of the majority of scarabæid beetles, *Adoretus umbrosus* undergoes its transformation (beneath the soil) at Hawaii in the short period of seven weeks.* Likely to be introduced in the grub or beetle condition in the soil of boxes containing growing plants, or in decaying vegetable matter from Sandwich Islands or from Japan.

Vine Weevil (*Otiorhynchus sulcatus*). A small beetle, that when adult consumes the leaves of various plants, and that as a larva gnaws their roots and rootlets, injuring in this way not only the vine but various fruit trees. Introducable in soil containing plants either as a grub or nymph. From Europe and South Australia, being already introduced in latter locality.†

Vine Weevil (*Otiorhynchus picipes*, Fabr.). Of like habits. Similarly from Europe.

Burrowing Scale Insect (*Chionaspis biclavis*, Comstock). A scale insect living under the outer skin of the bark, infesting orange, coffee, guava, gardenia, and various shade trees. Introducable on nursery stock comprising the above plants from the Sandwich Islands, Tahiti, and Southern Mexico. Of "a cargo of 325,000 orange-trees that arrived at San Pedro (California) from Tahiti on 15th June, 1891," Alexander Craw writes, "The trees were fumigated five times with double and treble strength hydrocyanic acid gas, and dipped twice in a strong caustic solution, with the result that the trees were injured, but sufficient scales survived to justify legal proceedings being instituted against the trees as a nuisance. . . The trees were destroyed."‡

Mealy Bugs—(1) *Dactylopius vastator*, Mask.; (2) *Dactylopius ceriferus*, Newstead. On nursery stock comprising various trees and shrubs; in the soil in which plants are being introduced, and in crevices of boxes and packages that are used in this connection. From Eastern Asiatic ports, including those of China; from the Sandwich Islands and other groups of the South Seas.§ Should either of these insects become established here, it is considered that the ladybird (*Cryptolæmus montrouzieri*), whose predaceous habits as regards mealy bugs were first made known by the writer, would keep it in subjection.

INSECTS INJURING STRAWBERRY.

Strawberry Weevil (*Anthonomus signatus*, Say.). Feeds as a grub within flower-buds, and thus prevents the formation of fruit to the extent of destroying one-half prospective crop. In soil whilst hibernating, or about strawberry plants. From the United States of America.

Victorian Strawberry Beetle (*Rhinaria perdrix*, Pascoe). A weevil the grubs of which tunnel in the central shoots of the plant. A "very serious enemy of strawberry-growers" (C. French). In strawberry plants. From Victoria and Tasmania.

Strawberry Aleyrodes (*Aleyrodes (?) vaporarium*). A minute plant-louse occurring on foliage. On strawberry plants and other nursery stock. From United States of America and elsewhere. It has been already widely disseminated, on stove plants, in other countries.

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* *Cf.* A. Kœbele. Report of the Entomologist of the Hawaiian Government. "Planters' Monthly," Honolulu. Feb. 1897.

† *Vid.* A Lunardoni, *Gli Insetti Nocivi*, p. 336, 1889; and G. Quinn, Journal Bureau Agr. of S. Austr., Ap. 1897, p. 282.

‡ Fifth Report of State Board of Hort., California, 1895-6, pp. 356.

§ Concerning these two scale insects, the following facts have been recorded :—

"*Dactylopius vastator*, Mask. Most of the shrubs and trees were so infested by the then recently introduced and most pernicious of coccids ever met with (*Dactylopius perniciosus*, Mask.), that their destruction in the near future seemed imminent, had not relief been brought. . . . The coccid is a native of China, where it had been met with in the neighbourhood of Hongkong." —A. Koebele, "Planters' Monthly," Honolulu, Feb. 1897, p. 67.

"*Dactylopius ceriferus*, Newst. Another numerous scale insect, and one that had longer been introduced than the previous species (*i.e.*, *D. vastator*)—viz., *Dact. ceriferus*—had always been seen covering the leguminous trees, often to such an extent that many of them lost their entire leaves, and in some instances even were destroyed entirely by the quantities of mealy bugs present."—A. Kœbele. Report of the Entomologist of the Hawaiian Government, 1896. *Op. cit.*

INSECTS INJURING CITRACEOUS PLANTS.

Perak Pomelo Moth (*Nephopteryx sagitiferella*, Moore*). (*Fam.*, Phycitidæ.) A small moth that lays several eggs at one spot on the rind of the fruit, the resulting caterpillars penetrating to and tunnelling through and through the pulp. Injuring pomoloes, lemons, limes, and other Citraceæ. In fruit, and in soil in which nursery stock is packed. From Perak and the Malay Archipelago generally.

Orange Fruit Flies—(1) *Ceratitis capitata*, Wied. In fruit—not necessarily citraceous—or in parcels or packages that have contained the same, and in soil. From East Indies, Western Australia, or Jamaica. (2) *C. catoirei*, Guérin Meneville. Similarly. From Mauritius and Bourbon. (3) *C. hispanica*, De Brême. Similarly. From Mediterranean provinces.

Oranges Aleyrodes *or* White Fly (*Aleyrodes citri*, Riley and Howard). Small insect—ultimately winged—thickly crowding under surface of leaves. On nursery stock comprising citraceous plants. From Florida, Louisiana, and other of the United States of America.

Orange Scale Insects—(1) *Aspidiotus longispina*, Morgan. On fruit nursery stock, comprising Citraceæ, mango, fig, &c. From China and Sandwich Islands. (A. Koebele).† (2) *Aspidiotus albopunctatus*, Cockerell. On oranges, &c., and on nursery stock, comprising Citraceæ. From Japan. (A. Craw). (3) *Aspidiotus duplex*, Cockerell. Similarly, and from same region. (A. Craw). (4) *Chionaspis bielavis*, Comstock (*vid.* pg. 37). From Sandwich Islands, Tahiti, Mexico, &c.. (5) †*Mytilaspis citricola*, Pack. (*M. flavescens*, Targ. Toz.). On oranges, lemons, &c., and on nursery stocks, comprising citraceous plants, Murraya, croton, holly, &c. From Mediterranean region, Florida, South Seas, &c. (6) *Parlatoria pergandi*, Comstock. On citraceous fruit and on citraceous nursery stock. From Florida. (7) *Parlatoria zizyphi*, Lucas. On citraceous fruit, and on citraceous and other nursery stock. From China and Sandwich Islands. (A. Koebele, *op. cit.*) And from Mediterranean provinces and Batavia. (H. T.) (8) *Ceroplastes floridensis*, Comstock. Florida wax scale. On nursery stock, comprising various plants, including citraceous ones. From Florida and West Indies. (9) *Ceroplastes cirrhipediformis*. On nursery stock, citraceous, ilex, persimmon, &c. From Florida.

INSECTS INJURING THE OLIVE.

Olive Pollinia (*Pollinia costæ*, Targ. Toz.) A scale insect. On olive truncheons from the Mediterranean provinces.

INSECTS INJURING COFFEE.

Burrowing Scale (*Chionaspis biclavis, vid.* "Orange").

Green Bug (*Lecanium viride*, Green).‡ On nursery stock, including Citraceæ mango, guavo, tea, &c. From South India and Ceylon.

Coffee Mealy Bug (*Dactylopius adonidum*, Linn.)§ Upon nursery stock comprising various ornamental plants, and in soil about the roots of same, and in plant cases and packages. From India and from Sandwich Islands and other parts of South Seas.

Coffee Aleyrodes. On nursery stock. From South Seas.

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* Wray, Ind. Mus. Notes, vol. ii., No. 1, pp. 21-24, 1891.

† Rept. of Entomologist of Hawaiian Gov., Plant. Month., Feb. 1897, *pass.*

‡ "Since the publication of J. Neitner's 'The Enemies of the Coffee Tree,' many new enemies have made their appearance, notably the *Lecanium viride*, which has practically wiped out coffee cultivation in many districts. Its vigour, and the rapidity with which it is propagated, have defeated any remedial measures that we could afford to apply, and consequently planters are everywhere turning their attention to the cultivation of tea in the place of coffee."—E. E. Green.

§ "*Dactylopius adonidum*, Linnæus, has been present upon most all plants. It is the scale that has marred the coffee industry in the Islands [*i.e.*, Sandwich Islands, H. T.] ever since the attempt was made to grow the tree, over fifty years since, by its large numbers sitting round and sucking out the sap of the young berries, producing a premature colouring and dropping of the same. It likewise lives upon the roots, not only of the coffee, but many other trees and plants in the tropics."—A. Koebele. Report of Entomologist of Hawaiian Government, 1896. *Plant. Month, Honolulu, February*, 1897, *pages* 68 *and* 69.

INSECTS INJURING MANGO.

Green Bug (*Lecanium viride*, Green, *vid.* "Coffee," p. 38.)

Mango Fruit Maggot (*Dacus ferrugineus*, Fabr.). Pest with habits corresponding to those of common Queensland and New South Wales fruit maggot. Does considerable damage to fruit—(E. C. Cotes). In fruit or soil of Dacus-infested plantations. From India, &c.

INSECTS INJURING HOPS.

Hop Plant Louse (*Phorodon humuli*). A very injurious insect. On nursery stock, consisting of plum trees, on roots of which it winters in the egg state. From the United States of America and from Tasmania, where it has already become established.—E. H. Thompson.

INSECTS INJURING DATE-PALM.

Eastern Palm Weevil (*Rhyncophorus ferrugineus*, Oliv.). In various palm plants. From India and Singapore. The larvæ of this large weevil are white legless grubs; they tunnel into the trunks of date (*Phœnix dactylifera*), cocoanut (*Cocos nucifera*), and other palms in India, and kill a large number of trees.

American Palm Weevil (*Rhyncophorus cruentatus*). Said to "eat bulbs of date palms, and destroy these plants in Florida." In all kinds of small palm plants. From Florida and West Indies.

Date Palm Scale (*Parlatoria victrix*, Cockerell). On palm plants from Egypt.—A. Craw.

INSECTS INJURING COCOANUTS.

Eastern Palm Weevil (*Rhyncophorus ferrugineus*, Oliv., *vid.* "Date Palm").

American Palm Weevil (*Rhyncophorus palmarum*, Linn.). In various palm plants from South America and Southern California.

Ceylon Cocoanut Palm Weevil (*Sphenophorus panipennis*, Nietner). In palm plants. From Ceylon.

Palm Scale Insect (*Diaspis vandalicus*, Galveg.). Concerning its work at Havana we have the following testimony:—"Disease due to this, killing many cocoanut palms, and at one time almost threatened to annihilate all the plantations producing cocoanuts for markets and export." (Otto E. Reimer). On cocoanuts. From West Indies and elsewhere.

Palm Scale Insect (*Aspidiotus destructor*, Signoret).* Said to be extremely destructive to scale insects (E. C. Cotes). On cocoanuts. From Laccadive Islands (India), Reunion, &c.

Cocoanut Palm Defoliator (gen. et sp. ?).† Very injurious to the foliage of the cocoanut in Fiji; even threatening destruction of this palm there.—(A. Koebele.) Occurring also apparently in British New Guinea.—H.T. On the leaves of growing palms and in cocoanut leaves used in packing. From Fiji and other South Sea Island groups.

Cocoanut Palm Mealy Wing (*Aleurodicus cocois*, Curtis). Injurious to foliage. On palm plants. From the West Indian Islands.

INSECTS INJURIOUS TO PULSE (Cowpea, &c.)

Large Grey Pea Weevil (*Bruchus emarginatus*, Allard). In peas (*Pisum sativum*). From India, &c.

Red-legged Pea Weevil (*Bruchus rufimanus*, Boh.). In peas and broad beans. From Europe.

Four-spotted Bean Weevil (*Bruchus quadrimaculatus*, Fabr.) In table beans. From Europe and America.

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* "A minute insect that to the naked eye looks like a mealy scurf on leaves. It has been reported as extremely destructive to cocoanuts (*Cocos nucifera*), palms. . . . It sucks up the juice of the leaves to such an extent as to sap the vitality of the trees and to destroy great numbers of them." (E. C. Cotes.)

† "A small black pyromorphid, closely related to our *Acoloithus* and *Harrisonia*."—C. V. Riley. *Insect Life*, v. 270. 1893.

Note.—*Bruchus pisorum*, Linn., *Bruchus obtectus*, Say., and *Bruchus chinensis* have been detected on stored peas and beans in Brisbane seed-stores; and if not generally disseminated or established where cowpeas, peas, and beans are grown, should be added.—*Vid.* H. Tryon, "Bean and Pea Weevils." Trans. Nat. Hist. Soc. of Qd., vol. i., pp. 16-20. 1891.

INSECTS INJURIOUS TO CEREALS.

Wheat Midge (*Diplosis tritici*, Kirby). Larvæ live within flowering glumes and cause abortion of grain. In soil or other vehicle containing pupæ. From Europe and the United States of America (formerly introduced to this region).

Hessian Fly (*Cecidomyia destructor*). In straw and hay packing, and in grain badly cleaned and containing the pupæ (the so-called "flax seeds"). From Europe, the United States, and New Zealand, being introduced within recent years to the this southermost Australian colony.*

European Saw Fly (*Cephus pygmæus*, Linn.) From Europe or America; introduced to latter country. Importation to Queensland not highly probable.

Wheat Stem Maggot (*Meromyza*, sp.) Breeds freely in several kinds of grasses besides doing so in wheat stalks. In straw and grass in packages. From the United States of America and Canada (*vid.* "Report, Canadian Entomologist, 1889").

Joint Worm (*Isoma tritici*). This hymenopterous insect is stated to do a considerable amount of injury in wheat-growing districts. In straw used as packing, since insect hibernates within the stalks. From the United States of America and elsewhere.

Gran Aphis (*Toxoptera graminum*, Boisd.). Attacks oats and other cereals. Introduced formerly into America from Europe, and therefore a possible importation to Australia. From European countries, including Mediterranean provinces.

INSECTS INJURING MAIZE.

Sugar-cane Moth-borer (*Diatræa saccharalis*, Fabr., *vide* "Sugar-cane"). In cane "sets."

Sugar-cane Beetle (*Ligyrus rugiceps*, Lec.). Stated to be "the worst insect enemy of the corn plant on heavy wet land" in Missouri, U.S.A. (*vide* "Insect Life," I. 217). In cane "sets." *Vide* "Sugar-cane."

Corn Root-borers (*Diabrotica longicornis*, Say., and *D. 12-punctata*, Oliv.). The former insect, the grub of a beetle, has been stated to have "become a terrible pest in fields of Indian corn all over the Western States of America" (F. M. Webster). In soil containing the roots of growing plants. From North America. Introduction not highly probable.

INSECTS INUJRING SUGAR-CANE.

Moth Stalk-borer (*Diatræa saccharalis*, Fabr.).† This destructive borer does not appear to have become established in Queensland. Attacks also maize and sorghum. In sets of sugar-cane from East Indies, India, Mauritius, and Louisiana.

Javanese Stalk-borers‡ (*Scirpophaga intacta*, Snell., *Grapholitha schiztaceana*, Snell., and *Chilo infuscatellus*, Snell.)

Beetle-borers (*Sphenophorus obscurus*, Boisd., and *Sphenophorus sacchari*, Guilding). Highly destructive insects (*vide* "Insect Life," i. p. 185). Also damaging banana. In sugar-cane or cane "sets" and in banana stools. From the Sandwich Islands, New Ireland, New Guinea, Tahiti, West Indian Islands, and South America.

American Sugar-cane Beetle (*Ligyrus rugiceps*, Lec.). In sugar-cane or cane "sets." From Louisiana (*vide* "Report Div. Ent. Rep. Dep. Ag. U.S.A. 1880").

INSECTS INJURING BANANA.

Beetle Borers (*Sphenophorus spp.*). *Vide* "Sugar-cane." Cane plants and "sets" and banana stools. From British New Guinea, Sandwich Islands, &c.

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* *Cf.* T. W. Kirk.—"Report of Acting Biologist," "2nd Report Department of Agriculture, New Zealand," pp. 81-87, Wellington, 1894; and H. Tryon, "Journal of the National and Agricultural Association," No. 24, Brisbane, 26th May, 1888.

† That the stalk-borers belonging to the genus Diatræa, occurring in South America, Mauritius, India, and the East Indies, are referable to a single species is at least doubtful.

‡ Dr. W. Kruger. *Berichte der Versuchsstation für Zuckerrohr in West Java.* Heft I., Dresden, 1890.

Apiculture.

BEE-KEEPING FOR EXTRACTED HONEY.

By H. STEPHENS.

Part I.

The best time to commence with bees is in the spring, about September, or as soon as the cold weather is over, although they may be got at any time during the summer; but the earlier in the season the better, as they will have a longer time in which to gather honey before the winter, and will pay for themselves in the first season with ordinary care, and if a swarm can be secured, the expense of starting is very trifling. Most people have seen a swarm of bees hanging to the branch of a tree, and have no doubt kept at a safe distance away from them; but those who wish to become bee-keepers must not be afraid of stings, and bees, when they have swarmed, are not generally disposed to use their stings unless too roughly handled, as before leaving the hive the worker bees fill themselves with honey, and a bee in that state is like a man after a good dinner—not inclined to be quarrelsome. If a swarm of bees settles on a branch that can be conveniently cut off, they may be carried where you wish, of course within a reasonable distance; but it is best to make a cut on the underside of the branch first, as if this is not done the branch when cut through may hang by the bark; but it often happens that the bees are not so obliging as to cluster on a branch of this kind, in which case they have to be secured by means of a box or swarm-catcher, and the plan of working is then as follows:—

When the bees are nearly all clustered, place or hold the box underneath the swarm; and then with the other hand sharply jerk the branch they are on, when they will fall into the box, which must be closed at once with anything that will keep the bees from escaping, and if the queen-bee is inside they will remain quietly with her, and may be left in a shady place till a hive can be prepared, which should only require putting in position, as it does not do to be behind with things, but everything should be ready beforehand. Of course they may be left in the box they were caught in; and if an entrance is made in the lower edge, and the box placed on a piece of board to form a bottom, the bees will go to work and start building comb just as if they were in the best frame hive; but most people who commence bee-keeping will wish to start right, and keeping bees in box hives is neither starting right nor most profitably. The proper hive to use is what is known as the frame hive; because the bees, instead of fixing their combs to the sides of the hives, are made to fix them into light wooden frames which hang from a rebate in the top edge of the hive, thus permitting the combs to be lifted out when necessary for observation. This is a very great advantage, and has made bee-keeping pleasant and easy as compared with the old methods, when much was left to chance. The plan of having the combs built in frames was first invented by Rev. L. L. Langstroth, and the frame hive is in consequence known as the Langstroth hive.

The usual number of frames in a beehive in this colony is ten, but some beekeepers use an eight-frame hive, which has exactly the same sized frames. In this paper the ten-frame hive will always be meant, as that is the kind most generally used.*

* Full details are given here by the author for the construction of a perfect frame hive. Exigencies of space, however, compel us to omit this portion of the paper.

WAX FOUNDATION.

After the frames are wired they are filled with sheets of "foundation," which is simply wax made into sheets and passed between two rollers that impress them with the bottoms of the cells. This saves the bees so much extra labour; and as bees use from 12 to 14 lb. of honey to make one pound of wax, the advantage of using whole sheets of foundation is obvious; also, as all worker foundation may be used, the production of undesirable drones is kept in check, and honey is also saved in that way. There are three kinds of foundation made—thick, medium, and thin (for comb honey). The two first are used for honey to be extracted. The price is 2s. per lb., and the approximate number of sheets to the lb. is—

Thick broad foundation	5 sheets
Medium	7 ,,
Thin for section boxes	26 half-sheets.

WIRE EMBEDDER.

The foundation is fixed into the frames with what is called a "wire embedder," of which the Easter day is a useful kind. It is made of tin, and the wire is pressed into the wax by a rocking motion of the tool.

Before putting the foundation into the frames a piece of board should be provided, cut to fit easily into the inside of the frame; and the wax should be slightly warmed and laid on this board, the frame placed over it, and the wires pressed in.

OILCLOTH MATS.

On top of the frames and underneath the cover, a mat of oil, or American cloth is placed, with the oil side down. The purpose of it is to prevent the bees from sticking the cover down, and to permit the bee-keeper to expose the frames gradually by gently peeling the mat off by one corner. They are best kept without holes, as it is more convenient in working the bees; the cover of the hive also should be kept tight to prevent the ingress of rain.

Now, to get back to the swarm of bees that were left in the box in a shaded place. They have now to be placed in the frame hive, which is effected by moving the frames to each side and shaking the bees down into the centre of the hive. If it is a very large swarm, some frames may have to be removed and be replaced afterwards when the bees get settled. The mat and cover are next put on, brushing any bees away that may be in the road. If it is a good swarm and the queen is there, they will go to work at once to draw out the the foundation, usually the centre frames first; and when they have the comb built the bees will bring in pollen and honey, and the queen will commence laying.

About a couple of hours after the bees are hived, it will be necessary to examine the hive to see if they are working properly and that the foundation is not falling out of the frames, as it sometimes does if not put in firmly, thus preventing the bees from building nice straight combs. If they are going on well they may be left alone for two or three days, but for a beginner with bees it is just as well to look at them often, as he thus makes himself familiar with their method of working, which is very simple when once learnt. A smoker and a bee-veil are necessary in order to enable the observer to examine bees in comfort. When the smoker is burning well, the cover must be lifted off the hive. Then the oilcloth mat must be gently peeled off, some smoke being blown on to the bees at the same time. After the mat is off, one of the centre frames is gently lifted out and search made for eggs and young larvæ in the cells. A bee's egg being very small, a novice may have some difficulty at first in detecting it, but if the comb be held in the right light it may easily be seen.

If eggs are seen, it is tolerably certain that the queen is all right, so there is no necessity to look for a queen every time the hive is opened; only the eggs need be sought for. As soon as a queen is lost the bees will start queen cells with these eggs or young larvæ, except at the swarming season, when they

make cells whilst the queen is still there. If a centre frame cannot be got out without crushing the bees, one of the side frames must be removed and placed alongside the hive; then the others are moved along till one is found with eggs and brood in it. If there are plenty of eggs and brood in the hive, it is all right; also it must be noticed if they are cramped for room. If so, the honey-board is put on and a super or top story added, filled with frames of foundation or with empty combs. In a strong colony the queen lays for nine months in the year, and only takes a rest in the winter time or during a scarcity of honey, and it has been estimated that a prolific queen lays from 2,000 to 3,000 eggs daily, but she would probably lay that number for a short period only. In three days after the eggs are laid they will hatch out into small larvæ or grubs, and the bees feed these larvæ with a mixture of pollen and honey, partially digested, for a period of nine or ten days from the time the eggs were laid. They then seal the mouth of the cell up, and the young worker bee hatches out after eleven or twelve days, or about twenty-one days from the time the egg was laid. The queen takes only sixteen days to hatch, and the drone the longest time of all, hatching out twenty-four or twenty-five days from the laying of the egg. After the hive is full of honey and brood, provision must be made for giving the bees more room, so another hive body will be required with ten frames of comb or foundation, which is placed upon the lower one with a "queen excluder" or zinc honey-board between them, the object of which is to prevent the queen and drones from coming into the top story or super and the queen from laying there, for the super is for honey alone, and the queen should be given plenty of room in the lower hive or brood-nest. As the combs in the super are filled with honey the bees will seal the cells over, and it is the honey that is taken from sealed combs that is the best and thickest, as it has then been ripened. Bees usually commence storing honey in the centre frames first, and as these are being filled they may be moved to the side of the hive and replaced with the empty ones, so as to fill the super up in every frame regularly. When the brood-nest and super are filled with honey and brood, the bees make preparations for swarming by building shallow queen-cells (which resemble the cup of an acorn in shape), and in each of these cells, if she is ready, the queen lays a worker egg, which, just before hatching, the bees liberally supply with a very concentrated food called "royal jelly," supposed to be similar to that supplied to every young worker larvæ, only a great deal richer. This food is given freely during the whole of the larva period, and after nine days from the time the egg was laid the queen cell is sealed up, and the young queen hatches out in about one week more, or sixteen days from the laying of the egg. But before the cells hatch out, the swarm will leave with part of the bees, and the first hatched queen will destroy the other cells; but it is probable that the bees help her to do so, and sometimes, instead of the queen destroying the cells, she will lead out another swarm—that is, if the colony is sufficiently strong. All swarms after the first swarm are called after-swarms, and are accompanied by virgin queens. They are more difficult to hive than first swarms, and will generally fly farther from the hive before they cluster, as the queens are more active. It is desirable to give an after-swarm a frame of eggs and young brood, as it holds them together better, and lessens the chance of their leaving the hive. In fact, it is a good plan to give all newly hived swarms a frame of eggs or young larvæ, as they go to work better when so supplied, and it enables one to tell if the queen is there, as if she is lost, the bees will start queen cells with the eggs or larvæ; and, as before-mentioned, there is no need to trouble to look for the queen often, because if eggs are present the queen must have been there within three days. When the super or top story is filled with honey it may be extracted, but first of all the bees will have to be removed from the combs, so each frame must be lifted out and jerked sharply in front of the entrance of the hive, and any bees left on the combs brushed off with a bee-brush or a bunch of soft grass or leaves. But a much better way to get the bees off the combs is to use a bee-escaper or super-clearer, which, when the honey is ready to extract, is put between the

super and brood-nest, or between a full super and an empty one that is placed where the other was. Then in about six or eight hours, more or less, the bees will have gone through the escape into the lower hive, and the full super may be lifted off without a bee on the combs, or at most only a dozen or so. It may then be carried to the honey-extractor, and the honey taken out and then returned to the bees to fill up again. Anyone who has once used a bee-escape will never trouble to brush the bees off the combs again. In examining a colony of bees that has a super or top story on, the *modus operandi* is as follows:—First remove the flat cover, then lift off the super and place it on the cover. Thus the bees in the super are shut in; if the oilcloth mat is tight as it should be, the bees in the super cannot give trouble while examining the brood-nest. This is an advantage of the flat form of cover, as with a gable cover you cannot lay the super on it, and if you put it directly on the ground, pieces of grass and other matter will stick to the combs. A gable cover allows of more ventilation than the ordinary flat form, and in very warm weather it is desirable to have a well-ventilated hive, as if it is too close and hot the bees will hang in a cluster on the outside of the hive during the warmest part of the day, and of course they would be better occupied doing some useful work; but in places where there are only a few very hot days in the season, the ordinary flat cover does very well, and is simpler to make; but whichever cover is adopted it is best to have them all alike, as if some are flat and others gable they may have to be changed about, and this will give such a different appearance to a hive that the bees will not recognise it. After the super is removed the honey-board must be lifted up by one corner and cleaned of any wax that may have been built there, also the wax and propolis must be scraped off the tops of frames. A tool like a square trowel or scoop about 2½ inches wide is very handy for this purpose, as the pieces of wax and propolis have only then to be shaken into a tin or the comb bucket. If the bees are doing well and gathering honey, the honey-board may be replaced and the super and cover put on.

LOSS OF QUEEN.

It sometimes happens that the bees lose their queen, either through old age or by her being killed in some way. If this happens in a hive where there are worker eggs and young larvæ, it does not matter so much, for they will be able to raise another in about sixteen days from the time the eggs were laid; but it must be noted here that if the worker larvæ which they use to make a queen, is three days old, or six days from the laying of the egg, the queen will hatch out in ten days, so the time when the queen will hatch is governed by the age of the larvæ the bees use; and they seem to have a preference for using those that are rather old, but larvæ one or two days old make the best queens, as they have the benefit of the royal jelly during the whole of the larval period, when an older larva would be to some extent a worker, and the queen from such would not be likely to be so good. But it is when the bees have no eggs or young brood with which to make a queen that the trouble occurs, as if the bees have no means of raising a queen, one of their own number will take upon itself the duties of the queen and will lay eggs too, but these eggs will only hatch into drones. The presence of fertile workers may be suspected if more than one egg is observed in the cells. Sometimes three or four are laid irregularly all over the comb, the cells being skipped about and the eggs not laid in order as is done by a queen, and if the bees are not given a queen they will at last die out. It is best to give also several frames of brood with some hatching brood among it.

DRONES.

The drone is the male bee, and is easily distinguished from the worker or queen by being much larger and by not having any sting or being furnished with pollen baskets on its legs. Its duty is to fertilise the queen, the drone dying as soon as this is accomplished. A queen when once fertilised does not require a second fertilisation, but if through having imperfect wings she is

not able to fly and meet the drone, she will still lay eggs, but they will only produce drones, and she is called a drone-laying queen, and must be replaced with a good queen. A strange thing about drones is that they have only one parent, as the eggs which they are hatched out of are not fertilised. The queen may lay drone or workers' eggs at pleasure, and if there are not sufficient worker cells in the hive, the bees will make use of drone cells by adding a rim of wax round the edge of the cell, and thus reducing the size. If bees are allowed to build comb without using foundation, they will make a quantity of drone comb which is not required, so that is another point in favour of foundation; and full sheets should always be given. Drone brood is distinguished from worker by its larger size and by the rounded appearance of the caps of the cells when sealed. During the winter, and when there is a great scarcity of honey, the worker bees kill off the drones by hunting them out of the hives; but in any colony that has queen cells they will always keep some drones in order to fertilise the queen when she hatches.

(*To be continued.*)

BEE-KEEPERS' ASSOCIATION OF VICTORIA.

The Beekeepers' Association of Victoria is taking vigorous steps towards stamping out foul brood, and a Bill dealing with the subject has been drafted by the solicitors of the Association for introduction into Parliament.

Mr. L. T. Chambers, Honorary Secretary of the Association, writes:—

I have little doubt of the future of our business and the possibility of opening up a foreign trade at a payable price. I have had many ventures, and feel assured that it may be done by the exercise of a little perseverance.

The attempts to find a market in London by the methods adopted in 1895 met the reception that might be expected. But nevertheless there is a good market there and elsewhere in the United Kingdom.

The main difficulty, as I see it, is to be able to supply when we do open a market. For instance, at the beginning of this year, at the request of an English firm, I sent forward a sample case of average Victorian honey, with quotation, and am now faced with an order, "ship 100 cases per month till further advice."

Needless to say that none can be sent, as only half a crop was gathered in consequence of drought.

A Tropical Industry.

INDIA-RUBBER (CAOUTCHOUC).

By E. COWLEY,
Manager, Kamerunga Nursery Cairns.

It is now about twenty-five years ago that the writer's attention was first directed to India-rubber. It was brought about by meeting a gentleman in Mauritius, who had been sent to Madagascar by a French company to collect caoutchouc. His success had, however, been limited, and he was returning to Europe. Even twenty-five years ago the exigencies of trade demanded a a larger supply of caoutchouc. This demand since that time has been very considerably augmented, so much so that prices have risen owing to the shortage of supply. The cultivation of India-rubber-producing plants has been essayed both in India and in Borneo with considerable success, particularly in India. Up to comparatively recent times India-rubber was obtained by tapping the indigenous trees in the countries in which they grew, and was traded like other natural products to Europeans and Americans. There is no record of caoutchouc being used by any of the ancient nations, notwithstanding the fact that India-rubber is produced from *Ficus elastica*, which is indigenous to India and other Asiatic countries. The best rubber is, however, obtained from South America, and is called "Para rubber." The first notice of India-rubber was given nearly 500 years ago by Herrera, who, in the second voyage of Columbus, observed that the inhabitants of Hagh played a game with balls made "of the gum of a tree," and that the balls bounced better than the balls of Castille (Herrera Historia, dec. 1, lib. iii, cap. iv). Torquemada, however, seems to have been the first to have mentioned by name the tree yielding it. In his "Monarquia Indiana," published at Madrid, 1615, he says: "There is a tree which the Mexican Indians call Ulequahuitl; it is held in great estimation, and grows in the hot country; it is a very high tree; the leaves are round and of an ashy colour. This tree yields a white milky substance, thick and gummy, and in great abundance." He further states that the juice was collected and allowed to settle in calabashes, and was afterwards softened in hot water, or the juice smeared over the body and allowed to dry, when it was rubbed off. The tree mentioned by Torquemada has usually been identified as *Castilloa elastica* (*Cerv.*); but the above account cannot apply to it, as that tree is described by Cervantes as one of the loftiest trees of the north-east coast of Mexico, and its leaves are not round, but oblong-lanceolate. *Castilloa* (probably in commemoration of Castillejo), a genus (containing two or three species) belonging to the order Urticaceæ, and having male and female flowers, alternating one with the other, on the same branch; *C. elastica* contains a milky juice, yielding caoutchouc"—Nicholson, A.L.S., Dictionary of Gardening. Even at that early date the Spaniards used the juice of the "ube-tree" to waterproof their cloaks. The fact, however, did not attract attention in the old world, and no rubber seems to have reached Europe until long afterwards.

The first accurate information concerning any of the caoutchouc trees was furnished by La Condamine, who was sent in 1755 by the French Government to measure an arc of the meridian near Quito. In 1751 the researches of M. Fresnau, an engineer residing in French Guiana, were published by the French Academy; and in 1755 M. Aubht described the species yielding caoutchouc in French Guiana. Nevertheless, India-rubber remained for some time unknown in England, except as a curiosity; for Dr. Priestly, in the preface to his work on "perspective," called attention to it as a novelty for erasing pencil-marks, and states that it was sold in pieces of cubic half-inches for 3s. each. Most readers of about fifty years of age will remember it in somewhat similar sizes

used in schools, but will remember it in no other form, except, perhaps, in what was known as mackintoshes or waterproof coats. It was not, however, until the beginning of the 18th century that the India-rubber industry really commenced. The rapid progress that this has made during the present half-century may be perceived by a glance at the following tables, which have been taken from the last edition of the "Encyclopædia Britannica":—Imported into England in 1830, 464 cwt.; in 1840, 6,640 cwt.; in 1850, 7,616 cwt.; in 1870, 152,118 cwt; in 1879, 150,601 cwt. It has been computed that in 1870 there were in Europe and America more than 150 manufactories, each employing from 400 to 500 operatives, and consuming more than 10,000,000 lb. of caoutchouc. The imports into the United States of America have largely increased during the few last years preceding 1879; at the time of writing this has been still more increased.

Caoutchouc-yielding trees appear to be found in that tropical strip of the earth's surface included within 10 degrees of latitude on each side of the equator; yet the quantities supplied from this huge belt, of the better kind of rubber, fail to satisfy the demand. This demand is yearly increasing, and it is not unlikely that some substance will eventually be found as a substitute. The varieties which are almost exclusively used when great elasticity and durability are required are the "Para," "Ceara," and "Madagascar" rubbers. There are others of less value from Mozambique, West Africa, Assam, Borneo, Rangoon, Singapore, Penang, and Java, &c. The best of all and the most valuable in the markets of the world is the "Para." This is the product of *Hevea braziliensis* (Mull., Arg.). Mr. Nicholson, A.L.S., in his Dictionary of Gardening, gives the following account of this tree:—

Hevea (from *Heré*, a vernacular name in Northern South America); syn. *Micranda siphonia*, Ord. Euphorbiaceæ. A genus comprising nine species, of tall stove trees, natives of the damp forests of tropical America. Flowers in dichotomous cymes. Leaves alternate, on long petioles, digitately 5-foliate; leaflets petiolate, entire. Of the two or three species yet introduced [into Great Britain] the best known is the one here described. It succeeds in a sandy loam. Propagated by cuttings, made of half-ripened wood, and inserted in sand, under a hand glass, in heat. *H. braziliensis* (Brazilian); flowers green, white in May; leaves light-green, digitately trifoliate; height, 60 feet. Tropical South America, 1823. This plant furnishes the well-known Para rubber of commerce (Encyclopædia of Horticulture, p. 140).

An effort to introduce this plant was made by the Department of Agriculture by means of seed, but the nuts were found to be unfertile on arrival at Kamerunga. It is not at all certain that *Hevea braziliensis* is likely to flourish even in North Queensland, except, perhaps, at the extreme end of York Peninsula, or on some of the numerous islands surrounding Thursday Island. The whole of British New Guinea is included in what may be called the caoutchouc-producing latitude, and the introduction of *Hevea braziliensis* would probably be found to well repay an effort to acclimatise it on some of the river banks of that possession, particularly at the east end, where the rainfall is considerable. It would seem that other species of *Hevea*, as well as *Micranda siphonoides*, which grows in the valley of the Amazon and its tributaries, are used by the natives indiscriminately to furnish "Para" rubber. All these trees seem to flourish best on rich alluvial clay slopes by the side of rivers where there is a certain amount of drainage, and the temperature reaches from 89 degrees to 94 degrees F. at noon, and is never cooler than 73 degrees F. at night, while rain is seldom absent for ten days together.

Nowhere in North Queensland do these conditions prevail. The minimum thermometer has been known to go very low into the forties at Kamerunga, and dry weather has prevailed for about three months at a time, so that, except for curiosity, it would not seem advisable to undertake the culture of *Hevea braziliensis* or of any of its congeners in our Northern territories. It may, however, be instructive to persons interested to learn how Para rubber is collected. The caoutchouc is collected in the so-called dry season, between August and February, which would correspond with the Queensland season between April and September.

The trees are tapped in the evening, and the juice is collected on the following morning. To obtain the juice, a deep horizontal incision is made near the base of the tree, and thence a vertical cut extends up the trunk, with others at short distances in an oblique direction. Small shallow cups made from the clayey soil and dried in the sun are then placed below the incisions to receive the milk, each cup being attached by sticking a small piece of clay to the tree and pressing the cup against it. The juice each tree yields is about 6 oz. in three days. It has a strong ammoniacal odour, which rapidly goes off, and in consequence of the loss of ammonia it will not keep longer than a day unchanged; hence when it has to be carried to a distance from the place of collection, 3 per cent. of liquid ammonia is added. The juice is said by Bruce Marren to yield half its weight of caoutchouc, but 30 per cent. appears to be the usual quantity. To obtain the rubber the juice is heated in the following manner:—A piece of wood about 3 feet long, with a flattened clayey mould at one end of it, is dipped in the milk, or the latter is poured over it as evenly as possible. The milk is then carefully dried by turning the mould round and round in a white vapour obtained by heating certain oily palm-nuts (those of *Attalea excelsa* being much preferred), the vapour being confined within certain limits by the narrowness of the neck of the pot in which the nuts are heated. Each layer of rubber is allowed to become firm before adding another. A practical hand can make 5 or 6 lb. in an hour. From whatever cause, the rubber thus prepared is the finest that can be obtained. The flat rounded cakes made in this manner are known in the London market as "Biscuits."

(*To be continued.*)

DELEGATES TO THE FARMERS' CONFERENCE AT GATTON, 10TH JUNE, 1897.

Farmers' Conference.

AT THE AGRICULTURAL COLLEGE, GATTON, 10TH, 11TH, AND 12TH JUNE, 1897.

AT the invitation of the Minister for Agriculture, a large number of delegates from various farming centres in the Northern, Central, Western, and Southern districts of Queensland assembled in conference at the Gatton Agricultural College on the above date. The Conference was carried on for three days, three sessions being held on each day. There were present:—

Chairman: Hon. A. J. Thynne, M.L.C., Secretary for Agriculture.

Delegates: Eastern Downs Horticultural and Agricultural Association (Warwick)—Jas. Wilson and W. D. Lamb. Central Downs Agricultural and Horticultural Association (Allora)—W. Deacon and G. Moulday. Border Agricultural, Horticultural, Pastoral, and Mining Society (Stanthorpe)—R. Hoggan and K. W. Scholz. Drayton and Toowoomba Agricultural and Horticultural Society (Toowoomba)—W. R. Robinson and W. C. Peak. Wallumbilla Farmers' Association—Geo. Williamson and T. W. Caswell. Logan Farmers' and Industrial Association (Loganholme)—A. Watt and Thos. Armstrong. Logan and Albert Agricultural and Pastoral Society (Beaudesert)—W. H. Stephens and M. S. Smith. Agricultural and Pastoral Society of Southern Queensland (Beenleigh)——. Savage. Burpengary Farmers' Association—J. A. Bourke and J. F. Fountain. United Pastoralists' Association of Queensland (Brisbane)—C. W. Murray. Zillmere Horticultural Society—S. Lang and H. Robinson. Lockyer Agricultural and Industrial Society (Laidley)—A. Philp, jun., and M. O'Keefe. Rosewood Farmers' Club—H. M. Stephens and T. E. Coulson. Ipswich and West Moreton Agricultural and Horticultural Society (Ipswich)—H. T. Hooper and P. W. Cameron. Gympie Agricultural, Mining, and Pastoral Society—S. Harding. Pialba Farmers' Association—J. B. Stephens. Wide Bay and Burnett Pastoral and Agricultural Society (Maryborough)—J. E. Noakes and Geo. Stuckey. Biggenden Progress Association—A. W. Baulch and J. H. Simpson. Degilbo Progress Association (Woowoonga)—F. A. Griffiths and H. B. Griffiths. South Isis Planters' and Farmers' Association—T. H. Wells and H. Epps. North Isis Cane-Growers' Association—A. C. Walker and W. J. Young. Central Queensland Farmers' and Selectors' Association (Coowonga, Rockhampton)—T. Whiteley and E. Adams. Marathon Pastoral and Agricultural Society (Longreach)—J. H. McConnell. Pioneer River Farmers' Association (Mackay)—E. Denman and E. Swayne. Herbert River Pastoral and Agricultural Association (Ingham)—J. Lely.

Officers of the Agricultural Department: P. McLean (Under Secretary for Agriculture), Professor Shelton (Instructor in Agriculture), J. C. Brünnich (chemist), John Mahon (dairy expert), A. H. Benson (fruit expert), A. J. Boyd (editor of the "Queensland Agricultural Journal").

Messrs. J. V. Chataway, M. Battersby, MM.L.A., P. Waller (Neusa Vale), and W. Soutter (Acclimatisation Society) were also present.

FIRST SESSION.

THURSDAY, 10TH JUNE, 1897, 11 A.M.

CHAIRMAN'S ADDRESS.

The CHAIRMAN (Hon. A. J. Thynne) said: Gentlemen,—Before opening this Conference I think it behoves me to say a few words upon the business we have in hand, and generally upon the subject of agriculture. I think, however, I cannot begin saying anything before offering to you all a most cordial welcome to this, the Agricultural College of Queensland. To me it is an element of the greatest possible satisfaction that the first Farmers' Conference that it has been my fortune to preside over, should hold its meeting in this College, and I am sure that your sympathy and support will be enlisted and secured in the objects for which this institution is established. I have to express personally my great obligation to the representatives of the different societies for the hearty way in which they have accepted the invitation of the Department to attend the Conference; and if there can be any degree of cordiality in this welcome, I should say that those gentlemen who have come great distances from the North are entitled to a greater welcome than the others. On behalf of the farmers of the South, we welcome among us the farmers from the North, to join with us in discussing matters of general agricultural interest. Whatever may be the effect of individual transactions, I am sure the general result will conclusively show that the interests of the agriculturists of one part of the colony are equally the interests of agriculturists all over the rest of the colony. This gathering, representative as it is of nearly the whole colony, is indicative of a desire on the part of agriculturists everywhere to mutually aid and assist each other in the promotion of the agricultural interests of Queensland. I think that in offering to you this welcome to this Conference, I ought in the first place to make some reference to the origin of the idea of holding it. Some months ago the gentlemen connected with the Pioneer River Farmers' Association made a suggestion that such an agricultural conference should be held. At that time my association with the Department was not of a character which would entitle me to make any arrangements for any long period ahead. Later on I felt that if we could arrange a conference so that it could be held in this building, a very great gain would be secured, and therefore as soon as I ascertained the time when the buildings would be available, the invitations for the Conference were sent out.

The objects of the Conference mainly are to discuss matters of mutual interest to the agricultural community. We have on our list a number of very important and very useful subjects which are to be introduced by those gentlemen who have chosen them for their papers, and subjects which have also been suggested for discussion, I will, however, refer to one or two matters which are not included in our syllabus, and to which I think it would be an advantage if the delegates and the farmers generally of Queensland gave some little attention. First, there is the important question of the transportation of produce. I do not think I am at all exaggerating when I say that our methods of handling produce, especially grain produce, are most primitive, and that until some better means of handling grain produce is devised we can never really attain the production of grain which this colony ought to be producing. During last year I happened to be on the Downs, and at one of the railway stations in a grain-growing district I saw a very large number of farmers' teams waiting their opportunity of getting their loads away by rail. I could not help feeling what an unnecessary waste of energy, waste of time, and what a tax it was upon the industry that such a system should continue. I have since given the subject some little consideration and attention. When in Canada in 1894 I saw, as a passing traveller, some of the means which they took for handling their grain, and I can assure you that the system they have adopted there effects such a saving in time, labour, and expense generally as to provide a handsome profit to the grower of the grain and to the merchant who buys it. By the use

of elevators the grain is handled in the most rapid and economical method; and until such a system is introduced here, we can never hope to compete with those countries that already have it. It may be said then, Why has not the Government done something in this way? That is a very pertinent question; but before introducing such a system it is first of all necessary to secure the co-operation of the grain-growers themselves. When the grain-growers are seized of the necessity of the economy, and they combine to express their desire to have it, I do not think the Minister for Railways will stand in the way of the introduction of the system. The initial work rests largely with the farmer. On the occasion already referred to, I made a rough estimate of the number of times that the bag of maize has to be handled from the time it leaves the farm till it reaches the consumer—say at Charters Towers. If you count the number of times a bag has to be stacked here and stacked there, perhaps fifteen or twenty times will be few enough. That adds to the cost of the maize, and that cost must come off the profit of the man who grows it. Until the grower realises this loss, he will continue to lose what would be to him a very liberal and wide profit. A rough explanation of the system which is adopted in Canada and similar countries may be given. In the first place, the question of bags is non-existent. They are not used at all in the handling of grain. The sack question was a few years ago, and perhaps still is, a burning one among our farmers. The Canadian grain-growers have inexpensive lifts for their own barns. They can be put up for about from £7 10s. to £10, and they save the whole of the labour of handling, and very often they are worked by the ordinary horse-power. The grain is dumped into a trough from which it is carried by a simple machine up to a bin on an upper floor. When it is desired to send it out, a trapdoor floods it into wagons, which carry it to the railroad platform. Trucks are run underneath the platform, and receive the grain in shoots. The grain is then carried to an elevator, the doors of the trucks are opened, and the grain pours in. It is then cleaned, graded, and put into bins. If it has to be shipped, it flows from the elevator into the ship. From the ship it is pumped out like water. I do not think I am far out in saying that the waste of energy in our own system is equal to a loss of from 3d. to 6d. per bushel. If we could devise some means by which a portion of this could be saved, then the association of farmers for common and mutual objects cannot be entirely without some result. I am speaking on this subject, because it is one which is rather misunderstood in Australia, and because the prospects of our ever becoming a large grain-growing country depend greatly on our adopting such an economic and time and labour saving system, in order to hold our own against countries which already have these advantages to aid them. In this connection it may be mentioned that in 1894 a commission was sent from Victoria to America to inquire into the methods of grain-growing there. I only saw their report the other day, but I was very pleased to see in it that very many crude ideas of my own were confirmed and enlarged by the careful inquiry that had been made. In the States I may say that the cost of cleaning grain thoroughly from all impurities, grading it into the different classes, weighing and loading it into ship or other railway train does not cost more than between ¼d. and ½d. per bushel. I was under the impression that the cost was lower, as I had been told at Fort William that it was only ¼d. per bushel, but in the report of the commission it is put slightly higher. Even if it were 1d. per bushel, what an enormous saving such a system would make to our people.

The high cost of machinery in Queensland is another subject. I have investigated this matter a good deal, and may say at once, without wishing to make any special complaint, that it is a matter resting entirely with the farmers themselves. In the States the reaper and binder, which the Australian farmer has to pay from £55 to £65 apiece for, costs about £18. I am taking that figure from the report I mentioned previously. From my own experience, in isolated cases, I know that by taking the proper steps farmers can obtain machinery for themselves at very much less cost than they have to pay now. Of course, I do not blame the machine men so much. They have to import

quantities of machinery, a large amount of which becomes useless and unsaleable by going out of fashion. But the loss on this old stock finally comes back on the agriculturist, and he could, by combining and by using a little business forethought, get his machinery at a much less cost than at present. I speak of this because I think the time has come when there ought to be a better spirit of mutual help and co-operation among the different farmers. I give you this as an illustration of one of the directions in which combination would be of very great benefit.

There is a third subject. But, first of all, I would like to express the satisfaction with which we have seen the returns which were received in respect of our last shipment of butter from this colony to England. I think we have very great reason to be proud of the result of that shipment. I hope the fact that we have succeeded in getting such a high price for our butter will encourage us to endeavour to go on and keep up the supply in future. We cannot, however, hope to successfully compete with other countries until we make up our minds to avail ourselves of the economy and improvements with which they have been working, and one of the first of these is the selection of suitable dairy cattle. I know that what I am now going to speak of is a debatable subject among stock-raisers; but probably a greater blunder cannot be made by our farmers—and it is one that is being continually made—than that of using crossbred or mongrel bulls. I remember at a Queensland show, telling the people that I had seen cattle exhibited under description of breeds which I could not recognise in the slightest way as belonging to those breeds. In fact, wherever you go in this country you will find in shows animals entered which have no right to be competing in the classes where they appear. You see crossbreds, and you know that from crossbreds you can never count upon anything like certainty in their progeny. I have seen upon farms, animals the owners of which were proud to have at the head of their herds—animals which ought not to be allowed to exist at all. In truth, until there is some combination among the dairy farmers of this country, and a determination on their part to improve the breed of cattle, the colony can never be able to take that position in the export of dairy produce to which it is entitled. This reminds me of the small herd of pure-bred Ayrshire cattle which have just been introduced for the use of the College, and of the pure-bred Ayrshire bulls which have also been imported from Victoria for disposal among our principal dairying districts by competition for the best exhibits of dairy cattle, under test. I may explain why this particular breed was selected for this purpose. Of course, the Jersey, Ayrshire, and Holstein have proved themselves three of the most valuable dairying breeds for Australia. The milking strain of the Shorthorn, I know, is advocated by many. However, I think I shall be borne out when I say that by crossing Jersey bulls with ordinary cows you do not improve the quantity of the milk, but you improve the quality very materially. This at least has been my experience; and so it occurred to me that the best line to go upon first was the introduction of a breed which was well known for its large milking qualities. This, I thought, would be best effected by the use of Ayrshires. When we have increased the yield of milk in our cows, we can perhaps think of improving its quality by the use of another breed.

I have mentioned a few of the subjects in which farmers can materially help themselves. The instruction, however, will not be all from one side, and one of the great hopes I have from this Conference, from the discussions that will ensue, and from the views that will be expressed, is that not only myself, but the country generally, may learn in what direction the agricultural thought is trending, and what assistance can be granted to it. So far as the Parliament and Government are concerned, I believe there is a sincere and hearty desire to do everything that can be done to promote the agricultural interest. It has fallen upon me to hold the active administration of the Agricultural Department, and in this to give action to the wishes of Parliament and Government, and I hope that from this Conference we will be able to get the material by which further to promote the interests of agriculture. I feel sure

that anything that is feasible will receive most careful consideration from everyone connected with the Department. Many think that the field of the operations of the Department should be very much wider than we propose extending them. My idea of the functions of the Department is that in the first place we should be able to give every agriculturist in this colony useful information upon any subject bearing upon his business upon which inquiry is made. It is for this purpose that we have already secured the services of specialists, who need no recommendation from me. I do, however, hope to see additional specialists added to our staff. In this great question of agricultural education, which you now see exemplified in the establishment of this institution, in the carrying on of experiments which cannot be effectively made by private individuals, or even if they can be made, cannot be communicated to others with the same facility with which similar experiments carried on by, or under the supervision of, the Department can be, and in the promotion of combined action to promote common interests in these and other matters you will find the officers of the Department always ready to join and assist in every way in their power. If they were not to do so they would not be performing the duty they owed to the country. I do not think, however, there will be much cause for complaint in this respect. In fact, I sometimes fear that the Department may go too fast for the conservative character which has always been attributed to the agricultural class the world over.

In conclusion, gentlemen, I may say that personally I feel very flattered and proud that you have responded to our invitation. I trust that our mutual intercourse will be productive not merely of substantial good for the agricultural industry of Queensland, but that it may promote feelings of fellowship and kinship, and a unity of interest among the farmers of Queensland in the East and the West, the North and the South, so that in the future they may be able to have some means of understanding clearly and distinctly the aims and wishes of the different classes of farmers all over the colony, and that they may be able to make their voices heard and their wishes and wants known, so that those who desire to assist them may be able to do so in a helpful and practical manner.

GENERAL BUSINESS.

Mr. THYNNE then informed the meeting that it was proposed, at the conclusion of the Conference on the forenoon of the 12th instant, in order to give those delegates who desired it an opportunity of visiting the Darling Downs, that they should be taken by train to Toowoomba in the afternoon of that day, and after tea go on to Warwick by special train. They would sleep there, and proceed on the morning of the 13th to Killarney, and on the way inspect the recently established State farm at the Hermitage, returning to Brisbane the same evening at half-past 10.

Mr. LELY (Ingham) congratulated and thanked the Minister and his Department for the splendid arrangements that had been made for the benefit of the delegates. The trip to Killarney and the Downs would give many of the delegates their first opportunity of seeing this celebrated country, and, consequently, besides being enjoyable, it could not be otherwise than instructive to them. There was certainly philosophy in doing and seeing as much as they could.

On the suggestion of Mr. P. McLEAN, Under Secretary for Agriculture, Messrs. Lely, Denman, Whiteley, Wells, Wilson, and Hoggan were appointed a committee to bring up recommendations for discussion at future sessions.

Mr. Hoggan was appointed convener of the committee. The session then adjourned.

SECOND SESSION.

On resuming business at 2·15 p.m., Mr. THYNNE announced that he had been requested, on behalf of some of the delegates who were interested in sugar cultivation, to say that all such gentlemen were invited to meet in the secretary's room at 7 a.m. on the following morning. The recommendation

committee had also suggested that a question-box be provided, into which delegates who wished for information on any particular subject could deposit their written questions. It was thought this would be a very useful way of disseminating information on minor subjects. Mr. Thynne also stated that the chairman of the Recommendations Committee would read out the proposed resolutions to the Conference a session or two before it was proposed to discuss them. This would give delegates time to give some little consideration to the proposed resolutions.

Mr. HOGGAN, on behalf of the committee, then read out certain resolutions which it was intended should be discussed at a future sitting.

Mr. G. STUCKEY (Maryborough) then read a paper on "Notes on Farming in the Wide Bay and Burnett District," in which he dealt shortly with the description of farm lands in those districts, and explained how farming operations should be conducted on scrub lands, and what were the most profitable crops to grow. He recommended summer fallowing, and advised farmers to combine dairying and grazing with farming. He also supplied valuable information as to the land available for selection in the district.

At the conclusion of his paper, Mr. STUCKEY expressed his pleasure at being present at the Conference—representative, as it was, of the bone and sinew of the colony. The place where the Conference was being held also gratified him. The College was only the beginning. The end would only be seen by their children.

Mr. MOULDAY (Allora) initiated an animated discussion, during which Mr. STUCKEY described fully the method of draining as carried out by him, and its effect upon lucerne and other crops.

Mr. P. MCLEAN remarked that the scrub of the Wide Bay district was very light compared with that of some other localities.

In reply to a question by Mr. Hoggan (Stanthorpe), Mr. MCLEAN said Pecan nuts had been distributed by the Agricultural Department all over the colony, and in many cases the young trees were doing remarkably well.

Mr. WHITELEY (Rockhampton) said some trees of the Pecan nut were growing well in the Rockhampton district. Speaking on fallowing, as recommended by Mr. Stuckey, he said the summer months were too hot in the tropics for the land to lie fallow.

Mr. STUCKEY said his own farming experience in Queensland was confined to the Wide Bay district. He had found fallowing in the summer months advantageous. On one occasion land so treated had given him 7 tons of hay to the acre. Land alongside, not fallowed, had given comparatively a poor crop.

In conclusion, the CHAIRMAN said they had had a very interesting paper from Mr. Stuckey, which had provoked a most useful discussion. Mr. Stuckey had given his experiences as a farmer, and they could not be without some lessons applicable to many of the farmers present.

Mr. E. DENMAN, of Mackay, then read a paper on

"THE SUGAR INDUSTRY AND ITS REQUIREMENTS."

AFTER a few preparatory remarks conveying a friendly greeting from the Northern to the Southern farmers, he said :—

The interests of the cane farmers in the North and the general farmer in the South are identical.

We have to-day three things which the Pioneer River Farmers' Association have long desired to see—viz., a representative Conference, an Agricultural College, and a Minister for Agriculture. The farming community has good cause to rejoice that their interests are in the keeping of a gentleman whose heart is in his work, whose sympathies are with the farmers, and whose chief aim and ambition, I am sure, is to lift agriculture to the high position it should hold in commerce, in society, and in politics.

Very few are aware of the magnitude of the sugar industry, of its importance to the colony, or of the vast sum that has been invested in it. From the report of the Sugar Commission it would be seen that between four and five millions pounds sterling have been invested in it, and that the annual disbursement exceeds £800,000.

The price of sugar and the cost of production have now met, and something must be done, and done quickly, to prevent the extinction of the industry and the destitution and desolation which must inevitably follow.

The greatest aim of a true Statesman should be to settle people on the land, and any industry which assists to do this successfully is worthy of great consideration. Look at the great sacrifice Germany makes in this respect; look at the immense sum she pays annually in bounties on beet sugar! Does she do this to supply England with cheap sugar? No. Her object is to keep her fighting men on the land, and to do this the people of Germany have to pay 5d. per lb. for the same sugar that is sold in England at 1½d. per lb.

There are at the present moment 20,000 people actually dependent on the sugar industry of this colony. It provides a vast amount of work for the foundries in Townsville, Bundaberg, Maryborough, and Brisbane, and also affords a good market for maize and other feed stuffs, and for general farm produce. From authoritative sources I find that in one year Mackay alone imported 1,500 tons of maize, 498 tons of potatoes, 104 tons of chaff, 70 tons of green fruit, 95 tons of pollard, and many other products of the south in large quantities, and at the present moment, on a single estate, 800 horses brought from South Queensland are being fed on southern maize. One auctioneer in Mackay disposed of 1,030 southern horses in one year. I merely mention these facts to show the far-reaching benefits of the sugar industry.

Now let us see if that industry has assisted settlement. I think it has done so in a greater degree and more successfully than any other industry. As my object is not simply to make statements, but to adduce facts to support any statement I may make, I will try and do so by illustration, taking four selections conterminous with my own.

After I took up my selection I had to wait eleven years for the erection of a mill before I could grow any cane. In the interim I and my neighbours grew maize, and not only supplied Mackay wants, but exported to most of the inland and coast towns of the North, thus competing with Southern farmers in a branch of agriculture peculiarly their own. In time, mills were erected on three of these selections, each of which in a single year consumed 1,000 bags of maize. Whilst engaged in maize-growing, the only persons on the land were either the selector or his bailiff and from two to five Kanakas. Now, let us see the change wrought by the erection of mills and the advent of cane-growing. Mr. Paget says (*vide* Sugar Report)—"£60,000 has been expended, which last year returned no interest. The wages paid to Europeans amounted to £2,113 12s. 8d.; to Kanakas, £995 13s. 8d." Mr. Robertson (Habana) says: "We have invested £62,686, and we paid in wages to Europeans £2,488; to Kanakas, £2,377." Mr. Boulton says: "Including Foulden, we have invested £151,699 13s. 7d. We paid in wages to Europeans, £2,933 10s. 1d.; to Kanakas, £1,756 14s. 6d.

To these sums must be added rations for both Europeans and Kanakas, and even then we do not arrive at the actual disbursement on these estates. I do not think anyone will attempt to deny that the expenditure of these large sums benefited not only the district but the colony also.

I particularise these mills for several reasons. They are on what are known as "scrub estates," on which most of the work is done by hand labour, and consequently the ratio of Kanaka wages to those of Europeans is much larger than on other estates.

I will now illustrate what the closing of a single sugar estate means to a locality, and what the loss of the industry would mean to North-eastern Queensland. On the occasion of a lady friend leaving the Mackay district I drove her to a friend's house, and our route lay through eight miles of cane-

fields, with only one small break in the shape of a small township. Only last month, on her revisiting the district, I again performed the same journey with her. The change she saw drew from her the remark: "What a change! What desolation!" Now, what was the change? Along the whole route there was not a vestige of cane or of any other cultivation, and the township was almost deserted; a few cattle roamed over the abandoned canefields. A portion of the land referred to is the River Estate. In his evidence before the Sugar Commission the late manager of the estate said that £129,685 13s. 1d. was invested in the property. The working expenses in 1888 were £15,000 per annum. The wages to Europeans amounted to £3,702 1s. 10d., to Kanakas £1,460; European rations, £718; Kanaka rations, £1,754. This estate fed 100 horses daily.

I have pictured the desolation caused by the closing of a single estate; but who can say what would be the distress and destitution which must have overtaken some of the large number of citizens and labourers who formerly received this large sum in wages?

You may be interested in a few figures concerning a modern sugar estate; so I will take Homebush, formerly a cattle station employing two white men and a few aboriginals. The Colonial Sugar-Refining Company bought it, and converted it into a sugar plantation, and obtained certain concessions on the understanding that they expended £250,000. This the company did, and at one time were paying as much as £1,000 a month in wages.

At present this estate is held by farmers under purchasing leases to grow cane. Now, let us analyse these figures—

170 white farmers settled on the land.
100 white men constantly employed by them.
120 extra men during the six months' cutting season.
120 extra men in the mill, and white cane-cutters earning from £2,000 to £3,000 during the season.

Then we have—

7,000 tons of freight for coastal steamers.
7,000 „ „ teamsters and railways.
7,000 „ sugar for wharf labourers to handle three times.
7,000 tons for the refineries in Brisbane and Bundaberg.
Nearly 1,000 tons of Southern maize shipped, handled, and consumed on the estate; and, including contractors, 700 white men and 400 kanakas to consume Southern produce.

Surely, gentlemen, this is a very desirable change; and yet I tell you honestly that were those 400 Kanakas taken away, this gigantic co-operative plantation would collapse, and, still, not a session passes without someone tabling a motion for the abolition of this labour. Gentlemen, you can and will, I trust, assist in making this suicidal policy impossible.

The Government of Queensland advanced £50,000 to the farmers to enable them to erect mills and do without this class of labour. The attempt, honestly made, was a failure; and the restrictions, as far as they applied to field labour by Kanakas, had to be rescinded. The opinion of all those who have visited the sugar districts, and have seen for themselves, is that Kanaka labour is an absolute necessity.

Many think that labour-saving machinery may be invented to obviate the necessity for this class of labour. During my thirty-three years' experience of cane cultivation I have heard many devout wishes expressed on this point, but I fear we are no nearer the production of such machinery than we were in 1864. The cane farmer would hail it with joy. We do not employ coloured labour because we like it, but because it is an absolute necessity. Still, the members of the Pioneer River Farmers' Association, whilst in favour of Kanaka labour, are decidedly averse to Asiatic labour of any kind.

I see that the total output of gold in Queensland for thirty-eight years has reached 12,000,000 oz., worth about £40,000,000. These figures would make gold-mining appear to overshadow every other industry. But let us

reduce these imposing figures to something comprehensible and understood by most of us—let us reduce the ounces to tons—12,000,000 oz. is not quite 300 tons, so that the first thing that strikes us is that the whole of the gold produced in Queensland would not provide half-a-cargo for the smallest steamer on our coast for one trip, nor would it give more than a day's employment to the wharf labourers. I am not in a position to give the total output of sugar in Queensland, but, thanks to the *Sugar Journal*, I can do so for ten years, the figures being from official sources. The total output of sugar for those ten years (some of them exceedingly bad ones) was 630,000 tons, with 1,300,000 gallons of rum and 10,000,000 gallons of molasses—the whole worth at least £10,000,000. Surely these figures will prove that as a provider of work the sugar industry has no peer, and I wish to point out particularly that, whereas the gold figures extend over thirty years, the sugar figures are confined to ten only. Queensland has produced £40,000,000 worth of gold, but her goldfields are the poorer by that amount. The sugar-fields, which in ten years have produced £10,000,000 worth of sugar, could and would with fair treatment produce £20,000,000 in the next ten years ; and I make this statement with some knowledge of the capabilities of land, having served my apprenticeship upon an estate where cane had been grown continuously for 200 years.

It was at one time thought that fruit-growing would replace cane cultivation, but, as a large fruit-grower at one time, my experience is that when sugar-growing flourished fruit-growing prospered, but I am certain that fruit-growing and all other subsidiary industries together will never approach sugar in importance. Now, gentlemen, although I am here as the representative of a sugar district, my thoughts are not so wrapped up in that industry, important as it is, that I cannot extend my sympathies to anyone outside it. The Pioneer River Farmers' Association can and does extend its sympathies to brother farmers in the South in the terrible losses they in common with us experienced from drought and flood. Our sympathies extend to agriculture generally, and it is our great aim to see agriculture raised to the high and important position it should hold, and I do hope that we shall now make such suggestions that the Minister for Agriculture will, from our rough-hewn ideas, be able to perfect such measures as will help to free the farmers from some of the difficulties inseparable from their calling.

The possibilities of agriculture are great. Look at Chicago! What built that city? Her grain elevators—her splendid buildings—her immense packing industries? It was agriculture; and it is agriculture which should build our cities, our railways, and our harbours.

In conclusion, I think the cause of agriculture would be greatly assisted if a somewhat higher education could be had at the College without the necessity of sending country lads to the cities to obtain it. There they acquire city habits and city ideas. When they return home a farming life is distasteful to them. They cannot take to it, and yet every avenue to city life for which they may be fitted is hopelessly overcrowded. Agriculture as a profession is in Queensland capable of vast improvement, and we have in this College to-day a token that the head of this Department thinks so. We have, in this assembly of delegates from all parts of Queensland, unmistakable evidence that the farmers think so themselves.

We expect much, and I am sure we shall not be disappointed, from the Minister for Agriculture. He, too, has a right to expect something from us. He has asked us to give him our sympathy and support, and I trust all here will do so, not only in their own interests but in the best interests of the most ancient, the most honourable, but, I regret to say, at present the most depressed, of all professions—Agriculture.

In reply to a question of Mr. Moulday's (Allora), Mr. DENMAN said they could not successfully grow sugar without black labour. That was his opinion after thirty-three years' experience. A friend of his (Mr.

Pearce), to whom the farmers of Queensland owed the erection of the first central sugar-mill, had differed from him on this point, and had tried to grow sugar with white labour. He failed, however.

Mr. THYNNE having suggested that perhaps Mr. Denman might go further into the details of the failure of white labour to do this work,

Mr. DENMAN instanced the Mackay central sugar-mills. These were originally under an obligation only to use cane that had been grown by white labour. They had tried to do so, but if the Government had not withdrawn the prohibition they would have had to have thrown up the business. The furthest they have got is to have white labour only within the mill. He then mentioned the cases of white contractors cutting cane, but refusing to load it. They should always remember this: Cane once cut had to be crushed within twenty-four hours. It was not like wheat; and if men refused to handle it, it was spoilt. In fact, the only work white men will do in the canefield in the North was the cutting. They had advertised for men for other work, but could never get any to agree to do it.

Mr. O'KEEFE (Laidley) here remarked that he believed there was a prevailing notion that white men would not do the work because the wages were not good enough.

In reply to this, Mr. SWAYNE (Mackay) read extracts from a report of a sugar company's inspector at Mackay, and gave instances of the actual wages earned by European cane-cutters in the North. Throughout one season two gangs earned 25s. 6d. per week per man after paying for rations. New hands had earned at the rate of 18s. 3d. per week clear of ration money and another shilling for extras. These were new hands. Older hands on a similar job earned 25s. per week clear of everything, and others made up to as much as £2 per week.

Mr. SWAYNE pointed out that many of the mills in his district would require 400 tons of cane every twenty-four hours. Every stoppage that occurred had to come out of the cost of the cane. Again, with the exception of butter, sugar was the only agricultural product of Queensland that had to compete in the world's markets. The price of sugar in this country was ruled by Java, and Java was probably ruled by Europe. The prices paid by their competitors for field labour would be interesting. In the figures given, the men had to find themselves in everything, including food. Europe (beet sugar)—Men, 2s. per day; women, 1s. per day; harvesting done by machinery at a cost of 6s. per acre. Demerara and West Indies—Coolie labour, at 10d. to 1s. 4d. per day. Fiji—Kanakas, at 50 per cent. less cost than in Queensland. Tahiti—Coolies, 9d. per day. Java and Philippines—5d. to 8d. per day. Straits Settlements—Coolies, 5d. per day. Mauritius—6d. per day. Reunion—1s. 3d. per day. Egypt—7½d. per day. In Queensland the Kanaka costs the farmer 2s. 6d. per day.

Mr. THYNNE said the subject was to a certain extent a delicate one, and he trusted the discussion on it would keep clear of party politics. Personally, he would be very sorry if it appeared he had encouraged the utilisation of the Conference for a political purpose. So long, however, as they kept clear of party politics he thought the members of the Conference were quite within their rights in expressing their opinion on matters of State policy which affected their interests. Mr. Denman's paper had brought before them, from his particular point of view, many of the difficulties the sugar-planters of the North had to contend with. The whole of the matter resolved itself into two questions—whether white men could do the work necessary in the production of cane for the mill, and, if so, would they do it? Mr. Swayne had said he considered they could do the work. Then came the question, Were they willing to do it? This introduced a third question. Were they offered a fair price for doing it? They had a statement from Mr. Swayne to the effect that men could earn from 18s. to 25s. 6d. per week clear of rations and quarters. They could then ask themselves if the work deserved a higher rate of wages, and, if so, could the sugar industry afford it? The whole matter, he thought, appeared to resolve itself into these questions.

Mr. T. Whiteley said they had been told that the price of sugar had reached such a stage that if something was not done for the industry it was in danger of collapsing. If this were so, the Northern farmers would have to look to other crops. Mr. Denman had said that fruit had been tried, but had not been a commercial success. There were, however, other crops, such as coffee, tea, manilla, which might be tried, and which would perhaps be able to somewhat relieve the sugar industry. With regard to the labour question, it appeared that it depended on outside countries where labour was cheap, and the matter then resolved itself into what the industry could afford to pay. If this were so he was inclined to think it would perhaps be better to let the industry go. Of course that was his own opinion.

Mr. Denman said the cultivation of coffee would bring them still further into the labour difficulty. Coffee would require more cheap labour than sugar. The chief present trouble of planters was the low price of sugar. If all the Kanakas in the Mackay district were taken away the industry would collapse. All the small cane planters employed Kanakas. He generally had about four himself. One of the great advantages of the Kanaka was his reliability, which was quite of equal importance to cost.

Mr. McLean instanced the case of the Mackay central mills, which were established to assist the production of cane by European labour. Financially the mills had been a success, but the agreement that they should only use cane grown by white labour had never been kept. Shortly after they started, three-fourths of the cane that went through them were produced by black labour.

Mr. Deacon (Allora) said many people were afraid coloured labour was never going to cease in the North. Were Asiatics to be employed when the supply of Kanakas became exhausted?

Mr. Denman said the Kanakas would last out their time.

Mr. Deacon, continuing, said the question of the reliability of white labour was one the Downs farmers had also to deal with. They were always troubled with men at the busy seasons who wanted wages and not work. Only recently he had offered two men, who were doing nothing, 4s. a day and rations, but it was refused.

Mr. Lely reminded those present that theirs was a large colony, with very different conditions, and if they were all to progress as agriculturists it must be by a certain amount of mutual giving and taking. The black labour question was, perhaps unfortunately, a political one. It was, however, a question of livelihood to many of them. He might first inform them the law relating to the illegal employment of Kanakas was enforced by the Northern farmers. He then asked, Was the South going to participate in the benefits of the sugar industry by encouraging its development in the North, or were they going to extinguish it? The only way in which the South could assist the North was to allow it to grow cane in a manner that would enable them to compete with other sugar-producing countries. If the South were blind enough to stop this, the blow would fall on the North, but the South would feel it almost as quickly. The Kanaka question was one of economy. It was also one of reliability. Every planter must have a staff of reliable labour. Unless he can keep this labour, he cannot carry on his occupation as a sugar-grower, and at the present price of sugar it was impossible to pay white labour wages which would be remunerative to both employer and labourer. As it was, they were handicapped by having to pay 2s. 6d. a day for their cheap labour. If they were to open up the North they must have cheap reliable and acclimatised labour.

Mr. O'Keefe (Laidley) said the question appeared to be one of pounds, shillings, and pence. The North, however, was the only part of the colony which got the benefit of this cheap labour. He asked: Could maize be grown by white men at present prices in the North? The Southern maize-grower could get no assistance in the shape of coloured labour.

Mr. DENMAN said the difficulty with cane was that all work in connection with its cultivation and harvesting had to be done by hand. They had never been able to get any suitable machinery for the work. This was where cane differed from maize, wheat, and many other crops.

In reply to a question of Mr. Moulday, Mr. DENMAN said sugar could not be grown profitably in the North without black labour.

Mr. NOAKES (Bundaberg) furnished some information on the subject. Every islander landed cost the planter at least £30. He formerly used to employ ninety boys, but he had now leased all his land to farmers to grow cane, and had found this arrangement the most satisfactory. All these small farmers, however, employed Kanakas.

The discussion then closed, and the delegates left the room to inspect the College silo, which had just been opened.

The ensilage was, in the presence of the delegates, fed to the stock in troughs, and the eagerness with which they ate it, even from the hands of the visitors, was a sufficient testimony to its excellence.

THIRD SESSION.

THURSDAY EVENING, 7·30 P.M., 10TH JUNE.

Mr. LELY said he had a small explanation to make. His district had arranged to be represented at the Conference by the Hon. A. S. Cowley and himself, but circumstances had prevented the former gentleman from attending. Mr. Cowley had, however, handed to him a paper on sugar bounties, and had asked him to read it at the Conference. With the permission of the President he would do so.

The paper, which, according to Mr. Lely, represented the consensus of opinion of the sugar-growers of the Herbert River district, was as follows:—

THE West Indian sugar-planters are in dire trouble, and for those of Queensland, trouble is looming in the distance, for we have glutted the Australian market, and will have shortly to compete in that of London with the cheap continental sugars; while every season the supply of labour becomes scarcer than before. It is not my intention to deal at present with this latter difficulty, but to lay before you the suggestions of English economists with regard to the ruinous competition we meet with in the London market in connection with the bounty-fed German, French, and Austrian sugars; and these bounties are so high that the German manufacturer can actually sell his sugar cheaper in England than he can in Germany. The proposal of Mr. Jager and other British economists who have taken up the case on behalf of the colonies is, in his own words, as follows:—"Let tea come in free to England and put a duty upon sugar coming from foreign countries to make up for the loss which the revenue would sustain by the withdrawal of the tax on tea. What can the freetrader say against this suggestion? To talk of freetrade while tea, which comes from our own colonies, is taxed, and sugar, which comes from foreign countries, is free, is absurd. At the time sugar was made a freetrade article, nearly all of it came from our colonies, while nearly all of our tea came from China. Now the situation is entirely reversed. All our tea practically comes from India and Ceylon, while all our sugar practically comes from foreign countries. Nobody would suffer by the change of taxation, as there are no industries based upon tea after it is imported into this country. If it did increase the consumption of tea, India and Ceylon would benefit by it, and at the same time the consumption of sugar would be increased, for the two go hand in hand. And further, if home-grown beet sugar were free from taxation, as well as our colonial sugar, the cultivation of beet would be fostered, to the great advantage of agriculture." After the proposal I have just quoted was published in England, a further suggestion was made that coffee and cocoa, both in the main produced in British colonies, should also be placed upon the free list, and it is to the proposal that England be asked to admit tea, coffee, and cocoa free and

to tax sugar from foreign countries that I invite your support. Were the duty removed from tea, coffee, and cocoa, and a tax to produce a like sum to that now yielded by such duty placed upon foreign sugar, it is quite certain the English people and the English Government would be none the poorer; but I think I shall be able to show you that the purchasing power of the poorest classes, to provide whom with a free breakfast table, which is the constant aim of the freetrader, would be increased. The consumption of tea may be said to be general in England. All that is used is purchased by each consuming family in what I may call its plantation condition, that is—as has been before mentioned, nothing is manufactured from it. The average annual consumption of sugar in England is 77 lb. per head, but of those 77 lb. only 14 lb. per head is used in its raw state by the family; the balance being employed in the manufacture of confectionery. Now, confectionery is a luxury not largely used by the poorest classes, so the effect of the proposed alteration would be that well-to-do people would pay a little more for their confectionery, while the poorest classes would pay less for their tea. Experts inform us that the increase in the cost of jam would be only half-a-farthing per lb. In submitting to you the advisableness of approaching Mr. Chamberlain, through our Government, on this subject, I would urge that it is one of Imperial importance, concerning as it does both England and the colonies; that it is a step in the direction of an Imperial Zolverein, and is certain of sympathetic consideration on the part of the statesman who so ably presides over the destinies of Greater Britain.

After reading the paper, Mr. LELY suggested that the Queensland Government cable to Sir Hugh Nelson the result of their deliberations on this subject. Such a cablegram would strengthen his hands. He had already been written to on the matter.

Mr. THYNNE said the paper Mr. Lely had been kind enough to read had come rather unexpectedly, and he doubted whether any of those present were in a position to discuss it immediately. The subject was a very important one, and he suggested that it be dealt with at a future sitting. The paper was then referred to the Recommendations Committee.

CLIMATIC DIFFICULTIES, PESTS AND BLIGHTS IN NORTHERN CANEFIELDS.

Mr. J. LELY (Ingham) said he had unfortunately been unable to prepare the paper set down for him, but with their permission he would be glad to make a few impromtu remarks on the above subject. First came the question of climatic difficulties. There was a sort of notion prevailing among many Southerners that those who lived in the North were well off in many respects, but he would like to give them a slight idea of many of the difficulties they had to contend against. It was very easy to acquire land certainly, but the chief difficulty they had to contend with was the climate. The malaria was always around them. What the ultimate result of the Northern climate on Europeans would be he could not say. In India, it was known, people of European origin died out in three generations, and it was not unlikely the same thing would take place in our tropic North, unless a mode of life were adopted which would counteract the influences of the climate. Of course, in the North of Queensland they had easy access to a milder climate by getting on to the Herberton tableland. This climatic condition was at the bottom of the necessity for having a staff of labour which would not be affected by the malaria arising from the soil. The South Sea Islander, and those native born to such a climate, were not affected by it. They retained their health in places where the white man was bound to succumb, and the white labourer knew it. He could not stand the work during the hot season. The Herbert River, where he (Mr. Lely) lived, was a paradise compared with some of the Northern districts, but he remembered when the Herbert was a den of fever. But they had got over that, and for many reasons the

climate had vastly improved, although the malaria was still in the soil.* Another phase of the climate was the rainfall. They had cyclones, dry seasons and excessively wet ones, and floods. Then they had excessively dry seasons, occurring often in May, the month they relied on during which to plant the cane, and the result is the loss of a year. Then came exceedingly wet seasons, which, again, had to be subdivided into exceedingly wet and exceedingly *wet* wet seasons. The second kind of season mentioned was so serious in its effects that the planting of cane often did not take place till the following October. These, of course, were exceptional seasons, but still they were not of unfrequent occurrence. Then came the question of blights. They were not troubled much with gumming in the North, although it existed. Then there was a disease which might be called blighted stooling, which appeared to arise from an unhealthy condition of the roots. The diseased cane would send up stools which would never come to anything. Rust was a formidable disease, but fortunately of late years they had not been troubled with it. Eighteen years ago it had destroyed nearly all the cane on the river, the varieties in vogue then being the Bourbon† and the Salangore. The planters then tried the Cheribon, but this was found to be a difficult cane for manufacture, and it had ultimately to be abandoned. Mauritius Gingham, Striped Singapore, and Rappoe were now among the standard varieties in his district. Rot was their next trouble. When attacked by this disease the heart of the cane would turn yellow, and if they examined it closely they would detect the presence of a small worm. This disease was chiefly prevalent in good seasons, and attacked plant cane more than ratoons. The disease was infectious, and was so serious that it was compelling them to abandon some of their best varieties. It was not unlikely due to enfeebled constitution. A cane would perhaps be healthy enough, but when its development was forced, through the agency of a good season, it became a victim to the disease. The New Guinea canes had so far been proof against it, as had also the White Bamboo, Moore's Purple, and Daniel Dupont. Among cane pests were the borer, the locust, the grasshopper, the caterpillar, the canegrub, and the waterhen. Mr. LELY described at considerable length the destructive operations of these pests. The planters ultimately combined to destroy the locusts, and, digging trenches, attacked them when in their crawling stage, drove them into the trenches and buried them. It cost them about £1,050 to do this, but since then there has been no resurrection of the locust to any extent, although it was still there. Floods also kept down this nuisance. The last pest he would refer to was the grub. This uninteresting looking "reptile" was the product of an egg that was laid by a beetle commonly known as the cockchafer. It emerges from the egg in February, if conditions are favourable, say a fortnight after its mother has deposited the egg. If, however, conditions were not favourable, the egg would perhaps remain in the ground till next season, when the grub would come out. He had personally known four months to elapse between the time when the egg was laid and the time when the grub emerged from it. This fact made the grub pest a difficult one to deal with. Immediately after hatching, the grub is about one-eighth of an inch long, but it grows rapidly, and when full grown averages about 2½ inches in length. The egg having been laid at the foot of a cane plant, the young grub begins to feed on the root of the cane stalk. It then goes through the process of destroying the roots, and finally, by working into the heart of the stalk, kills the whole cane. The unfortunate planter then had a good chance of seeing his crop ruined about two months before crushing. The cane generally showed the first indication of grub at the end of March. When the weather gets colder, and it has done its damage, the grub turns into a chrysalis, and lies dormant till the advent of the hot weather. It then turns

* By clearing and cultivation most districts formerly unhealthy become purified. Humpybong was abandoned as a settlement owing to the prevalence of fever and ague. To-day it is a health resort.—Ed. *Q.A.J.*

† The Bourbon cane, which often yielded 4 tons of sugar per acre, was the first to succumb to the rust, and Black Java was substituted in the South.—Ed. *Q.A.J.*

into a beetle, and flies away to reproduce more of its species. If the weather kept dry, however, it stayed in the ground, and this made the collection and subsequent destruction of them easier. It was owing to this last fact that they had been able to fairly satisfactorily cope with the pest on the Herbert the last couple of seasons. His own losses from it this season would only be a third of what they were a few years ago. They were thus making some headway against the grubs. In conclusion, Mr. Lely said he had mentioned some of the blights and pests Northern cane-growers had to contend with, but he could assure them that the unfavourable climatic conditions were a greater consideration with them than all the blights and pests put together, and they could therefore perhaps understand the desire for that kind of labour which was suitable for their climate. It should be remembered they were descended from people who had been brought up in temperate climates for thousands of years, and he might say if a white man were paid really what he should be paid, taking into consideration the injury to his constitution through work in the canefield, £1 a day would hardly recoup him.

Mr. Epps asked for particulars about Cheribon cane, but Mr. Thynne reminded him that few varieties had the same name in two different districts.

In reply, Mr. Lely said the objection made by manufacturers to Cheribon was that owing to the presence of a large amount of acid in it, clarification was rendered difficult. He did not wish to infer that it was a hard cane to crush.

In reply to another question of Mr. Epps, Mr. Lely said he had had no experience of bisulphide of carbon in the destruction of cane grubs, although he believed it had been used. He had tried, however, diluted ammonia. This would kill the grubs if sufficiently strong, and without prejudice to the cane.

Mr. T. Whiteley here remarked that he had tried this latter recipe for oranges, but had found it very expensive.

Mr. Lely said he considered all chemicals were expensive, even if it were only in the labour of applying them. They might do, however, for nurseries. The ammonia was applied at the root of the cane.

Mr. J. C. Brunnich said he had been one of the first in Queensland to make experiments with a view towards the destruction of the grub. He had also been one of the first to try the application of bisulphide of carbon for this purpose, although at first he had been hampered by not having the proper apparatus. However, he could now give them a good idea of what it would cost to apply this particular chemical; and it might be added that it was the only satisfactory remedy for the grubs. He had tried trenches, lime, sulphuric acid, chemicals, in fact everything that could be imagined. With the majority of chemicals, when they were strong enough to kill the grub, they were generally strong enough to kill the cane, and so far as lime was concerned it was harmless. Bisulphide of carbon, however, was a splendid destroyer of grubs, and if properly used could be applied with comparatively little labour and expense. When the leaves of cane begin to wither, the probability is grubs are the cause, and if a stool was knocked over the grubs, generally about fifteen of them would be found at the foot. A little bisulphide of carbon, applied with a force pump into the earth amongst them, would be sufficient to kill them all. The chemical, although extremely volatile, had the advantage in this case of being very heavy, and this resulted in its staying in the ground instead of rising out of it. A small quantity would kill all grubs within a radius of 2 feet of the place where it was injected. After the destruction of the grub by this means the roots of the cane would recover within the course of a couple of months, a network of roots at the foot of the stool would be formed, and the crop would be saved. This remedy could be effectively applied at a cost of about from £2 to £2 10s. per acre. Bisulphide of carbon was easily manufactured, and could probably be made on the spot. A good force pump was necessary for its application.

Mr. Lely thanked the last speaker for his information, and stated that if the grubs could be destroyed for £2 10s. an acre and the crop saved, the remedy was a practical one. It was not uncommon to soak cane plants in a

solution of some poison, but this Mr. Lely thought unnecessary, as it was in the soil the grubs were found. Frequent stirring of the ground, however, had a good effect in killing this pest. In conclusion, Mr. Lely referred to Mr. Tryon's pamphlet on grubs, and stated that some of the recommendations for the combatting of the pest therein advocated—namely, the systematic collection of the beetles and the destruction of the foliage harbouring them, coming from such a reliable authority as Mr. Tryon, had considerably strengthened the hands of those planters who had been hitherto adopting these methods.

Mr. HOGGAN mentioned Pyrethrum as a plant which might be tried in coping with insect pests. It was the basis of most insect powders, and it was said that wherever it was growing there was no insect life.

Mr. BOURKE also contributed to the discussion on Mr. Lely's remarks.

Mr. THYNNE pointed out that Mr. Lely had painted only the darker side of sugar-growing. He did not know, however, of any branch of agriculture in any part of the world which did not have its difficulties to contend with. In any event, if the agriculturists of any country were for a number of years in a position to carry on their calling without difficulties, they would soon have little grit and sustaining power left among them. It was difficulties that made men of them. They sympathised deeply with the Northern farmers in their troubles, but that sympathy was due because they knew in every part of the country the farmers had obstacles to overcome, perhaps not always of the same character, but equally puzzling and trying in connection with all our agricultural industries. Mr. Lely's address had, however, given and elicited much useful information; and he trusted that the Department's own experiments, the results of which would be published periodically, would be able to relieve many of the difficulties their friends in the sugar-growing districts had to contend with.

Mr. A. WATT (Beenleigh) then read his paper on—

SUB-DRAINAGE.

SUPPOSING an irrigation and a general drainage scheme adopted by Parliament, and the farmers to be told that they could not have both at once, but to choose which they would have first, would not they choose the drainage scheme? I think so. It seems very strange, in a climate such as ours—so liable to drought—that we hear so little about sub-drainage. The wonderful improvements which have been brought about by sub-draining in the old countries, in the easier working of the soil, in the retention of heat and moisture, and in increased yield, are evident to all experienced agriculturists. We are told that at the experimental farms in the south the soil retains moisture through the surface being kept loose. Every practical farmer knows that a loose surface makes a good mulch, but unless the land has natural drainage through a porous subsoil, or through one artificially drained, it will in a drought set hard and have but little loose surface. On the banks of our rivers and creeks we find, as a rule, deep porous soils, which, with frequent stirring with implement or hoe, will retain the moisture during a considerable drought, as will also the deep chocolate forest soils if kept frequently moved, but when the subsoil is a retentive clay it is a different matter. Now, we have considerable areas of good black soil, overlaying an impervious clay—what in Scotland would be called good wheat land—but owing to the clay subsoil the surface becomes waterlogged; the water, instead of sinking, evaporates slowly by the surface, and, especially in hot weather, fermentation sets in, sours the soil, it bakes and cracks in dry weather, and vegetation becomes miserable. Such land will stand neither drought nor wet; but drain it, and by the intelligent application of lime and good cultivation, that land will become mellow, free, and durable. The drains on the latter class of soil should not be more than 18 feet apart and 2½ to 3 feet in depth. Should the clay be within plough-furrow of the surface, the lesser depth will act best. Depth depends upon the nature of the subsoil and the outlet, but the further they are apart the deeper they should be, to draw the superabundant water

A SNAPSHOT AT THE AGRICULTURAL COLLEGE—GATTON.

from the greater intervening space. Surface-drains or water furrows are very wasteful, as the valuable ingredients in the soil are carried off. We have instances of low-lying localities on tidal rivers and creeks where surface-drains can hardly be avoided, the land not being sufficiently elevated to admit of sub-drains, although, a good many years ago, some low-lying land on a sugar plantation on the Logan was sub-drained, and, to get a fall for the minor drains, the leaders or main drains had flood-gates put on to block the rising tides; those drains worked well, considering that they were blocked twice every twenty four hours. It sometimes happens that, owing to the subsoil, you cannot avoid deep draining. Most of you have, no doubt, noticed land that required draining lying in plough-furrow or harrowed after a spell of wet weather; in the process of drying it presented a clouded appearance, patches remaining dark, others quickly drying and lighter in shade, showing sudden changes in the nature of the subsoil. I saw a considerable stretch of that class of land drained in Scotland. In testing the ground to fix the depth of the drains, we found the subsoil in the wet patches consisted of a stiffish, muddy-looking mass, intermixed with stones resembling chips of freestone of various sizes; the intervening patches or bands consisted of a sandy clay. It was thought, before testing the ground, that 3 feet would be a suitable depth, but it was found that in the stony, muddy-looking patches it would be difficult to bed the pipes. The wet ground was then tested for bottom, which was got at 4½ and 5 feet. It was, therefore, decided to put in the drains 5 feet deep and 1 chain apart; luckily, no leaders were required—each drain had an outlet into a burn or creek. That land had been drained before during a previous tenancy. The material used in the old drains was flagstones, which could be had in abundance on the sea-coast close by; they were rough-dressed and set into the drains in the form of an inverted V, the apex upwards. Now, unless well fitted and packed, you can easily understand that extra pressure on one side would cause the stones to shift, slip, or fall flat and choke the drain. That is what happened in this case; hence the necessity for being careful in such expensive work, in the setting and covering of the pipes, stones, or timber, as the case may be—so that the drains may be as permanent as possible. Pipes make the most efficient drains; but should long carriage make them too expensive, and should timber be plentiful and the subsoil clay or other firm substance, a good economical drain can be made of hardwood slabs, of a uniform width, and in from 3 to 4 feet lengths; lay one edge of the slab on the side of the drain, and lean the other edge on the opposite side, thus giving a triangular space for the water. Such drains last, and work well. It would not, however, be advisable to follow down steep slopes with this class of drain, as the action of the water would be injurious. Stones if convenient may be, and often are, used with good effect—the large stones on the bottom, the smaller on top. Subsoiling after draining is an additional protection against drought. A Scotch swing-plough makes a good subsoiler; take off the mould-board, and, if necessary to ease the resistance, reduce the wing of the share. Cattle-yard and stable manures or commercial fertilisers are useless; in fact, sometimes injurious to land that requires draining. In establishing an orchard, vegetable, or flower garden, disappointment may be avoided by an examination of the subsoil. A practical man can tell at a glance what is required to ensure success. Gardens have been laid out at considerable cost, and the one thing essential left out—viz., underground drainage. Some years ago I was told by a gentleman, who now owns one of the best gardens about Brisbane, that he had spent a lot of money on his garden, and was bitterly disappointed until he dropped on the right man in the person of a Scotch gardener, who told him the land required thorough draining. The gardener was allowed a free hand, and the result is now evident. I need hardly state that it costs less to put in the drains when you are preparing the land for fruit, &c., than either before or after. I have trenched forest land for fruit, and put in drains very

cheaply at the same time. I cleaned out each trench that suited the width the drains were to be apart; then dug out in drain fashion to the necessary depth. I used stones, getting sufficient for my purpose out of the land I was trenching. One reason for multiplying instances of the beneficial effects of draining is that many who have taken to farming in the colony, and especially our young men, have never had an opportunity of seeing draining carried out systematically. Nor are they likely to see it carried out to any extent by private enterprise. It is too costly. A Draining Act on the lines of the Imperial Draining Act should be adopted by Parliament; the money advanced by the Government on long and easy terms, on the recommendation of draining commissioners appointed for that purpose. The Act has worked well in the old countries; and why not here, where we are more liable to drought and floods? There is nothing like a good constitution to withstand disease; therefore give the soil a good constitution by draining and intelligent cultivation; then you may expect healthy plant life that will withstand many of the diseases and pests which now destroy the crops. The old adage "Like begets like" applies here as in everything else; an unhealthy soil cannot be expected to produce healthy vegetation. One more important advantage gained by draining is being able to work so soon after wet. There is nothing will make the farmer fret and worry more than weary waiting for undrained land to dry sufficiently and the season slipping past.

In reply to a question of Mr. Deacon,

Mr. WATT said it would not be neecssary to drain land with a porous subsoil, or land with a subsoil 15 feet down, although drainage would improve any land.

In reply to questions from Messrs. Stephens, Noakes, and Bourke, Mr. WATT said it was of great consequence that the tiles be so laid that they could not shift. There was no necessity to make tests as to whether land wanted drainage or not. A practical man could easily see at a glance whether it was wanted or otherwise. For melon-hole country he would put the drains 18 feet apart, and have the drains 2½ feet down. If artificial manures were put to sour land, they would make the land sourer still.

Mr. STUCKEY explained how he prevented drains from shifting. He had special tools made and so arranged that if a pipe was loose he had it practically buried in the solid earth, so that it could not shift. It was a very safe way, and as far as the tools were concerned they could be made from old hoes.

Mr. SWAYNE said the Pioneer River Farmers' Association had been gathering information on the subject of drainage, and all they had got hitherto had gone to confirm Messrs. Watt's and Stuckey's statements. He believed a Drainage Act could be introduced into Queensland with very great advantage. Another matter on which legislation was required was riparian rights. So far as he knew, they had nothing of the kind in Queensland with the exception of a clause in the Divisional Boards Act. Individuals should have similar powers.

Mr. LELY endorsed Mr. Swayne's remarks. A thorough system of drainage, similar to systems that had been inaugurated by syndicates in other parts of the world, would be of great advantage in many districts of the colony. In Queensland, however, a syndicate would probably be beyond the question, and they would have to fall back on the Government. Such a draining system was out of the power of the small agriculturist, and, if they were to secure its advantages, it would have to be under some sort of State aid. The benefits of drainage were being shown in his own district, on the Victoria Plantation. The land was not bad, and was capable of producing good crops. Still, it was second-class and had a clay subsoil, but now its disadvantages were being obviated by the Colonial Sugar Refining Company, who had purchased a large drainage plant. They were now manufacturing on the plantation very superior drain-pipes, which were being laid through their lands at a depth of from 2½ to 3 feet, and at intervals of half-a-chain apart. They were 3-inch and 2-inch pipes. The Company were laying these drains all through

their lessees' lands, and were charging only a very small sum for them. The beneficial effects of these drains had already become manifest. The Government might well inaugurate a similar system. At present the most expensive item to individual farmers in draining was the cost of freight on the pipes. Some soils did not require draining, but in the main, of course, all soils would be benefited by drainage.

Mr. O'KEEFE agreed that drainage was a pressing question. In the Lockyer district it was forcing itself upon several, but unfortunately a farmer could not drain his land without generally interfering with his neighbours' properties, and it was thus a matter that could not be taken up by individuals. He doubted, too, whether it could be successfully undertaken by divisional boards, and trusted the subject would be brought up prominently before the Government.

Mr. THYNNE said the clause in the Divisional Boards Act about drainage, which had been referred to, had originally been suggested to him by Mr. E. J. Stevens, and he (Mr. Thynne) had had it introduced into the Bill when it was passing through Parliament. The clause, however, had been simply introduced as an experiment, and, he believed, had so far practically remained a dead letter. The whole question was a very large one, and required much consideration. If those interested formulated a definite scheme in this matter, perhaps it might be possible to do something to assist them. Personally this subject of State co-operation in the matter of drainage had only been brought up before him within the last few months, and then the suggestions had only been of such a general character that he had been unable to prepare any definite proposal on the subject either for his colleagues or for Parliament. There were several other questions, he added, which were equally difficult to deal with for similar reasons.

Mr. DENMAN said that in 1846 £1,000,000 under the Scottish Drainage Act was voted by the Imperial Government for drainage purposes. With the exception of £9,000 all this had now been paid back. This showed that drainage was a profitable undertaking.

Mr. LELY said with such an example as that quoted by Mr. Denman, he thought the Queensland Government might well pass a similar Act here. Such an Act would be of immense assistance to agriculture. Money could be advanced to bodies of farmers to enable them to drain their lands. This principle of lending money to co-operative groups of farmers was in force in many parts of Germany and France, and was, in fact, the same as the present Central Sugar Mill system, which was now being started in Queensland. To make it a success, however, true co-operation among their farmers was absolutely necessary.

On the motion of Mr. STEPHENS, seconded by Mr. NOAKES, it was then decided to refer this question of provision for drainage to the Recommendations Committee.

The CHAIRMAN then read apologies for non-attendance from Messrs. J. H. Davidson (of Wellington Point) and John Cameron (of the United Pastoralists' Association).

The Conference adjourned at 10 p.m.

FOURTH SESSION.

FRIDAY MORNING, 11TH JUNE, AT 9 30 A.M.

Mr. J. C. BRUNNICH read the following paper on the

IMPORTANCE OF CHEMISTRY TO AGRICULTURE.

PROFESSOR WARINGTON, in a lecture recently delivered before the University of Oxford, draws attention to the great difference in the position of agriculture at the present day and a hundred years ago. He says—

A hundred years ago agriculture was an art, having only few points of contact with natural science. At the present time both the materials and the operations of agriculture have been so far examined and elucidated by patient scientific investigations that we may now give the title of agricultural science to this edifice of true theory.

This is undeniably true, but agriculture will always remain an art if we consider that art deals with practical ways and means to accomplish certain things.

Science again gives us the explanation of these ways and means, so that really art and science have to work hand in hand to maintain agriculture in its present eminent position.

The science which helped agriculture more than any other is undoubtedly chemistry.

No other science, electricity perhaps excepted, has made such wonderful progress in the present century as chemistry; and there is hardly, in the present time, any occupation or industry in which chemistry does not play an important part.

Let us briefly consider what chemistry is. You all know that man, with all his science and wonderful appliances, has never and will never succeed in creating matter, any more than he can destroy existing matter.

All the bodies which surround us, the air we breathe, the food we consume, the clothes we wear, the earth on which we grow our crops, are all composed of a few distinct constituents, which at present cannot be further decomposed and which are called elements.

Only a few of these elements exist in nature in an uncombined state. The most of them are combined in such a wonderful manner that no one would suspect such combination, judging only by the ordinary senses. Who would, for instance, suppose that starch, cane-sugar, and cotton are simply composed of carbon and of water!

The science of chemistry has to come to our aid to tell us the nature of these combinations, and which elements take part in their formation.

Chemistry further tells us in which manner we can force the elements or combinations to unite and to form new bodies.

Chemistry also proves that all things are formed out of pre-existing matter. A plant which grows is not a creation but simply a transformation of other existing bodies. Again, when a plant decays in the ground, or when a tree stump is burned, the bodies which took part in their formation are not lost but simply transformed into other bodies which in their turn will again be assimilated by other growing plants.

Emerson, in one of his essays on farming, says—

> Who are the farmer's servants? Not the Irish, nor the coolies, but geology and chemistry, the quarry of the air, the water of the brook, the lightning of the cloud, the castings of the worm, and the plough of the frost.

That chemistry is to be the servant of the farmer is now universally recognised, and consequently we find amongst the staff of Agricultural Departments a large number of chemists.

In the United States a very great number of agricultural experimental stations and agricultural colleges exist, and I may mention that, for instance, at the New York Agricultural Experimental Station out of a total number of 16 officers 7 are chemists; at the South Dakota Experimental Station and also at the Virginia Agricultural College out of 8 officers 3 are chemists; and at Alabama Agricultural Experimental Station, 4 out of 11. In the southern colonies, besides the agricultural colleges and experiment farms with their staff of experts, exist agricultural laboratories with chemists in charge and several assistants.

The work to be carried out at an agricultural laboratory is very large and of a varied nature, and consists chiefly in the following:—

Analyses of soils.
Analyses of waters, chiefly irrigation waters.
Analyses of manures.
Analyses of foods and feed-stuffs.
Analyses of dairy products.
Analyses of plants, fruits, and grains.

Experiments with wheats and testing them as to milling qualities, &c.
Practical experiments in the field.
Investigations about stock-poisoning.
Experiments and analyses of insecticides.
Preservation of meat and other products.
Experiments and investigations in agricultural industries, as sugar, wine, tanning, &c., &c.

The value of soil analyses to the farmers has been much discussed. Some authorities deny all value, and others again put too much faith in it. The truth must lie somewhere between these two extremes.

Chemical analysis alone is very often misleading, and I have analysed soils which according to the analysis should be first-class soils, but which as a matter of fact would not grow anything on account of their heavy clayey nature. This adverse property would, of course, have been found out by the mechanical analysis, which at the same time would point out that these soils could be improved by draining or green manuring.

Very often the analysis of a soil shows its deficiency in certain necessary constituents.

It is principally the want of nitrogen from which many of our soils in Queensland suffer, and this, perhaps, has to be attributed to adverse climatic conditions. The advantages of green manuring have been known for a very long time, but the scientific explanation of the fact that nitrogen is assimilated from our atmosphere by the help of the root-nodules of leguminous plants is only a recent discovery made by Professor Hellriegel. The active agents of this wonderful process are *Bacteria* found in these root-nodules.

Our farmers will find no cheaper or better way of supplying this want of nitrogen to their soils than by green manuring with leguminous crops; and the cow-pea (*Dolichos sinensis*), introduced from America by Professor Shelton, seems especially suited for this purpose, and yields excellent crops in different parts of this colony.

A crop of cow-pea grown in the Mackay district could be ploughed under after eight weeks' growth. This crop weighed 9·7 tons (vines and roots) per acre, and supplied to the soil per acre 2·87 tons organic matter, 150 lb. of nitrogen, 35 lb. of phosphoric acid, and 96 lb. of potash; these ingredients representing a manuring value of £5 per acre.

The analyses of waters, chiefly water used for irrigation purposes, is important, as very often the water during its passage through the earth may take up constituents which are detrimental to plant life.

The analyses of artificial manures is undoubtedly part of the most important work of the agricultural chemist.

It is of the greatest importance to the farmer to know if he really receives value for his money spent in manures, and it is a great pity that the Fertilisers Bill, regulating and controlling the sale of manures, was not passed by the last session of Parliament.

The farmer cannot afford to experiment with various manures, and in the choice of his manures he should be guided by the analyses and by practical results obtained at experiment stations.

Another important branch of the analytical work is the analysis of dairy products, foods for our own consumption, and feed-stuffs or fodder for our cattle.

Interesting experiments can be made with regard to the preservation of fodder in silos, which would show how far the nutritious value of the fodder is influenced by storage.

With regard to the testing of wheat, a large amount of work has been done in the New South Wales Agricultural Department by Dr. Cobb and Mr. Guthrie.

Of course it will be necessary to repeat these experiments with our own wheats. Over 300 varieties have been sown at the College farm. All of these will need testing, and this will involve a great deal of work during the coming year.

A great many interesting investigations can be carried out with regard to stock-poisoning, and to the yield of some of our native plants in volatile oils, valuable extracts, gums, resins, &c.

Very important also are experiments and investigations in our agricultural industries, in which chemistry plays an important part. Amongst the foremost of these stands our sugar industry.

The chemist is not only necessary for the cultivation of the cane crop by trying to improve its quality and quantity, and regulating and controlling the cutting of the cane, but he is also the principal man in the mill in order to control the losses and direct the process of manufacture. Other industries —as, for instance, preservation of meat, butter, and other products for export— will also come more or less under the control of the agricultural chemist.

But let us not forget that analysis alone cannot decide everything, and science alone is not sufficient for successful farming.

Experience and practice are absolutely necessary.

The chief aim of the Agricultural College about to be started is to teach our youths both the practice and science of agriculture, and thus to turn out useful, practical farmers, who can direct and investigate the why and wherefore of the necessary practical work by the elements of science.

Mr. WATT said there was a general impression among farmers that fertilisers put on land were apt to be largely carried away by draining. Nitrate of soda, for instance, was said to be easily carried away by drainage waters. He would be glad to hear Mr. Brünnich's opinion on this point.

In reply to this and other questions, Mr. BRÜNNICH said in using artificial manures in this colony there was always that danger. Tests had been made of the water coming from drains, and it had always been found they contained a large amount of fertilising materials, and for this reason he always advocated green manuring. For instance, a crop of cow peas represented a manurial value of £5 per acre. Although the cow pea, of course, took a large amount of nutriment from the soil, still most of its ingredients came from the air, and consequently the soil was bound to benefit appreciably by the addition of the cow-pea vines which had grown upon it. Even such materials as phosphoric acid, which the cow pea did obtain from the soil, were improved in manurial value by being assimilated by the cow pea, although in any event, in the case of phosphoric acid, soil has generally a superabundance of this substance. Cow peas also loosened the land mechanically, and were in most cases preferable to artificial manures. The cow pea could be applied to any crop, although his own experience had chiefly been with cane. There was no land so light that could not be benefited by it. He had made experiments with dozens of other plants for the purpose of obtaining similar results as those secured from the cow pea. Corn, sorghum, and several indigenous Fiji plants had been tried. Sunflower made an excellent green manure, as did also oats and rye. Leguminous plants, however, were far and away the best for this purpose. In the North the cow pea could be planted at almost any time, and about eight weeks elapsed from date of planting to the time when the crop was ready to be ploughed under. About 60 lb. of seed to the acre were required, and it was generally sown broadcast. In reply to a suggestion of Mr. Whiteley's, that the roots be left in the ground and the vines be fed to cattle, but whose manure should be returned to the soil, Mr. BRÜNNICH said such a plan would probably be equal in manurial value to ploughing the vines under direct, but it would most likely be more expensive.

Mr. ADAMS (Rockhampton) said he had been growing the cow pea for the last couple of years, and he had found it would not do in winter. It also seemed almost a sin to plough it under, it being such an excellent fodder. Even when he did utilise the vines for feed, he had always found the ground on which the peas had been grown greatly improved in quality.

Mr. THYNNE said a difficulty in cow peas was the mowing. If the vines were cut with a horse rake in the ordinary way they would get too much of the soil mixed with them, and they would not make as good fodder as they otherwise would. A new system, however, was to lift the cutter in a particular way and have a machine like a reaper and binder that would throw the vines on one side, so that the horses did not tramp on and spoil them. When these vines were ultimately prepared and stacked away they were excellent to mix with maize fodder.

Professor SHELTON said he had always taken the deepest interest in the cow pea. Mr. Brünnich's method of manuring was on the whole the cheapest and most satisfactory that could be employed. Barnyard manure was of course good, but the mere hauling of it, to say nothing of the cost of the manure itself, was a tremendous burden. Cow peas, on the other hand, required no special cultivation, and were easily ploughed under. As to time, do not plough under a great mass of green sour peas. Do not plough them under three or four months before you want to use the land. On the contrary, let the vines lie on the ground and rot there if needs be. Very little of their valuable ingredients would be lost, as the ground would absorb all the decomposing material and the rain would carry it down into the soil. Then when it was necessary to plough the land for the next crop, plough the decaying vines in. With regard to removing the vines for fodder, of course, if the manure was returned to the soil great benefit would accrue. Even supposing, however, the vines were made into hay and sold off the farm, the soil would still have benefited materially from the cow peas growing upon it. In the case of clover, this fact had been conclusively proved in England by Dr. Voelker. Mr. Brünnich had mentioned the mechanical effects of cow pea on the soil, and he would also like to mention the smothering effects. No weed could live where there was a crop of cow pea. Even nut-grass, he thought, might succumb to it. In fact Mr. Knox, of the Colonial Sugar Refining Company, had told him nut-grass could be completely smothered by cow peas. It was one of the most useful crops they could grow, whether for fodder or for green manuring.

Mr. WHITELEY asked if the cow pea could be used in an orchard.

Professor SHELTON said he would not advise planting cow peas or anything similar in an orchard, and Mr. MOULDAY agreed with him.

Mr. BENSON said they would be useful in an orchard as a mulch, but for nothing else.

Mr. CASWELL (Wallumbilla) also bore testimony to the value of the cow pea. He had been growing it four years, and had proved its value as a manure on land on which it had been ploughed under, on land on which it had been allowed to rot, and on land on which it had been grown, but from which the vines had been removed for fodder.

Mr. W. R. ROBINSON, of Toowoomba, then read the following essay on—

BACON PIGS AND HOW TO BREED THEM.

It is the duty of every farmer who keeps a pig to endeavour to produce a class of animal that he can obtain the highest price for. Buyers are always open to give a higher price for a good, shapely pig than a common ill-bred slab; moreover, the superior animal will give the breeder or fattener a quicker return than the inferior one. I am free to admit a wonderful improvement has taken place in our pigs during the past five years. The pig industry in Queensland promises to be a very large and profitable one. A few years ago, to see fifty or sixty pigs yarded at a sale was considered a big sale; in Toowoomba alone, we now put through as many as 450 on one sale. But there is still room for improvement in our bacon and pigs. The first point to be taken into consideration is the selection of the sire. The old idea of "half the breeding goes down the throat" is exploded. Take, for instance, the weedy-hammed pig that one often sees roaming about the up-country stations; all the feeding in the world will never make it a good, shapely bacon pig; you may put a certain amount of fat on it, and that's all. The Berkshire

is the recognised breed—in Queensland at any rate; his colour, activity, and general thrifty habits are more suitable to the climate than any other. White pigs are not thought very favourably of, owing to the sun causing their skin to crack and become scurfy. Therefore, secure a pure Berkshire boar to start with, and in doing so select a boar from a pure herd, whose breeding is not doubtful; go and see his sire and dam if possible, and satisfy yourself that they possess all the good qualities of what good bacon pigs should be—namely, quiet disposition, plenty of length, short face, wide between the eyes, face well dished, level underline, good back slightly arched, ribs well sprung, hams deep, round, and full; good silky coat of fine hair, and plenty of it; well-set legs, erect ears—nice and fine. Always avoid a coarse, heavy-boned, rough-looking boar, and remember that like begets like. The sow should be rather opposite to the boar. What a farmer wants is a good, long, roomy sow, rather coarser than the boar. There is no need for her to be pure-bred; better not, as pure sows are not prolific enough for ordinary purposes. The half or three-quarter bred sow that will give her owner ten to thirteen pigs at a litter, and rear them well, is the class of sow to mate with the pure sire. Always avoid short, nuggety sows for breeding purposes; they, as a rule, give poor litters, are bad mothers, are apt to lay on fat in place of yielding a large supply of milk for their young, whereas the long, roomy sow will, if anything, lose condition while rearing her litter, because she is the better milker of the two. The brood sow should have plenty of exercise while in young; she should be active, thrifty, and not of a delicate constitution; a good feeder, with great digestive powers. The next point—and a very important one—after you have got your litter of young pigs, is to keep them growing, and this is where so many farmers fail. The most serious complaint with many litters is scours. This is generally caused by a sudden change of food not suitable to the sow; the best remedy I have found is to give the sow a few feeds of pollard mixed rather dry, with a little chalk; or if the young pigs have got to that age that they will drink out of the trough, mix a little soot with their food. Either of these simple remedies will check the complaint. Young pigs should not be allowed to go back for a day; they must be kept growing as rapidly as possible if you want to get them off your hands. Remember after three weeks the sow is gradually becoming unable to supply their wants. Your duty then is to provide for them. The best plan is to let the sow out for an hour or two during the warmer part of the day, and give the youngsters a little sweet milk in a small shallow trough; they will very soon come up and learn to drink; and you then can gradually leave the sow out a little longer every day, and increase their food, adding pollard, bran, boiled crushed maize, barley meal, or potatoes. In this way they come on very quickly, and never really require any weaning, although it is often advisable to remove them to another pen. Give them plenty of good warm bedding to nestle in; cold, damp, draughty pens are always to be avoided; warmth is a great thing to help pigs on; they cannot stand cold or draughts. I am sorry to say too little attention is paid to piggeries. Small lucerne paddocks make the best run for growing pigs. Three and four months' old pigs fed in their pens of a morning and allowed the run of a lucerne patch all day and put into their pens and fed at night, come on very quickly; they make better growth than pigs constantly penned up; five to six months' old pigs treated in this way should fatten readily. When fattening or topping off, an acre or two of peas is about as fine a feed as you can turn them on to, but few, if any, farmers seem to try it; they prefer to stick to the old plan of throwing them in a number of cobs of corn for the pigs to worry at, and in dirty pens they waste as much as they eat. Maize is a fattening food, and amongst the best, but it is very heating, and pigs become tired of it; they want green food with it, also coal or charcoal, a little salt and sulphur now and then. Corn and cob meal is a splendid food, and, I think, better than whole corn. Pea-fed pork is worth more than any other, and I think it is a crop well worth our farmers trying. After your pigs are fattened up to 140 lb. to 150 lb. weight, every day you keep them they are eating their heads off; so

you must make it your business to clear them, and have stores ready to take their place. There is one little item I find I have overlooked, and that is: To see your pigs have plenty of clean water every day; there is nothing they like better, and although you may think you have fed your pigs well they may be languishing for a drink.

In reply to a question of Mr. H. M. Stephens,

Mr. ROBINSON said he believed in boiling or soaking corn cobs or meal for young pigs.

Mr. ARMSTRONG coincided with the statement as to the value of pure-bred sires. Like Mr. Robinson, however, he also preferred half-bred sows. Till they were five months old he allowed his young pigs the run of a 20-acre paddock. With regard to colour, too, he had always found black far superior to white.

In reply to Mr. Whiteley, Mr. ROBINSON said he did not know of any Essex pigs in Queensland. The improved Berkshire was ready for market when about five or six months old.

In reply to another question, the reader of the paper said lumpy jaw in pigs was a disease that only seemed to occur in offal and slaughter-house fed pigs. Pigs with such a disease, he added, should be immediately destroyed.

Mr. MCCONNELL (Cressbrook) mentioned the case of pigs losing their strength in the loins when they were about three or four months old.

Mr. ROBINSON said this was caused by a small worm in the kidney or kidney fat. A little dose of turpentine given in the pig's food was a good remedy, as was also rubbing turpentine externally across the loins. It was rather difficult to administer medicine internally to pigs, but one way was to give the pig the toe of an old boot to chew. While the pig was doing this the medicine could be poured down the upper of the boot, and a hole having been previously made in the toe, the liquid would run through it down the pig's throat.

A gentleman present mentioned Red Tamworths, and stated that although they made excellent bacon, they took too long to come on to be good commercial pigs.

Mr. ROBINSON said he had had no personal experience with the Red Tamworth, but he believed the Messrs. Chirnside, of Melbourne, had some very good specimens of the breed. He further added, in regard to sires, that a bad practice of some farmers was to get a pure-bred boar, but when he was dead get one of his progeny from some half-bred or mongrel sow and put him in the place of the late sire. When a new sire was wanted they should always get a pure-bred one from a well-known herd. Another thing he would impress upon them was the importance of hair in the selection of swine. Always get a pig well covered with good hair. It was an excellent sign to go upon.

In reply to Mr. Caswell, Mr. ROBINSON said pouring hot lard into their ears was a good remedy for pigs suffering from staggers. Another good way was to hit them a sharp blow between the ears or on the nose; in the latter case hard enough to make the nose bleed; or they could be bled behind the ears; bleeding would nearly always effect a cure. Other remedies for the same disease were a little bran mash with some Epsom salts; or else use an enema, injecting soap-suds and castor oil.

Professor SHELTON congratulated Mr. Robinson on his paper. Black was the right colour for pigs. In America, for every one white pig seen there are 100 black ones. The Poland China was an excellent pig; but it was hardly worth while introducing him here. He reaches an immense size; but in Queensland a 250-lb. pig is unsaleable. The Berkshire met their requirements much better. The Essex was only a little ball of fat. His flesh lacked the layers of lean and fat which makes good bacon. Lucerne paddocks were excellent for the pigs, but not good for the paddocks. The pigs' sharp feet would soon cut the plants, and the lucerne would have to go. This, of course, was the only objection to the use of lucerne in the way advocated. With

regard to grinding the whole corn cob, it was necessary that it should be ground to the condition of powder, otherwise it was not worth while feeding it. In grinding whole cobs it took 33 per cent. more labour and energy to do it than it did to grind a similar weight of shelled corn only. The core made up 18 per cent. of the whole cob. He thought it was a mistake to boil corn for pigs. Some years ago several of the American experiment stations, his own among the number, carried on a series of elaborate experiments on this point. At these, given numbers of pigs were fed on different rations, and the results of the experiments unanimously showed that a pound of raw meal gave something like 10 per cent. more pork than a pound of boiled meal. This experiment referred solely to corn meal. Many other foods, however, might be improved by boiling.

Mr. Robinson said he had not meant to convey the impression that farmers should boil all the corn or cornmeal they intended for their pigs. He had referred to young pigs, particularly those at the weaning stage. Boiled meal seemed to better suit the digestive organs of the young animals. In winter especially they seemed to prefer warm feed at night.

Mr. Stuckey said he had had some experience in pigs, and could thoroughly endorse Mr. Robinson's remarks. He had found the Berkshire the best kind both for rearing and curing. It matured early. The white kinds also came to maturity early, but they were all fat, and consequently unsaleable. With regard to the disease that might be called the staggers, and which caused the pig to keep turning round, endeavour to climb posts, and otherwise seem to lose its head, he might say that if one killed and examined such a pig it would be found that one of its kidneys would be completely gone, and nothing but a bladder of water left. Pigs, however, often seemed to recover from this disease. He agreed with Mr. Robinson in attributing the weakness in the loins to a worm in the kidney. He had seen this worm, and had found it also in the spine. He had seen pigs with well-developed and healthy forequarters, but the hind parts completely gone owing to the action of this worm. In conclusion, he advised those present, who were interested in swine, to avail themselves of the first opportunity to inspect the Zillmere Bacon Factory.

Mr. Coulson mentioned spaying as an operation that was largely carried on in some of the pig-raising districts of England. In reply, Mr. Robinson said that he had never practised this operation, and personally did not think it worth while in Queensland. In America and England large pigs were the rule, but here the markets demanded a lighter animal, and consequently the operation would be of little practical use. He found sows throve better if left alone. In further reference to staggers, pumpkin seeds should be avoided in feeding pigs. Such seeds might cause strangulation of the bowels.

Mr. T. Whiteley mentioned that a lot of his pigs had been killed by scrub ticks.

Mr. Robinson said personally he had never known pigs to be killed by scrub ticks. Lice were troublesome sometimes, but the best thing for them was a little kerosene.

Mr. Coulson said he had known scrub ticks to be destructive to pigs. Kerosene applied externally and internally was a good remedy.

Mr. J. Lely also contributed to the discussion. Large numbers of pigs were raised in North Queensland, and an additional adjunct to its diet there is molasses. Curing bacon was of course difficult there, and the pig was chiefly raised for pork, although, doubtless, excellent bacon could be made in several parts of the North. He knew something of the "staggers," and had seen whole litters of pigs go off in twenty-four hours after developing its symptoms. It was evidently a form of congestion of the brain, and such a congestion could arise from an action of the kidney. The feeding of the animal on hot foods, when not accompanied by a warm sty, might also produce this congestion. There might of course be many causes for this malady, and in fact it might be the result of several different diseases.

Mr. R. Hoggan then gave notice of proposed resolutions of the Recommendations Committee—

"1. That this Conference supports the recommendations recently made in England to the Imperial authorities by Mr. Jager and others in reference to the advisability of admitting tea, coffee, and cocoa into Great Britain free, and the imposition on foreign beet sugar of a duty equivalent to the amount of revenue now obtained from the tax on tea, coffee, and cocoa.

"2. That this Conference is of opinion that such a course of action on the part of the Home Government would be a distinct gain to Queensland and the other tropical and sub-tropical British colonies, and a step towards Imperial federation; and it would therefore recommend that this motion be cabled by our Government to Sir Hugh Nelson, to be placed before Mr. Chamberlain.

"3. That this Conference recommends the passing of a Drainage Act for allowing reasonable rights to owners and occupiers of land for taking their surplus water through adjoining properties; and also recommends to the various associations here represented the consideration of the question of extensive co-operative drainage with a view of approaching the Agricultural Department for the purpose of obtaining State assistance for the execution of such work."

On the motion of Mr. Noakes, the committee were also requested to bring up a resolution with regard to the inspection of pigs for human consumption.

Mr. T. Whiteley asked the Chairman if it was intended to distribute any of the Department's Ayrshire bulls in the Central district?

In reply, Mr. Thynne said that at present it was not thought advisable to send any of the animals in question to districts where they were liable to be attacked by ticks, until such time as bulls could be sent that were immune against the disease. As soon as this could be done the matter would be attended to.

The Conference then adjourned to the agricultural implement shed, where Professor Shelton delivered an informal lecture on

FARM IMPLEMENTS.

Professor Shelton explained the various implements in the shed. Among these was a subsoil plough which could be purchased for about £4. It was, however, one that any blacksmith could make. It only required two horses. The next was a Yankee stirring plough. This was an excellent soil pulveriser, and was one that would probably be good for turning in green manure. It was chiefly useful for land with a heavy subsoil. He would not specially recommend it for red soil, as that land is generally sufficiently friable. A machine for cultivating corn was explained. In certain States of America maize was the great crop, and one could ride for hundreds of miles and see on either side of him, as far as the eye could reach, nothing but fields of this cereal. The key to corn-growing in that country was the "corn marker." By its use they marked 11 acres a day, got ahead of weeds, and got straight lines. It was no use trying to raise corn cheaply unless they had straight lines. The seed could either be planted in drills or by the "check row" system. In the drills the larger yield was obtained, but under the check row the land could be cultivated more cheaply. The extra yield in favour of the drill system was averaged at about 8 bushels per acre. The lister was simply a double mould-board plough, which threw the earth left and right. About 6 acres a day could be managed with this implement, the ploughing, planting, and covering all being done in one operation. This plough was also provided with a subsoiler. Sulky listers could be obtained which did the same work, with the man driving. The lister in the States costs about £6. Farmers getting their tools direct from America should get them from New York, and have them sent out by sailing vessel. This took longer than when they were sent out by steamer from San Francisco, but it was far cheaper. Maize planted by the lister would stand drought better than when planted any

other way. The lister was best suited for flat land, and should not be used for ploughing hill-sides, because rain would wash out the furrows. It was very useful in the destruction of weeds. A practical demonstration was given of the use of a check row planter, the object of which was to save marking. He had purchased this machine for £10, although its price in the States used to be about £15. Mr. Chamberlain, of Gowrie, was using a similar implement at the present time.

The corn harvester was a tool that a blacksmith could make for about £3. Mr. Marriage, of Yangan, had one in use at Killarney.

A side-hill plough, which cost about £3 5s. 6d. in Sydney, was very useful for ploughing down the side of a hill, and also for gardening.

A roller, a rake, an Acme harrow, and a walking cultivator were also explained. A walking cultivator was to be preferred to a riding one.

This concluded the session.

(To be continued.)

Probable Meat Trade with Egypt.

In his report to the Home Secretary on the possibilities attending the opening up of a fresh market for tinned meats and for the disposal of live cattle, dated 6th April, 1897, Mr. Finucane, Queensland Commercial Agent in Southern Europe, states his impression that a live cattle trade might be initiated in Egypt with a fair prospect of success. During interviews held with officers who had experience with Australian meat in Malta and in England, he found that in every case the meat was reported on favourably. The principal obstacle to a paying trade in Egypt is the price. The authorities provision the garrison at Cairo at 3½d. per lb. all round for beef and mutton, and General Knowles, commanding the army of occupation, had recently (6th April, 1897) signed a contract at that price for the ensuing twelve months. The Egyptian meat supplies are drawn from the following countries: —

Mesopotamia and Odessa	Cattle.
Syria	Sheep.
Greece	Pigs.

Owing to the prevalence of disease amongst these animals, the Chief Veterinary Inspector of the Government of Egypt and others are anxious to put a stop to the importation of cattle from these countries.

Acting on the advice of the former gentleman, Mr. Finucane waited on Lord Cromer, and asked if His Lordship would submit the question of facilitating the introduction of Queensland cattle into Egypt.

This the latter at once consented to do, and pending a reply it would be well for the Pastoralists' Association and others interested in the meat export trade to consider the question of sending cattle to Egypt, and then to strengthen Mr. Finucane's position by supplying him with full information as to freights, the supply that can be relied on, weight of beasts, prices that will pay, and especially as to Government guarantee that cattle shipped are free from disease.

The latter item is of paramount importance, as since writing his report our agent has seen all the officials concerned, and they are quite willing to facilitate the introduction of live cattle if guaranteed sound by the Government.

TINNED MEATS.

It would appear from the report under consideration that eventually a good market may be found in Egypt for Australian tinned meats, which are absolutely unknown there, American goods being in general use.

Mr. Finucane makes several suggestions as to advertising their meats in the country, which will no doubt commend themselves to Queensland export of tinned meats companies.

Meanwhile the attention of the companies interested has been directed to Mr. Finucane's report, and they will thus be in a position to take whatever action they may think best to open up what may prove a very lucrative trade.

A list is appended to the report showing the number and kinds of animals slaughtered at various centres in Egypt for food during the month of January, 1897 :—

Bullocks and bulls	1,967
Cows	1,138
Buffaloes	1,357
Calves	6,688
Sheep	26,073
Goats	613
Pigs	639
Camels	79
Total	38,554

Besides which number 1,824 were destroyed as being unfit for food.

Botany: Contributions to the Flora of Queensland.

By F. MANSON BAILEY, F.L.S.

Colonial Botanist.

Order MALVACEÆ.

SIDA, Linn.

S. argentea. *Bail.* (n. sp.) The stems, petioles, as well as most other parts of the plant closely clothed with silvery peltate, ciliate scales. Stems or the lower branches from a procumbent stem erect, slender, about 12 in. high. Leaves rather distant, erecto-patent, narrow-linear, 1 to 2½ in. long, 1 to 2 lines broad, slightly tapering towards the point, rounded at the base to a petiole of a few lines. Stipules subulate, nearly as long as the petioles. Peduncle axillary, solitary, filiform, about 8 or 9 lines, articulate above the middle. Calyx under 4 lines diameter, lobes deltoid, silky-hairy on the inside. Petals twice as long as the calyx, broadly-cuneate, almost roundly-lobed at the end, veined. Stamens under 10. Style-branches recurved. Carpels hairy, probably few, but only imperfect specimens to hand.

Hab.: Eulo, Paroo River, *J. F. Bailey*, Dec. 1896. The thick coating of the silvery scales gives to the thin stems the appearance of silver rods.

Order STERCULIACEÆ.

RULINGIA, R. Br.

R. rugosa, *Steetz*, Flora Austr. i. 238. A shrub so closely resembling *R. pannosa* in indumentum and foliage that it is difficult to distinguish it without the fruit. Leaves usually narrower, more rugose, and almost bullate. Flowers in cymes, scarcely exceeding 2 lines in diameter when expanded. Ligula of the petals marked with 3 dark lines. Ovary tomentose. Capsule about 4 lines diameter without the setæ, not so hard as in *R. pannosa*, and readily dehiscent, beset with soft pubescent setæ, which is long in some specimens, short in others.

Hab.: Capalaba, *J. Shirley.*

Order AMPELIDEÆ.

VITIS, Linn.

V. adnata, *Wall.*, Flora Austr. i. 448. The young shoots and under side of the leaves more or less covered with a short tomentum, which sometimes disappears with age. Leaves petiolate, broadly cordate, almost orbicular, acuminate, 3 to 6 in. diameter, bordered with small bristle-like teeth, 5-nerved, and penniveined, the primary veins connected by transverse veinlets. Flowers scarcely ½-line diameter, numerous in corymbose cymes. Petals 4, cohering by the tips and falling off together. Style shortly subulate, at least in the fertile flower. Fruit small, globular. *Cissus adnata,* Roxb.; Wight, Ic. t. 144.

Hab.: Ranges about Cairns, *L. J. Nugent.*

Order LEGUMINOSÆ.

KENNEDYA, Vent.

K. exaltata, *Bail.* (n. sp.) A robust pubescent climber, according to Mr. E. Cowley, attaining to the tops of tall trees. Stems hairy. Stipules oblong-lanceolate, 7 or 8 lines long including the portion (about 3 lines) produced below the insertion, clothed with appressed hairs; stipellæ very narrow and the lower ones rather long. Petioles about 4 or 5 in., petiolules from 1 to 1½ in. long. Leaflets 3, somewhat orbicular in outline, 2 to 5 in. diameter, the lateral ones 2, the terminal usually broadly 3-lobed, the midrib of each lobe ending in a bristle-like point, pale on the under surface. Racemes axillary; peduncle somewhat flattened, about 3 in. long, bearing about the centre a hairy lanceolate bract; raceme or portion bearing the flowers about as long as the peduncle. Flowers solitary or in pairs (violet-coloured and very attractive, *E. Cowley*). Pedicels about 2½ lines long, curved, hairy. Calyx-tube gibbous, very hairy outside and slightly so inside, long as the pedicel; the two upper lobes united to the end, 3½ lines long; lateral ones about the same length, but more acute; the lower or keel lobe about 6 lines long, somewhat acute. Standard obovate, about ¾-in. long, with 2 auricles at the base of the lamina, claw short, the wing and keel petals about as long as the standard, all obtuse. The free stamen sometimes, if not always, connate for some distance up with the others. Ovary stipitate, hairy; upper portion of the style glabrous. Stigma terminal. Pod not seen.

Hab.: Scrubs of the Barron River, *E. Cowley*. The flowers upon the specimens received being all more or less injured by insects, the absence of pods, as well as the peculiarity noticed in the stipules and stamens, may, when better known, cause this plant to be removed out of the genus in which I now place it; but with the material to hand I can do nothing better with it.

CASSIA, Linn.

C. Brewsteri, var. Marksiana, *Bail.* (n. var.) An erect tree of 50 or 60 ft., trunk 12 or more inches in diameter; wood pinkish, close in grain, and tough; branchlets dark-coloured, fluted. Leaves 8 or 9 in. long, bearing about 7 or 8 pairs of leaflets, glabrous except for a slight tomentum upon the rhachis; leaflets from nearly lanceolate to oblong-ovate, 1 to 3½ in. long, shortly petiolulate; the leaves nearest to the flower racemes often of only three leaflets. Racemes terminal on the branchlets, about 3 in. long. Flowers crowded, on slender pedicels; bracts minute. Sepals oblong, 3 lines long, pubescent on the back. Petals yellow, 5 or 6 lines long, obtuse, tapering to the base, marked by a dark central and distant lateral veins. Stamens of the normal form. Pod about 1 ft. long, 5 lines broad, nearly terete, dark glossy-brown, and marked with transverse ribs between the seeds.

Hab.: Upper Nerang Creek. Foliage and wood, *F. M. B.* 1886. Flowers, pod, and leaf, *Hon. C. F. Marks, M.D.*, Dec. 1896.

I saw trees of this form growing at the above locality when collecting timbers for the Colonial and Indian Exhibition in 1886, but could not then obtain flowers or pods, and, thinking that the distinction in foliage might be due to situation, had a log worked up, and gave it in the catalogue as var. *tomentilla*, an error which must be corrected in the next edition of the Queensland Woods.

Order MYRTACEÆ.

MELALEUCA, Linn.

M. thyoides, *Turcz.*, Flora Austr. iii. 162. A tall shrub with numerous small slender branchlets, usually whitish, but glabrous or nearly so. Leaves spirally arranged, scale-like, closely appressed and imbricate, thick, peltate and concave, very obtuse and scarcely ½-line long on the smaller branchlets; more distant, acuminate, and nearly 1 line long on the longer branches. Flowers

whitish, in ovoid globular or oblong heads, terminal or the axis very soon growing out into a leafy shoot. Calyx-tube ovoid-campanulate, about ¾-line long or shorter and broader in the males, with very short and broad lobes. Petals ½ to ¾ lines diameter. Staminal bundles 2 to nearly 3 lines long, the claws exceeding the petals, each with 5 to 9 filaments at the end. Stigma dilated. Fruiting calyxes truncate, in some specimens about 1½ lines diameter, in not very compact globular heads; in others 2 lines diameter, in very dense oblong spikes; in others again still larger and only 2 or 3 together. Cotyledons very broad and folded. *M. cupressina*, F. v. M., Fragm., iii. 114.

Hab.: Lake Dunn Station, *Miss C. E. Crossman*. Only a few small specimens received, which seemed intermediate between *M. thyoides* and *M. tamariscina*, Hook.

Order SAPOTACEÆ.

SIDEROXYLON, Linn.

S. Dugulla, *Fail.* (n. sp.) (The aboriginal name at Barron River, *E. Cowley*.) Tree of about 70 ft., trunk diameter 2 ft., bark grey with numerous shallow longitudinal cracks. The young slightly hairy, leaves oblong-lanceolate, 3 to 5 in. long, and seldom exceeding 1 in. wide at the broadest part, tapering from above the middle to a petiole-like base; the apex usually very blunt, glabrous on both faces, the upper glossy, texture thin. Flowers not seen. Fruit nearly sessile and almost globular, green, 1 in. or more in diameter, containing 5 seeds, embedded in a soft pulp. Seeds brown, glossy, ½-in. long.

Hab.: Barron River, *E. Cowley*. Fruit eaten by natives.

Order VERBENACEÆ.

CLERODENDRON, Linn.

C. lanceolatum, *F. v. M.*, Fragm. III. 145, Flor. Austr. v. 63. A tall shrub or small tree, the foliage and inflorescence softly velvety, pubescent or glabrous. Leaves on rather long petioles, lanceolate or ovate-lanceolate, acute or rather obtuse, 2 to 3 in. long. Cymes in the upper axils several-flowered, shorter than the leaves, on short peduncles. Bracts narrow, acute, or the outer ones more leafy. Calyx broadly campanulate, about 2½ lines long when in flower, divided to near the middle into obtuse lobes. Corolla usually pubescent outside, the tube about ¾ in. long, or rather more, the lobes scarcely 3 lines. Stamens rather long. Fruiting calyx enlarged, of a deep purple colour, very open, 4 to 5 lines diameter, the lobes recurved. Drupe oblong, about 4 or 5 lines long, near or quite black when ripe.

Hab.: Torrens, near White Mountains, *R. C. Burton*. Coomooboolaroo, *Mrs. G. Barnard*.

Order LAURINEÆ.

ENDIANDRA, R.Br.

E. insignis, *Bail.* (*Cryptocarya insignis*, Bail. Bot. Bull. II. 15.) Flowers minute in slender trichotomus panicles under 2 in. long, pedicels slender longer than the flowers. Flowers nearly globular in the bud, usually about a line long; outer segments nearly rotund, inner ones somewhat apiculate, hairy on both sides. Stamens (in the flowers examined), the 3 inner ones alone fertile. Ovary and style more or less hairy.

Hab.: Ranges about Cairns, *L. J. Nugent*. Flower specimens. In Bot. Bull. II. this tree was placed in Cryptocarya, but no flowers had then been seen.

Order ORCHIDEÆ.

BULBOPHYLLUM, Thon.

B. radicans, *Bail.* (n. sp.). Stems elongated, sometimes to the length of several inches, clothed with scarious, striate, torn sheathing scales, and long wiry roots. Pseudobulbs narrow-cuneate, mostly hidden by the stem-scales. Leaves linear 1½ to 2½ in. long, 2 to 2½ lines broad, tapering at the base, the apex with a minute recurved point, texture thin, veins obscure. Peduncles 3 or 4 lines long, filiform, bearing 2 or more loose, scarious, somewhat obtuse sheathing bracts. Flowers yellow, calyx-tube slender, 1¼ lines long. Sepals broad-lanceolate, the points acute, 1¼ lines long, longitudinal veins 3 to 5. Petals narrow-lanceolate with only a central vein, hyaline and scarcely half as long as the sepals. Labellum thick, nearly as long as the sepals, expanding into side-lobes in the lower half, attached by a short claw to the basal projection of the column, disk-plates 2. Column-wings ending in rather long incurved threads. Pollen-masses oval, golden-yellow. This species is nearly allied to *B. nematopodum*, F. v. M., and it is probable that the specimens mentioned in my report of the Bellenden-Ker Expedition in 1889 as *B. nematopodum*, which were not bearing flowers at the time, belonged to this new species.

Hab.: Range near Cairns, *L. J. Nugent.*

Order FUNGI.

COPRINUS, Fries.

C. micaceus, *Fries.* Cooke Handb. Austr. Fungi, 69. Cke. Ill. t. 673. Pileus submembranaceous, oval, then campanulate (2-4 cm. broad), subrepand striate, discoid, sprinkled with fugacious, micaceous granules, at length naked, rimoso-sulcate; stem hollow, silky, even, whitish (8-10 cm. long 5 mm. thick), gills adnexed, lanceolate, whitish, brown to the middle, then turning black. Spores 8 x 6 μ.

Hab.: At the base of a decomposing mulberry stump in a Brisbane Garden.

XEROTUS, Fries.

X. Drummondi, *Berk.* Cke. Handb. Austr. Fungi, 100. Gregarious; pileus reniform, lobed, or crispate, ferruginous, tough, smooth (1 cm. broad), attenuated behind into a short obconic stem; gills distant, adnate, rather broad, becoming blackish.

Hab.: Eumundi.

HYDNUM, Linn.

H. delicatulum, *Klotsch.* Cke. Handb. Austr. Fungi, 172. Pileus effused, reflexed, coriaceous, thin, margin reflexed, narrow, yellowish, hymenium becoming whitish; spines very thin, regular, distant, setaceous, punctate with brown.

Hab.: On Eucalypt bark, Jimbour, *C. J. Gwyther.*

DICTYOPHORA, Desv.

D. phalloidea, *Desv.* Cke. Handb. Austr. Fungi, 211. Pileus thickened at the apex, at its union with the stem; stem white lacunose, with 2 or 3 strata of cavities; indusium net-like conic, or campanulate, white, arising from lower margin of the pileus, and depending almost to the volva, with the lower margin entire; pileus campanulate or conical, white, externally reticulate.

Hab.: On the soil, Oxley Creek, *D. O'Connor.*

DIACHÆA, Fries.

Sporangium stipitate; stem prolonged within the sporangium as a columella, and, together with it, filled with small granules of lime; capillitium of threads extending from the rigid columella to the wall of the sporangium, becoming thinner and thinner, combined into a thick net. *Cooke Handb. Austr. Fungi.*

D. leucopoda, Bull. Cke. Handk. Austr. Fung. 403, Cke. Myx. 44, fig. 178. Sporangium cylindrical, obtuse, stipitate; stem short, thickened at the base snow-white, prolonged within the sporangium into a cylindrical, obtuse, white columella, not reaching to the apex; threads of the capillitium whitish, thin; spores translucent, violet, beautifutly iridescent 7-9 μ diam.

Hab.: On a living plant of Ophiopogon growing in a bush house at Indooroopilly.

USTILAGO, Pers.

U. australis, Cooke's Handbook of Aust. Fung. 324. Produced within the ovaries; spores black, subglobose or angular and deformed, smooth, 8 μ diameter, or 8 x 6 μ.

Hab.: On inflorescence of an Eriachne, Muckadilla, *Mrs. Trenouth.*

VERMICULARIA, Fries.

Perithecia erumpent or subsuperficial, thin-carbonaceous, black, globose conical, at length concave, the summit perforated or mouthless, clothed with rigid somewhat long sooty septate bristles, sporules cylindric-fusoid, often unequal-sided, continuous, hyaline, on various basidia.

V. herbarum, *West.* Sacc. Syll. Fung. III., 226. Perithecia somewhat loose, gregarious, erumpent-superficial, globose, depressed $\frac{1}{3}$ mm. diameter, black, covered with crowded rigid, unequal, dark bristles. Sporules cylindrical, nearly straight, obtusely rounded at the ends, 20-22 x 3-4 μ, granulose, hyaline.

Hab.: Destructive to Carnation plants in a Brisbane garden. This fungus is known to infest plants of Dianthus, Solanum, Sedum, Yucca, &c., in Europe and South Africa.

General Notes.

RUBBER IN UPPER BURMA.

The *Imperial Institute Journal* for April, 1897, has the following on the Rubber Industry:—"From a recent report on the forests of Upper Burma, it appears that the difficulties of transport from the Hukong Valley are increasing as the more accessible of the rubber trees are being worked out. The forests at the head of the Namkong are rich in rubber, and the tree attains a height of 200 feet, with an enormous girth. The Kachins go far and near to collect the rubber in the dry season, and the chiefs levy toll on the produce as it passes down the rivers. The Chinese control the trade, selling provisions and cloth to the Kachins, who pay in rubber. The produce of the forests within the drainage area of the Tarou River goes to Assam, across the passes of the Patkoi Mountains. Rubber in this district is said to be growing scarcer, and it often takes a man forty days to collect a coolie-load, although the Singpho villages levy a tax on each collector. When first collected the rubber is very pure, but the Nagas have acquired the trick of adulterating it with earth and stones, so that Assam rubber is not regarded with favour in the Calcutta market. The rubber that goes to Rangoon is also adulterated, the Chinese being adepts in the art. The report states that it is useless to apply legislative protection and regulation to these rubber forests, unless the districts are taken over and administered directly, for the Singphos are extremely independent and own no masters, while some of the chiefs affirm that they could not enforce rules or interfere with the collectors. But the protection of the trees growing within our own administrative sphere would be possible, though Kachin opposition would have to be dealt with."

THE BUTTER INDUSTRY OF CANADA.

From the same journal we quote some remarks on the Butter Industry of Canada which are of interest to Queenslanders at the present juncture:—"Much careful thought has lately been given to the butter industry by the Government of Canada, where, owing to the vast and magnificent pasturage, it is capable of almost illimitable expansion. A glance at the Board of Trade returns shows that there is ample scope for the export of this product to the mother country. During last year the United Kingdom imported £15,344,083 worth of butter, of which Denmark alone sent £6,288,407 and France £2,537,690. Although during recent years Canada's contribution has increased, yet the necessity for greater efforts is demonstrated by the fact that in 1896 the value of the Canadian article imported only amounted to £339,744. The action of the Government in arranging for the requisite cold storage, both on land and sea, will be of incalculable benefit to Dominion farmers, and give additional impetus to the export trade. During the present year the Department of Agriculture has arranged to open in Manitoba and the North-west territories seventeen creameries, to be worked on the co-operative plan, under Government supervision. The charge to be paid by farmers to the milk department for manufacturing will be 4 cents per lb., with a further 1 cent per lb. to defray the Government loan, and it is expected that the monthly output of produce for export to Great Britain will reach a value of some 30,000 dollars."

THE BRITISH IMPORT TRADE IN EGGS.

The British Import Trade in Eggs has since the year 1850 exhibited a most remarkable growth, and there seems no reason why Australia should not have a large share in that trade.

The *Board of Agriculture Journal* says that fifty years ago the importation of eggs into the United Kingdom amounted to 3 eggs per head of the population of Great Britain and Ireland, but so great has been the subsequent growth of the trade that in 1896 the supply from abroad reached a total of 40 eggs per head. Last year the importation amounted to 1,589,387,000, of the value of £4,185,000. Until 1870, 90 per cent. of the imports into the United Kingdom was received from French ports; and though France still contributes a large proportion, her consignments to this country have decreased consistently during the last twenty years. Neither Belgium nor Germany produce sufficient eggs to meet the demands of their own population; and though it appears from the statistical tables that large quantities are received from these countries, it must be pointed out that the bulk of the receipts from Belgian ports consists of Italian and Austrian eggs, while those arriving from German ports are for the most part the produce of Russia and Austria-Hungary. From the declared value of the imports, we learn that the average value of the eggs imported for the last twenty-five years ranged from 7½d. to 10½d. per dozen. The supplies from France fetch the highest price, and Italian and Danish produce come next.

The highest figure given in the average price here does not seem excessive, but when the raising of poultry for export is carried on, as it will be on a large scale, doubtless efforts will be made to also compete with European countries in the egg market, as Queensland has already successfully done in the butter and fruit market.

PRICKLY PEARS FOR STOCK.

It is perhaps not generally known that in Mexico the prickly pear is not regarded as an evil, but as the very reverse.

The Rev. Herbert Heath, who lately left Queensland, stated that he had resided for many years in Mexico, and had had many opportunities of observing the uses to which the prickly pear was put by the rancheros. In dry seasons, and even during good seasons, the vaqueros and peons go out on to the runs and cut down quantities of mesquite bushes, and make piles of them at intervals over a large extent of country. Labour being plentiful and very cheap, the work is performed in quicker time than might be supposed.

Quantities of prickly pear are now cut and thrown on to the heaps, which are then fired. The heat and evolved steam disarm the leaves and fruit of their thorns and prickly hairs, and the cattle assemble and eat the juicy leaves and succulent fruit with greater zest than they ate the grass.

In reply to a question we asked about the possibility of destroying and exterminating the plant in Queensland, Mr. Heath said: "You don't know the valuable fodder plant you have here. I can tell you this: Take away the prickly pear from Mexico, and rancher, rancheros, vaqueros, and all who have to deal with cattle may leave the country, for there will be no further employment for them. Cattle will be a thing of the past." We shall be glad to know if the prickly pear has been systematically tried as fodder in Queensland.

FARMING BY THE WEALTHY CLASSES.

In the course of an address to the Dominion Shorthorn Breeders' Association at Toronto (says the *Live Stock Journal* of 30th April), the President (Mr. A. Johnston, of Greenwood, Ontario) said: "If I were asked my opinion as to the greatest want in shorthorn matters in this country and in the United States, I would unhesitatingly answer—that of moneyed men who take an active and participating interest in this and in all other matters pertaining to agriculture. In the old lands it is vastly different. There, from Royalty down

to the tenant-farmer, all take a patriotic pride in being connected with the soil on which they live, other than mere ownership and revenue derived therefrom. I think the subject is worthy of the consideraton of our men of wealth. It is not to be hoped that the wealthy can make money in any line of farming, but the country can never prosper while only the very poor farmer tills the soil; and if men of wealth and social standing hold aloof from the soil, the more moderately wealthy will also avoid it; whereas, if our wealthiest citizens made it fashionable to take up some line of agriculture, moneyed men of less means would imitate, and the certain result would be improved methods and more ambition. In England and Scotland, and indeed in all the old lands, the tenant-farmer has many opportunities during the year of meeting on equal terms with his lordship of high degree who is engaged in farming in the vicinity. Even the Queen and the Prince of Wales are largely engaged in farming and pure-bred stock raising. In conclusion, I desire to say that no class of business men in the world have stood higher from a moral standpoint than the real breeders and importers of shorthorn cattle during the past fifty years. This has been so not only in Canada but also in the United States and Great Britain. It is much to say, but I believe it will not be contradicted. If we do not number in our ranks men of great wealth, we do number among us men of great ability and considerable influence, and I venture to say that in every neighbourhood in which they are found they will at least carry a full share of the respect and trust of the locality."

The following eloquent passage by Henry Howard Molyneux (4th Earl of Caernarvon) will appeal forcibly to the present generation of Australians. We reproduce it in the hope that it may stimulate the latter to emulate the indomitable courage and perseverance of their fathers:—

"What will be the character and tendencies of that young generation who have been born and brought up in Australia, and who know no other country or home? Whatever they may be, let no one deceive himself into the belief that they can be identical with their fathers, or with that earlier race who were, in very truth, the pioneers and makers of Australian civilisation. By vigour of intellect, by force of will, and by strength of limb they subdued the wilderness, hewed their way through trackless forests, and turned a rugged country into the rich land of promise it now is. They were giants; and unaided, and sometimes single-handed, they did their work with a thoroughness to which words can scarcely pay an adequate tribute. They had seen the rough sides of things, and—rightly or wrongly—they were not always content with the support which England gave her adventurous sons, who, in far-off lands, whence hardly an echo came back, and in hardship and danger, were planting great colonies and extending the distant bounds of the Empire; they sometimes murmured at the apparent forgetfulness; they often rebelled against what they deemed the interference and dictation of Downing street. But all this has passed away; the survivors of this brave race are now standing in the sunset of life, and amid the long shadows that are cast across their path, they condone past wrongs, they only remember the land of their birth with its manifold and tender associations, and they turn with almost passionate and pathetic fondness to their early home and the 'old country.' . . . Whatever may be the precise character of the political and official ties which in the future will exist, it would be treason to our best traditions to question the enduring affection which throughout all time will bind the Australian colonies and the Mother-country to each other."

THE MARYBOROUGH SHOW.

The Twenty-second Annual Exhibition of the Wide Bay and Burnett Pastoral and Agricultural Society was opened on the 2nd June by the Hon. A. J. Thynne, Minister for Agriculture.

Owing to the severe drought the exhibits were not so numerous, nor was the competition so keen, as on previous occasions. Still many of the exhibits were of sterling merit, especially in the cattle and horse sections. In the

farming and other kindred classes the Woowoonga district showed up well, Mr. O'Reilly's trophy being most creditable. Other exhibitors deserve great credit for the excellent samples of fruit, vegetables, butter, cheeses, and which afforded a good idea of the capabilities of the district.

THE LOCKYER SHOW.

The show of the Lockyer Agricultural and Industrial Association at Laidley was opened on the 17th June by His Excellency the Governor, and proved a very great success. The Hon. A. J. Thynne, Minister for Agriculture, was also present. His Excellency expressed himself as being very much pleased to be present on the occasion, and said that he took a deep interest in agricultural shows. The Hon. A. J. Thynne spoke *inter alia* of the Agricultural College at Gatton, and said he hoped it would be fully availed of by young and old, and he expressed a desire that farmers would show more of the element of organisation, which must ultimately lead to success.

The entries for blood stock were not numerous, but prizes were taken for stallions and mares, and were awarded to Messrs. S. Welch, W. H. Pitt, and J. Waters. The hackneys, especially ladies' hackneys, were very much in evidence.

The dairy section was well represented by some very fine Jersey and Ayrshire cattle. Good shorthorns and Herefords were also exhibited.

The entries of sheep were very limited, but this was compensated for by the exhibits of pigs, principally Berkshires, which were very good indeed. Numerous prizes were awarded in this section.

Despite the late dry season, now so happily passed away, the exhibits of farm produce were most creditable and of excellent quality; splendid samples of lucerne, oaten, wheaten, and panicum hay being shown.

The first prize for rye was awarded to Mr. J. Logan, junr. The judges must have had no light task in making their awards where most of the exhibits were of such excellent quality.

The poultry shown were very fine, especially the heavy varieties.

Some good hams and bacon were shown, as were good samples of home-made jams, pickles, bread, and cheese, the latter shown by the Model Dairy Company.

Mr. A. Philp had a splendid assortment of oranges and other fruits of the Citrus family. It is estimated that 2,000 people were present on the opening day.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

SHOW FIXTURES.

Wellington Point Agricultural, Horticultural, and Industrial Association	3 July
National Agricultural and Industrial Association of Queensland, Brisbane	10 August
Royal Agricultural Society, Toowoomba	4 August.

Farm and Garden Notes for July.

As a general rule and with a fairly good season the field operations for the month will consist of preparing the land for the maize and potato crops, and continuing sowings of oats, barley, rye, &c. Prairie and other grasses may still be sown if this has not already been done in March and April. In suitable localities early potatoes may be planted. Rice may also be sown during this month.

In the Kitchen Garden full sowings may be made of cabbage, carrot, broad beans, peas, lettuce, radish, onions, beetroot, eschalots, parsnips, &c. Rhubarb, asparagus, and artichokes should be planted out.

In the Flower Garden there is plenty of work to be done in thinning out and replanting misses in the beds sown and planted out during the past two months. Roses may still be planted. Sow everlastings, annuals, larkspur, antirrhinum, dianthus, cosmia, chrysanthemum, tricolour, petunia, coreopsis, &c.

In the Orchard, grape vines and fruit trees should be planted, and growing trees should be well washed with a good strong compound, as a preventive against disease. Also prune all fruit trees, including vines, if not already done in June.

Public Announcements.

THE *Queensland Agricultural Journal* will be sent free of cost to all agricultural societies, schools of art, local libraries, and country newspapers in the colony, and to agricultural newspapers and institutions of importance in other portions of the world. Secretaries of agricultural, horticultural, pastoral, and kindred societies in Queensland are invited to furnish the Department of Agriculture with information as to their respective membership in order that the necessary number of copies of the Journal may be supplied.

[CIRCULAR No. 1.]

The Queensland Agricultural College,

OPEN FOR THE RECEPTION OF STUDENTS, 1ST JULY, 1897.

EXAMINATION OF CANDIDATES, 30th JUNE, 1897.

THE College offers to Queensland youth a Direct Education in the Practice and Science of Farming. To carry out the intentions of the Government in this respect the School has been liberally equipped for its proposed work. This equipment (in part) embraces—

A Competent Staff of Teachers;
A Farm, consisting of 1,692 acres of land;
Five Commodious Buildings;
Dormitory Accommodation for 56 Students;
Three Breeds of Dairy Stock;
Implements, Apparatus, and Library.

Plans for a Commodious Chemical Laboratory and Lecture-room have already been approved by the Minister. This building, it is expected, will be ready for the use of Students of the Second Half-year.

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In the Orchard, grape vines and fruit trees should be planted, and growing trees should be well washed with a good strong compound, as a preventive against disease. Also prune all fruit trees, including vines, if not already done in June.

Public Announcements.

THE *Queensland Agricultural Journal* will be sent free of cost to all agricultural societies, schools of art, local libraries, and country newspapers in the colony, and to agricultural newspapers and institutions of importance in other portions of the world. Secretaries of agricultural, horticultural, pastoral, and kindred societies in Queensland are invited to furnish the Department of Agriculture with information as to their respective membership in order that the necessary number of copies of the Journal may be supplied.

[CIRCULAR No. 1.]

The Queensland Agricultural College,

OPEN FOR THE RECEPTION OF STUDENTS, 1ST JULY, 1897.

EXAMINATION OF CANDIDATES, 30th JUNE, 1897.

THE College offers to Queensland youth a Direct Education in the Practice and Science of Farming. To carry out the intentions of the Government in this respect the School has been liberally equipped for its proposed work. This equipment (in part) embraces—

A Competent Staff of Teachers;
A Farm, consisting of 1,692 acres of land;
Five Commodious Buildings;
Dormitory Accommodation for 56 Students;
Three Breeds of Dairy Stock;
Implements, Apparatus, and Library.

Plans for a Commodious Chemical Laboratory and Lecture-room have already been approved by the Minister. This building, it is expected, will be ready for the use of Students of the Second Half-year.

FEES.—£25 per annum, payable half-yearly in advance, and a deposit of £1 as a guarantee against damage of buildings and furniture.

The Fee covers board, washing (not to exceed ten pieces weekly), room rent, and lights. Each room is furnished with bedstead, bed, pillows, chairs, and table. All other furnishings must be supplied by the Student.

LABOUR.—Students work one-half of the time, a day of labour alternating with one of study.

The Practical Work proposed for Students embraces, besides the care of Live Stock and the operations included in Tillage and Harvesting, Fencing, Clearing and Grubbing, Tile-Draining, and Construction of Farm Buildings.

COURSE OF STUDY.

First Half-year—

Arithmetic
English Composition
Drawing
Botany
Agriculture (Lectures).

Second Half-year—

Mensuration
English Composition
Drawing (Technical)
Agricultural Botany
Elementary Chemistry
Agriculture and Horticulture (Lectures).

Books and Stationery are supplied by the College at actual cost price.

NON-RESIDENT STUDENTS.—The Minister desires to encourage the attendance of Non-Resident Pupils, who are prepared to fulfil the College regulations in all other respects. The conditions of the admission of such Students to the privileges of the College may be learned upon application to the Principal.

Students should secure tickets to the College Station, located about one mile from the College buildings. All Passenger and Mixed Trains, except the Sydney Mail Train, stop, due notice having been given the Guard, for passengers to alight at this Station.

The Train leaving Brisbane at 6 a.m. is due at the College Station at about 9 a.m., and the Train departing from Toowoomba at 7 a.m. reaches the College Station at half-past 9 nearly.

Students travelling by the above Trains will reach the College, on the morning of the 30th of June, in time for the Examinations. The College teams will meet these Trains for Students and their effects.

Students travelling by Steamer are advised to proceed at once to the College on landing. Board and lodgings will be supplied such Students for the time that elapses to the opening of the College: provided notice of the wishes of the Student in this regard is given in advance.

For further information address—

THE PRINCIPAL,
Agricultural College,
GATTON.

The Queensland Agricultural College,
5th June, 1897.

By Authority: Edmund Gregory, Government Printer, William street, Brisbane.

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