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Event and Comment.

A Year of Achievement.

The year 1922 was remarkable for agricultural progress in Queensland so far as constructive and ameliorative legislation of far-ranging effect can be regarded as evidence of progress. The most important of a long list of agricultural measures designed expressly in the farmer's interest, and therefore the national interest, is the Primary Producers Organisation Act, which was foreshadowed by the Premier (Hon. E. G. Theodore) in pre-sessional addresses, and introduced and piloted through Parliament by the Minister for Agriculture and Stock (Hon. W. N. Gillies). This measure has placed under the control of the farmers of Queensland the machinery for their own industrial redemption, and the onus of making the best of a beneficent Act now rests upon them. Legislation is not an end; it is merely a means. There is no short cut to prosperity. We must plan our work and work our plan, and this applies particularly to rural organisation, and more particularly to the tasks confronting the farmers' councils called into being by the legislation of last year.

Babel or Pentecost.

By the time these words are read the ballot for the election of district representatives on the Council of Agriculture will have been taken. In a very striking message to the farmers of Queensland in our last issue, Mr. Gillies emphasised the importance of wise choice in the selection of councillors, and his hope that they would be chosen from men of breadth of mind, honesty, sincerity, ability, stability, and firm faith in the scheme upon which last year's great forward movement was founded was no doubt echoed in the mind of every earnest farmer. On the elected leaders of the movement now depends the future of the farming industry; on them now depends the issue as to whether farmers will arrive at the day of Pentecost or slip back to Babel.

Unity of Purpose and Action.

As has been observed more than once in these columns, there can be little orderly building in an industry unless those concerned unite in thought, purpose, and action. There must be an idea, in the sense of vision, of larger results and better conditions common to the greatest number. The Government has provided plans, specifications,

and layout of a great rural development in Queensland, but the farmers themselves must do the building. The hope of prosperity by ballot is more or less an illusion; there is only one formula that can directly apply to rural organisation, as with our daily aspirations and ordinary avocations, and that is the age-old, four-lettered formula called work.

Necessity Compels Co-operation.

The remarkable preliminary success of the Queensland Producers' Association, incorporated under the Act referred to, is evidence that the Queensland farmer has readjusted his point of view to focus the effects modern social and economic changes are having upon his industry. Necessity has compelled him to affiliate with his fellow farmers in fairness to them and to himself. The pinch of hard times and marketing problems, the futility of solo fighting of trade combinations, both on the buying and selling sides, transport difficulties, and excessive operation costs are the main forcing factors in the general forward move towards wider and wiser co-operation. The pressure of need is one of the primary principles of joint action. Another is combination on a broad, constructive, sound, economic basis now made possible in Queensland by the Primary Producers Organisation Act.

Brains versus Brains.

The sound business way is the only way. No new commercial venture can expect to escape the fierce competition of existing enterprises, directed by keen brains, with which it will inevitably be beset. Brains must be met with brains, and no co-operative concern can expect a full measure of success unless based on modern business principles and economically conducted. This applies to what may be described as the front line activities of the Queensland Producers' Association. The creation of efficient farmers' marketing organisations, as provided for in its incorporating Act, must naturally incur the hostility of interests already entrenched. It is an army axiom, amply proven in practice, that the best defence is offence. A passive or negative attitude is the worst weapon in war. Farmers can only win a fair deal for themselves and their fellows by adopting a positive policy, by planning intelligently and performing effectively the organisation of the selling end of their enterprise.

The Selling End.

After sugar, the dairying industry is Queensland's most important source of agricultural income. Approximately £8,000,000 sterling is the annual value of dairy products to this State. While the question of increased production must be ever before us, it is obvious that no less attention must be paid to the marketing end of the business. In fact, under existing conditions the twin problems of marketing and distribution demand more and immediate attention from those to whom is committed the task of directing rural industries, from the executives of individual co-operative concerns to the men charged with making the Queensland Producers' Association the driving, pulsating force its progenitors conceived. In the current PRODUCERS' REVIEW is set out succinctly the advantage of intelligent organisation at the selling end of one branch of the agricultural industry alone, and which applies equally to other sections. As a result of effective control Queensland dairymen received an additional £200,000 over Southern prices for their produce in twelve months. The REVIEW comment is worth quoting:—

"In this State dairymen are organised more effectively, and as a result of that organisation the prices of local sales have been fixed by a body representative of the dairymen—the Queensland Butter Pool. The personnel of the pool, whose work has not been appreciated at its full value, is as follows:—Messrs. J. Purcell (chairman), T. Flood Plunkett (Logan and Albert), H. M. Stevens (Queensland Farmers'), F. J. Dobson (Caboolture), W. Stephens (Southern Queensland), W. T. Harris (secretary Co-operative Dairy Companies' Association). These gentlemen have capably handled a difficult situation, and, despite repeated efforts by importers of Victorian butter to break the local market, have maintained a price higher than that ruling in the South.

"At time of writing, the wholesale prices in the three chief butter-producing States are as follows:—

	s.	d.	
Queensland	186	8	per cwt.
New South Wales	168	0	„
Victoria	154	0	„

(At one stage the Victorian price touched 144s.)

"If it had not been for attempts by importers to break the market, the local price would have been at least 2d. per lb. more. Failure to obtain that extra 2d. has meant during the last four months a weekly loss to Queensland dairymen of £2,500.

"But what would the loss have been if the market had been broken, and prices had fallen to the Victorian level?

"From 1st October, 1921, to 30th September, 1922, Queensland dairymen received £200,000 more than they would have received if Victorian prices had ruled here."

The Teaching of History.

The PRODUCERS' REVIEW is worth quoting again—

"The teaching of all history is that the farmer can never—in fact, no one can ever—prosper as a mere producer of raw materials.

"The men who dig coal live in huts; the men who handle it in fine houses. The men who grow sugar-cane live humbly; those who control the distribution live prosperously. The agents live much more pretentiously than the dairymen whose butter they sell. And so the list could be lengthened indefinitely.

"Wherefore the farmer is fighting to-day for a larger share of the wealth that he creates. He is fighting to be something more than a producer of raw materials. He is fighting to get and keep for himself the profits that come from handling and distributing—and wiser handling and distributing—of the products of his toil. He is fighting to bring about a realisation of the prophecy uttered nearly 3,000 years ago—

> 'They shall build houses and inhabit them; and they shall plant vineyards and eat the fruit of them. They shall not build and another inhabit; they shall not plant and another eat.'

"The farmer who does not fight with his brother farmers in their effort to 'make themselves masters of their own industry' is hindering them and hurting their cause. The interests that are fighting to keep the farmer 'a mere producer of raw materials' are wealthy and powerful, but the farmers have only to stand together in order to win. And all must stand together. The present chaotic conditions are due to lack of organisation in the past. The Queensland Producers' Association provides the organisation for the future, and those in control must have the ability to evolve from the present chaotic conditions a system which will ensure to the producer a proper share of the fruits of his labour."

Obstinate Apathy.

The Queensland Producers' Association is rapidly getting into its stride and should soon straddle the rut of obstinate apathy so evident in some restricted rural circles. Among some farmers there is apparently a tendency to drift—a weak sliding backwards into the sapless dreariness of a fatalistic "What's the good," that extraordinary mental attitude with which so many regard every move towards industrial betterment. The Association offers the means of promoting co-operation on the widest possible scale, not only among farmers, but between them and other sections of the community whose interests are identical or parallel. The possibilities of the State-wide plan have been fully demonstrated, but one of the minor problems of organisation is the indifference of some concerned directly in its success. In such cases, doubtlessly, indifference is due to lack of thought, and vigorous organisation will help to round up the stragglers. To properly develop the great agricultural industry every primary producing unit in the State must be welded into one solid organisation. Farmers individually have everything to gain by making the Association as strong as possible.

QUEENSLAND AGRICULTURE IN 1922.

BY H. C. QUODLING, Director of Agriculture.

Subjoined is the full text of the report of the Director of Agriculture (Mr. H. C. Quodling) taken from the Annual Report of the Under Secretary, Department of Agriculture and Stock (Mr. Ernest G. E. Scriven), to the Minister (Hon. W. N. Gillies) for submission to Parliament.

COTTON.

An Encouraging Outlook.

The outlook generally from an agricultural standpoint is most encouraging. The most striking feature witnessed during the year was the very live interest taken in cotton, a crop apparently destined to play a most important part in land settlement. Figures shown elsewhere in the Department's report help to bear this out. These, however, do not present a true indication of what the future holds in store. What actually counts, and can be relied upon to provide a most encouraging perspective and more accurate indication of what may be termed "the pulse" of the industry, is the extraordinary number of inquiries being made through the Department respecting cotton, and the desire generally expressed by persons of settling in the State if facilities are forthcoming. Hitherto, no better opportunity has presented itself of settling large areas of Crown lands in the cotton belt.

At this stage of the resuscitation of an industry, ripe for development under a guarantee price, with the certain prospect of up-to-date ginning establishments already at hand or in prospect for the treatment of the crop, a note of warning should be struck respecting the prevailing idea amongst growers that little else matters on the farm as long as an extensive area of cotton can be put in.

Obviously, the farmer who has the necessary family labour available is the better equipped man for cotton-growing than the one who employs labour. Observation goes to prove that the tendency, in some instances, is to put more land under cotton than can be properly cared for, to the detriment of other branches of farming, dairying, and pig-raising, which might also be reasonably carried out on the same farm.

Quality of Queensland Cotton.

The excellent reports received through the British Cotton Growing Association on the quality of last year's cotton, over 1,000 bales, proved most encouraging, and the average length of fibre—1⅛ inches—placed the Queensland article in the long-staple Upland class, which alone is sufficient indication of its quality. It was shown, however, that with a greater uniformity in character and length of staple much better results were attainable. With this objective in view the Department established several seed propagation areas (in temporary quarantine) with seed obtained through the Agent-General, and the Australian Cotton Growing Association also. The cotton-growing on one quarantine area developed a bacterial leaf disease and was destroyed by order of the Chief Quarantine Officer for Queensland. A second area showed traces of the same trouble and is under close observation, with the prospect of the crop being dealt with summarily also. Three other plots at Capella, Charters Towers, and Cooktown made satisfactory development. Seed selection work is in hand in connection with the latter plots, and it is satisfactory to note that every prospect exists of obtaining a sufficiency of seed for about 300 acres for planting in the spring of this year, and if no untoward circumstance obtrudes itself, ample supplies of improved seed should be available to meet all requirements in 1924. In this way there is every prospect of producing a uniform type of cotton with a staple probably reaching 1¼ inch in length. Substitution of a variety of cotton of this quality even for the present class of cotton, which is admittedly good, must enhance the value of the State's output in a marked degree.

MAIZE.

The Northern Crop.

The season generally was not as satisfactory as it might have been, although the crops were all that could be desired in certain districts favoured by regular rains during the growing season. Less maize than usual was planted on the Atherton Tableland. The quantity of grain carried over from the previous year was large and the quality indifferent, on account of an exceptionally wet season, and these facts militated against the utilisation of available lands, some of which were devoted to dairying instead. Although Townsville and the Northern markets were open, there was little prospect of competing successfully in the more Southern markets on account of high transport charges. As a result the 1921-22 crop on the Tableland is not expected to exceed 7,000 tons. Although the district's average yield is comparable with the highest obtainable elsewhere, the wet season ceased earlier than usual and the precipitation proved to be slightly below the average.

Lower Southern Yields.

In the main maizegrowing districts in Southern Queensland the summer rains were not so plentiful as in the previous year; this caused curtailment of output.

Seed Improvement.

Good and substantial progress was made with the departmental scheme of seed maize improvement. Fresh importations of grain were made from the United States of America to supplement the varieties now in cultivation. The technical work associated with seed selection and the production of high yielding strains of grain has been placed in the hands of Mr. C. McKeon, Assistant Instructor in Agriculture, whose efforts in segregating and propagating some choice varieties are meeting with success. Thirty plots, aggregating 9½ acres in area, were established in the following localities:—Tingoora, Murgon, Manyung, Goomeri, Imbil, Kilcoy, Yandina, Boonah, Beaudesert, and Marburg.

The practice of selecting grain from the field propagation plots was continued for the purpose of providing seed for sale to farmers; in this way tangible results should be forthcoming and the returns from individual farms increased.

Three useful varieties have been added to those commonly grown by an importation of seed from the United States of America, viz., Funk's Ninety-day, Funk's Yellow Dent, and Eureka. In summarising the results of the season's trials, Mr. C. McKeon, the maize specialist, stated as follows:—

> "The Funk's Ninety-day gave easily the best results of the imported varieties with a yield of 55 bushels per acre. The type proved to be very even and the variety a heavy yielder."

Other results obtained from departmental seed were generally most encouraging and afford evidence that careful selection of high-yielding strains is calculated to improve the standard and aggregate yield of grain in the State.

An extension of the remarks to the latter varieties is as follows:—

> "Reid's Yellow Dent returned 70 bushels per acre. The crop at Kilcoy (a four-months one) attracted much attention. Cobs were exceptionally large, with a good depth and type of grain. Husk covering showed a decided improvement. Cobs were carried very low on the stalk and turned down well during ripening.
>
> "Golden Beauty Maize, a five-months corn, grown also in the Kilcoy district, returned 85 bushels per acre. This variety gave very fine results. It was raised from seed selected from low-bearing plants, and the improvement in the position of ear was very marked. Type of grain good, and husk covering very good."

Improved Yellow Dent grown at Bunjurgen, near Boonah, averaged 90 bushels per acre—

> "An exceptionally fine crop. Weather conditions throughout were very favourable. Cobs were very large and of splendid type. Plants were spaced 2 feet apart in the rows, which probably accounts for the extra development of the ears and grain. Easily the best crop of the season."

To encourage the production of specified types of grain, arrangements were made with the Royal National Agricultural Association to revise their schedule for maize.

The work designed for the purpose of determining the amount of moisture in Atherton-grown maize—in the field, barn, bag, and tank—has been consistently followed up and some useful information compiled. Mr. Field-Assistant Wise, who has been engaged in the compilation of data, is following up the matter of moisture content of marketed grain to complete a series of tests.

WHEAT.

Better Grain.

Although the aggregate yield proved to be somewhat less than last year, the quality of grain was better; in fact, only a small percentage proved to be under f.a.q. standard. Results of this character compare more than favourably with the best wheat-producing States in the Commonwealth.

The Wheat Board's operations were facilitated in no small degree by having grain of this excellent description to handle. Overseas shipment of grain was continued by the Board, and Queensland wheat has been well received by the trade.

Co-ordination of Activities.

The co-ordination of activities of the Department and the Wheat Board, for the betterment of the industry, was arranged in time for the present planting season, and put into practice. All available stud seed from State farms and field propagation plots was placed with approved growers, whose land was first inspected by a member of the Board in company with an officer of the Department. The reduction aimed at in the number of varieties in cultivation—from about 70 to 22—is a first step towards the elimination of many unsatisfactory kinds. The outline of the scheme is appended:—

1. The Department of Agriculture to co-ordinate its wheat-breeding and wheat-testing work and to link it up with the activities of the Wheat Board.
2. The scientific and technical work necessary to give effect to the scheme to be carried out as at present by the Department of Agriculture, and when seed of improved varieties recommended by the Department is available from time to time in sufficient quantities, the Board to take it over by purchase (at a price to be mutually agreed upon at the time) and make arrangements for sowing the respective varieties in localities and on picked areas recommended by the Department as suitable for the purpose of propagating supplies of the several kinds.
3. The Board, in sequence, to secure seed from these sources, rail it to its central depôt for cleaning, fumigation, grading, and storage, for ultimate despatch to the localities decided upon for the commercial propagation of specified types of wheat.
4. For the purposes of the successful working of the scheme, and of the production of standard types of grain, the State to be classified into districts or zones, so that efforts may be directed towards the growing of suitable types and varieties within each for delivery to, and subsequent distribution by, the Board. In this way it would be possible to draw upon certain classes of grain for milling or export, as may be required.
5. That a classification be made of varieties now in cultivation, with a view to the discarding of those which are undesirable or unsuitable for Queensland conditions, or which are of soft, starchy, poor milling, or indifferent keeping qualities.
6. That the Board take the necessary steps to further this latter object by ensuring the delivery by the grower of all wheat to the Board which comes under this latter category. In this way, the usual reservations or arrangements for next season's seed by the grower will be brought into line with the policy of standardisation, as the approved wheats can then be supplied in lieu thereof.
7. That for the purpose of ensuring the preservation of supplies of pure seed of varieties finally approved of under the scheme, the Department to continue the work of seed selection by maintaining small nursery plots at its wheat-breeding or on other farms, with the object also of the improvement by selection, and the maintenance of certain strains within the respective varieties, which could be drawn upon should the identity or purity to type of the original varieties require to be renewed at any time.
8. That seedsmen dealing in seed wheat be furnished with an outline of the scheme in order to secure their active co-operation in effecting its aims and objects by placing varieties purchased from the Board, or other sources, with growers in districts or zones to which such varieties have been allotted.

Field Tests and Trials.

The officer deputed to carry on last season's field tests and wheat trials, Mr. C. S. Clydesdale, Assistant Instructor in Agriculture, reported good progress in all operations. Work of this character, dependent as it is on the highly technical and skilled efforts of the manager of the Roma State farm in breeding up and selecting new types of wheat, is demonstrating in a marked degree that Queensland's requirements are being catered for and successfully met. Farmers are showing a greater interest in this class of experiment work than formerly, which is tangible evidence that its importance is recognised.

Ten varieties of wheat, produced at the Roma State farm, were tested at different centres—Allora, Jandowae, Bell, and Inglewood—under field conditions, the plots aggregating 46½ acres in area, the highest yield being recorded at Inglewood with "Cedric," 30 bushels per acre.

The comparative trials of over 130 varieties of wheat, principally new crossbreds, admitted of the selection of a limited number exhibiting improved field characteristics and ability to resist rust; and these latter have in turn been sown again this season

in larger areas to admit of extension trials under field conditions. This gradual process of evolution is calculated to furnish further evidence of the fitness or otherwise of the varieties for general cultivation, providing that the imprimatur of the chemist and miller is received.

Wheat taken from one of the Department's seed propagation plots proved to be of good quality, and when exhibited by the grower at Toowoomba was only beaten by .5 in a strong competitive class.

Prospects Promising.

Touching the question of the industry generally, matters appear to be promising, as the area put under crop and in course of preparation for planting should show an increase on last year's figures.

Good rains fell during the month of June, and expectations of suitable conditions for germination were realised.

Arrangements have been made by the Wheat Board for increased storage accommodation at several railway centres, which will go a long way towards the removal of disabilities in this direction.

Barley.

The growing of malting barley (once a specialised industry) appears to have its limitations, due to the restricted local demand by brewers. The generally accepted opinion is that Queensland is capable of producing large quantities of first-class barley if a profitable market could be found. Last year's crop was ravaged in some localities by the so-called "army worm," which occasioned damage.

Darling Downs farmers, many of whom are dairying in conjunction with crop raising, are paying attention to the growing of cape and skinless barley as a fodder crop for grazing off, with good results.

Canary Seed.

Canary seed growers, who harvested good crops, found themselves restricted in a marked degree in the matter of a payable price and an indifferent demand for their product, so decided to form a "pool" in order to regulate supplies and prices, but at the time of writing the price still remained low and the demand less active than formerly.

Lucerne.

Lucerne still holds pride of place in many districts where its cultivation is specialised in, but the excellence of the plant for cropping purposes calls for a wider recognition of its value on the average Queensland farm, it being generally recognised that if more lucerne were grown on dairy farms it would naturally follow that better results would be obtainable through the use of a protein-yielding food, an essential in milk production.

English Potatoes.

Of the varied assortment of crops grown (particulars concerning which are to be noted in the statistical returns), *English Potatoes* occupy an important position as a food crop. It is an anomaly to find that such a large quantity of potatoes still find their way here from Southern States, a circumstance which means a big loss to Queensland growers.

Sweet Potatoes.

Facts made known concerning the quality and extraordinary yields (over 30 tons per acre) of potatoes obtained in the trials carried out by the Instructor in Agriculture at Rockhampton, Mr. G. B. Brooks, have focused attention on this crop, and it is significant that upwards of 10,000 cuttings were sent out last year from propagation plots, the distribution covering a wide range of country. Evidence of this character serves to indicate that growers recognise the importance of making the best use of their land for the production of maximum crops.

The pamphlet on "Sweet Potatoes," prepared by Mr. Brooks for publication (affording as it does a wealth of technical detail dealing with the classification of varieties), promises to provide a very useful and instructive addition to the printed matter on this subject.

Dairy and Pig Fodder Plots.

Reference was made in last year's report to the establishment of dairy fodder and pig fodder plots on the North and South Coasts respectively. The results generally were excellent, the season being an exceptionally favourable one. Returns of this character should be sufficiently convincing without further elaboration.

RESULTS OF DAIRY FODDER TRIALS.

Varieties.	YIELDS PER ACRE OF GREEN FODDER.											
	A. Hulse, Yandina.				F. G. Burton, Bridges.				J. B. Stephens, Nindoolmbah.			
	Tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb.
Prince wheat and peas ..	16	16	2	12	2	14	0	2	13	10	0	10
Prince wheat and vetches	10	16	0	8	6	1	2	4	11	17	2	20
Patriot wheat and peas ..	16	4	0	12	9	2	0	0	14	0	3	16
Patriot wheat and vetches	11	6	3	4	2	0	2	1	12	18	1	26
Rye and peas	10	16	0	8	5	5	1	9	14	11	2	22
Rye and vetches	7	11	1	0	Destroyed by wallabies				16	4	0	22
Cape barley and peas ..	12	3	0	9	10	16	0	8	13 (two cuttings)	10	0	10
Cape barley and vetches ..	7	11	1	0	2	19	1	19	15	2	2	0
Skinless barley and peas ..	11	6	3	14	Destroyed by wallabies				5	18	3	10
Skinless barley and vetches	5	13	1	21	Destroyed by wallabies				5	2	2	15
Ruakura oats and peas ..	9	9	0	7	4	3	2	25	18	18	0	14
Ruakura oats and vetches	7	11	1	0	Destroyed by wallabies				17	16	2	2
Algerian oats and peas ..	8	18	1	1	3	6	0	19	9	3	2	18
Algerian oats and vetches	6	15	0	5	Destroyed by wallabies				9	14	1	24

The yields generally on Mr. F. G. Burton's plots were reduced by the depredations of wallabies.

Seed sown 17th and 18th May on F. G. Burton's farm and on 26th and 27th May on A. Hulse's farm.

Rainfall taken at Yandina during period of growth of crop 20.71 inches—twenty-eight wet days.

Seed sown on J. B. Stephens's farm, 17th and 18th May.

Rainfall during period of growth of crops 18.93 inches—forty wet days.

RESULTS OF PIG FODDER TRIALS.

Varieties.	A. Hulse, Yandina, N.C.				F. G. Burton, Bridges, N.C.				J. B. Stephens, Nindoolmbah.			
	Tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb.
Yellow globe mangel ..	35	2	0	26	28	12	2	10	23	15	1	12
Long red mangel ..	33	17	0	19	52	13	1	11	24	6	0	18
Sugar beet	32	8	0	24	24	6	0	18	20	14	0	15
Silver beet	15	17	1	11	10	11	0	18	9	0	0	6
Scotch kale	9	9	0	7	No record				Not sown			
Dwarf Essex rape ..	16	4	0	12	16	4	0	12	10	5	2	24
Purple-top swede ..	24	6	0	18	51	17	0	16	13	10	0	10
Elephant swede ..	25	13	0	19	32	8	0	24	16	4	0	12
White Belgian carrot ..	11	12	1	3	No record				19	6	0	14
Large drumhead cabbage	27	10	3	26	No record				17	5	2	24

Seed sown on F. G. Burton's and J. B. Stephens's farms, 18th May. On the 25th May on A. Hulse's farm.

Rainfall 20.71 inches for Messrs. Burton and Hulse's farms (twenty-eight wet days), and 18.93 inches for J. B. Stephens's farm (forty wet days).

STATE FARMS.

Gindie.

Development work, directed towards the improvement of the property, including that of water supply, fencing, and of erection of yards, improvement to cattle dip, &c., has been carried on throughout the year and more efficient control attained. New cultivation areas were added to the existing ones.

Much preparatory work was given to the main cultivation areas to provide supplies of hay and ensilage for stud stock and working horses, and the extra cultivation resulted in exceptionally good crops of hay, wheaten yielding 2 tons per acre and oaten 30 cwt. Good weather was experienced for curing the crops. Approximately, 100 tons of maize were cut and chaffed into the silos.

The season generally was favourable (approximately 26 inches of rain) for the stud herd of shorthorns, and the young stock are very promising, but prices for young bulls for herd improvement have dropped in keeping with the present depression of the cattle industry. Three shows were attended during the year with teams of cattle to advertise the stock, and honours won throughout. At Rockhampton good competition had to be met, and the farm carried off the champion prize for bull with an animal bred on the place, beating last year's champion, an imported animal. Females also bred on the farm gained most of the prizes, although unsuccessful in the championship. The aim throughout to produce typical sires for sale to improve the quality of district herds is meeting with success. Three animals of our own breeding were put over the scales to determine whether the early maturing qualities claimed for the cattle had been realised; the weights bear this contention out. The champion bull—Gindie Duke of Beauford 2nd, 28½ months old—turned the scale at 1,834 lb., whilst two young cows in the fat stock section weighed 1,518 and 1,442 lb. respectively.

Kairi.

Development work in the way of falling an area of over 50 acres of scrub was undertaken. Maintenance of existing areas proved a heavy item, as undergrowth and weed-growths, forced into activity by a generous rainfall, had to be coped with. Stud stock (Jerseys and Illawarra shorthorns) have improved in numbers and quality, and the work of classification has entailed the testing of a large number of different samples of milk from individual animals in the herd. The dairying industry has assumed large proportions on the Tableland, and evidence goes to prove that herd testing is a work which cannot long be delayed.

An excellent demand has set in for cane sets from sugar districts below the range, it being recognised that the change of climate undergone on the highlands here by the varieties being grown to meet this demand will have an excellent effect and overcome disabilities which cane is subjected to when grown consistently under forcing climatic conditions on the coast.

The stud of Berkshire pigs has increased, and when matters were practically booming in this line in keeping with developments expected in the way of a co-operative factory, the demand for animals for breeding purposes was difficult to meet; as the factory proposition is not finalised, interest in this excellent side line to dairying has waned.

The purchase of a young Suffolk Punch stallion from the well-known Dangar stud in New South Wales has equipped the farm with a long-felt want.

Warren.

The season was not as satisfactory as it could have been, owing to the falls of rain being sporadic in character. Throughout the year effort has been directed towards putting the property on as efficient a basis as possible, and minor improvements were consistently directed towards this objective. Useful experiment work was engaged in and added interest shown in the farm operations. A feature which promises well from an educational standpoint is the instructional work to pupils of the local school, who are keen to acquire a knowledge of agriculture. Lectures and practical demonstration work have been combined. It is purposed to extend this class of instruction and co-operate with the head teacher of the school.

Arrowroot, grown on a 3-acre demonstration area, has proved itself a very valuable crop for providing large supplies of "bulbs" for pig-feeding purposes. Local farmers are interested, and the experiment is one of the most striking successes of the year's operations. It was also demonstrated that the ordinary dun field pea, when grown under field conditions, was another valuable crop to the district, the growth of the crop and the selling of a large amount of seed bearing this out.

The Ayrshire stud has been maintained in a state of efficiency and the young stock are promising. Berkshire pig breeding has proved a profitable line of work, and the animals from this farm are doing much towards improving the standard, both of breed and quality, of the district's pigs.

Hermitage.

The principal work of the year was directed towards the testing of a large number of different varieties of wheat, barley, and oats, both in the stud seed selection rows and in larger areas under field conditions. Co-operation was arranged in the comparative tests of over 130 Roma State farm crossbreds, and although sown rather late in the season, the results were conclusive in respect to the susceptibility of certain strains to rust, and more pronouncedly so regarding the quality looked for in carrying out the trials, *i.e.*, rust resistance. Comparisons drawn from these tests and of the field trials have shown that some varieties possess extraordinary powers of rust resistance. This elusive quality in the field characteristics of wheat has evidently been fixed. Seed supplies of some of these have been made available to farmers for the present season's sowing.

During the year the farm was used as a depôt for a quantity of seed wheat from demonstration plots carried out under the Field Branch of the Department, and the whole of the grading and despatch of the grain was undertaken.

The sheep kept on the farm have been improved by careful culling, and proved valuable in conjunction with the raising of wheat and other cereals.

Roma.

Wheat-breeding work, for which this farm was principally established, absorbs a good deal of time and attention, but the results of several years devoted to this all-absorbing subject are now manifest. Encouraging reports have been received of the several new varieties which have been brought into cultivation, and it is satisfactory to be able to record the fact that a distinct objective has been attained in the co-ordination of the technical work on the one hand, carried out in the evolution of new strains of wheat at this farm, with that of the demonstration plots conducted by the field branch of the department and the linking up of these several activities with those of the Wheat Board. Propagation of improved varieties of this character under conditions to insure purity of type, and their substitution for older and possibly inferior kinds, should have an excellent effect on the industry. Fertiliser trials carried on for a number of years, effecting, as they have done, some slight improvement in the yields of grain by the use of special mixtures, have not yet shown that fertilising will pay, unless the quantity of fertilisers applied can be reduced to a minimum.

AGRICULTURAL CHEMISTRY.

Valuable work has been carried out by the Agricultural Chemist in the milling of new crossbred wheats and in the testing of the nutritive qualities of the resultant flour. One feature of outstanding importance is the fact that Queensland-grown grain is equal in quality to grain grown in the other States, and, in a number of instances, it has shown out to advantage. This farm has participated in the comparative tests of Australian varieties carried out in conjunction with the Bureau of Science and Industry.

Another section of plant-breeding work taken up a few years ago, viz., that of the production of new varieties of grapes, is affording some excellent data.

A retrospective view of the year's work indicates that good progress has been made. My thanks are due to the whole-hearted and loyal efforts of the staff throughout the three divisions of the State—North, Central, and South.

THE QUEENSLAND DAIRYING INDUSTRY.

A YEAR'S REVIEW.

BY E. GRAHAM, Director of Dairying.

The following review of the dairying industry in Queensland is taken from the Annual Report of the Under Secretary, Department of Agriculture and Stock (Mr. Ernest G. E. Scriven), to the Minister for Agriculture and Stock (Hon. W. N. Gillies) for presentation to Parliament.

A feature of the season just terminated was the favourable weather conditions which prevailed throughout the spring, summer, and early autumn months, and changed adversely to dairying for the remaining portion of the year.

The lack of rain during March and April was responsible for a curtailment in the amount of green fodder usually available for dairy stock, and the customary feeding-off of the young crops of wheat by the dairy herds during the winter months in the Downs district did not take place. Dairy farmers in the coastal areas were unsuccessful in raising satisfactory crops of sorghums, imphee, &c., so generally utilised for winter feeding, because of the comparatively dry condition of the soil during the months when crops of this nature make much of their growth.

The comparative scarcity of fodder on the farms, coupled with a winter more severe than the average, resulted in a pronounced reduction in the milk yield, affecting in turn the complement of butter and cheese produced within the closing months of the season.

A New Record of Production.

Despite the foregoing unfavourable seasonal conditions, the amount of dairy foodstuffs produced within the year was in the aggregate considerably in excess of the quantity manufactured within the former year, and consequently a new record of production has been established in this State. Formerly, the high mark of butter production in Queensland was credited to the season 1920-21, but the production is higher this season. The following are the particulars of theproduction within the respective seasons:—

Season.	Amount Butter Production.
1920-21	40,751,373 lb.
1921-22	60,923,194 lb.
Increase for season 1921-22	20,171,821 lb.

No change occurred within the year to the uses to which the milk raised on the dairy farms was ultimately placed. The milk produced was utilised for domestic purposes and in the production of butter, cheese, or condensed milk, the production of butter claiming by far the larger proportion of the total amount of the milk raised.

Generally, the standard of quality of the dairy produce manufactured within the year was well maintained. A number of factories effected an improvement in the quality of the butter manufactured therein. Especially was this noticeable in the cases where pasteurisers were installed and the pasteurisation of the cream supply carried into operation.

Neutralisation and Pasteurisation.

It is calculated that at present at least 90 per cent. of the total amount of butter manufactured in this State is made from cream which has been subjected to neutralisation and pasteurisation prior to churning.

The few remaining companies which have so far refrained from adoption of pasteurisation of cream intend to install the necessary plant and carry the process into practice at their factories if it is found that any considerable percentage of their output of butter is being submitted for export overseas. It is anticipated that practically the whole of the butter intended for export during next season will be from churnings of cream to which pasteurisation has been applied.

Although the beneficial effects accruing to the quality and keeping properties of butter as a result of pasteurisation of the cream supplies are widely known and accepted by manufacturers, several experiments were carried out during the season for the purpose of testing the efficiency of pasteurisation towards arresting the deterioration in the quality of butter intended for cold storage extending over lengthy periods, such as is involved in the exportation of butter to markets in Great Britain

and other countries overseas. In every case the results of the experiments were in confirmation of the results of former experiments which had been carried out from time to time, and go to provide, if such is necessary, additional evidence in support of pasteurisation.

Generally, the quality and appearance of the butters coming forward for market indicate that factories are giving closer attention to what may be described as the details in manufacture than was the case during the war and the years immediately subsequent to it. This may be regarded as a healthy sign and be taken as an indication that manufacturers are alive to the importance of zealously guarding the reputation of dairy produce of Queensland origin and the necessity to avoid any loss of prestige which would assuredly take place if laxity in attention to the methods of manufacture is allowed to creep in.

Market Conditions.

The reversion to open market conditions in Great Britain that occurred during the year brought with it a return to the older and more established order of affairs, under which dairy produce of this State is brought into open competition with that of other countries; but in another respect the position of the market was unique, because of the heavy accumulation of stock of Australian butters which were owned and held in cold storage by the Imperial authorities, and it was found most difficult to dispose of the new season's make of Australian butter in either satisfactory quantities or at remunerative prices. Merchants were afraid to purchase large quantities of butter, bought in a hand-to-mouth way. These conditions prevailed throughout the earlier portion of the season, and eventually the Imperial authorities decided to unload the stocks of stored butter held by them. It is understood that this butter was sold at a figure considerably less than half the amount of the original purchase cost. Immediately those stored butters were made available to consumers at a comparatively low price, the market for freshly-made Australian butters collapsed, and as a result the dairy industry here received a severe shaking.

Manufacturing companies were for some months unable to gauge accurately the true position of the markets, and with nothing more for their guidance beyond the definite knowledge that the value of butter had become depreciated and the condition of the market reduced to a disorganised and chaotic state, exporting companies were placed in a most awkward position, particularly as they had further quantities of butter shipped on consignment, upon which it appeared that they would be faced with heavy reclamations.

It was natural, under the circumstances, that manufacturing companies sought to protect themselves against additional monetary loss by adopting the only means within their power, and that was to materially reduce the rates for cream delivered to them; and in this way the value of cream was reduced to a figure lower than that recorded within the past ten years.

The adjustment made in this manner was efficacious in adding to the security of the position of manufacturing factories, but it did not tend towards the alleviation of the difficulties which producers were experiencing. Excessively low rates for cream brought consternation amongst dairy farmers, who found it impossible to carry on dairying profitably. Luckily, this unsatisfactory condition of affairs was short-lived, as fortunately the market for dairy produce recovered much more rapidly than was generally anticipated, principally on account of the demand for the cold-stored butters being stronger than it was expected would be the case even by those closely connected with the trade. The butters were eagerly sought after by consumers, and the incident indicates that the appetite of the consuming public for butter has not been seriously affected either by the rationing of supplies, as was customary for some years past in Great Britain, or by the enforced use of margarine as a substitute for butter. Evidently there still exists practically an unlimited demand for butter provided the quality is satisfactory and the price within the purchasing power of the people.

The rapid recovery of the market brought considerable relief to producers, and the oversea market has now assumed a much more buoyant tone, and with little or no butter carried over in cold stores a continuance of satisfactory prices may be reasonably expected. Certainly the prospects for the approaching season are encouraging and the outlook is decidedly in the producers' favour.

Cold Storage.

The matter of the inadequacy of cold storage accommodation available for the storage of dairy produce has been referred to in former reports upon the industry, and the importance of ample and efficient cold storage, affecting as it does the

quality of the dairy produce intended for export and the progress of the industry generally, has been specially mentioned.

The complement of dairy produce coming forward during the flush of a normal season has reached a point beyond the capacity of the existing cold stores, and the Government has, in consequence, decided upon the erection of a cold storage premises, which will be situated on a water frontage at Hamilton. It is intended that provision shall be made within the cold storage premises to allow for the cold storage of dairy produce, fruit, eggs, and products of like kind.

The work of construction of the necessary buildings and wharfage accommodation for vessels receiving refrigerated cargo from the stores has been under way for some time past, and the progress made to date gives promise of a section of the premises being completed and available for use for storage purposes early in the new year.

Improved Shipping Service.

Throughout the year a much-improved shipping service than that on offer for seven or eight years past has been enjoyed, and the export section of the industry has benefited accordingly. Ocean liners carrying produce in refrigerated chambers have left our port with greater frequency of late, and, in addition, transit charges have been reduced somewhat.

Revival in Interstate Trade.

There has taken place a revival in the interstate trade in dairy produce, which may be attributed to the abandonment of "winter-pooling" of butter—a practice which owed its origin to the war. The requirements of Southern States in butter fluctuate considerably in agreement with the winter season experienced by them. The indications are that the volume of the "interstate trade" in butter during this winter will exceed 30,000 boxes. The popular taste in Australia is for "fresh" butter which is held in preference to butter which has been subjected to cold storage.

A comparatively small quantity of butter was introduced by merchants into Victoria from New Zealand during the earlier months of the winter, and by far the greater portion of this butter was utilised for the purpose of the trade in tinned butter, and it was ultimately reconsigned by Victorian merchants to the markets in the East. By arranging to carry out the tinning operations in bond, payment of the duty charges imposed upon imported butter was avoided, and it thereby became possible to land New Zealand butter in Victoria, repack the butter into tin containers in bonded store, and later ship it to the East at a cost lower than the then prevailing quotation for Queensland butter. No exception can be taken to the indulgence in a trade of this nature, but the incident is mentioned because it was reported that the reason of the intake of butter from New Zealand was to the quality of Queensland butter being found unsatisfactory for the Melbourne market, but the statement was ill-advised, and quite unwarranted on the grounds alleged.

It was really the matter of difference in the relative cost of purchase between Queensland and New Zealand butters that militated against the exclusive use of Queensland butter for the purpose of meeting the entire shortage of Victorian requirements in butter. In other words, New Zealand was prepared to accept a price for butter which, exclusive of import duty, was somewhat below the figure at which Queensland was prepared to do business at the moment the purchase was effected. Only a limited quantity of butter of New Zealand origin actually passed into consumption in Victoria.

CHEESE.

The production of cheese in this State continues to be carried on upon a fairly extensive scale, and because of the population of Queensland being less than that of either New South Wales or Victoria, which are the other principal centres of cheese production in the Commonwealth, it automatically follows that there is a proportionate curtailment in the aggregate amount of cheese disposed of in the local market here, and that this State has a goodly percentage of the total production of cheese available for exportation every normal season.

Queensland's Foremost Position.

Queensland occupies the foremost position in respect to the quantity of cheese exported each year, and it is not an unusual happening for Queensland to contribute three to four fold the amount of cheese exported each year by the remaining States of Australia.

Within the year something more than 15,000,000 lb. of cheese was produced, the production being approximately 3,500,000 lb. in excess of that for the former twelve months.

This branch of dairying has reached a stage where it is necessary that careful consideration should be given to the matter of deciding the lines upon which the future development of the industry is to be directed.

In the initiatory stages of the manufacture of cheese in this State it frequently happened that a cheese factory was erected in a somewhat isolated centre to serve the needs of the small dairymen in a community who otherwise would have experienced great difficulty in marketing the milk raised on their farms.

Erection and Equipment of Factories.

As is customary in the case of settlers in a new locality, there was a limit to the amount of capital available for expenditure in the erection and equipment of the cheese factory, and although elaborate buildings and plant were not within reach, the factories generally served the purpose intended of them, and laid the foundation of the cheese industry in this State. However, what was tolerably serviceable as factory, plant, and equipment ten or more years ago fails to meet the requirements of to-day, particularly as we have reached a stage where the principal proportion of the total amount of cheese manufactured is marketed in oversea countries, which incidentally means that the quality of the cheese must be of a standard sufficiently high to withstand the stress of the voyage across seas.

Necessity of Pasteurising Equipment for Cheese Factories.

In previous reports the necessity to add pasteurising plants to the equipment of cheese factories has been emphasised, and if manufacturers here desire to retain a footing for their cheese in oversea markets, it is obvious that they must specially cater for the requirements of such markets, and supply a commodity of the standard of quality suited to the popular taste of the consumers. This can be done by arranging for the pasteurisation of the milk under accredited methods prior to manufacture, but before it is practicable the installation of milk-pasteurising plants at many cheese factories is necessary.

It is granted that money is required in order to purchase and equip a factory with a pasteurising plant, but the expenditure involved is warranted, and amongst the principal advantages to be gained by so doing are (*a*) improvement in the standard of quality, (*b*) material increase in the yield of cheese, (*c*) the production of a cheese which will better stand the conditions of transit from factory to cold store and from cold store to oversea markets. The benefits accruing under the heading of either (*a*) or (*b*) are material, and either is individually sufficient to merit the installation of a pasteurising plant forthwith in every cheese factory in receipt of a reasonable quantity of milk.

By no means at our command, other than the general adoption of the principle of pasteurisation of milk for cheese purposes at factories, is it possible to bring about the improvement in the general standard of quality of the cheese output from factories, a matter which is so essential in order to place this particular branch of the dairy industry upon a satisfactory and permanent footing.

One of the principal companies engaged in the manufacture of cheese installed a milk pasteurising plant at the head factory during the year, and the results derived from its use have been sufficiently beneficial to encourage the company to extend the principle of pasteurisation to some of the branch factories in the immediate future.

For some years past the annual reports submitted have been strong in the advocacy of pasteurisation of milk at cheese factories, and as a consequence it is interesting to record that the results accruing from the application of the principle of pasteurisation of milk at a cheese factory in this State stand in substantiation of the claims voiced in favour of the method by this office.

There remains no longer a doubt whether the adoption of efficient pasteurisation of milk will, when applied here, be equally as advantageous as it has proven to be in other countries. Any hesitancy by factories in the installation of milk pasteurisers on that score is no longer warranted, and the experience so far is that, both in respect to theory and practice, the pasteurisation of milk is a sound proposition for cheese factories, and the equipment of the cheese factory is alike imperfect and inadequate unless a replete pasteurising plant is included.

HERD TESTING.

The practice of testing the dairy herds of individual dairy farmers that were submitted simultaneously in any district or locality was continued throughout the year.

The importance and value of herd testing to the industry generally and those engaged in it individually has been frequently emphasised, and the advantages to be gained by the submission of the herds in unrestricted numbers to a butter-fat test has been advocated from practically every quarter competent to advise upon the matter.

Test Results the Best Evidence of Worth.

Babcock test results are the only undeniable form of evidence of the worth of a cow as an agent for the production of butter-fat. To rely solely upon appearance in the selection of a dairy cow, assessing her merits as a producer in accord with the degree to which she appeals to the eye, or even to weigh her milk without also determining the butter-fat content of same, is frequently, if not always, a misleading plan, and in this connection it is significant to relate that no owner of an untested dairy herd has yet been successful in accurately indicating to the herd-testing officer, prior to herd-testing operations, the relative order of merit of the cows in his herd; and, what is even more convincing, in proclaiming herd-testing as the one reliable means whereby the productive capabilities of a dairy cow are to be determined, is the fact that to date no owner of a dairy herd has been successful in his selection of the animal yielding the most butter-fat in his herd immediately prior to the commencement of the testing operations. Consequently, it can be claimed that herd-testing provides the solution of what otherwise would remain a most difficult and intricate problem—that is, the accurate assessment of the relative merits and demerits of the respective cows in the dairy herds as producers of butter-fat.

Without doubt herd-testing should be more fully patronised by dairy farmers, as it really constitutes the keystone of economic dairy farming.

The Difference Between Profitable Work and Drudgery.

Other things being comparable, it follows that dairy farmers utilising dairy cows capable of the production of something less than 120 lb. of butter per annum cannot successfully compete with dairymen elsewhere whose herds yield equivalent to 300 lb. of butter each year. There exists a distinct difference between "drudgery" and profitable dairy farming, and the elimination from the herds of the unprofitable cows, whose presence is to be exposed by the adoption of systematic herd-testing, leads on to the latter goal, along what is the shortest and most certain route.

Particulars of the localities at which testing was carried out and the results of the testing of the dairy herds within the year, as contained in the report of the Herd-testing Officer, are given below.

Report of the Herd-Testing Officer.

During the first month of the year I was engaged in testing dairy herds on the Atherton Tableland, and although the season was not very favourable for big yields, a fair number of dairymen availed themselves of the opportunity, with the result that twenty-seven herds were submitted and 690 cows tested.

On returning to the South, herd-testing was continued in various districts without interruption until the month of May, when, owing to continued dry weather conditions, testing operations slackened off until rain improved conditions slightly, and work was continued throughout the remainder of the year. The centres in which I have operated in the course of the year are as follows:—Atherton (in the North); Greenwood, Bell, Burton, Warra, Texas, Yelarbon, Gibinbell, and Kurrumbul (on the Darling Downs); Rosewood district in the West Moreton; and Boonara Estate, Goomeri, and Mundubbera in the Burnett.

Satisfied Dairymen.

In Greenwood district tests were continued from last year, and when the fourth testing period was completed in November the dairymen interested decided to discontinue the tests for a season or more, expressing entire satisfaction with the scheme, and they intend at a later date to again apply to this Department for the services of a herd-testing officer. In September a series of tests were commenced in the Warra district, also taking in a few herds from Ehlma and Brigalow to the west of Warra. Further tests were subsequently carried out in the months of December, March, and June, a total of fifty-nine herds being submitted and 1,580 cows tested.

Seasonal Set-backs.

From Yelarbon, on the South-western Railway, an application came along in December, and a testing centre was formed there early in January, with the result that the largest number of herds of the season was submitted and 823 cows tested. Great enthusiasm was shown at the time, and it was arranged to have a second test carried out in April; but on arriving there the season had been so dry and severe that practically all the dairymen were reduced to milking once a day, and only two herds were submitted.

In Goomeri district two tests were carried out in November and February, but here again weather conditions interfered with any further tests being taken during the season.

Texas, situated about 30 miles from Inglewood, was visited during December, and 645 cows were submitted to the Babcock test. Unfortunately, when a retest was mentioned later on, no response was received, and therefore no further tests were carried out. In February twenty-three herds were submitted and 505 cows tested in Mundubbera district, but here again weather conditions interfered with further tests.

At the end of February a series of tests were commenced in the Rosewood district, and subsequent tests taken during April and June. The Testing Association there asked to have a test carried out every sixty days, and I certainly think this an improvement on the ninety days period, which has, up to the present, been the custom under the scheme of herd-testing.

Although the number of herds submitted in this district are not large, much good work has already been done, and it is anticipated that, as summer approaches, many more dairymen will join in the movement. The total number of herds submitted during the year was 278, comprising 6,916 cows.

Test Results.

The daily average yield of milk of all animals tested is shown as 17.5 lb., and the average butter-fat per cent. 4.1, while the average yield of commercial butter daily amounts to .84 lb. The highest herd average recorded is 1.30 lb. commercial butter. If we compare a herd with an average production of 1.30 lb. commercial butter with a herd producing the average—viz., .84 lb. commercial butter daily—taking the lactation as 300 days and both herds containing forty cows, the following figures are of interest:—40 cows of the better herd produce 15,600 lb. of butter, while 40 cows of the average produce 10,080 lb., a difference of 5,520 lb. Taking butter at 1s. 6d. per lb., the best herd returns £1,170, against £750 for the poorer herd, a difference of 54 per cent. in favour of the better herd. If it were possible to improve the dairy herds throughout Queensland to that level, it would mean, roughly, £4,000,000 sterling additional to the dairy farmers of Queensland. While this may not be possible for many years to come, it should not be a very difficult task to raise the average production of our dairy herds by 25 per cent. Assuming that there are 400,000 dairy cows in the State, this would mean an approximate gain of £1,900,000.

During the year sixty-eight samples of herd milks have been analysed for solids; also a large number of skim milks have been put through, which in many instances have shown that considerable losses occur during the operation of skimming—in one instance to the extent of 2½ lb. butter per day.

In most cases an improvement is generally made by more speed, higher temperature, or an addition of more dishes in the bowl of the separator.

As in the past, every opportunity has been given to dairy farmers to learn the method of testing milk and cream, and a fair amount of time has been given to this. During the present season I have been so busy that very few inspections of herds have been made, although in many instances I have been asked to go; but on account of so much actual testing it has been impossible.

As will be observed from the summaries attached, many farmers do not continue the testing, which is much to be regretted, as it is impossible to make any estimate of an animal's production unless at least three testings are carried out.

In regard to this I think the Department should try in some way to exact a promise from applicants that they will continue the tests for at least six months. This would also help the Department in arranging the work of testing for the officers engaged in this work.

PARTICULARS OF DISTRICTS WHEREIN TESTING OPERATIONS WERE CARRIED OUT.

District.	Month.	Number of Cows.	Average Daily Yield of Milk.	Average Fat per cent.	Average Daily Yield of Commercial Butter.
			Lb.		Lb.
Atherton	July	690	13·3	4·3	·67
Greenwood	August ..	257	22·1	4·0	1·02
Ditto	November ..	279	20·4	4·0	·94
Goomeri	ditto ..	681	19·0	3·88	·87
Ditto	February ..	489	19·2	4·0	·89
Texas	December ..	645	18·9	3·7	·82
Yelarbon	January ..	823	20·8	3·8	·92
Ditto	April ..	39	..	..	..
Mundubbera	February ..	505	18·5	4·0	·86
Burton	March ..	157	18·8	4·2	·92
Warra	September ..	382	20·8	3·9	·91
Ditto	December ..	507	18·2	3·75	·80
Ditto	March ..	506	18·9	4·0	·88
Ditto	June	185	12·6	4·6	·68
Rosewood	February ..	156	19·5	4·0	·90
Ditto	April ..	298	12·4	4·4	·64
Ditto	June ..	155	12·0	4·1	·57
Koonda-ii	ditto ..	162	11·3	4·8	·64
Total	..	6,916	..	..	..
Mean average	..	..	17·5	4·1	·84

SUMMARY OF HERD-TESTING OPERATIONS.

Number of cows tested	6,916
Average daily yield of milk per cow	17.5 lb.
Average daily yield of commercial butter per cow	.84 lb.
Average fat per cent. of all cows tested	4.1 %
Highest average yield of milk in a herd per diem	28.7 lb.
Lowest average yield of milk in a herd per diem	4 lb.
Highest average yield of commercial butter in a herd per diem	1.30 lb.
Lowest average yield of commercial butter in a herd per diem	.28 lb.
Highest average fat per cent. in milk of a herd	6.1 %
Lowest average fat per cent. in milk of a herd	3.0 %
Highest yield of milk recorded for a cow per diem	45.5 lb.
Highest yield of commercial butter recorded for a cow per diem	2.18 lb.
Highest test recorded	7.9 %
Lowest test recorded	1.2 %

Technical Instruction.

The conveying of instruction to those engaged in the manufacture of dairy produce was continued throughout the year, and an increased number of requests was received for assistance in dealing with what may be regarded as the more intricate or technical phases connected with the manufacture of dairy products. The applications from factories were of particularly frequent occurrence during the warmer months of the summer, which is naturally the period wherein factories experience the most difficulty in the treatment of the milk or cream received from the dairy farms.

At present there are five dairy instructors engaged upon the dairy staff, but owing to the growing demand from factories for their services and the appreciable expansion of the industry which has taken place within recent years, the time is at hand when consideration must be given to the advisability of strengthening the number of dairy instructors somewhat.

Analyses.

A considerable number of samples of dairy produce, also water used for dairy factory purposes and ingredients employed in the manufacture of either butter or cheese, such as salt, rennet, preservative, artificial colouring matter, were submitted during the year to the Agricultural Chemist (Mr. J. C. Brünnich) for analysis, and the Government Bacteriologist (Mr. C. J. Pound) carried out the examination of many specimens of dairy products forwarded for bacteriological purposes by the Dairy Branch.

CONSERVATION OF FODDER.

No distinctive progress was made during the year in the matter of conservation of fodder in any of the accredited forms; consequently, as a result of the somewhat severe winter and with a decrease in the customary amount of the rainfall, coupled with an absence of ample supplies of fodders stored on the dairy farms in readiness to draw upon for the feeding of dairy stock, there occurred a noticeable shrinkage in the quantity of dairy produce raised during the winter period.

Insurance Against Shortage.

Dairy farmers will fail to enjoy the maximum return from their industry until such time as every dairyman conserves on his farm an ample supply of fodder to meet the requirements of his herd during every period of shortage in the supply of field pastures.

The conservation of fodder on an elaborate scale is something that cannot be achieved without the exertion of considerable effort on the part of owners of dairy herds, but there is no denying the advantages that are to be gained by the general adoption of a higher standard of animal husbandry.

The dairy farmer who conserves his fodder scores heavily during periods of dry weather over the man who does not practise the conservation of fodder. The former receives comparatively higher monetary returns from the factory for his produce; he reduces the risk of loss in his stock to a minimum, and immediately the season changes to normal his cows respond with an increased flow of milk, owing principally to the fact that their vigour had not been impaired by the temporary withholding of sufficient nutriment.

It appears that in the aggregate the advantages to be gained by fodder conservation are too great to sacrifice longer, and the way to overcome the difficulty is for every dairy farmer to conserve a supply of fodder on the farm, either in the form of ensilage or as hay in stacks, according to the kind of crop which may grow to best satisfaction in his particular locality.

THE BANANA BEETLE BORER—IV.*

BY JOHN L. FROGGATT, B.Sc., of the State Entomological Staff.

Mr. Froggatt is specially investigating the history and habits of the Banana Beetle Borer, and subjoined is his fourth progress report which has been made available by the Minister for Agriculture and Stock (Hon. W. N. Gillies).

The following report covers the period August to December, 1922, during which the course of this research work was considerably interrupted through several causes. As assistance was not available, some lines of experimentation have not been able to be carried to such lengths as was anticipated. Observations on the habits and life history of the borer have been continued, and some fresh lines of investigation begun.

Those more directly interested in banana-growing are being more generally seized with the seriousness of the position as regards the menace of the banana beetle borer to the industry. During the last six months, further information, obtained on the distribution and depredations of this pest, shows it to be present in several parts previously thought to be clean. In one case reported, the plants were trying to throw bunches, but had only enough strength to partially develop half the first hand, and sometimes a few fingers on the second. The grubs of the beetle borer had completely riddled the butts, and had travelled 2 feet to 3 feet up the stems. Although speaking volumes for the vitality of the banana plant, it shows what havoc the borer will cause if allowed to run wild, and further, what a huge menace to the district such a plantation is.

THE EGG.

With imagos under observation, the rate of oviposition remained low throughout August; early in September, however, it increased most markedly and remained high until the middle of November, when it began to decrease again. From then, to the end of December, it has shown fluctuations, but has been below the average of September-October. The counts of the eggs, month by month, are given in Table A. A considerable increase in the activities of the beetles, in the field, was manifested in the first half of September, as compared with those pertaining in the previous month, thus corroborating laboratory observations.

These data, taken in conjunction with others previously obtained, appear to show that there are two periods in the year during which the activity of the beetles is infinitely greater than at other times—namely, March to the middle of May, and September to the middle of November (both inclusive); their activity appears to be greater in the summer than in the winter months.

Eggs laid in September matured in an average of 15 to 17 days; in October in 9.6 to 10.7 days; in November in 6.4 to 7.7 days; and in December in 6 days. Further details are given in Table B.

About twenty-four hours before the larva is ready to emerge, the jaws appear as two fine brown lines; then the palpi are to be seen, and later, the plates of the head. This gradual development is plainly visible through the egg envelope. When ready to emerge, the larva eats a hole in the covering, and by contracting and expanding the body, gradually draws itself out, at the same time working its way into the plant.

THE LARVA (OR GRUB).

The grubs have been largely bred in thin slices of corm, changed as required, in order that their development might be more closely studied. The rate of mortality amongst those transferred was exceedingly high, but sufficient were bred to enable definite data to be obtained. The larva casts its skin (or "moults") at least twice before reaching maturity; one took place 5 to 7 days, and, another, 20-24 days, after emergence; there are probably one or more moults between those cited.

The period for the larva to reach full developmnt has been found to be from 55 to 60 days (eggs laid 4-12 September, 1922) to 27 to 33 days (eggs laid 3-6 November, 1922). Details of observations are given in Table C.

When the larva has finished feeding, it lies comatose in the end of the larval tunnel, the body becoming flaccid and elongated and the thoracic segments more prominent. This dormant period lasted for 2 to 3 days, when the larval skin was cast, leaving the pupa lying bare.

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* No. 1, "Queensland Agricultural Journal," September, 1921, Vol. XVI., pp. 200-208.
No. 2, "Queensland Agricultural Journal," May, 1922, Vol. XVII., p. 240.
No. 3, "Queensland Agricultural Journal," October, 1922, Vol. XVII., p. 279.

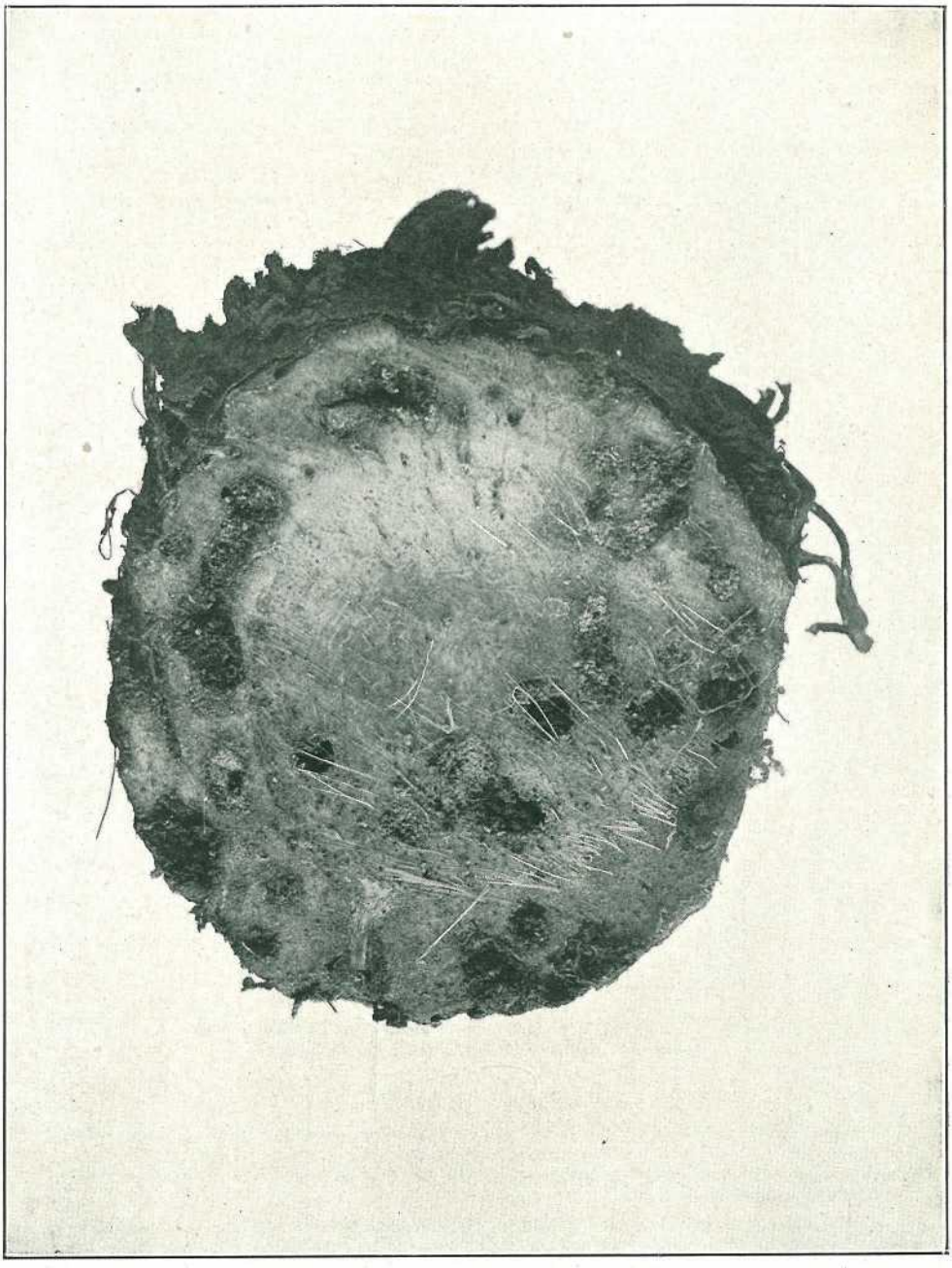


PLATE 22.—INFESTED BANANA CORM, SHOWING GRUB TUNNELS.

THE PUPA (OR CHRYSALIS).

With larvæ pupating in September, the pupal period was 12 to 14 days; early in October it had decreased to 8 to 11 days; and in November-December the average was 6-7 days. Details are given in Table D.

From one to two days before the beetle is ready to emerge, a faint colouring of the joints of the legs is first noticed, and a little later, the plates of the head; this gradually spreads then deepens in tint until the whole body is a lemon, to light reddish-brown, which is the colour of the beetle on leaving the pupa.

In some cases a few fibres are found in the rear end of the pupal chamber; this is more generally found in old corms of a dry nature.

Records on the full life-cycle (from egg to emergence of beetle) gave 78 to 86 days for eggs laid 4-12 September, 1922, the period gradually decreasing to 41 to 44 days for those laid 3-6 November, 1922. Details are given in Table C.

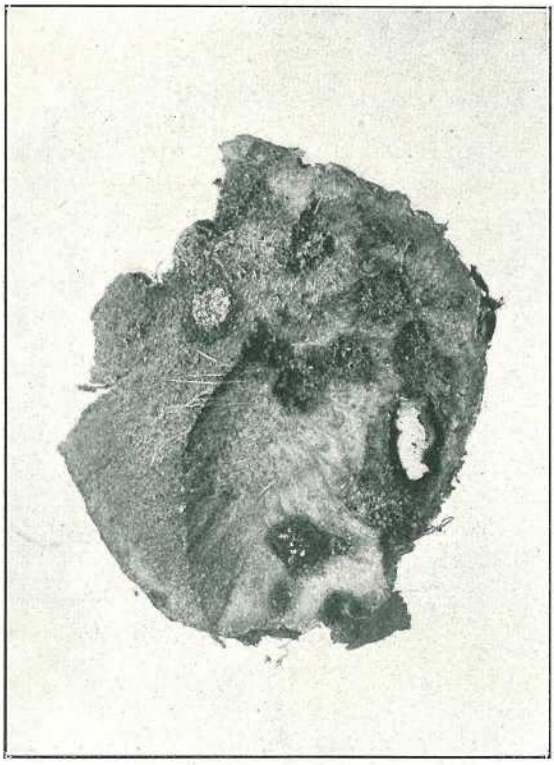


PLATE 23.—BANANA CORM, SHOWING GRUB TUNNELS AND PUPA OF BANANA BETTLE BORER, IN SITU.

THE IMAGO (OR BEETLE).

The beetles lie dormant for 6 to 7 days before showing any marked inclination to move about, by which time they are a very dark reddish-brown in colour. They do **not** become fully coloured for about 14 to 15 days (average) after emergence, and often take longer than this.

The rate of mortality amongst the newly-emerged beetles bred in the laboratory was very high. Field observations, to check this under natural conditions, were not practicable.

Continued observations on the longevity of the imagos have shown that feeding on banana corm they live 474 to 489 days; in this case the beetles were collected in a plantation on 11-18 May, 1921, and died out 4-12 September, 1922. Imagos bred from pupæ, collected in the field and fed on corm, lived for a maximum period of 471 to 488 days. Details of the results of these observations are given in Table E.

Progressive results (in percentages) of the total number of beetles alive in this series are shown in Table F.

In moist or damp soil, the beetles will live without food for some time, but kept under by dry conditions they die rapidly.

Tests on the poisoning of corm baits have been continued, but owing to a continued scarcity in the number of beetles to hand, and numerous interruptions affecting the essential continuity of procedure, this work could not be carried to the degree of finality that was anticipated. A number of tests were made with borax as the active principle. Over long periods of exposure to the treated corm, this chemical was found to be extremely deadly on the beetles, but over shorter periods, such as would normally be the case under field conditions, it was not nearly so effective. No test, so far, has given results comparable with those obtained with either "Paris green" or arsenite of soda, used as dry powders. (*Vide* Banana Beetle Borer III., "Agricultural Journal," October, 1922.)

Experiments have been made in both the laboratory and the field to ascertain the powers of flight, if any, of the imagos. In order to prevent them crawling away, a kerosene tin was cut down and filled with water: the beetles were placed in a tin lid, without corm, on a float, moored in the centre of the tin. These tests were started, both in the morning, and late afternoon, during October, November, and December. In no case did beetles get across the water. Further series of tests, on this function of the adult, will be carried out at a later date.

Where beetles are exposed to heat, in such a way that they are unable to crawl from it, they roll on to their backs, and after waving their legs in the air for a few seconds, die. The heat of the sun on a tin lid is sufficient to give this result. In no case have they been observed to even attempt to expand their wings.

It has been stated that the beetles can be drowned by submergence in water. In order to test this, a given number of beetles were taken in each of five lots, one, acting as a control, with the beetles feeding on corm over damp earth; in the other four, no corm was placed. In No. 1 the earth was damp, in No. 2 it was wet, and in No. 3 it was waterlogged. In No. 4 the beetles were submerged in ordinary tap water. In Nos. 1, 2, and 3, the beetles were buried in the soil. After a period of ninety-six hours' immersion, 90 per cent. were removed alive from these lots and, feeding on corm, were still alive ten days later. It, therefore, does not seem at all likely that it would be practicable either to drown the beetles out of a plantation, or, even kill them by immersing infested suckers in water. It should be stated that the jars, in which the tests were made, were exposed to ordinary room temperature throughout the course of each series.

Preliminary tests have been made with Paradichlorobenzine in order to ascertain its action on the beetle borer when added to the soil.

Laboratory experiments have shown that, when a few grains of the chemical are sprinkled on the bottom of a tin, and covered with 4 inches of soil, beetles, being buried 3 inches below the surface, they appear on top of the soil within two to three hours, whereas, under similar conditions without the chemical, they do not show up within at least eight hours. It thus drives them out from a confined area. The odour was quite noticeable in the soil for more than a fortnight after being treated. In a closed space, its vapours are exceedingly deadly on both the grubs and the beetles. Field tests with this compound have not yet been carried far enough to enable conclusions to be drawn from them.

There is no doubt whatsoever, but that the most important factor in laying out a plantation, in relation to this pest, is to start with clean suckers. There is far too great a spirit of laxity over this matter, although more attention is now being paid to it than heretofore. It is not sufficient to see a plantation looking healthy and in other ways prosperous, to say that it is free from beetle borer. It may be present to a very slight extent, even in only a few stools. A careful examination should be made before taking suckers from any plantation, particular attention being paid to old stems and butts; if the pest is present, the grub tunnels will be found. Even if the plantation appears to be free, make doubly sure of obtaining clean suckers by never allowing the suckers to lie on the ground, overnight, in the plantation; or, in other words, do not dig any more suckers than can be carted away that same day.

As no new advice can be given on remedial measures, it is unnecessary to reiterate what has been published before on it.

Statements have been made that small red ants destroy a considerable number of the grubs of the beetle borer. In order to do this, they must first gain entrance to the tunnels in the corm. During the last twelve months, a careful watch has been kept, in a large number of plantations for any occurrence of ants in banana corms. In old bulbs, where the beetles emerging had left openings onto the surface, ants

have been found nesting, often in considerable numbers, in old disused tunnels. In the new workings, where the grubs were, however, they have never yet been seen. It was not expected that they would be, because the grubs pack up the tunnels so tightly behind them with their sawdust-like excreta, that the ants are unable to reach them.

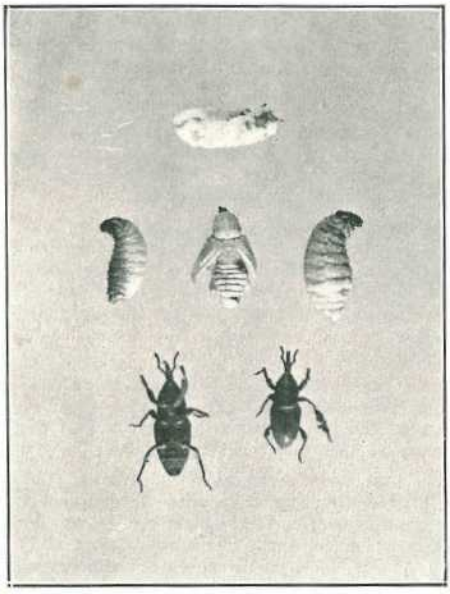


PLATE 24.—GRUB PUPA, AND ADULT OF BEETLE BORER.
(Natural size.)

Owing to numerous inquiries having been made as to what the beetle is like, &c., it is thought advisable to add a few brief notes on the various stages.

The eggs are small white objects, about one-twelfth of an inch long; they are laid singly in small burrows, lying just under the surface of the plant, at about ground-level.

The grub, on emerging from the egg, begins to tunnel its way into the plant, packing up the space behind with sawdust-like excreta. When fully developed, it comes to rest close to the surface of the bulb and turns into the pupa. When full-grown, it is about half an inch long, the body creamy white with the head reddish-brown. It is in this stage that the borer does the damage to the plants, the grubs devouring an enormous amount of plant material.

The pupa (or chrysalis) is slightly under half an inch in length; it is creamy white and shows the outlines of the beetle. This is a quiescent stage.

The beetle is slightly less than half an inch long and jet black in colour. It has a long, slightly-curved trunk, in front of the head. It is extremely sluggish, and pretends to be dead when disturbed.

In conclusion, the writer wishes to express his indebtedness to Messrs. Brünnich (Chemist's Branch) and Coleman (Pure Seeds Branch) for supplying samples of Paradichlorobenzine for experimental purposes.

SUMMARY OF CONCLUSIONS.

I. Development and deposition of eggs is at its maximum in spring and autumn, decreasing most markedly in summer and winter.

II. The imagos, feeding on corm, have lived for more than seventeen lunar months in captivity.

III. The beetles can survive an immersion in water, at room temperature, of ninety-six hours' duration.

IV. Tests on the powers of flight of the imagos have, so far, given negative results.

V. Para-dichlorobenzine, in laboratory tests, has shown strong toxic properties on the beetles in a confined space.

VI. Care in obtaining suckers free from the pest cannot be too strongly emphasised.

EXPLANATION OF PLATES.

No. 1. Section of Banana Corm, showing Grub Tunnels and Nature of Injury.

No. 2. Pupa of Banana Beetle Borer in situ.

No. 3. Larvae, Pupæ, and Imagos of Banana Beetle Borer.

TABLE A.

Lot. (Refer to Table F).	Eggs Laid to 31st July, 1922.	Eggs Laid for Months of—					Total Eggs Laid to 23rd December, 1922, in the Lots.
		August, 1922.	September, 1922.	October, 1922.	November, 1922.	December to 23rd inst.	
*E	55	0	..	..	..	..	55
F	507	0	..	..	..	..	507
G	2,084	0	0	..	..	..	2,084
H	62	0	..	..	..	..	62
I	1,653	1	0	..	..	..	1,654
J	559	1	7	0	..	..	567
K	697	0	0	0	..	..	697
L	435	0	..	..	..	..	435
T	191	0	25	31	11	0	258
U	16	0	0	..	..	..	16
V	87	4	0	..	..	..	91
*W	3	2	1	3	7	..	16
X	2	6	159	322	151	71	711
Y	..	1	163	412	189	116	881
Z	..	..	30	361	223	85	699
1	..	..	..	147	140	22	309
2	..	..	..	120	120	20	260
3	..	..	..	..	99	111	210
4	..	..	..	..	..	210	210
5	..	..	..	..	..	0	0
Totals ..	6,351	15	385	1,396	940	635	9,722

TABLE B.

Eggs Laid.	Days to Showing of First Sign of Mandibles.	Days Thence to Emergence of First Larva.	Days for Total Emergence.
28/8/22 to 29/9/22	9·5–15·8	2·4	15–17
	(Max. 14–21)	..	(Max. 19–26)
	(Min. 7–11)	..	(Min. 13–14)
29/9/22 to 30/10/22 ..	7–8	1	9·6–10·7
	(Max. 9)	..	(Max. 11–13)
	(Min. 6)	..	(Min. 8–9)
30/10/22 to 27/11/22 ..	5·6	1	6·4–7·7
	(Max. 7)	..	(Max. 7–9)
	(Min. 5)	..	(Min. 6–7)
27/11/22 to 20/12/22 ..	5	1	6
	..	..	(Max. 6–7)
	..	..	(Min. 5–6)

TABLE C.

Eggs Laid.	Egg Period in Days.	Larval Period in Days.	Pupal Period in Days.	Full Life Cycle in Days.
4-12/9/22	18–21	55–60	5 (Min.)	78–86
13-19/9/22	19–20	48–49	7	69–76
18-22/9/22	14–15	55–58		69–73
19-26/9/22	18–20	41–42	6	60–68
22/9/22–12/10/22	11·2–12·8	42·6–47·2	6·6–7·8	59·2–65·4
12-27/10/22	7·5–10	36–39·7	6·5–7·7	52·5–56
27/10/22–3/11/22	5·5–9	33–34·5	5–6	44·5–49
3-6/11/22	6–8	27–33	5–6	41–44

TABLE D.

Larva Dormant.	Larva Pupated.	Pupa Coloured.	Imago Emerged.	Dormant Period in Days.	Days from Colouring to Emergence.	Pupal Period in Days.
..	16-18/9/22	29-30/9/22	30–9/22 to 1/10/22	..	1–2	13–14
18/9/22	23-25/9/22	4-5/10/22	6-7/10/22	5–7	2	12–13
30/9/22	3-4/10/22	..	13-14/10/22	3–4	..	9–11
9/10/22	11-12/10/22	18-19/10/22	20-21/10/22	2–3	2	8–10
16/10/22	16-17/10/22	23/10/22	25/10/22	..	2	8–9
13/11/22	15-16/11/22	20/11/22	22-23/11/22	2–3	2–3	7
10/11/22	11-13/11/22	..	19/11/22	1–3	..	6–8
20/11/22	20-21/11/22	25-27/11/22	27-28/11/22	..	1–2	7
24/11/22	26-27/11/22	30/11/22 to 3/12/22	2-4/12/22	2–3	1–2	5–7 (av.)
29/11/22	30/11/22	4-5/12/22	6-7/12/22	1	2	6–7
1/12/22	3/12/22	8-9/12/22	10-11/12/22	2	1–2	7–8 (av.)
4/12/22	5-11/12/22	10-15/12/22	11-17-12/22	1	2–3	7–8 (av.)
7/12/22	7-11/12/22	13-15/12/22	14-17/12/22	1–2	1–2	6–8 (av.)
8/12/22	9-10/12/22	14/12/22	15-16-12/22	1–2	1–2	6
11/12/22	11-13/12/22	16-17/12/22	17-18/12/22	1	1	5–6
11-14/12/22	14-15/12/22	20/12/22	21-22/12/22	1	1–2	7

TABLE E.

Collected or Bred.	Lot. (See Table F.)	Dates of Collection or Breeding.	Dates of Last Death.	Life in Days.	Life in Terms of Lunar Months, &c.
Bred ..	E	24-27/4/21	1-15/8/22	471–488	16 months 3 weeks and 2 days to 17 months 1 week and 5 days
Collected ..	F	29/4/21 to 5/5/21	25/7/22 to 1/8/22	454–461	15 months 3 weeks and 5 days to 16 months 1 week and 4 days
Collected ..	G	11-18/5/21	4-12/9/22	474–489	16 months 3 weeks and 5 days to 17 months 1 week and 6 days
Collected ..	H	24/5/21	21-28/8/22	454–461	16 months and 6 days to 16 months 1 week and 6 days
Collected ..	I	28/5/21 to 4/6/21	18-22/9/22	478–482	17 months and 2 days to 17 months and 6 days
Collected ..	J	18/7/21	6-10/10/22	445–449	15 months 3 weeks and 4 days to 16 months and 1 day
Collected ..	K	1/8/21	29/9/22 to 3/10/22	424–428	15 months and 4 days to 15 months 1 week and 1 day
Collected ..	L	2-15/9/21	1-15/8/22	320–347	11 months 1 week and 5 days to 12 months 1 week and 4 days
Collected ..	T	21-24/2/22	4-8/12/22	283–290	10 months and 3 days to 10 months 1 week and 3 days
Collected ..	U	14-15/3/22	4-12/9/22	172–181	6 months and 4 days to 6 months 1 week and 4 days
Collected ..	V	10-11/5/22	25-29/9/22	198–203	7 months and 2 days to 7 months and 1 week
Bred ..	W	16-20/4/22	27/11/22 to 1/12/22	221–224	7 months 3 weeks and 4 days to 8 months

TABLE F.

Lot.	*E.	G.	H.	I.	J.	K.	L.	T.	U	V	*W.	X.	Y.	Z.	1	2	3	4	*5
Date Collected or Bred.	24-27/4/21.	11-18/5/21.	24/5/21.	28/5/21 to 4/6/21.	18/7/21.	1/8/21.	2-15/9/21.	21-24/2/22.	14-15/3/22.	10-11/5/22.	16-20/4/22.	20-21/7/22.	1-12/8/22.	1-16/9/22.	13/10/22.	18/10/22.	7-8/11/22.	27-30/11/22.	1-4/12/22.
No. Collected.	16	379	26	324	85	119	72	50	16	190	9	144	90	150	58	50	270	100	7
Alive on—	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1/8/22 ..	6·8	15·0	3·9	11·1	4·7	·8	1·4	22·0	12·5	89·5	77·8	95·8	..	..	..	..	..	..	..
15/8/22 ..	..	7·1	3·9	8·7	4·7	·8	..	16·0	6·3	87·9	55·6	95·8	100·0	..	..	..	..	..	..
28/8/22 ..	..	3·2	..	5·6	4·7	·8	..	12·0	6·3	78·9	44·4	94·5	98·9	..	..	..	..	..	..
12/9/22 ..	..	..	..	1·2	2·3	·8	..	10·0	..	2·1	44·4	93·8	96·7	..	..	..	..	..	..
22/9/22 ..	..	..	..	..	2·3	·8	..	10·0	..	1·1	44·4	92·4	93·3	100·0	..	..	..	..	..
29/9/22 ..	..	..	..	..	1·1	·8	..	10·0	..	..	33·3	92·4	91·1	100·0	..	..	..	..	..
3/10/22 ..	..	..	..	..	1·1	..	..	10·0	..	..	22·2	91·7	87·7	100·0	..	..	..	..	..
10/10/22	..	..	..	..	..	..	..	10·0	..	..	22·2	90·3	86·7	100·0	..	..	..	..	..
16/10/22	..	..	..	..	..	..	..	6·0	..	..	22·2	90·3	85·6	100·0	100·0	..	..	..	..
23/10/22	..	..	..	..	..	..	..	4·0	..	..	11·1	87·5	83·3	99·3	93·1	100·0	..	..	..
10/11/22	..	..	..	..	..	..	..	1·0	..	..	11·1	77·8	76·7	96·0	87·8	98·0	100·0	..	..
1/12/22 ..	..	..	..	..	..	..	..	1·0	..	..	..	65·2	68·9	90·7	81·0	92·0	95·2	..	..
8/12/22 ..	..	..	..	..	..	..	..	..	..	..	..	64·6	66·7	89·3	81·0	86·0	94·1	99·0	100·0
15/12/22	..	..	..	..	..	..	..	..	..	..	..	60·4	60·0	86·0	75·8	80·0	92·9	99·0	100·0
30/12/22	..	..	..	..	..	..	..	..	..	..	..	52·8	53·3	83·3	70·6	74·0	89·6	96·0	100·0

A SUMMARY OF SOME EXPERIMENTS CARRIED OUT BY THE BUREAU OF SUGAR EXPERIMENT STATIONS—VI.

BY H. T. EASTERBY, Director.

The first article of this series, in the course of which Mr. Easterby discussed deep cultivation experiments and tabulated comparative crop results from subsoiled and non-subsoiled fields, was published in the May (1922) *Journal. The second instalment, an account of the results of irrigation experiments and the action of irrigation and manures upon the density and purity of sugar juices, appeared in the June* (1922) *issue. The third instalment, treating of experiments in fertilisation, was published in the August number. The September issue contained an account of distance experiments and resultant crops. In the October Journal, Mr. Easterby continued his summary, with notes on the introduction and testing of cane varieties and the testing of certain varieties of cane at Mackay.*—Ed.

Experiments to Determine if Cane Sets Cut from Arrowed Canes have a Prejudicial Effect on the Germination and Subsequent Yield.

It has been frequently stated that cane planted from arrowed sets resulted in a poorer strike and a lower tonnage of cane per acre. No definite information upon this point exists in Queensland, and it is usual to advise the planting of non-arrowed sets where possible. In order that reliable data upon the question might be secured, an experiment was laid down at the Mackay station in a most careful and accurate manner. An absolutely uniform piece of land was chosen and carefully prepared.

The plants were selected from a field of cane of the variety known as Q. 116. This was all of the same age, but some had arrowed while other portions had not. Care was taken to choose canes for plants under both these conditions that were as like each other as possible in all details except arrowing. The same number of three-eye plants were placed in every drill.

Great care was taken in the planting, each one being carefully inspected before placing in the drill, so that every precaution might be taken that none of the eyes were in any way damaged. The germination was most carefully noted every week during the early period of growth, every shoot showing in both plots being counted.

Early in December, whilst the process of stooling out was in progress, a further count of every shoot above ground was made.

The cane in both plots grew exceedingly well and made a fine stand. From the counts at the times abovementioned, the following table has been compiled:—

DETAILS OF GERMINATION IN THE ARROWED AND NON-ARROWED PLANT EXPERIMENT.—PLANT CROP 1914.

Number of Plot.	Variety of Cane.	Date of Planting.	Total Number of Eyes Planted.	Plants Cut from—	Date of First Germination.	Shoots Showing on 4th Sept.	Shoots Showing on 11th Sept.	Shoots Showing on 18th Sept.	Shoots Showing on 25th Sept.	Shoots Showing on 2nd Oct.
1	Queensland 116	1913. 5 Aug.	528	Arrowed Cane	1913. 28 Aug.	87	148	190	214	232
2	Queensland 116	5 Aug.	528	Non-arrowed Cane	25 Aug.	122	178	238	287	306

PLATE 25.—SUGAR EXPERIMENT STATION, GORDONVALE, N.Q.

DETAILS OF GROWTH IN THE ARROWED AND NON-ARROWED PLANT EXPERIMENT—PLANT CROP, 1914.

No. of Plot.	Variety of Cane.	Date of Planting.	Total No. of Eyes Planted.	Plants Cut from—	No. of Shoots Showing on 9th October, 1913.	No. of Shoots Showing on 1st December, 1913.	Actual Count of Canes on 1st August, 1914.
1	Queensland 116	5 Aug., 1913	528	Arrowed cane	260	748	770
2	Queensland 116	5 Aug., 1913	528	Non-arrowed cane	335	888	777

From the above tables it will be seen that the non-arrowed cane sets assumed the lead, which was maintained right up to August, 1914, but it is noteworthy that the big lead in the beginning was reduced to almost equal numbers by that date, and the arrowed cane finally produced almost as many sticks as that planted from non-arrowed cane.

Summary of Crop Results.

TOTAL CROP RESULTS TO DATE OF CANE IN THE ARROWED AND NON-ARROWED PLANT EXPERIMENT—PLANT AND FIRST RATOON CROPS, 1914-1915.

Number of Plot.	Variety of Cane.	Plants Cut from—	PLANT CROP, 1914.		FIRST RATOON CROP.		TOTAL YIELD—TWO CROPS.	
			Yield of Cane per Acre in English Tons.	Yield of Sugar per Acre in English Tons.	Yield of Cane per Acre in English Tons.	Yield of Sugar per Acre in English Tons.	Yield of Cane per Acre in English Tons.	Yield of Sugar per Acre in English Tons.
1	Queensland Seedling 116	Arrowed Cane ..	55·5	8·2	29·7	4·9	85·2	13·1
2	Queensland Seedling 116	Non-arrowed Cane	51·9	8·0	27·3	4.5	79·2	12-5

The above table shows that the yield from the cane where arrowed cane was used for planting gave a higher yield in the case where the plants were cut from non-arrowed cane.

QUEENSLAND TREES.

BY C. T. WHITE, F.L.S., Government Botanist, and W. D. FRANCIS, Assistant Botanist.

No. 17.

THE BLACK APPLE OR BLACK PLUM (*Sideroxylon australis*).

Its large bluish-black fruit has made this species fairly well known, especially in the temperate coastal parts of New South Wales, such as Illawarra. There is a purplish-black dye in the "skin" of the fruit, and the large, very hard, glossy seeds when pierced at the ends are sometimes made into necklaces or other ornaments by children. The trees attain a height of 100 feet and a barrel diameter of 2 feet. The large tree shown in the picture illustrates the typical form of the species. The channels or grooves in the barrel are very often seen in the trees. In common with other species of Sideroxylon, the bark and green parts of the Black Apple when cut or bruised exude a milky juice, but in some cases we have noticed that the exudation of the latex from the green parts is scanty. The tree is found in the rain forests of Eastern Australia, from Illawarra, New South Wales, to Rockingham Bay, North Queensland.

Photo. by W. D. Francis.]

PLATE 26.—THE BLACK APPLE OR BLACK PLUM (*Sideroxylon australis*).
A tree on Tambourine Mountain.

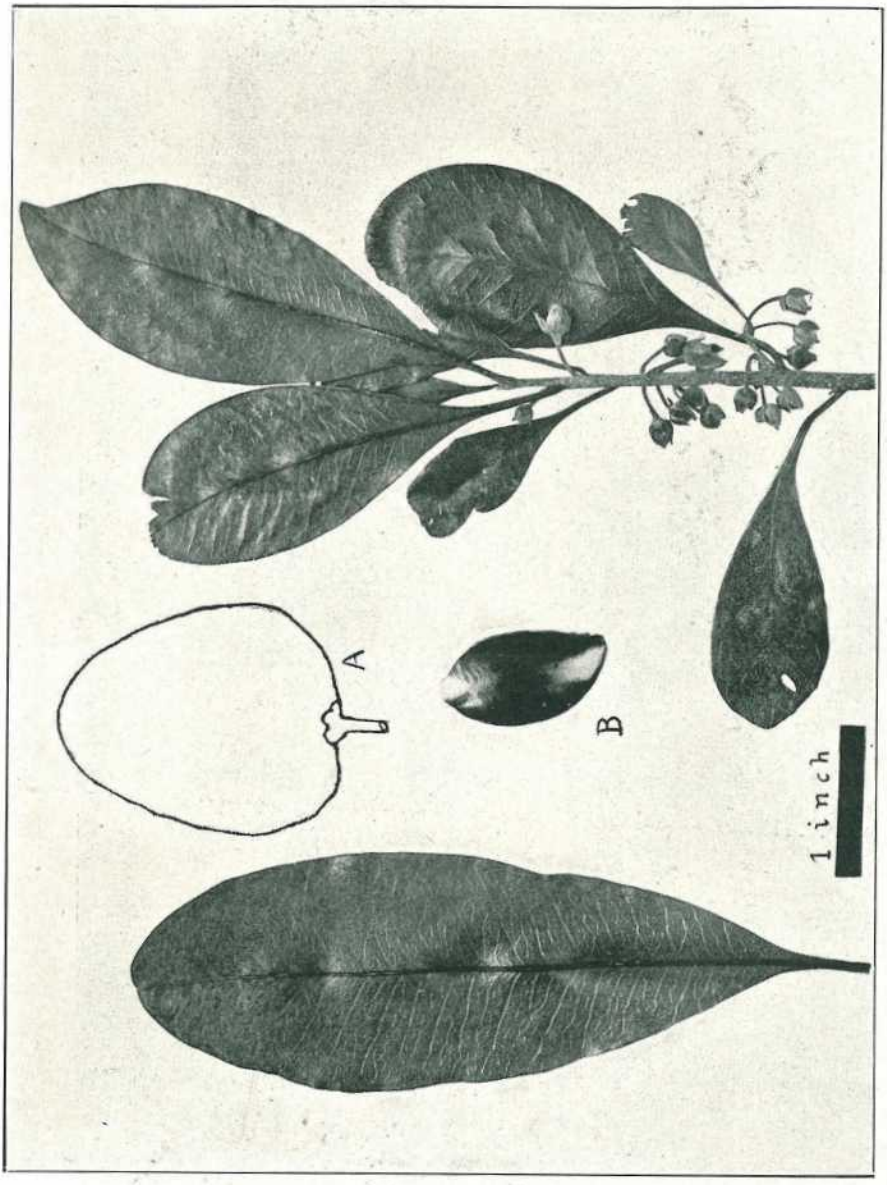


Photo by Dept. Agriculture and Stock.] PLATE 27.—BLACK APPLE OR BLACK PLUM.

A.—Diagram of fruit, slightly reduced. B.—A seed.

THE DAIRY HERD, QUEENSLAND AGRICULTURAL COLLEGE, GATTON.

MILKING RECORDS FOR DECEMBER, 1922.

Name of Cow.	Breed.	Date of Calving.	Total Milk.	Test.	Commercial Butter.	Remarks.
			lb.	%	lb.	
Pretty Maid of Harelmar	Ayrshire ...	11 Sept., 1922	960	3·7	41·40	
Bellona	,, ...	30 Aug., ,,	900	3·8	39·90	
College Meadow Sweet	Friesian ...	18 Sept., ,,	930	3·6	39·00	
Thyra of Myrtleview	Ayrshire ...	22 Aug., ,,	810	4·0	37·80	
College Mignon ...	Jersey ..	22 Nov., ,,	660	4·8	37·20	
Confidence... ...	Ayrshire ...	13 Aug., ,,	750	3·8	33·30	
Hedges Nattie ...	Friesian ...	20 May, ,,	660	4·2	32·40	
Yarraview Snowdrop	Guernsey ...	1 Sept., ,,	540	4·9	31·20	
College La Cigale	Jersey ...	10 July, ,,	420	5·9	29·10	
Songstress ...	Ayrshire ...	4 July, ,,	630	3·9	28·80	
Miss Fearless ...	,, ...	30 May, ,,	630	3·9	28·80	
Dawn of Warragaburra	Jersey ...	17 May, ,,	540	4·5	28·50	
Wattle Blossom ...	Guernsey ...	8 Sept., ,,	540	4·2	26·70	
La Hurette Hope	Jersey ...	30 June, ,,	420	4·9	24·30	
Dear Lassie ...	Ayrshire ...	19 June, ,,	540	3·8	24·00	
Netherton Belle ...	,, ...	19 July, ,,	450	4·3	22·50	
Miss Betty ...	Jersey ...	15 May, ,,	360	5·1	21·60	
College St. Margaret	,, ...	16 June, ,,	330	5·5	21·30	
College Bluebell ...	,, ...	22 Oct., ,,	390	4·7	21·30	
Hedges Dutchmaid	Friesian ...	23 Sept., ,,	540	3·3	20·70	

Rainfall for the Month, 313 points.

WEEDS OF QUEENSLAND.

BY C. T. WHITE, Government Botanist.

No. 29.

THE PEACH LEAF POISON BUSH OR WILD PEACH (*Trema aspera*).

Description.—A shrub or small tree, branchlets clothed with rather soft hairs. Leaves usually 2-3 inches long and about ¾-1 inch broad, borne on stalks of 3-4 lines, the base more or less rounded, the apex tapering into a rather slender point. Upper surface rough, with short rigid hairs, under surface velvet-hairy, edges serrate. Flowers small, borne in short bunches (cymes) in the axils of the leaves. Fruit black, ovoid or globose, 1-2 lines in diameter.

Distribution.—A very common plant of Northern and Eastern Australia, often comes up very thickly as secondary growth on "scrub" farms.

Botanical Name.—*Trema* from the Greek *trema*, a hole (the hard bony covering (endocarp) of the seed is rough and pitted with holes); *aspera*, Latin, meaning rough, referring to the roughness of the upper surface of the leaf.

Poisonous Properties.—*Trema aspera*—variously known as Wild Peach, Poison Peach, or Peach Leaf Poison Bush—is commonly regarded as one of our worst poisonous plants, and there are numerous references to it as a plant reputed poisonous to stock in the writings of Australian botanists. It has been held by some that the harmful effects attributed to the plant were due to its tough and indigestible nature, when ingested by stock in the absence of softer and more palatable feed, as the plant belonged to a family of plants, the Ulmaceæ, the members of which as a general rule are quite wholesome.

In the proceedings of the Royal Society of Queensland (vol. 32, No. 11) Mr. F. Smith, B.Sc., and the writer, published a paper showing that at times the plant produced a prussic-acid-yielding glucoside, and at such times, if eaten in quantity, especially by hungry stock, might cause death. The presence of this glucoside in quantity would, on the whole, fortunately, appear to be rare, and what controls its formation is impossible on our present knowledge to say.

I have often noticed Wild Peach to be eaten freely by stock without ill effects following, and W. D. Francis, writing in this Journal (vol. XII., n.s., p. 30), stated that the weed was extensively eaten by cattle in the Kin Kin district during drought periods, but that it was the cause of very few if any losses in the district. My personal opinion is that Wild Peach, though at times definitely poisonous, has on the whole been very much overrated as a stock poison.

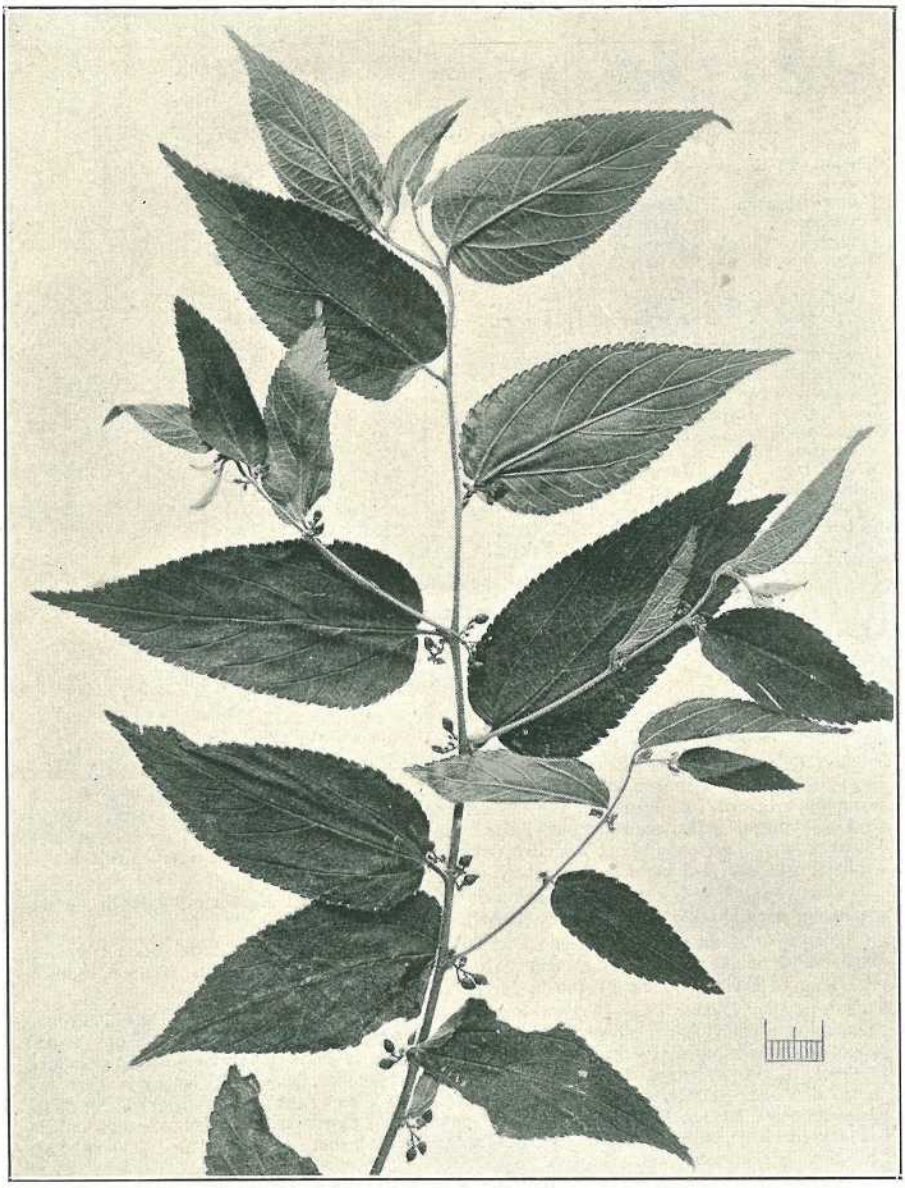


PLATE 28.—TREMA ASPERA
(Wild Peach or Peach-leaf Poison Bush).
(About natural size.)

STOMACH WORMS *(STRONGYLUS CONTORTUS)* IN SHEEP.

BY W. G. BROWN, Sheep and Wool Expert.

This is a pest which yearly is increasing in virulence in districts where it has been long established, and what is most serious is invading districts hitherto free from its ravages.

Like the prickly-pear, its approaches are slow, and almost unnoticed, but when fully entrenched, it will take years to eradicate, and in the meantime do enormous damage to the flocks.

For many years it was believed that the warm and normally dry areas of Western Queensland would always be exempt because of the heat and dryness, but time has shown that these places in the West are as badly infested as any district in Queensland.

Direct losses amongst the young stock must be very great, and the damage does not cease there, for those which survive are stunted and debilitated. Thus they become an easy prey to starvation, blowflies, &c.

The object of this article is to show that the pest can be dealt with and, in time, eradicated. This opinion is founded on knowledge of the life history of the worm, experiences of other parts of the world, and personal experience in Australia.

SCOPE OF ARTICLE.

1st. The life history of the parasite.

2nd. Theories in regard to infestation of country.

3rd. The various measures taken to combat the pest.

4th. Summary and recommendation.

The Life History of the Stomach Worm.

If the life history of a parasite be fully known, it is certain that soon or late it can at least be controlled. The history of this particular pest is very well known. It has been investigated by many well-known helminthologists, and all are agreed. Given shortly, it is this:—

The female worms lay their eggs in the stomach of the animal. These eggs pass out of the body in the excreta. They contain living embryos, which, when suitable conditions of warmth and moisture arise, undergo further development. They hatch out in periods, varying according to temperature, high or low, from two hours to three or four weeks. If the temperature be below 40 degrees Fahrenheit the eggs remain dormant, and can remain in that condition for two or three months, and afterwards hatch out when the weather becomes warmer. The young worm feeds on the organic matter contained in the droppings, and grows until it is one-thirtieth of an inch in length. No further growth takes place until a suitable host has swallowed it, and, as it climbs to the top of the grass blades this is very probable. After being swallowed it matures in the fourth stomach of ruminants (cattle, sheep, or goats) in from two to three weeks.

Before the worm has reached the final stage it does not easily withstand the influence of cold or dryness, but when the so-called ensheathed form is reached, it is endowed with longevity, and grows into the adult stage in the stomach when taken up by a sheep. Such ensheathed larvæ have been found alive six months and longer (Dr. Arnold Theiler, C.M.G., Director of Veterinary Research, S. Africa).

INFESTATION OF ANIMALS.

One thing appears to be quite certain—there is no such thing as "wormy" country. Worms do not appear spontaneously anywhere, and they are not a special creation. They must be carried and deposited by a ruminant. If wheat be sown, wheat will grow. If worms be sown, worms will be produced.

There are only two ways by which infestation of animals and land can be caused—

(*a*) By introducing infected stock on clean land.

(*b*) By placing clean stock on infected land.

Thus the question of control and eradication resolves itself into two methods, which are not impracticable in our case—

(*a*) Cleaning infected land before allowing ruminants to graze on it; and

(*b*) Cleaning infected sheep before allowing them to graze on clean land.

CLEANING INFECTED LAND.

Quoting Dr. Theiler again, he says—

"The facts which come out of the foregoing notes indicate that as long as sheep graze over pastures which are infected with wire-worms, so long will they be reinfected, particularly when the climatic conditions—warmth and moisture—are favourable for the exit of the worm from the eggs, and for development to the ensheathed stage. Accordingly it must be our endeavour to free a pasture from infection. This can only be done by starving the young worms out, which, as has been shown, will occur within a year, when no proper hosts (*i.e.*, all ruminants) are grazing over the same veld. A farmer must, in the first place, make arrangements that he always has some pasture at his disposal over which no ruminants have been grazing for nine months to one year, so that he can turn his sheep on to such veld as soon as they show worm infection. Before doing so, however, he must take the second important step—viz., to clean his sheep from worms by collecting his sheep into a kraal to dose them. . . . .

"It must be stated here that even the best medicine does not kill all the worms in all sheep, there are always some parasites which escape. Accordingly, a clean pasture will in time become reinfected, particularly in a warm and moist season. It is here that a sheep farmer will be able to show his skill in handling his flock, so that during these periods they never remain on the same pasture, but are changed systematically on to the same veld. When infection becomes too strong again, a new dosing and another change on to clean veld is necessary, the infected land to be kept free from ruminants. In adopting this system of dosing and moving on to clean ground, it will be possible after the lapse of a certain time to free, comparatively speaking, both the pasture and sheep from worms, or at least to so reduce them in number that the worms can easily be kept in check.

"There are additional measures which help to reduce the infection. They can be applied as such, or better in conjunction with above.

"One of them is the burning of the grass. It is known that the young worms crawl up to the top of the grasses from where they reach the stomach of the host. The grass burning should be done in rotation—viz., not the whole farm at a time, but in patches at different times of the year."

Thus Dr. Theiler; and the advice is full of instruction for us. In regard to the burning off of grass, a very common opinion of Queensland sheep farmers is, that on worm-infected country, the grass which grows after the burn cleans the worms out of the animal. This is a dangerous fallacy. It is true that wormy sheep do improve on grass grown on burnt country, but the explanation is this: The grass which comes after a burn is generally soft and nutritious. Worms are blood-sucking animals, and ruminants grazing thereon, make enough blood to satisfy the worms and leave enough for the sheep to improve in health and condition. The worms always get the first share of the blood. In the meantime, eggs of the worms, which have not been cleared out be it noted, are reinfecting the burnt lands. How quickly the land can be reinfected may be understood when it is known that one female stomach worm lays from 1,000 to 1,500 eggs, and there are thousands of female worms in the stomach of a badly infected sheep.

From the foregoing it is to be seen that, after a burn, or in the case of country free from worms, sheep should be dozed at least three times before being turned on to the land, especially if they are known to come off wormy country. Worms are to be found in sheep in the fourth stomach or abomasum.

Sheep have four stomachs,—First, the "paunch" or rumen. This is the reservoir. The animal gobbles the grass or feed and when satisfied lies in the shade and bringing up the balls of the food from the rumen chews it thoroughly. The chewed food passes into the second stomach or reticulum, otherwise known as tripe in cattle; from there it passes to the third stomach, the omasum or "bible," and then it is passed on to the abomasum or true stomach. It is here that true digestion takes place, and it is here that the thousands of worms are found in a badly infected sheep.

Two instances of several cases I know of, will illustrate the value of Dr. Theiler's arguments when properly applied.

In the first case a man kept one hundred and forty sheep on 14 acres of paspalum. These sheep were Romney Marsh, and had been on the holding for nine years, without trouble or loss of any kind. When I first inspected the sheep they were "mud fat," to use a sheep man's expression, and the youngsters particularly healthy. I warned the owner that on no account should be put strange sheep on his heavily-stocked paddock without thoroughly drenching them twice at least. Twelve months later I called at his place, and found that he had bought sixty "cheap" sheep from a holding notoriously worm-infested, shortly after my first visit. I learned that a few months after his purchase, all the strange sheep had died, all his own weaners, and the remainder of his one time beautiful flock, unthrifty

and full of worms. His land was hopelessly infected, and he had to give up sheep. *Note.*—He had not drenched the strange sheep. *He had put infected sheep on clean land.*

In the second case. About three years ago a telegram came to the office: "3,600 mixed weaners plenty water, grass, 600 dead, rest dying. This from a well-known holding in the Central West."

I thought "worms," and took up enough arsenic and Epsom salts to drench 3,000 sheep twice. One look at the flock showed heavy infection of stomach worms; worms had never been seen in the district before. The sheep were miserably poor and whitefaced, sluggish, and many of them badly "bottled." They were drenched twice and there were few more losses. I advised the owner to put them on to a clean paddock after the second drench, and he did so.

The history of the case shows "infected stock put on clean country," and shows that by following the advice of Dr. Theiler the paddock was cleaned, for the owner kept all stock out of the paddock for twelve months. He assured me eighteen months later that no more worms were found in sheep running there. This paddock was stocked with worms by a mob of worm-infested ewes from wormy country. Here was distinctly a case of clean country infected by wormy sheep, and country made clean by keeping ruminants off for twelve months.

DRENCHING, HOW AND WHAT TO USE.

Drenching is a cheap and simple operation. There are many different drenches on the market, but I have found arsenic and Epsom salts the best and cheapest of all. One of the best authorities in America, Mr. I. F. Craig, M.A., M.R.C.V.S., says in the "Veterinary Review," February, 1915, page 499, after reviewing the action of many worm drenches: "Arsenic, in my hands, has given better results than other drugs."

The arsenical drench I have found very useful is 2 oz. white arsenic (not less than 90 per cent. ars. acid), 6 lb. of Epsom salts, 5 gallons water.

Take an ordinary five-gallon drum, put about 3 gallons water in, and boil the water. Then add the arsenic and Epsom salts. Boil for forty-five minutes, stirring occasionally; add cold water to make 5 gallons.

Dozes.—2 oz. for adult sheep.

1½ oz. for sheep from 9 months to 18 months old.

1 oz. for lambs from 4 months to 9 months.

Fast the sheep for at least fifteen hours before drenching. Drench on four legs, keeping the head slightly above the level. The proper instrument for drenching is a conical-shaped measure, which is adjusted so that more than the proper dose cannot be given. They are to be obtained at any of the agents or retailers dealing in instruments for use with sheep.

Arsenic is a tonic, and dissolved with Epsom salts may be given every seventh day for about a month without danger.

SUMMARY.

Do not put clean sheep on infected country.

Do not put infected sheep on clean country.

If practicable, keep animals which chew the cud off an infected paddock for twelve months.

If practicable, burn off the grass on infected country and only allow clean sheep on the burnt country.

Weaners, or sheep from 3 to 9 months' old, are in danger of their lives if not drenched regularly on infected land.

Keep salt up to the sheep. It is hopeless to expect salt or any other lick to abolish worms, yet it acts in a certain measure against worms.

Overstocking will help to infect country in one-third of the time that reasonable stocking will.

Any country can be freed of worms in time.

Symptoms of worms are—pale faces, pale skin, pale eyes, tongues, and lips, and often a swelling under the jaw. This means anaemia. The most constant symptoms are scouring, eating of sand and earth, and unusual thirst.

A wormy sheep is one of the first attacked by blowflies.

Do not wait until the animal is dying before treating it, for often the symptoms are too advanced for the sheep to recover, even though the worms be removed.

RECOMMENDATIONS.

Do not introduce wormy sheep on clean country.

Do not introduce clean sheep on infected country.

CANE PEST COMBAT AND CONTROL.

The Director of the Bureau of Sugar Experiment Stations (Mr. H. T. Easterby) has received the following report under date 11th January, 1923, from the Entomologist at Meringa, near Cairns (Mr. Edmund Jarvis).

Moth-Borers of Sugar Cane.

Whilst searching for hymenopterous parasites of our large moth-borer (*Phragmatiphila truncata*, Walk.) numbers of young ratoons with dead hearts were collected at Riverstone, near Gordonvale, which, when subsequently examined, were found to harbour larvæ and pupæ of the smaller Pyralid moth-borer (*Polyocha* sp.).

This insect, although a minor pest of cane, must be considered as being responsible at times for injuries of a rather serious nature, extending in all probability over a considerable area, but, fortunately, so far as observed, affecting only a small percentage of the crop.

On the 18th November, 1920, the writer collected from within an area of one square chain no less than forty-four dead hearts from ratoons eighteen inches high in a canefield at Pyramid, which, when examined, yielded thirty-three larvæ of *Polyocha* sp. In the present instance, however, about 8 per cent. of the shoots collected contained examples of this borer, and fully 8 per cent. of these were parasitised by a braconid wasp-parasite, *Tineid Moth-borer*.

Many of the dead hearts in ratoons got at Riverstone were caused by a little borer, smaller than a clothes-moth (9 m.m. wing expanse), of a dark slaty-grey colour. This pest proved very abundant at Pyramid in 1919, where it was observed infesting third ratoons. Out of seventy-five shoots examined by the writer at that time—about 10 per cent. of those destroyed on a space of about 100 square feet—no less than fifty-five were killed by this moth-borer, and twenty of these contained living specimens of the larvæ.

A full description, together with illustrations of the life-cycle stages of this new cane-borer, was published last year (1921) in Bulletin No. 11 of this Office. Strangely enough, although occurring commonly in several localities around Cairns, this insect was not included in any of our large collections of Australian *Lepidoptera*.

The severest infestations apparently occur among third ratoons, many of which spring from buds situated above ground level, the trouble being less noticeable in the case of first ratoons that arise mostly from buried eyes; while shoots from plant-cane originating well under the soil are rarely attacked.

Notes on Para-dichlorobenzene.

Since reporting on this subject last month, advice has come to hand that the United Kingdom can supply us with a crude form of commercial *P. dichlorobenzene* at £5 per cwt. This is a substantial reduction on the German quotation of £6 per 100 lb., but we are glad to be able to announce that, according to latest advice, the British Drug Houses, upon making further inquiries, find there is a more crude form of this compound which can be supplied at £4 per cwt.

This will bring the cost down to about £2 per acre for a treatment of one drachm injections placed 12 inches apart.

Up to the present we have experimented only with the refined brand of *P. dichlorobenzene*, marketed under the name of "Globol," so that the effect on cane-grubs of crude forms of this compound has yet to be determined. I am of opinion, however, that we shall find these cheaper brands efficient soil fumigants.

Results of Field Test.—On 2nd November a field experiment was started at Meringa in which forty-eight stools of young plant cane (D. 1135) were treated with ¼ to ½ oz. injections, placed along one side of a row, and from 4 to 6 inches from the stools. The adjoining rows of cane on each side of the treated row formed controls.

All injections were 6 inches deep, some being placed immediately opposite the stools and others diagonally in intermediate positions.

When examined six weeks later (14th December) both treated and check stools had made equal growth, while results obtained were as follows:—

> Injections of ¼ oz. placed diagonally and 4 inches from centre line of stools, and injections of ½ oz. situated 6 inches from stools, but opposite same, had no injurious effect on the cane.

Injections of ¼ and ½ oz. placed 4 inches from, and opposite stools, caused some of the outer leaves to wither and curl. The odour of the fumigant had penetrated about 10 inches on all sides of injections, and although the ¼ oz. doses had entirely evaporated, the soil was still charged with the smell of *P. dichlorobenzene*. In another experiment, injections of ½ oz. placed 7 inches below the surface were found to have completely evaporated after fifty-one days, the rainfall during this period being only 91 points.

Emergence of Cane-Beetles.

The long continued dry spell of over three months' duration, terminated, happily, on the 21st instant, when 87 points were registered at our laboratory, followed next day by 46 points of rain.

Temperatures during the forty-eight hours immediately preceding these thunder showers had been very high, the maximum shade heat on the 19th instant being 170° F., and on the 20th 100.5° F.

Cane-beetles appeared close to the Station on the 22nd instant on feeding trees of *Eucalyptus tessalaris* (Moreton Bay Ash), but were not to be found in any numbers until four days later, when they were noticed on *Ficus pilosa* and *nesophila* as usual. Up to the present, however, the emergence has not been heavy at Meringa this season, owing, doubtless, to the recent drought conditions. Specimens collected on the 22nd were observed to be much rubbed, owing probably to repeated attempts to dig their way to the surface before the ground had become softened by rain. More rain (23 points) fell on the 27th instant, so that moist conditions favourable to further emergences have been maintained.

Lepidiota frenchi appeared very freely on the 23rd instant, being the year of its greatest emergence. Grubs of this species pupate at a greater depth than those of the grey-back, so are less likely to be affected by climatic influences.

Lepidiota rothei Blackb. and *Dasgynathus australia-dejeani* Macl. are in evidence as usual.

Species of the class *Insecta* appear to have suffered as a whole from the long spell of dry weather, insects of all orders being very scarce at present.

Office Collection of Insects.

In 1914, when first taking up a study of the cane-grub problem, the writer considered it advisable to form a collection of insects, comprising the following classes:—

(1) Insects devouring the roots of cane.
(2) Insects attacking the stalk and leaves internally.
(3) Insects injuring stalk and leaves externally.
(4) Insects closely related to our more destructive cane pests.
(5) Useful insects, parasitic and predaceous.
(6) Insects incidentally associated with sugar-cane.

During the past eight years a reference collection of this kind has been gradually acquired, but owing to our work in this connection having been of a spasmodic nature, the number of species collected has naturally been small, amounting in all to only 3,796 specimens.

Of these, about 380 species are beetles, of which, 101 species are closely related to our root-eating *scarabœidæ*.

Parasitic insects of the order *Hymenoptera* number about 123 species; while dipterous insects include 74, of which 21 are *Tabanidæ*, (March Flies) and 28 species *Asilidæ* or Robber Flies, the larvæ of the latter insects being predaceous on grubs of our cane-beetles.

Experiments with Aromas for Attracting Cane-Beetles.

This interesting form of control is at present being investigated, and results, so far, have been decidedly encouraging. On the 29th of this month, for instance, it was proved beyond doubt that *Lepidiota frenchi* can be attracted artificially by means of aromas distilled from the bark and foliage of certain of its favourite food-plants.

It remains to be seen by future experimentation which of these odours will prove to be the most attractive. We may, I think, consider this discovery a decided step forward in the right direction, since there is every probability that our grey-back beetle, as I have long believed, will be found to respond positively to odours of a similar nature.

Details of work in this connection will be given in next month's report.

PLATE III.—PREDACEOUS ENEMIES OF CANE GRUBS.

Fig. 1. *Promachus doddi* Bezzi, female. Natural size.

Fig. 2. Egg-mass of same, taken from leaf of sugar-cane. Natural size.

Fig. 2a. Same, enlarged.

Fig. 2b. Separate egg of same, more enlarged, showing segmented larva doubled up inside.

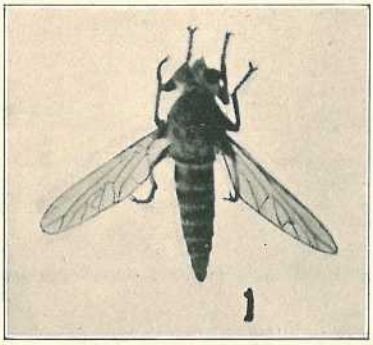
Fig. 3. Grub paralysed by newly hatched Asilid maggot, attached to skin on thorax.

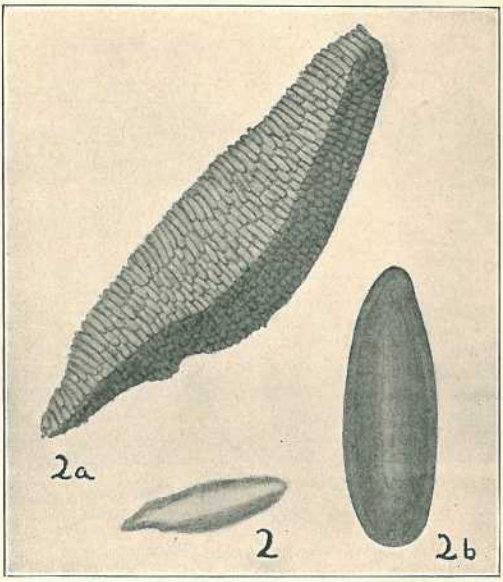
Fig. 4. Maggot; full-grown.

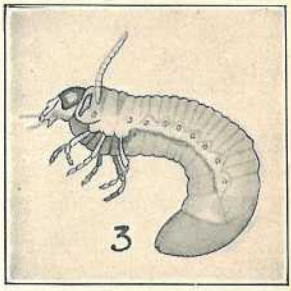
Fig. 5. Asilid pupa.

Fig. 6. Larva of *Agrypnus mastersi* Pascoe.

Fig. 7. The parent beetle, a skip-jack.







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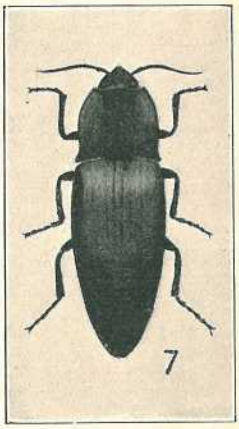

Del. E. Jarvis.

PLATE IV.—STAGES IN THE LIFE HISTORY OF CAMPSOMERIS RADULA FABR.

Fig. 1. Adult female. Natural size.

Fig. 2. Adult male. Natural size.

Fig. 2a. Vertex, showing the three characteristic yellow spots. × 5.

Fig. 2b. Labrum, plain, which is characteristic of this species. × 5.

Fig. 2c. Pygidium, with characteristic yellow on proximal portion. × 7.

Fig. 3. Paralysed grub, showing characteristic position of the wasp egg. Natural size.

Fig. 4. The egg, two views. Magnified.

Fig. 5. A male larva feeding; age seven days. Natural size.

Fig. 6. A female larva, ten days old, still feeding. Natural size.

Fig. 7. The cocoon of the wasp, in cell. Natural size.

Fig. 8. The pupa of same, in cocoon. × 2.

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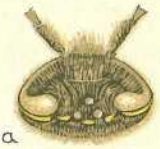
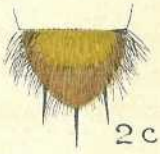


2a

2b

2



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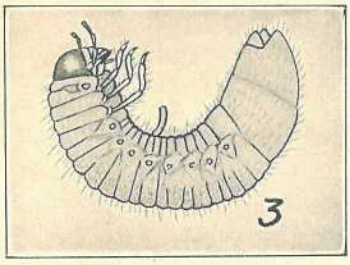

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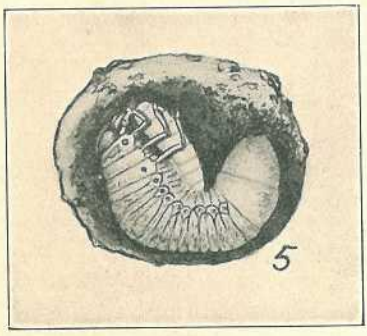

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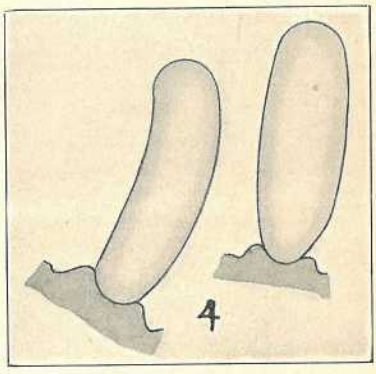

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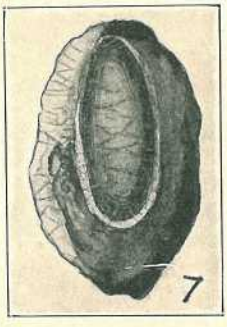

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Del. E. Jarvis.

PLATE V.—COMMON SCOLIIDS OF THE CAIRNS DISTRICT.

Fig. 1. *Campsomeris tasmaniensis* Sauss., female, the usual marking. Natural size.

Fig. 2. Male of same. Natural size.

Fig. 2a. Showing the two characteristic small yellow spots. × 5.

Fig. 2b. Pygidium with no yellow, which is characteristic of this species. × 9.

Fig. 2c. Labrum, showing characteristic dark spot in centre. × 5.

Fig. 3. *C. tasmaniensis*, a variation in the marking of the female. Natural size.

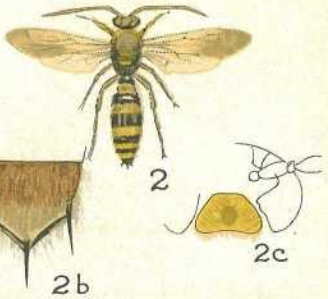
Fig. 4. *Campsomeris carinifrons* Turner, female. Natural size.

Fig. 5. *Scolia formosa* Guer., female. Natural size.

Fig. 6. *Campsomeris ferruginea* Fabr., female. Natural size.

1

2a



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Del. E. Jarvis.

PLATE VI.—COMMON SCOLIIDS AND THYNNIDS OF THE CAIRNS DISTRICT.

Fig. 1. *Scolia soror* Smith, female. Natural size.

Fig. 2. Male of same. Natural size.

Fig. 3. *Tiphia intrudens* var. *brevior* Turner, female. × 3.

Fig. 3a. Outline, showing natural size of above.

Fig. 4. *Thynnus pulchralis* Smith, male. Natural size.

Fig. 5. *Zaspilothynnus vernalis* Turner, male. Natural size.

1

2

4

3

3a

5

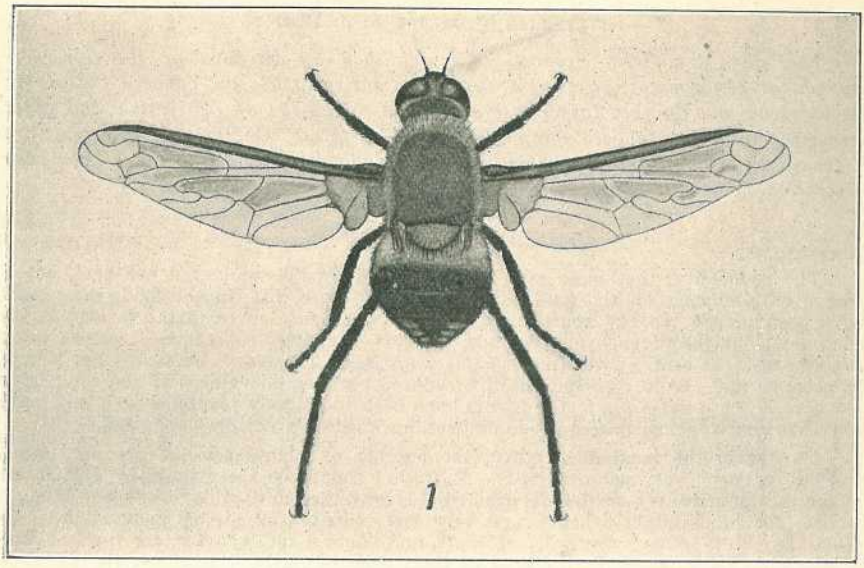
Del. E. Jarvis

PLATE VII.—HYPERPARASITES OF SCOLIID WASPS.

Fig. 1. *Hyperalonia funesta* Walker. × 2.

Fig. 2. A pupa of one of these flies. × 2. (After Davis.)

Fig. 3. A Rhipiphorid beetle. × 3. (After Davis.)



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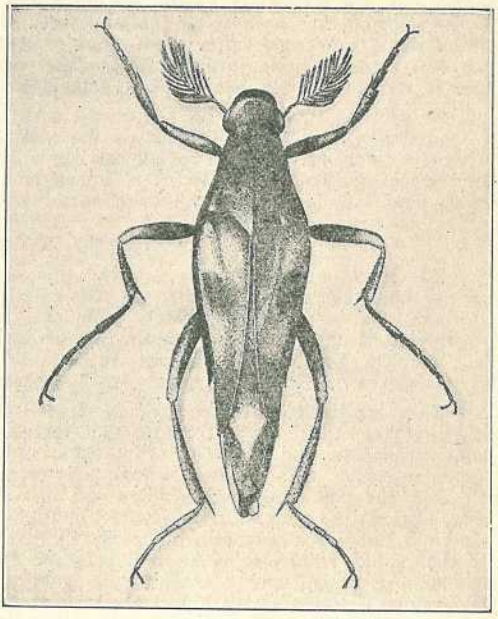

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TOBACCO CULTURE—II.*

BY M. P. MARTIN, Chief Controller, Tobacco Industry, Madagascar.

Translated by MAJOR A. J. BOYD.

The latest "Bulletin Economique," published by direction of the Governor-General of Madagascar, contains a very informative article on Tobacco Culture in Madagascar and on the East Coast of Africa. Methods of cultivation and after treatment of the tobacco crop, which will interest Queensland growers, are exhaustively set out, and from this article the following interesting notes have been abstracted. The first instalment appeared in the January Journal.—Ed.

TEXTURE OF THE SOIL.

Compactness.

The compacity, that is to say, the number of seedlings planted per acre, has a very great influence on the final quality of the tobacco. If, in the field, the plants have been placed too far apart, the development of the leaves certainly attains its maximum, but the parenchyma—that is, the soft or spongy substance—becomes thick and the rate per cent. of nicotine sensibly increases. The leaves harvested are heavy, but coarse, and are in consequence of a reduced commercial value. If the compacity per acre is too great—*i.e.*, if the plants have been too closely planted—each one may, while showing apparently real good qualities, have actually not developed sufficiently.

To obtain the maximum return, the number of plants set out per acre must oscillate between very narrow limits. But what should be these limits? This is an unknown quantity yet to be determined. Meanwhile, until this has been done, I advise, for lands slightly heavy and very rich, capable of giving good returns, to space the plants in rows about 5 feet apart, and about 4 feet apart in the rows—about 12,000 plants per acre. In the case of light soils of medium fertility, the distance between each row a little less than 4 feet apart, and about 3 feet apart in the rows, making about 17,000 plants per acre.

WEEDING, DOUBLE PLOUGHING, EARTHING UP.

I think it is needless for me to dilate upon the advantage of weeding, double ploughing, and earthing up. Besides the destruction of noxious weeds, second ploughings are immensely useful, during a dry season, in delaying the desiccation of the soil and thus by keeping the land fresh, enabling the normal growth of plants which would otherwise suffer from want of water which would prematurely be the cause of signs of premature maturity. The earthing up consists in surrounding the base of the stem with a good heap of soil. Its beneficial effects are indisputable.

As soon as the plants have attained a sufficient height, the two seminal leaves are twisted off. Then a portion of the soil is drawn up around the stem. The adventive roots, which strike out almost immediately near the wound caused by taking off the leaves, develop rapidly in the upcast soil and prepare an increase in the crop which pays largely for the process of earthing up.

PRUNING, TOPPING.

The leaves on a naturally growing tobacco plant are not all of the same size or the same chemical composition. Their individual values are consequently very unequal. On examining separately each leaf, from the top or bottom, one becomes aware that their dimensions, length, and breadth, increase progressively to obtain a maximum height, then they decrease rapidly and bear no more but a few small leaves at the very top, the size of which deprives them of all commercial value.

As to the thickness of the parenchyme, it has been shown that there is an increase starting from the base to the top. The percentage of nicotine increases under the same conditions, and in strong proportions. Thus it is that in certain varieties the leaves near the soil, or lower leaves, may not contain more than .50 per cent. of nicotine, the percentage of alcaloids will increase from leaf to leaf to reach 2 per cent. towards the middle of the plant, 4 or 5 per cent. in the last leaves of marketable size, and a rate per cent. still higher in the by-tongued leaf, located under the flower. If the plant of tobacco is allowed to grow freely, the ground leaves will show a feeble development and consequently a very poor weight (500 to 600 leaves to a kilogramme), whilst at the top of the stem there will be leaves too small to have any commercial value, besides which they are too highly charged with nicotine.

**Bulletin Economique de Madagascar.* La culture du Tabac a Madagascar (Extraits du rapport de M. le contrôleur principal Martin, des manufactures de l'Etat en mission à Madagascar).

Pruning is an operation which consists in destroying at the base of the plant, besides the two seminal leaves which should have been removed during the process of earthing up, two or three leaves of little value because of their want of weight and almost entire want of nicotine. It is effected by breaking at several inches from the stem the petiole of the leaves to be done away with, and abandoned eventually on the field.

Topping is the operation by which the stem is divided near the summit in such a manner as to retain, on each plant, the exact number of leaves which will admit of obtaining the best returns in weight as well as in quality. The operation is a somewhat delicate one, but it really presents no difficulty. In fact, it is sufficient to separate, with due care in order not to injure them, the leaves composing the terminal bud and to cut off with the finger-nails or some simple instrument, on the plant, the upper part of the stem which bears the floral bud, and the three or four leaves situated immediately below it, which are very rich in nicotine and would only obtain a small size. This being done sufficiently early, topping allows the sap to afford nourishment only to the saleable leaves, which will thus attain the maximum development.

If the number of leaves thus preserved on each plant is considered insufficient—that is to say, if the stem has been divided too low—each leaf attains a strong development, but the tissue composing it is thick and coarse, therefore of inferior quality. Furthermore, whatever may be their individual dimensions, the weight of the whole of the leaves per plant will be poorer than it would have been if the number of leaves saved had been greater.

If, on each topped plant, too many leaves are allowed to remain—that is, if the stem has been cut off too high up—each leaf will possess the required fineness and quality, but the total will not weigh more than it would have yielded had a few extra leaves been suppressed.

As a résumé to enable me to make myself understood, I will say that each plant is capable of producing, with a proper number of leaves (say x) the maximum of weight and quality. If, after topping, the number of leaves retained is absolutely less than x, there will be a loss of quality and weight. If, on the contrary, on each plant a number of leaves has been retained superior to x, the weight and quality of the product harvested remain invariable. The gross yield will neither be greater nor less, but we shall have to deal with a greater number of leaves, and hence there will be loss of time and money. This loss, not being in all cases very light, we arrive at the conclusion that it will be more worth our while to top too high than too low. In other words, it is more worth while to retain on each plant a number of leaves more than x, rather than a less number.

But what is this number x of leaves to be preserved? It is materially impossible to give it a decided fixed value. It must vary according to the variety cultivated, and even for the same variety, according to the soil and locality where planted. It is thus that a tobacco plant will yield on any plantation its maximum return with nine or ten leaves, whilst another plant from the same batch of seed and of the same sowing, but transplanted elsewhere, only reaches its maximum with seventeen or eighteen leaves, perhaps more. These two maxima are not similar in any respect, and may vary in large proportions. M. Martin here cites many examples of the similarity and variations of the tobacco plant in France, Paraguay, and elsewhere, and concludes this item of his paper as follows:—"One can understand, under the aforesaid conditions, the impossibility of fixing for each plant, and even for each variety, a fixed number of leaves to be retained per plant. It is for the planter to determine—the rest is easy."

PRODUCTION OF SEED.

Some indigenous varieties of tobacco develop a splendid foliage and certain qualities highly appreciable; the types of a fixed character must be determined, and must be classified, and the qualities of each must be carefully judged, and by cultivation to develop those which appear likely to give the best return.

Seeds of foreign origin may possibly for the first year show satisfactory results, such as the physical appearance of the plants, and the kind of aroma; still, when cultivating the second generation, the whole of its original characteristics may disappear more or less completely. It follows that the highest yield of the first crop may diminish in considerable proportions in the second generation.

There is certainly a solution of this question—for instance, the establishment each year of experimental seed plots of such seeds—but I would only advise this course to be adopted for such varieties as present in a first sowing clearly superior qualities, enabling them to command a high price in the European markets. It is important to select such varieties as can be acclimatised without visible transformation, and a few of those which have for a long time in the country been showing such qualities as would suffice to render their cultivation largely remunerative. It is with

the object of drawing the attention of planters to the reproduction of these varieties as reproductresses, as the poor harvests of seeds, quickly brings on the crossing of the varieties.

Another matter of importance is the choice of, as plant mothers, the most vigorous kinds, and the most healthy, as certain diseases are capable of transmission by seed. Before starting to top the plants, the planter should look round his plantation and select the plants whose appearance presents the characteristics of the variety grown; such as the junction of the leaves with the stem, shape of the leaves, number and condition of the nerve system, being at the same time always careful to their fineness and to the size of the angle which they make with the median stalk or rib. The mother plants should be marked and allowed to grow freely.

When the seed capsules assume a chestnut colour the bunch is cut off and set away to dry, stem downwards to prevent the seeds falling out of the capsules. Nothing more need be done further than, when the capsules are dry, to crush them and winnow the husks from the seed. Tobacco seed will preserve their germinating power for several years if kept dry.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALLS DURING DECEMBER 1922 AND 1921 FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1922.	Dec., 1921.
North Coast.	In.		In.	In.
Atherton	7·35	21	12·12	6·42
Cairns	9·19	40	1·97	10·26
Cardwell	8·46	50	7·71	13·63
Cooktown	7·09	46	1·54	7·97
Herberton	5·66	35	6·08	7·27
Ingham	7·21	30	5·85	9·55
Innisfail	12 23	41	4·41	17·72
Mossman	13·00	14	4·42	24·28
Townsville	5·53	51	6·82	5·55
Central Coast.				
Ayr	3·58	35	5·94	9·09
Bowen	4·43	51	7·34	9·70
Charters Towers ...	3·51	40	6·12	3·50
Mackay	6·89	51	5·86	13·38
Proserpine	8 93	19	7·59	19·66
St. Lawrence ...	4·49	51	11·16	18·01
South Coast.				
Biggenden	4·47	23	3·60	12·50
Bundaberg	4·73	39	4·79	15·89
Brisbane	4·96	71	4·59	11·33
Childers	5·30	27	8·67	15 45
Crohamhurst ...	6·83	30	8·96	14·49
Esk	4·35	35	6·22	11·85
Gayndah	3 92	51	4·26	11·11
Gympie	5·73	52	6·30	11·14
Glasshouse Mts. ...	6·72	14	6·44	11·67
Kilkivan	4·28	43	3·94	12·33
Maryborough ...	4·65	51	6·38	11·23

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of Years' Records.	Dec., 1922.	Dec., 1921.
South Coast—continued:	In.		In.	In.
Nambour	6·30	26	5·15	13·76
Nanango	3·71	40	5·19	13·11
Rockhampton ...	4·62	35	4·13	19·42
Woodford	5·41	35	4·66	12·73
Darling Downs.				
Dalby	3·09	52	1·80	9·10
Emu Vale	3·58	26	4·35	6·52
Jimbour	3·16	34	2·16	7·68
Miles	2·54	37	4·16	6·02
Stanthorpe ...	3·48	49	5·87	6·61
Toowoomba ...	4·19	50	3·78	8·07
Warwick	3·50	57	4·29	9·27
Maranoa.				
Roma	2·34	48	5·30	4·89
State Farms, &c.				
Bungeworgorai ...	2·45	8	7·64	3 81
Gatton College ...	3·45	23	3·08	7·60
Gindie	2·61	23	3·98	2·16
Hermitage ...	3·03	16	3·85	7·47
Kairi	7·43	8	4·06	5·78
Sugar Experiment Station, Mackay	8·25	25	4·85	14·50
Warren	3·78	8	4·19	10·05

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for December, 1922, and for the same period of 1921, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
State Meteorologist.

EMPIRE COTTON GROWING.

The world production of cotton per annum is approaching 20,000,000 bales (of 500 lb.) of which the United States, in normal years, supplies about 70 per cent. The principal industries in Great Britain are those connected with cotton manufacture in its various phases, requiring about 4,000,000 bales of raw cotton per annum. The present position is that the world's consumption of cotton must increase, the United States supply may decrease owing to the boll weevil trouble and labour difficulties, consequently new sources of supply become a matter of immediate importance. Cotton-growing is not so simple and easy as some people think, but there is no doubt that, with organisation and scientific methods, the Empire could supply a large proportion, if not all, of its own cotton requirements, and, in particular, Australia may become a great cotton-producing country.

The above considerations are well known to cotton-growers and manufacturers, but in the public mind there is some confusion as to the various organisations which have been formed to develop cotton-growing within the Empire. The following particulars as to these organisations, together with some notes as to the cotton produced, supplied by Mr. S. W. B. McGregor, Senior British Trade Commissioner, will be of interest.

British Cotton Growing Association.

The British Cotton Growing Association was formed in London some years ago and has done excellent work in promoting the growing of cotton, largely in Africa. This association works on commercial lines, and in developing new areas will handle the cotton when grown, or in other words, will gin, bale, and dispose of the cotton on the Liverpool market.

The increasing importance of the subject led to the appointment by the Board of Trade, London, of an Empire Cotton Growing Committee, which, after nearly three years' investigation and inquiry, issued its report in October, 1919.

Empire Cotton Growing Corporation.

As a result of the above committee's labours the Empire Cotton Growing Corporation was established by Royal Charter in November, 1921. The general policy of the corporation has still to be determined, but apart from exploration and the investigation of new pioneer schemes, the principal work of the corporation will be of an educational character. Facilities will be provided to enable men with training to take up graduate studentships and readerships at British Universities in special cotton subjects. When trained, these men will be attached to the agricultural departments of the Dominions and Colonies. This work is considered of great importance, as any development of cotton-growing on a large scale must be on scientific lines and there must be a better supply of men competent to give advice and assistance to native and other growers.

It is proposed to obtain funds for the corporation by means of a compulsory levy on British cotton spinners of 6d. per bale of 500 lb. of cotton. A Bill to this effect was introduced into the House of Commons in July last, but failed to pass before the session closed.

The Empire Cotton Growing Corporation will work in close co-operation with the British Cotton Growing Association, the Earl of Derby being president of both bodies.

Australian Cotton Growing Association, Limited.

The Australian Cotton Growing Association, Limited, was registered in London in 1920. The Australian Cotton Growing Association, Queensland, Limited, which is a subsidiary to the London company, was registered in Brisbane in April, 1922, with a capital of £200,000. The latter is now in process of reconstruction to permit of greatly increasing capital and extension of its activities, which will include the ginning and marketing of Australian cotton and the establishment of oil mills.

Progress Made.

The estimated amount of cotton grown in new fields in the British Empire, mainly in Africa, between 1913 and 1921 (in bales of 400 lb.) was:—

1913 ..	72,800	1914 ..	82,350	1915 ..	75,200
1916 ..	78,800	1917 ..	72,600	1918 ..	54,900
1919 ..	79,600	1920 ..	105,800	1921 ..	164,000

The progress made is largely, if not wholly, due to the activities of the British Cotton Growing Association.

Notes on the most important new fields, in order of the quantity produced, are as follows. The cotton production is given in bales of 400 lb. and is for the year 1921.

Uganda.

Area, 110,000 square miles; population, 3,000,000. The Government impose a revenue tax of £1 per bale. Possibilities for extension of cotton-growing considered good. Production, 81,300 bales.

Sudan.

Area, 1,000,000 square miles; population, 3,500,000. Principally grown under irrigation. Quality good. Scheme in hand to cultivate 500,000 acres, estimated to yield 400 lb. cotton lint per acre. Railways required for transport. Production, 40,000 bales.

Nigeria.

Area, 336,000 square miles; population, 17,000,000. Production, 32,000 bales.

Tanganyika Territory (Formerly German East Africa).

Area, 348 square miles; population, 4,000,000. Germany considered possibilities of cotton-growing very favourable. Production, 7,500 bales.

West Indies.

Produce the finest Sea Island cotton grown in the world. The islands are small in area, and as there are other industries the possibilities of increasing the supply are limited. Production, 3,500 bales.

Nyasaland.

Area, 40,000 square miles; population, 1,250,000. Cultivation on the dual system, partly by European planters and partly by natives working their own land. Transport difficult and railway extensions essential. Production, 2,800 bales.

South Africa.

Cultivation of cotton arousing interest amongst farmers in certain districts of the Union of South Africa and Rhodesia, but is impossible in many of the provinces. In North and South Rhodesia, Northern Transvaal, Natal, and Swaziland, the farmers are successfully growing small quantities of cotton, and the prospects are considered good. Production (South Africa and Rhodesia), 2,000 bales.

Australia.

Estimated that there are 30,000,000 acres in Queensland capable of producing cotton, but some doubt exists in Lancashire as to whether the cotton industry, that depends on abundant and cheap labour, can maintain itself in Australia. Production, 800 bales in 1921, and 2,500 bales in 1922. Estimated production, 40,000 bales in 1923.

Kenya Colony (formerly British East Africa).

Area, 200,000 square miles; population, 4,000,000. Prospects uncertain. No production.

Mesopotamia.

Area (British Mandatory sphere), 150,000 square miles; population, 2,850,000. Soil and climate similar to Egypt. Great possibilities, and it is believed with a sound irrigation system about 1,000,000 bales per annum could be produced.

India.

Area, 1,803,000 square miles; population, 315,000,000. Production last season over 5,000,000 but quality only suitable for coarsest yarns and of very little use to Lancashire. Possibilities of improvement are enormous.

Ceylon.

Area, 25,840 square miles; population, 4,500,000. A little cotton grown from time to time, but for various reasons no progress made.

Other.

Cotton is also produced in small quantities in Cyprus, Fiji, Malta, Turks, and Caicos, but with the exception of Fiji is harsh and short stapled.

NOTES ON THE CITRUS ORANGE BUG *(ONCOSCELIS SULCIVENTRIS.)*

Subjoined is a preliminary report on observations made and investigations carried out in the Blackall Range area by Mr. Henry Tryon, Government Entomologist and Vegetable Pathologist, from the 15th to the 17th of January, 1923. This report was furnished by Mr. Tryon to the Under Secretary, Department of Agriculture and Stock (Mr. Ernest G. Scriven) for transmission to the members of the Mapleton Local Producers' Association, at whose request Mr. Tryon made the visit to the citrus groves on the Blackall Range and of which this report is the outcome. As the subject is one of general interest to fruitgrowers at this juncture, the observations and conclusions of Mr. Tryon have especial relevancy.—Ed.

Locality.

For the purpose of the inquiry the following typical orangeries were visited—all situated in the Flaxton area—viz., those occupied by Mr. H. Morris, Mr. J. F. Power, Mr. J. McIver, Mr. R. Morris, Mr. G. Still, Mr. A. D. C. Hetherington, and Mr. R. B. Shaw. (NOTE.—It was intended to include Mr. Dickson's orangery, where infestation during 1922 had been so pronounced, but Mr. J. Dickson was temporarily absent from the district.) Whilst local inquiry was restricted to these areas, it is not to be inferred that the presence of the insect does not extend throughout the Mapleton, Flaxton, and Montville area.

Insects Present.

These, so far as the usually recognised phases are concerned, were nearly all in the adult state—bearing organs of flight—as may be inferred from a description of a small collection obtained on the day preceding our visit. This comprised eighty-eight adults and eight larvæ representing three different stages of growth. However, the percentage of the larger larval forms was generally much below 8.3 per cent. as shown by this. With reference to the numbers, it was an uncommon occurrence for there to be as many as twenty bugs upon a tree; but by actual count growers had found, at an earlier period in the season, as many as 400 on small citrus trees and 1,400 on larger ones. The present relative decrease in numbers was evidently to be accounted for in part by the efforts at bug-destruction that had been systematically pursued. The two sexes were about equally represented in the insects present on any tree.

Insect Occurrence.

The adult insects occurred principally in clusters from two to ten, rarely in larger number. Clusters of eighty are said to have been earlier noted, but often solitary bugs, especially females, were noticeable. These insects, especially if solitary, readily took wing on disturbance after falling a few inches, from 6.30 a.m. onwards, and as long as sunshine prevailed.

They occurred for the most part closely united male and female, and where any group contained an uneven number of the respective sexes the odd insect might be male or female. The adult insects no longer attacked the developing fruit, even where this was still quite small (but already hard). They were confining their attention to the tender shoots. These, subject to the injury occasioned by the insects' penetrant and sucking mouth-organs, first curled over, and their young and small leaves shrivelled up and darkened, as did also the stem itself. It was to be inferred, also, from features present, that whilst so feeding they did not infrequently communicate disease—a fact that would suggest that some forms of citrus "die back" may originate in their habit. It was also to be observed that, apart from the former injury to the young fruit and its consequent dropping, an unseasonable flush in vegetative growth had often resulted in a manifestation more recent, however, of the same phenomenon.

It was noteworthy that the female bugs engaged in their amours—that were of long continuance—did not desist from feeding, and that they invariably settled themselves higher on the shoots than their consorts where the tissue was more succulent. (NOTE.—These facts are not without bearing on the question of the most expedient method of capturing the adults at the time of the year covered by this inquiry.)

Egg Production.

It was found that the ova had already grown to a large size in the interiors of the female bugs before these were visited by the males. Also that they are associated with large nutritive cells that appear to be largely absorbed before these eggs are actually fertilised. This suggests—as is actually found to be the case—that they are capable of hatching very soon after being laid.

Egg-deposition.

After evidently some days of what we may term "wedded life," the adult Orange Bugs separate and disperse. However, the females, already ready to lay their eggs, do

not travel far from the shoot on which this has been spent, often but a foot or two. In fact, individual female bugs, where several have been clustered together, may remain side by side and lay their eggs upon the same leaf. (NOTE.—This fact has a bearing on the successful search for the egg-batches.) In selecting a site for the eggs, a shoot is taken on which the foliage, although still pale and of a green, delicate nature, has about attained its full size. Exceptionally, however, they are deposited on old leaves, and not on these young ones. They are in by far the larger number of instances placed on the under leaf surfaces, especially where an adjoining leaf is almost opposed to this beneath. Their deposition is a matter of minutes only. Almost invariably each female lays fourteen eggs—only once have we met with fifteen. Moreover, with almost similar frequency, the eggs are laid side by side in a batch with a uniform arrangement—viz., a row of four in the middle, three on each side of this, and two again outside each of the latter rows. Exceptionally two batches may be laid side by side by two female bugs so as to form a single egg-mass. These eggs are spherical, glossy, pale leaf-green, and measure 2.5 mm. in diameter. When hatched the empty eggs are colourless and glass transparent.

Production of Larval Bugs (First Stage).

When laid (as we have seen) the embryo-bug is already well advanced in growth. Within a few days its limbs and the antennæ with their now red tips can be seen through their transparent shells. When eight to nine days have elapsed from the time of laying, hatching takes the young larval bug with its limbs still folded, pushing open a small circular convex cap that separates from the remainder of the shell along a line of small pores. These larval bugs are of a delicate green colour and of a bright hue, oval in outline and lowly convex. They measure 5 mm. x 3.5 mm. When hatched out, they remain side by side upon the under leaf surface, and apparently feed little, if at all. With the slightest disturbance, which may fall short of shaking, they voluntarily detach themselves, fall to the ground, and crawl about in different directions, to be soon lost if herbage is at hand. This is the stage at which, as it has been stated, the orange bug arrives on the Blackall Range, the adult insects and these diminutive larvæ, that are said to be met with during January and the succeeding month or two. Then it is said they quite disappear and are not to be met with, not a single bug, during the ensuing winter—two or three months (H. Morris). In the course of this brief inquiry, however, it was practicable to point out and demonstrate that there was a second larval stage that shortly succeeds the first, with habits that might throw light on this apparent temporary disappearance.

Within a few days, the Orange Bug larvæ of the first stage cast their skins; and this happens even when they have so far not partaken of any food. This moult, however, gives rise to a larvæ (second stage) very different both in appearance and habit from that representing the first stage from which it has been naturally derived. Though still pale-green, its body is now much flattened as if "beaten out," narrows somewhat towards the head, instead of being regularly oval, has the thoracic segments defined above by angular instead of curvey lines, and has the antennæ red-tipped (instead of black), whilst these organs placed together are now directed straight forward. The upper surface also is dull instead of being glossy, and finely wrinkled and areolate instead of being smooth. It now measures 7 mm. by 4.5 mm.

For a brief period, fourteen of these second-stage larvæ may congregate side by side on an under leaf surface, taking the place of the fourteen first-stage larvæ they have arisen from. These individuals may now move off one by one, dispersing themselves over the tree on which they happen to be, their movements being relatively rapid. As thin as paper, they now adhere flatly to their support—the under leaf-surfaces—and their colour harmonising with that of this, they are with difficulty only discerned on a tree, even if it be a tree but 18 inches high on which they occur. Further, being quite unlike (as we have seen) the larvæ of the first stage in this respect, not only do they not readily detach themselves voluntarily, but rarely can they be caused to drop to the ground from the branches of the tree on which they occur on these being suddenly banged. In fact, our efforts in this direction have only enabled us to secure individual second-stage insects, when, on the other hand, many larvæ of the first stage have been thus obtained, although we have known that the former have largely outnumbered their younger associates. (NOTE.—No statement can be made as to the length of the period passed by the Orange Bug in this second-stage phase of life. It is a matter that is being experimentally inquired into.)

Occurrence of Eggs and Larvæ of First Stage on Trees.

On a single small orange tree (estimated age ten years, H.T.) occurred twenty-nine batches—all of those save one consisting of fourteen—a total of 405 eggs. This number probably fell short of the actual occurrence, as it was impracticable in the brief period available to discover nearly all those present. Further, some mature female insects were also present to furnish additional eggs.

This quota of eggs was furnished by a tree in an orangery from which all the bugs discoverable on systematic "beating" or "tapping" have been removed, when for the most part in the larval stage, and although the number found, or estimated to occur, was evidently in excess of those present on the trees of the orangery generally, it illustrates:—

(1) The extent to which in early January orange trees, older ones especially, may harbour eggs; and

(2) That either the removal wholly of orange bugs by "beating" or "tapping" is not practicable, or, as is much more likely, "clean trees" are liable to be bug-infested from without, when their systematic "cleansing" is not generally undertaken by citrus growers through co-operative effort.

Of these twenty-nine batches the eggs of three had already hatched on 16th January, and from data to hand all would have done so on or before 25th January.

In other trees the proportion of egg-batches that had already hatched was larger.

Flying Powers of Adult Insects.

During the period occupied in the inquiry the conditions of permanent sunshine and warmth were very favourable to the exercise of the flying habit by the adult Orange Bugs. When disturbed, and often on slight disturbance only, they dropped a few inches only and then took wing. Thereupon they not only would at times repair to a neighbouring tree, but also fly far afield. Specific instances of their moving through the air far overhead in a definite direction until beyond the reach of vision occurred. This observation confirming previous ones suggests:—

(1) That the method successful in capturing immature Orange-tree Bugs as ordinarily practised requires to be greatly modified if that of the adults is aimed at; and

(2) The readiness with which an infested orangery may become a source of infestation for one originally non-infested or rendered so by special effort.

Larval or Nymph Orange-tree Bugs and Tree Attachment.

The insects show a varying degree of closeness in their adherence to their host plants, and corresponding difficulty with which they are capable of being dislodged according to the stage of life in which they occur. Thus of the five of those preceding the adult stage, they are detached most readily in their first green stage, and with greatest difficulty during the second and fifth stage (final)—*i.e.*, the one before that of the adult one is attained.

Native Source of Infestation.

It has been suggested that, insomuch as the Orange-tree Bug (*Oncoscelis sulciventris*) is a native insect and has originally proceeded from some native tree—

(1) That its indigenous food plants comprise not only our species of Wild Lime or Wild Orange (*Citrus australis* and *Citrus australasica*), but the other species of *Rutaceæ* that include these also; and

(2) That each year this injurious insect forsakes the orangeries in its hosts to repair to the scrubs that contain these trees, to return once more to the orangeries with the advent of spring and reinfest them.

The latter suggestion is not in harmony with the observations made by me and the testimony of local growers. In fact, a member of the Citrus Council, Mr. H. Morris, who probably has given more attention to the Orange-tree Bug than anyone whom I have had the privilege of meeting, goes so far as to state that—

"We don't see the fully developed black bugs until the beginning of December, or, it may be, until the latter end of November, their occurrence then being preceded by wingless larval insects or nymphs."

On the other hand, it would appear certain that the insects, finding a congenial home in the orangeries and all there that they require for their sustenance and life generally, not only maintain the original colony or colonies, apparently usually small in some cases, but yearly increase in the course of natural development until eventually their numbers (they having no formidable enemies) are beyond conception so to speak.

With regard to native host plants, a survey of a small native scrub, containing both citrus and other indigenous (*Rutaceæ*) plants, failed to bring to light a single Orange-tree Bug, and their occurrence elsewhere, even on native *Citrus* spp., as judged by former observations, is occasional only. Mr. W. B. Petrie, of the Forestry Department, whose knowledge of Queensland scrubs, scrub trees, and the more obvious insect associations of trees is generally recognised, had indeed stated that

he has never yet seen the Bug on a native citrus, although an insect resembling it, and that may be the *Oncoselis** (but still to be identified) he has encountered on *Pentaceras australis*, Hook-fil (*Rutaceæ*).

*NOTE.—An insect that, when adult, closely resembles *Oncoscelis sulciventris*, and is named *Stilidia indecora* has been confused with it, even by entomologists.

This conclusion points to the urgency of procedures that would not otherwise be even expedient, *i.e.*—

(*a*) To make war on the insects whenever they appear in an orangery, or indeed on an isolated citrus tree, even when few are present, and no noticeable ill-effect is traceable to their presence. As the outcome of an opposite course of action, suggested by the theory of an annual visitation, may be cited the most grossly infested orangery in the Blackall area (that there is no occasion to specify here) where—as has been reported in the Press—insects during the latter end of 1922 were collected in kerosene tinfuls. Herein they occurred in the previous year, in far less numbers, and were allowed to live and breed unmolested then, on the understanding that there might be no recurrence in 1922.

On the other hand, continued systematic measures of repression during 1920, 1921, and 1922 on a neighbouring orangery has greatly reduced the numbers there. And, as

(*b*) A second procedure to regard every infested orangery or citrus tree as a menace for the succeeding year to orangeries or citrus trees still unvisited by the insects.

Citrus, Relations of Orange Bug.

The insect was observed—as already elsewhere—on all the kinds of citrus in cultivation—including not only oranges and mandarines proper, but also lemons and citrons. Possibly, further inquiry might discover a predilection on the part for certain of these.

NATURAL ENEMIES.

Being one of those who earliest dwelt on the important role served by natural enemies in controlling insect pests (*vide* Tryon, H., Insect and Fungus Pests, I. 1889 *passim*), the question of the extent to which these were operating in the district received special attention.

Egg Parasites.

I found not a single instance of the eggs of the insect being parasitised, notwithstanding several thousands were examined. This was surprising, since it had come under my notice that, in the case of another large Orange-tree Bug, equally injurious elsewhere to citrus—the "Horned Green Bug," *Biporulus bibax*, Breddin; a small hymenopterous insect bred in the ova, and thus consumed their contents. However, a small percentage of the eggs in some egg-batches had failed to hatch, and these had either collapsed or developed a brown colouration; but in this case mere natural death seemed to have supervened.

Predatory Insects.

Two other heteropterous insects were found preying upon the Orange Bug (*Oncoselis sulciventris*). These insects insert their mouth organs in their living victims, in the part usually corresponding to the neck, and gradually extract their blood, just as the latter have been drawing upon that (the sap) of the citrus trees on which they subsist. These natural enemies are species of the bug-genera Asopus and an ally.

However, both these predatory bugs were of exceedingly uncommon occurrence at the time of the visit. This fact, and the circumstance that a single Orange Bug appears to provide sustenance for a single individual enemy for days, is an indication that their services in repressing the latter insect were insignificant.

Birds.

(*a*) *The Drongo* (*Chibia bracteata*).—A bird of medium size, of a dark colour, the plumage having a decided sheen, with a fork tail and red eyes, that I originally described as an enemy of the noisome insect under consideration, was present, but in far too few numbers to exert much influence in controlling it. This is a usual denizen of the scrubs and is being reduced in numbers with their disappearance.

(*b*) *Dollar Birds* (*Eurystomus pacificus*).—This exclusively insectivorous bird was seen in the orangeries under circumstances that would suggest that it was capturing Orange-tree Bugs, but I have no direct evidence. I was not disposed to

shoot one in search of this—*i.e.*, of its capturing any—nor does my previous inquiry into its dietary favour the view that it preys upon the insect in question.

(*c*) *Shrike Thrush* (*Graucalus melanops*).—This bird also present was pointed out as one that feeds upon the Orange-tree Bug under consideration. The remarks under Dollar Bird will apply here. It is the local "Blue Jay."

(*d*) *Quail.*—These birds, paired and with eggs, were found in two orangeries. From my knowledge of the habits of these it would appear that they would prey on the bugs, especially in their earliest green stage when these insects are so readily induced to precipitate themselves to the ground. As, however, the species of quail referred to nests in herbage it is difficult to realise that is can accomplish much in this direction in orangeries kept clean, as should be the practice.

Fowls.

(*e*) It was surprising to note with what avidity these fed upon the insect when brought to the ground—not excepting the adults. In fact, it was observed that in Mr. H. Morris's orangery some of these birds would dog one's footsteps as one walked amongst the trees and contend for the insects that had been caused to fall. It is a matter for consideration how far this habit is general in fowls and possible of being availed of.

Disease.—Presence not noted.

NOTE.—From this survey, it will appear that the more formidable of the natural enemies that usually very materially destroy harmful insects of this bug kind are absent at present from the district, and cannot be regarded as a factor in controlling the numbers in which the present one occurs. At the same time this absence, together with an indisposition to take any steps to cope with the insect, even when occurring in injurious numbers, that has characterised the attitude of all but a few growers until recently, are the chief explanations to account for the formidable bug population infesting so many of the orangeries of the district with the evils attending its presence. It is being made a matter for consideration with us as to how far this absence may be remedied.

CONTROL MEASURES.

At this early stage in the investigation, control measure can only be generally indicated, as it was found that our visit was not suitably timed for the prosecution of the necessary experimental inquiry, although the means for conducting this had been secured.

Eggs.

These are very difficult to destroy; the nature of their shells renders them almost impervious to fluids, and their spherical shape and polished exterior serves to shed any fluid sprayed upon them. Ones that had been coated with lime-sulphur have been found to be still alive. Further, the fact that the batches occur for the most part on the under leaf-surfaces principally of young leaves, and although really numerous at times (but always very few indeed as compared with the number in which leaves constituting the entire foliage occur), it is doubtful, even if our experiments did indicate any effective spray, its use would be economically justified, especially as the deposition of these eggs may extend in the case of any one tree over several days at least, and, therefore, more than one application would be required for their destruction.

No great difficulty has been experienced in finding these eggs, although always leaf green, and added experience would no doubt lead to further efficiency in this respect. Every batch of eggs destroyed accounts for fourteen young bugs killed also, as usually 100 per cent. of these hatch out. It may be then, that there will be special circumstances when bug-egg collecting will be fraught with material results, even if promoted by the offer of a small bonus to meet the cost of the undertaking.

Early Larval Stages (First and Second).

Stage I.—The young larval described previously may be readily killed by any of the ordinary contact remedies if once brought in relation with them. However, except for this fact, the remarks made under "Eggs" will apply. But, of course, *their* collection is out of the question. Moreover, the difficulty of reaching them is enhanced by the fact that the very least disturbance causes them to voluntary precipitate themselves to the ground. As they occur upon the outside of the trees, striking these with branches or any of the methods used in bringing down older larval Orange-tree Bugs might be availed of, especially if the ground beneath the trees were kept bare of herbage. The results following such a course, if alone undertaken, would, however, not appear to be likely to be very material in subduing the pest.

Stage II.—During No. II. Stage it is unlikely that any process can be brought to bear on the destruction of the insect. It can with difficulty be caused to drop, if at all, and it occurs distributed over the entire tree, and is small and most inconspicuous.

Later Larval Stages (Third and Fourth).

It is during the third and fourth life phases of the insects' growth when still young and not exhibiting either wings or wing-covers that measures of control can most effectively be entered upon. Then the Orange-tree Bugs are conspicuous objects by reason of both their size and colour—yellow and yellowish-red—and they readily fall on the trees being "beaten" or "banged."

The effectiveness of any contact spray diminishes as they grow older, and their skins become less pervious to this class of insecticides, so also with regard to measures that may be termed mechanical. The older the insect is then, with respect to these stages, the greater is the tenacity with which it clings to its host, and the greater the corresponding difficulty in bringing it to the soil after releasing its hold. When oldest it is of a bright-pink colour.

The insect was practically absent at the time of this initial inquiry, and so was not available for figuring in tests involving the use of special reagents that were at the time at our disposal. It is, however, very desirable to ascertain the efficacy of insecticides containing Derrine, and steps had been taken to already to do so then.

This investigation has to be, therefore, unavoidably postponed.

In the fifth larval or nymph stage, when the insect possesses conspicuous wing-covers of a green colour, much more convex or distended than before, it is then increasingly difficult to cope with, even by much mechanical means, as it is very tenacious, comparatively speaking, in its hold on the plant.

"Banging," "Beating," or Mechanical Procedures.

The efficacy of this procedure depends upon other conditions governing its successful adoption on the following requirements:—

(1) It must be conducted when the insect is the more readily brought down (*see* above, "Later Larval Stages"). Otherwise, if deferred, say, until the insect is already adult and endowed with wings, not only will poor results be obtained, but insects will be left to repair to neighbouring orangeries to those of the scene of operations, either forthwith or subsequently.

(2) The procedure must be carried out in such a manner as to occasion the utmost sudden jarring of the trees without in any way injuring them. This method is the one well known, generally speaking, to entomologists, and necessitates striking the branches one by one, climbing the trees for this purpose, if necessary.

(3) The possibility of preventing access to the trees on the part of the Orange-tree Bugs brought down must be prevented.

The Morris System.

In developing these requirements, and insomuch as the visit was not timed to admit of special experiments being entered upon, it will meet the purposes of this report if a system be described that has been elaborated, after much enlightened consideration, by Mr. H. Morris, who is almost singular in Blackall Range citrus growers in keeping in close contact with this office, and who was deputed to arrange the details of this local inquiry.

Mr. Morris has devised a special stout beater, measuring about 18 inches long, made of a certain tough wood. Nearly two-thirds of this is occupied with the well-shaped handle, somewhat curved, that balances the terminal part and admits of a good hand-grip. The terminal portion which is brought when beating in contact with the wood is squared, with one face, however, left flat, the others rounded off. Around this part of the beater is tightly fastened a piece of discarded motor tyre rubber for its entire length, the ends nailed in apposition, opposite the squared side. The rubber in passing over the latter, which admits of an air space, forms a sort of cushion which secures impact with the bark in striking with the avoidance of injury. The figure of the handle has reference to the position of the air-space. In practice, an operative climbs up inside the tree and suddenly bangs the leading branches, and then secondaries one after another, until all have thus received a shock. Of course, the soil beneath the trees should be bare to receive the insects that this action causes to be precipitated upon it.

Mr. Morris's scheme also provides for a device for preventing the fallen insects from climbing the tree trunks and repairing to their former feeding grounds as they are

wont to do, and also causing them meanwhile to congregate so that they can be scooped up and destroyed.

This is effected by placing a band around each tree at a few inches above the soil-surface composed of some special grease-proof paper, and on this grease itself is put after it is fixed in position.

This serves the purpose of causing the insects that have been brought down, sometimes as many as 800 from a single tree, to mass together after some time beneath it, as it is a barrier to their progress; and, thereafter, they may be scooped up with a piece of tin and dropped into a vessel containing lye or other lethal fluid.

Adult Insects (Winged).

These when congregated on the terminals of branches or in some such situations, especially when the sexes are together, cannot, of course, be captured in this manner. In capturing them I have recommended a net-like apparatus and a long stick padded at the striking end. The apparatus is composed of one "net" within another. The outer one may be of stout calico with the end capable of being opened by untying a string; the inner—shorter—one to be funnel-shaped and made of tin with the stem placed downwards, the outer edge forming the net margin instead of the usual ring. This, moreover, has a ferrule for a handle fastened on obliquely so as to admit of the mouth of the apparatus being held just under the little congregations of insects. These, on being beaten by the padded stick (or rather the end of the branch on which they occur being so treated), fall into the inner net and through the funnel into the outer net, whence they cannot escape. I have also suggested the possibility of destroying the adult insects under the circumstances referred to with boiling water (Mr. H. Morris on his part suggests steam as a modification), but neither of these (and both promise to be feasible) has yet materialised even to the experimental stage.

Use of Parasites.

Inability to discover any parasite at present associated with the Orange-tree Bug in the portion of the Blackall Range citrus-growing area examined, and therefore any controlling influence exerted by their agency, whilst pointing to the fact that the insect originally came to the district in a winged state from a scrub separated by a distance from it, too extended to be readily traversed by its foes of this description, and could therefore develop its inherent powers of increase to the fullest limits (hence its numbers), at the same time points to the expediency of investigating the *Oncoscelis sulciventris* in its native haunts—(1) with a view to the detection of such of its parasites as might be expected to occur there; and in so doing, if practicable (2) transferring them to the newly-colonised territory of their proper host, where, being confronted with the latter, a material lessening in the number of these pestiferous insects should result from their presence and habits of life.

Co-operation Effort.

The coping with this insect demands as a *prime consideration* concerted action carried out at one time on well-considered lines. Such a scheme I formerly devised for coping with the Sugar-cane Grub pests of the North, and whose adoption has been attended with such marked success wherever pursued. It is beyond the scope of this report to further enlarge on this necessity, but no effective co-operative work can be inaugurated without a leader in the movement possessed not only of enlightenment but with energy and enthusiasm. Such concerted effort can be seecured under the laws, but a well-conceived voluntary co-operative enterprise would, as experience in the above-mentioned connection indicates, far exceed any action that was enforced by the threat of penal provisions to meet the case of defaulters.

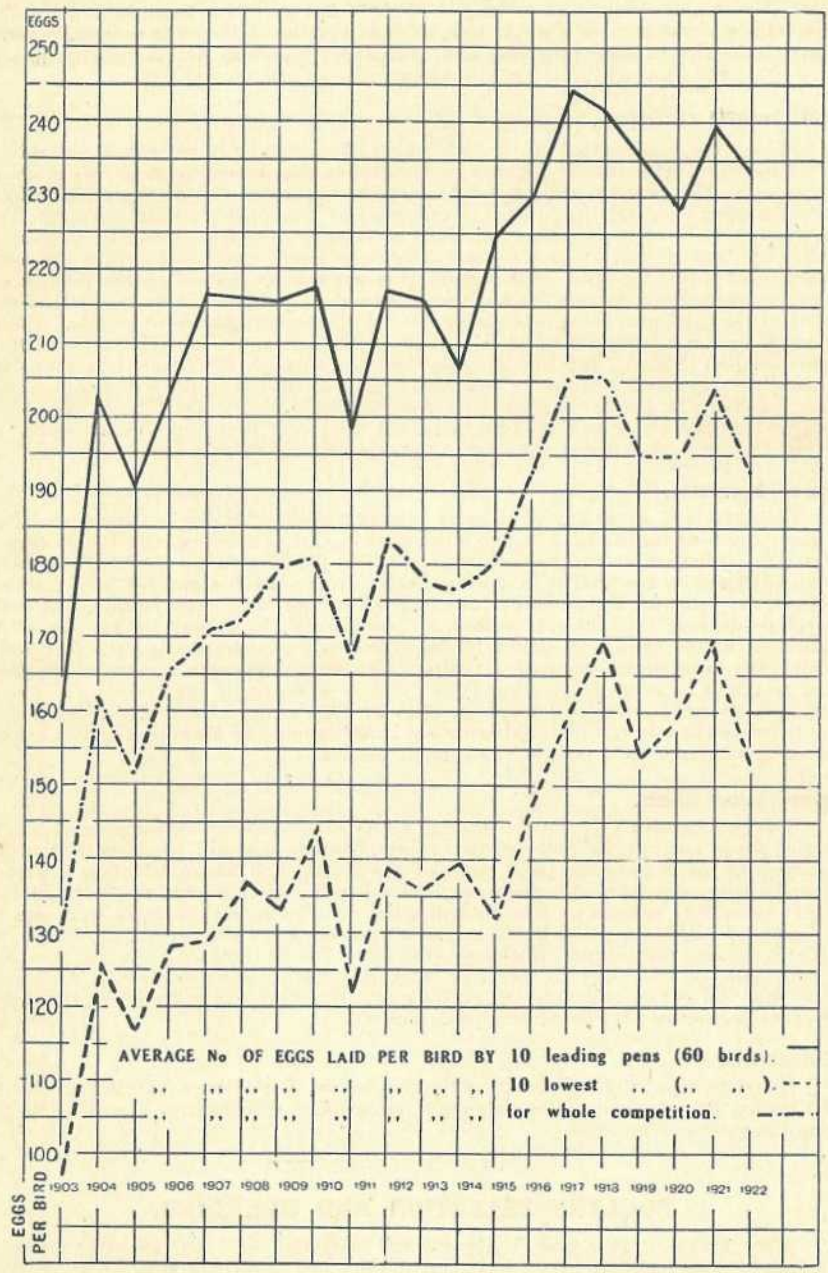
Obligations.

I have to especially confess my obligation to Mr. J. F. Power and Mr. A. Morris, of Flaxton, for very material assistance in prosecuting this inquiry, as well as to the junior members of my staff.

POULTRY SELECTION AND BREEDING.

This graph (from the "Agricultural Gazette of New South Wales") illustrates very clearly the excellent results to be obtained from careful selection and breeding. The diagram, which has been compiled from the records of the egg-laying competitions at Hawkesbury Agricultural College extending over twenty years, is self-explanatory. The full black line shows the average in each year of the 10 leading pens, totalling 60 birds—not necessarily the best 60 birds, as in the early years of the competition the birds were grouped in pens of six,

and it was not possible (as now) to pick out the 60 birds that actually laid best. For the same reason the lighter line shows the average of the lowest pens, but not necessarily of the poorest birds. The diagram shows up very strikingly the following points:—(1) The greatly increased egg-production of all sections—leading pens, lowest pens, and average for whole competition; (2) the average of the lowest



pens is now higher than that of the whole competition in the earlier years; (3) the average for the whole competition is now higher than the average of the leading groups in the early years. The most pleasing feature of the record is that the improvement, except for seasonal and other explainable causes, has been continuously progressive.

NATIONAL UTILITY POULTRY BREEDERS' ASSOCIATION COMPETITION, ZILLMERE.

Two thousand two hundred and thirty-five eggs were laid in this competition during the month of December, being an average of 18.625 per bird. There have been no cases of sickness in spite of the hot weather, but a few birds have been broody, thus reducing slightly the average score.

Pen No.	Owner.	Dec.	Total.	Pen No.	Owner.	Dec.	Total.
	WHITE LEGHORNS.						
2	A. Niel	28	233	30	A. S. Walters ...	17	173
29	A. S. Walters ...	21	224	36	Parisian Poultry Farm	22	173
43	J. J. Davies ...	27	223				
66	A. Cowley ...	25	215	48	M. J. Lyons ...	13	170
64	G. Trapp	26	211	17	R. Shaw	18	170
62	H. Sturman ...	24	207	18	R. Shaw ...	25	170
19	L. Andersen ...	16	205	57	M. Newberry ...	20	168
27	Oakleigh Poultry Farm	23	205	23	M. H. Campbell...	30	168
				41	G. Williams ...	21	167
7	J. Harrington ...	23	205	51	F. R. Koch ...	23	167
34	J. Purnell ...	25	205	56	W. H. Lingard ...	24	167
70	J. Hodge	27	202	37	Carinya Poultry Farm	23	166
72	Enroh Pens ...	22	200				
33	J. Purnell ...	12	200	73	A. F. Knowles ...	19	163
12	J. Potter ...	18	199	8	J. Harrington ...	20	163
77	Kelvin Poultry Farm	19	199	76	A. J. Bourne ...	17	160
				22	E. Stephenson ...	20	160
25	P. F. Adams ...	22	199	20	L. Anderson ...	21	160
61	H. Sturman ...	22	196	14	J. Hutton ...	23	155
63	G. Trapp	25	196	16	T. Flood	13	155
39	P. J. Fallon ...	25	195	82	E. C. Raymond ...	12	153
53	A. W. Ward ...	26	194	65	A. Cowley ...	16	149
68	R. D. Chapman ...	19	192	80	W. Bliss	24	148
79	W. Bliss	24	190	11	J. Potter	21	148
13	J. Hutton ...	26	190	5	Wambo Poultry Farm	20	146
44	J. J. Davies ...	24	189				
55	W. H. Lingard ...	22	188	81	E. C. Raymond ...	20	146
52	F. R. Koch ...	24	188	78	Kelvin Poultry Farm	25	144
47	M. J. Lyons ...	17	183				
24	M. H. Campbell...	20	182	31	R. H. Woodcock	19	142
58	M. Newberry ...	23	182	3	W. Becker ...	25	142
67	R. D. Chapman ..	24	182	71	Enroh Pens ...	19	139
10	P. Ruddick ...	24	182	45	H. Needs ..	16	138
46	H. Needs ...	24	181	15	T. Flood	16	135
49	R. Turner ...	23	179	59	C. Pickering ...	2	133
6	Wambo Poultry Farm	21	178	60	C. Pickering ...	9	132
				69	A. Hodge ...	11	128
40	P. J. Fallon ...	25	178	50	R. Turner ..	11	126
54	A. W. Ward ...	26	178	74	A. F. Knowles ...	0	123
26	P. F. Adams ...	26	178	75	A. J. Bourne ...	23	121
42	G. Williams ...	22	177	4	W. Becker ...	16	120
38	Carinya Poultry Farm	8	177	21	E. Stephenson ...	22	112
				32	R. H. Woodcock	17	108
9	P. Ruddick ...	17	174	28	Oakleigh Poultry Farm	0	107
35	Parisian Poultry Farm	20	174	1	A. Niel	13	17

NATIONAL UTILITY POULTRY BREEDERS' ASSOCIATION COMPETITION, ZILLMERE—*continued.*

Pen No.	Owner.	Dec.	Total.	Pen No.	Owner.	Dec.	Total.
			BLACK ORPINGTONS.				
96	R. A. Boulton ...	21	216	86	Kidd Bros. ...	14	155
92	C. C. Dennis ..	26	214	83	J. Hutton ...	5	154
88	W. A. Blake ..	25	213	102	Parisian Poultry Farm	12	150
107	E. Walters ...	14	197				
93	E. F. Dennis ...	18	194	84	J. Hutton ...	14	150
91	C. C. Dennis ...	24	189	109	Wambo Poultry Farm	16	148
108	E. Walters ...	23	188				
95	R. A. Boulton ...	19	187	112	A. Niel	26	145
105	H. Pearce ...	19	183	90	T. Brotherton ...	3	140
89	T. Brotherton ...	28	176	106	H. Pearce ...	12	140
101	Parisian Poultry Farm	18	174	99	L. J. Prichard ..	0	128
				110	Wambo Poultry Farm	13	127
103	J. Potter	20	171				
111	A. Niel	23	167	98	Enroh Pens ...	18	125
100	L. J. Pritchard ...	4	158	97	Enroh Pens	24	118
87	W. A. Blake ...	19	158	94	E. F. Dennis ...	3	103
104	J. Potter	13	156	85	Kidd Bros. ...	0	10
			OTHER BREEDS.				
120	T. J. Carr ...	23	178	115	G. and W. Hindes	10	129
118	J. H. Jones ...	24	174	117	J. H. Jones ...	0	120
116	G. and W. Hindes	12	162	113	Parisian Poultry Farm	10	120
119	T. J. Carr ...	23	159				
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CALIFORNIAN METHODS OF POULTRY RAISING AND MARKETING—II.*

In view of the widespread revival of interest in the poultry industry the subjoined article, the first instalment of which appeared in the January Journal, reprinted from the Journal of the Ministry of Agriculture, United Kingdom, and compiled from a Consular Report, will be regarded as of exceptional relevancy.—Ed.

Co-operative Marketing.

The Poultry Producers of Central California Incorporated, is an organisation typical of many in California designed to assist the farmer in marketing his produce in the most effective and economical way, and at the same time to obtain for him the best and most stable price possible.

It is proposed first to outline the methods employed at the Petaluma egg-depôt itself, and afterwards to indicate the co-operative principles upon which the organisation is built.

The depôt consists of a large rectangular building of one story, situated near the railway station, and having sidings and loading platforms along both sides, a third platform being provided at one end of the building for the convenience of automobiles.

Methods Employed.

Eggs are delivered in boxes of thirty dozen each from the railway truck, or, if the farmer lives in the vicinity, from his motor car. The quantities marked on the card attached to the box by the farmer are compared with those entered on a

*From a report drawn up by H.M. Acting Vice-Consul at San Francisco and communicated through the Department of Overseas Trade, U.K.

card inside the box, which is then re-nailed lightly. The boxes are stacked upon a small platform very much like a sled and sent to the re-sorting men upon an ingenious four-wheeled trolley. This is run underneath the loaded sled and jacked up by a single movement so that the sled runners are clear of the ground. Piles of boxes are kept upon the sleds so that they can be conveniently moved at any time with very little labour, and with practically no risk of breaking the eggs. The boxes have already been marked by the farmer according to the grade of eggs which they contain. If a box contains eggs of more than one grade they are re-sorted and made up into full boxes by the re-sorters.

The complete boxes are then inspected to ensure that their contents reach the standard required for the grade. The eggs, which are packed in cardboard frames of three dozen each, are transferred in one movement to somewhat similar metal frames running on a grooved table. They are swiftly looked over by experts who pick out any which are over or under size, dirty or of a bad colour. The frames are pushed along the table by the inspectors and the eggs are re-packed in boxes as they reach the end, the wire frames being shut up and returned along an overhead rack.

The repacked boxes are nailed up on the spot and removed on the sleds above described for shipment.

A Simple and Effective Grading Process.

The extreme simplicity and effectiveness of this grading process is due almost entirely to the education of the individual farmer in the methods of the institution. The great majority of the members can be trusted to grade their own eggs with considerable accuracy, and the inspection is actually only necessary to ensure a standard common to all the consignments and to detect occasional errors.

For the same reason, candling is very little done, except in the case of new members or for other special reasons. All the farmers whose eggs pass through the depôt are themselves members, and realise that care on their own part is necessary in order to dispense with more elaborate arrangements, the expense of which would devolve, ultimately, upon themselves.

The above process is extended in the case of dirty eggs and of eggs for preserving. The dirty eggs are placed upon an endless band of rubber-covered rollers which is passed beneath a funnel emitting a sand blast. As the rollers cause the eggs to revolve they are thoroughly cleaned without the deleterious effect caused by water.

The eggs for preserving are placed upon wire frames similar to those used by the inspectors and immersed for a second or two in oil which is kept at a temperature of 250 degrees Fahrenheit. This has the effect of driving out the air and of sealing the egg, thus rendering it capable of preservation for some months. It may be noted in passing that members are expected to send only sterile eggs to the depôt.

After the completion of the various processes, the boxes are stacked according to the grade of eggs which they contain and loaded on to barges for shipment to San Francisco, or on to railway wagons if for shipment by land.

Individual Care a First Constituent of Co-operation.

It will be noted from the above that the association does little beside co-ordinating the efforts of individual farmers. It in no way relieves them of the responsibility of delivering their eggs in the best possible state for marketing. If the grading and packing work at the depôt runs smoothly, it is because the farmers themselves have taken great pains that it should do so, by performing their own task as efficiently as possible. This is a point of some importance, as indicating the value of individual care as a first constituent of co-operation.

It might be thought that, since only some 65 or 75 per cent. of farmers in the district are members of the Co-operative Marketing Association, its usefulness was problematical. Actually, the proximity of Petaluma to the markets of San Francisco and the Bay Cities adjacent thereto makes it a simple matter for many farmers to make contracts for the sale of their eggs without having recourse to the association: it is when the industry outruns its local market that such a society becomes necessary. In short, though a prosperous co-operative society may be regarded as a criterion of the success of an industry, it is a result of success rather than its cause.

Constitution of Societies.

The question of the constitution of co-operative societies has received much attention in California. Such societies are to be regarded as accessory to the individual in his business, and not as profit-making concerns. They are to provide assistance to

the farmer in proportion to the size of his business through them, and to ensure that none but he and his associates have the controlling interest. The constitution of the Poultry Producers of Central California Incorporated, follows the main principles which have now been accepted in this country as essential for *bonâ fide* co-operative concerns. The initial capital is supplied by local poultry farmers, and subsequent issues are governed by the size of the applicant's poultry ranch—*i.e.*, he can only be allotted one 10.00-dollar share for every 1,000 hens or majority fraction thereof owned by him. Since he must, upon joining, sign an agreement to sell and deliver to the society all the eggs and poultry which he markets, it will be seen that the stock is fairly equitably divided.

The society is governed by a board of eleven directors, all of whom must themselves be poultry producers. An exception is made in the case of one of the directors, who is nominated by the State Market Director of California. There is an Executive Committee of five directors, and a salaried general manager. In addition to the usual annual accounts, the society issues a monthly auditor's financial statement showing the assets and liabilities, and the volume of business and operating costs during the month in question.

Methods of Selling.

The society sells the eggs at the best price it can get, and hands over the proceeds at the average price for the week to the producer, less the cost of the egg-boxes and certain other expenses. These include transportation, and a charge not exceeding 1 cent per dozen eggs for operating and selling expenses. At the end of the fiscal year a reasonable amount is put aside for reserves, dividend, advertising, &c., and the balance of the surplus, if any, is divided among the members according to their deliveries.

In addition to this, 1 cent per dozen is deducted from the selling price of the eggs handed to the producer, and placed to his credit towards the purchase of further shares. As soon as 10.00 dollars is made up in this manner the producer is given a further share in the society. This procedure will, however, cease as soon as the authorised capital has been paid up.

In times of plenty, the society, at its discretion, places a proportion of the eggs delivered in store, paying the producers at the end of the week at the current market price. When it is considered wise to sell these, the producers generally are credited with the further profit made, or debited with the loss incurred should storage and insurance absorb the profit. This second transaction is, of course, between the society and those producers only who made deliveries during the week in which the eggs were put in store.

The society has the right to send eggs to any market which it may consider advisable, and in that case is considered to have bought the eggs at the current market value at the time of shipment. The profit or loss on these transactions is, however, credited or debited to the general corporate fund, and not directly to the producers.

This Central Californian Society has not considered it yet necessary to apply co-operative methods to the marketing of poultry, but should it decide to do so, the members, after ten days' notice, are bound to begin delivering their poultry for marketing to the society as they now do their eggs.

These are only main points in an organisation typical of many which exist for the marketing of various agricultural products in California.

Business Principles Necessary.

It is thought that American methods could profitably be studied by poultry farmers in the United Kingdom. This is not to say that imitation of particular methods is all that is desirable, or that such imitation would, in fact, revolutionise the British poultry industry. The main point is the necessity of business principles in the building up of a prosperous industry. These have been applied with such conspicuous success in the United States, and notably in the district referred to above, that persons interested in the industry would be well advised to make a close study of these principles and the methods to which they have given rise. In particular, the spirit of co-operation and a certain financial courage, when allied with individual hard work and enterprise, would appear to be the main desiderata for success. When it is realised that so compact and successful a community as that of Petaluma has grown up in a State the size of England, but with only one-tenth the number of inhabitants, the possibilities of the poultry farming industry in the United Kingdom, where so tremendous and convenient a market exists, would seem to deserve exploitation to the fullest possible extent.

"THE PURE SEEDS ACT OF 1913," AS AMENDED BY "THE PURE SEEDS ACT AMENDMENT ACT OF 1914."

BY F. F. COLEMAN, Officer in Charge, Seeds, Fertilisers, and Stock Foods Investigation Branch, Department of Agriculture and Stock.

The abovementioned Acts are intended to regulate the sale of seeds for planting or sowing—that is to say, all vendors of seeds must comply with the Acts and Regulations thereunder.

Samples for Examination.

In order to ascertain if seeds comply with the Acts, samples may be submitted to the Department of Agriculture, Brisbane, for analysis. It is of the utmost importance that the samples be drawn by the sender from the seed in his actual possession, care being taken to obtain a small quantity from each bag, carefully mixing them together in order to make the sample truly representative of the bulk.

Weight of Samples.

All samples of seed sent for analysis must not be less than the weights herein set out, and in the case of seeds containing foreign ingredients double the weight mentioned should be sent.

Wheat, Oats, Barley, Maize, Rice, Rye, Cowpeas, Tares, Peas, Beans	8 oz.
Lucerne, Clover, Sorghum, Sorghum Sudanense (Sudan grass), Setaria (Foxtail millet), Japanese millet, White panicum, French millet, Linseed, Canary, Prairie grass, Buckwheat, Cotton	4 oz.
Rhodes grass, Paspalum dilatatum, Rye grass, Cocksfoot, Couch grass	2 oz.
All agricultural seeds other than those included above ..	2 oz.

Marking of Samples.

Before sending any samples care should be taken to see that the following particulars are plainly written thereon in ink:—

(1) Kind of seed.
(2) Quantity the sample represents.
(3) Marks on bags or grower's name.
(4) Name and address of sender.

Unless these particulars are plainly written on the sample delay will ensue.

When the information is required for commercial purposes a fee of 2s. 6d. per sample is charged, which fee should be enclosed with the covering letter advising of the despatch of the sample. All samples, with covering letter, should be addressed to the Under Secretary, Department of Agriculture and Stock, Brisbane.

The official reply is sent in the form of a report or certificate, which gives the percentages of purity and germination, also the percentage of the various foreign ingredients that the sample contains.

"Purity" means the percentage by weight of pure seed that the sample contains, and the term "Pure seeds" means the seeds of which the sample purports to consist after the impurities or foreign ingredients, as defined below, have been eliminated; but, in the case of those species, kinds, or strains of plants, the seeds of which cannot be distinguished from one another by expert examination, the use of the term "Purity" does not imply that the seed is genuine or true to name.

"Germination" means the percentage, calculated by number, of pure seeds as defined above which germinate during a germination test.

"Foreign ingredients" or impurities include inert matter, seeds of weeds, or seeds of any plant other than the seed in question, or dead, diseased, insect infested, non-germinable, or hard seeds.

"Inert matter" includes broken seeds less in size than one-half of a complete seed, or chaff, dust, stones, or any material other than seeds.

"Hard seeds" mean any seeds whose seed coats are so impervious to water as to delay germination.

FORM OF CERTIFICATE.

A certificate of analysis gives the following particulars:—

Calculated by Weight.	Calculated by Number.
Purity (or Pure Seeds) ..... per cent.	Germination ..... per cent.
FOREIGN INGREDIENTS.	
Inert matter .....per cent.	Hard Seeds ..... per cent
Seeds of weeds or seeds of any kind,* other than that to which the sample purports to belong .....per cent.	Dead and non-germinable seeds .....per cent.

* The principal seeds are (names of weed seeds, &c.).....

Unless the sender is careful to forward a truly representative sample the certificate is valueless. Under no circumstances is it a guarantee by the Department of Agriculture as to the bulk, but an analysis of the sample received, giving a plain statement of its condition at the time when such analysis was made.

Invoice must be given by Vendor.

On the sale of any seeds of not less value than one shilling the vendor must give to the purchaser an invoice stating that the seeds are for planting or sowing, the kind or kinds of such seeds, and that they contain no greater amount of foreign ingredients than is prescribed.

The actual wording on an invoice should be—

> "The seeds mentioned on this invoice are for planting or sowing, and contain no greater proportion or amount of foreign ingredients than is prescribed for such seeds."

Definitions of "Vendor" and "As grown."

A vendor is any person who sells, or offers or exposes for sale, or contracts or agrees to sell, or deliver any seeds. In other words, an Auctioneer, Storekeeper, Produce Merchant, Seedsman, Grower of the seed, or any other persons, are vendors whenever they sell or offer for sale any seeds as seeds for sowing. Section 6 of the Regulations provides for the sale of "As grown" seeds to seed merchants to be cleaned and graded by the merchant before being offered for sale as seed for sowing. The sale by farmers of "As grown" seeds is therefore limited to such merchants as are in possession of one or more efficient seed-cleaning machines. A farmer is a vendor under the Acts whenever he sells to another farmer or to any other person, and must give an invoice, as required by the Acts. The only exception is the sale of "As grown" seeds to merchants for cleaning and grading.

Prescribed Standards and "B" Grade Seeds.

The percentage of weed seeds, inert matter, dead and non-germinable seeds, and other foreign ingredients that may be contained in the different kinds of seeds are prescribed by the Regulations, copies of which may be obtained from the Department of Agriculture.

"B" grade seeds are seeds in which the amount of foreign ingredients exceeds the proportion set forth in Schedule A of the Regulations, but does not exceed the proportion set forth in Schedule B, such seeds may be sold as seeds for sowing, providing they are contained in bags or packages to each of which is affixed a label, brand, or stamp, clearly and indelibly marked, specifying: The kind or kinds of such seeds; that the seeds are "B" grade, for planting or sowing, and contain no greater proportion or amount of foreign ingredients than is prescribed; also the name and address of vendor. All invoices relating to such seeds must be distinctly marked "B" Grade Seeds.

Every purchaser should know the purity and germination of the seed that he intends to buy or sow; also its freedom from diseased or insect-infested seeds. These matters can only be decided by a thorough examination of a large and truly representative sample drawn from the actual bulk in the sender's possession. Seeds constitute the most variable material that the farmer or merchant purchases, and the success or failure of a crop, or even succeeding crops, may be wholly determined by the kind or condition of the seed sown. No one can afford to leave any doubtful point to chance, and it is but common prudence to ascertain the purity and germination of all seeds purchased before sowing or offering them for re-sale.

Free Analysis for Farmers—Better Seeds mean Better Crops.

In buying let quality be your guide; the best is never too good. No charge is made to farmers sending in samples of the seeds that they have purchased for their own sowing, providing the following particulars are plainly written on each sample:—

(1) Vendor's name and address.
(2) Name of seed.
(3) Quantity purchased.
(4) Date of delivery.
(5) Locality where seed is to be sown.
(6) Name and address of purchaser.

Although buyers and sellers are able to form a good idea of the market value or price, experience shows that they are frequently misled as regards purity and germination. It is impossible to determine the amount of weed seeds, non-germinable seeds, hard seeds, or inert matter other than by a purity analysis and germination test conducted under uniform scientific methods. Any opinion as to the quality or condition of any agricultural seeds is useless unless based on the examination of a truly representative sample. This work is undertaken by the Seed Laboratory of the Department of Agriculture.

Before sending any samples, care should be taken to see that the required particulars are plainly written thereon in ink.

COVERING LETTER.—All samples, with covering letter, should be addressed to—

The Under Secretary,
Department of Agriculture and Stock,
Brisbane.

SUGAR: FIELD REPORTS.

The Southern Field Assistant, Mr. J. C. Murray, reports under date 3rd January, 1923, as follows:—

Maryborough.

Cane is looking well in this district and acreages are gradually being extended. There is still a fair amount of land outside Maryborough that could and probably will be planted provided the price of sugar is sufficiently encouraging. This applies in a large degree to that tract of forest country that is lying between the city and Tiaro, where, excepting for frosted places, quite a lot of cane could be grown.

The varieties mentioned in the previous reports as making favourable progress are still doing well, while ratoons cane are making a good showing. It is probable here, as well as in other districts, that the farmers would get better tonnages from ratoons if they studied ratoon fertilising in suitable weather. Very often a ratoon crop which turns out a partial failure would have been a success had, say, judicious application of mixed fertilisers been used. Farmers are recommended to increase the humus content of the soil by green manuring. They are also recommended to remove useless and discarded varieties from their farms, as these only act as hosts for insect parasites and injurious bacterial agencies.

Pialba.

Farmers have had good rains, and the young crops, plant and ratoon, look forward and healthy. Canegrowers are paying more attention to scientific methods of production, and the result of this is observed on some of the plant cane and the appearance of the soil, which has been rendered friable by intensive cultivation and the use of lime. Great credit is also due to these farmers who have variety plots, for the care and discrimination with which they are looking after them. Cane varieties at present looking promising are Q. 813, E.K. 1, E.K. 28, Shahjahanpur No. 10, M. 1900 Seedling, and Demarara 1135. J. 247 is also making a good showing.

Liming has been conclusively proved successful on a typical Pialba soil, and one progressive farmer has had good results from the use of 2 cwt. meatworks, 2½ cwt. sulphate of ammonia, 2½ cwt. sulphate of potash, and 3 cwt. superphosphate. This mixture was applied with positive results. The soil, however, was a little better than a typical Pialba soil, that is to say, the texture was probably better. Guano has also been used on the same soil but with no positive results, until the ratoon crop, and then it was noticeable where the ½ ton per acre of guano had been placed.

Mount Bauple.

There is every prospect of a good season at Bauple next year. Splendid rains have fallen, in some instances a little too heavy, causing washaways in places, but, on the whole, the district has benefited greatly. The young plant cane and ratoon are very healthy and forward, showing no disease or evidence of parasitic attack. The farmers are busy keeping down weed growth and cultivating, the latter being very necessary to ensure against evaporation and caking of soil after the heavy rain. Farmers here are recommended to eliminate discarded varieties as much as possible, and only grow canes likely to develop into economic growth. There is little to comment upon since last visiting Mt. Bauple. The Shahjahanpur No. 10 is making a good showing and should do well in the district. Other canes making good progress include E.K. 1 (this variety looks particularly well), E.K. 2, E.K. 28, H. 109, Q. 970, M. 1900, and Q. 813. Reintroduced D. 1135 and M. 189 are canes that are making a very good showing also.

The Northern Field Assistant, Mr. E. H. Osborn, reports under date, 4th January, 1923:—

Proserpine.

At the time of my visit this area was suffering severely from the effects of dry weather, and consequently 1923 prospects were not too encouraging.

Very little of the November rain that fell at the Burdekin reached the Proserpine area, with the exception of Kelsey Creek and Banana Pocket. These districts had probably 1½ to 2 inches, against about half an inch in the other parts. Up to the end of November 37.39 inches of rain only had been recorded at the mill, which is a very big decrease below the general average rainfall.

34.167 tons of cane had been crushed for an average of 14.95 c.c.s. Some 4,610 samples were taken on an average of one for every 7.4 tons of cane. Below is a list giving particulars of the cane put through the rollers:—

Variety.	Average c.c.s.	Per cent. of crop.
H.Q. 426	15.6	26
Q. 813	15.5	9
B. 147, B. 208, Q. 1121, Q. 114, and Q. 116	15.5	3
Badila	15.4	10
M. 1900	15.2	5
Mixed varieties	14.4	12
Goru	14.2	13
S. Singapore	14.2	6
D. 1135	14.2	6
Malagache	14.1	10
		100 per cent.

It will be noticed that again this year H.Q. 426 is easily the favourite, but is run a good second by Q. 813, whilst the 3 per cent. of B. 147, B. 208, Q. 1121, Q. 114, and Q. 116 are also very high in sugar content.

When the very dry nature of the season is taken into consideration, it is really wonderful to see how well some blocks of plant cane are looking. Most of them, however, are either on or adjacent to the water frontages.

Among those most noticed was a 30-acre block of July plant growing upon Mr. R. Ruge's farm upon the river bank. At Kelsey Creek, Mr. J. C. Edwards has some very fine plant cane, consisting of Badila, M. 190, and D. 1135. His ratoons also show very good growth. This grower has ploughed deeply and often, has scarified continually, and has generally kept his cane in good order.

Probably more cultivation has been put into the Proserpine cane area this year than in any former one, and it is due to such continual work that the cane still holds out so well under such adverse weather conditions.

At Banana Pocket the conditions were very dry, although better than in Proserpine proper. Since my last visit several new farms have been opened up, and there are now twelve or fourteen growers in residence.

Among the cane growing there, Mr. R. Thomas's July plant stood out on its own, being ahead of any cane seen elsewhere in the Proserpine area. It consisted of H.Q. 426, Badila, N.G. 24 and 24 B., M. 1900, and D. 1135, and certainly looked very well indeed. Mr. Thomas said that his average density for twenty-months old plant cane of the above six varieties was 14.6 c.c.s It is to be hoped that all the available land in this area will soon be under crop, as the Proserpine mill is in need of such cane.

Lower Burdekin (Kalamia, Pioneer, and Inkerman Areas).

Kalamia finished crushing on the 16th December for 70,000 odd tons of cane, and although generally speaking the average density figures were below those of last year, yet in places some high figures were reached. One grower, I am told, had an average of 19.1 c.c.s. for a couple of weeks from B. 208.

Generally, the cane looks well despite the dry weather, and some really nice plots of cane were noticed. Among them was a block of 30 acres plant belonging to Mr. H. Parker (August) of H.Q. 426 and 24 B. This was watered at time of planting and afterwards manured with 4 cwt. of mixed manure to the acre. Nearby a small block of first ratoons (H.Q. 426) had been given the same treatment and was cutting at the rate of 20 tons to the acre. Some extremely nice cane was also noticed upon Messrs. Butterworth's, Wellington's, and Raff's farms.

The lastnamed grower has just added to his steam pumping plant an electric 8-inch pump, worked from the Ayr power-house. Mr. Raff speaks well of this installation.

Pioneer Mill.

This mill put through a total of 93,300 tons of cane for the season, but for a lower density than last year. For next year there is some 3,000 odd acres planted, of which about 60 per cent. has been planted early. This has all struck very well, as has also about half of the late plant. Some of the crops look very well, mainly B. 208, Badila, H.Q. 426 (Clark's Seedling), and the Gorus N.G. 24, 24A, and 24B. These varieties certainly grow to great advantage upon the Burdekin soil.

Mr. H. H. Kastener, of Klondike, kindly supplied the following interesting particulars of some cane varieties harvested by him:—

Variety.	c.c.s.	Value.	
		s.	*d.*	
Q. 908	14.0 ..	51	6	Planted in August, cut early next August.
Q. 855	13.1 ..	47	2¾	
Q. 970	12.7 ..	45	4	
Hy. No. 1 ..	15.5 ..	58	7½	
*Q. 813	14.7 ..	54	9¾	Planted in September, but cut in August (early).
„	15.1 ..	56	8¾	
„	14.1 ..	51	11¾	
„	15.0 ..	56	3	
„	16.0 ..	61	0	
„	15.0 ..	56	8¾	

Home Hill (Inkerman Mill).

The progress of this district during the past twelve months has been remarkable. New and substantial houses are being built in every direction, and the farmers generally are optimistic as regards the future success of their canegrowing operations; that is, of course, if the price of sugar keeps up to a reasonable figure. A large number of the farms are now being supplied with irrigation water, and a number of these interviewed seemed well satisfied.

Another noticeable feature was the very large number of tractors that have come into use since my last visit only six months ago. They are of all types, and are getting over a great deal of ground.

During the crushing just finished at Inkerman mill, some 119,000 tons were put through. Like the other Burdekin mills, however, the density was on the low side. This was caused by the dry weather early in the year. The State Farm records show that for July, August, September, and October only 2.28 inches fell, and of this amount 1.7 inches fell in July. Naturally, with such dry weather conditions, the cane crushed early in the season was badly dried. Going through the areas it was also noted that more attention is being paid to green manuring, liming, and using artificial manures, and most of the growers recognise their value. For instance, Mr. S. W. Gibson cut a 10-acre block of first ratoons, Badila, and N.G. 24B, for a return of 31 tons to the acre. This had been manured with about 6 cwt. mixed manure to the acre. As a plant crop he received a yield of over 40 tons per acre. Last year a first ratoon crop manured with the same quantity of manure gave him a 26-ton yield per acre.

Mr. Gibson uses 2 tons of earth lime per acre and also ploughs in Mauritius bean.

Pests in the Burdekin Areas.

At time of writing the grey-back cane-beetle is very numerous on and about Plantation Creek (in the vicinity of Norham). The Burdekin Canegrowers' Association are fully alive to the danger and are now very busy collecting beetles.

Some big cheques are being made by the various collectors—Mr. Hobson having paid one man £9 for three days' work, paying for the beetles at the rate of 1s. 6d. per quart. Another grower collecting has paid for 1,647 quarts between 1st and 26th of December. The association is to be complimented on the energetic way in which it is trying to minimise the effects of this pest.

In connection with cultivation matters generally, it is pleasing to see how this district is going ahead. Manuring is now being carried out to a very large extent. Quite a large number of growers are also using green manures, and liming is becoming far more popular. Roughly speaking, there are about thirty-six tractors on the Ayr side of the river. Two or three automatic light ploughs are already in use and three more are on order.

As a result of the recent beneficial rains the whole district presents a beautiful appearance, and at present everything points to a splendid season for 1923.

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* The Q. 813 was cut from an 8-acre block of medium shallow forest country, and was only ploughed twice, cutting at the rate of 17 tons to the acre. Its c.c.s, however, averaged nearly 16, or very much more than the average c.c.s of the mill for the season.

THE USE OF FERTILISERS IN SUGAR-CANE CULTIVATION.

BY H. T. EASTERBY, Director of Sugar Experiment Stations.

The past three years has seen a great increase in the use of manures for sugar-cane, but there are still many farmers who continually deplete their soils without in any way attempting to restore necessary plant foods. Moreover, the higher costs of production, combined with the possibility that we shall see a reduction in the price of sugar, makes it imperative that every farmer shall make it his business to get as much as possible out of his land by more intensive cultivation, proper soil handling, and by the aid of fertilisers where the use of them is indicated. The Sugar Experiment Station has for many years past freely encouraged cane farmers to send in samples of their soils for analyses, and obtain advice thereon, and up to the present upwards of 1,000 sugar soils have been so analysed. Many lectures on manuring have also been delivered by the Sugar Bureau, and particulars have been published in pamphlet form. With the results of soil analyses, letters of instructions as to the treatment of the land is forwarded.

It will be useful before proceeding to deal with fertilising substances to consider how much plant food is removed from the soil by cane crops. This appears to vary a good deal according to the variety grown—for instance, in some experiments carried out in 1915 and analysed, it was found that the three varieties of cane known as H.Q. 426 (or Clark's Seedling), Badila, and Goru, removed in pounds per acre the following amounts of plant foods:—

Name of Cane.	Potash removed. Pounds per Acre.	Phosphoric Acid removed. Pounds per Acre.	Nitrogen removed. Pounds per Acre.
H.Q. 426 ..	137	77	105
Badila.. ..	166	59	109
Goru	91	23	60

It will thus be seen that the constant growing of cane crops on lands where no attempt is made to replace plant foods means the removal of huge stores of mineral matter essential to crops, and the ultimate poverty of the lands. Farming under these conditions has often been compared to a spendthrift squandering his principal.

The Application of Manures.

The manurial elements needed in the growing of successful cane crops are nitrogen potash, and phosphoric acid. These are usually supplied in the following fertilisers:—

Nitrogen in—

- Nitrate of soda—contains about 15 per cent. nitrogen.
- Sulphate of ammonia—contains about 20 per cent. nitrogen.
- Nitrate of lime—contains about 12½ per cent. nitrogen.
- Nitrolim—contains about 18 per cent. nitrogen.
- Dried blood—contains about 11 per cent. nitrogen.
- Meatworks manure—contains about 3 to 4 per cent. nitrogen.

Potash in—

- Sulphate of potash—contains about 52 per cent. potash.

Phosphoric acid in—

- Superphosphate—contains about 16 per cent. phosphoric acid.
- Rock phosphate—contains about 18 per cent. phosphoric acid.
- Guano—contains about 15 per cent. phosphoric acid.
- Thomas phosphate—contains about 17 per cent. phosphoric acid.
- Meatworks manure—contains about 17 per cent. phosphoric acid.
- Bone dust—contains about 20 per cent. phosphoric acid.
- Basic superphosphate—contains about 19 per cent. phosphoric acid.

Phosphoric acid is found in a readily soluble form in superphosphate, it being practically all water soluble in that material. In the other forms shown above, the phosphoric acid may be partly citrate soluble and partly citrate insoluble.

Hints on Purchasing and Using Manures.

1. Do not take delivery of manures unless they are accompanied by an invoice certificate containing the guaranteed percentage of the article purchased, or, in the case of a mixture, the guaranteed percentages of the different ingredients.
2. Do not accept delivery of bags of fertiliser that are not labelled or branded.
3. It is much wiser not to buy fertiliser of low grade, as you may have to pay freight on a lot of useless material.
4. Always see you obtain the manure you order.
5. Do not give a higher price per ton than the registered price under the Fertilisers Act. This may be seen periodically in the "Agricultural Journal."
6. Do not buy more manure than you intend using, as fertilisers do not improve with keeping.
7. If possible, mix your own fertilisers, as you can vary the proportions to suit your own requirements.
8. Always remember you want to manure the crop, not the land.
9. Prevent bags of fertiliser from getting wet. This always leads to loss, and frequently sets the manure in hard lumps, difficult to break up.
10. Finally, always bear in mind that fertilisers give the best results on well-tilled soils and that they also need moisture in the soil. Applying fertilisers in time of drought is waste of manure.

Under the Fertilisers Act it is required that the dealer shall, at the time of sale or before delivery, give to the buyer an invoice certificate, signed by the seller or his agent, stating the full name and place of business of the dealer; the name, trade mark, brand, or sign used to mark packages containing such fertiliser, and used to identify such fertiliser; the quantity or net weight of fertiliser comprised in the sale; the composition of the fertiliser, setting forth the proportion per centum in which such fertiliser contains the following ingredients:—Nitrogen, phosphoric acid, potash, and lime, and the respective forms in which they respectively occur; and, in the case of bone dust, basic slag, agricultural lime, &c., the percentage of coarse and fine material.

Furthermore, every dealer who sells fertiliser, which term includes offering or exposing for sale and having in possession for sale, shall securely affix to each package a printed label, clearly and truly certifying: The number of net pounds of fertiliser in the package; the figure, trade mark, or sign under which the fertiliser is sold; the chemical composition of the fertiliser, in the same manner as stated on invoice certificate; and the state of fineness for certain fertilisers.

In mixing fertilisers care must be taken not to bring ingredients together which would lead to decomposition or loss of some part of the manure. Thus, should lime be mixed with sulphate of ammonia or superphosphate, loss would result, as it would also if Thomas phosphate were mixed with sulphate of ammonia.

Nitrate of soda is easily leached from the soil, hence it should not be applied during a heavy wet season. It is a great stimulant, and has frequently been found to add such strength and vigour to cane plants that it strongly aids in obtaining other mineral food, such as potash and phosphoric acid, from the natural resources in the soil. Nitrate of soda will often show its effects in a week or two, producing a rich, dark-green colour in the foliage, and cause a marked improvement in the growth of the cane.

Nitrogen, in the form of sulphate of ammonia, is not so quick in action as in nitrate of soda; while nitrogen in dried blood, bone dust, and meatworks is still slower in action, as they require chemical changes to convert them into nitrate so as to become available to the plant.

Meatworks, in the wetter cane areas of North Queensland, is often preferred to superphosphate as being less soluble.

As a rule, considerably more benefit is got from the manuring of ratoons than from the manuring of plant cane, and this experience is common. This is strikingly shown in the following summary of experiments carried out at Mackay:—

PLANT CROP. Tons of Cane per Acre.			FIRST RATOON CROP. Tons of Cane per Acre.			SECOND RATOON CROP. Tons of Cane per Acre.			THIRD RATOON CROP. Tons of Cane per Acre.		
Manures..	No Manures.	Difference.	Manures.	No Manures.	Difference.	Manures.	No Manures.	Difference.	Manures.	No Manures.	Difference.
50·7	47·4	3·3	42·4	31·7	10·7	38·8	24·1	14·7	35·9	19·8	16·1

The manures applied to the above were nitrate of soda, sulphate of ammonia, superphosphate and sulphate of potash.

It is not recommended that mixed fertilisers should be placed in the drill with the cane plants. As soon as the cane is about 18 inches high, drills 4 to 5 inches deep should be drawn about 10 inches from the cane plants on each side of the row, and the fertiliser advised is put into these drills and then covered, or a manure distributor can be used. Both sides of the row, however, should be treated. If nitrogenous fertilisers alone are recommended, such as nitrate of soda and sulphate of ammonia, they can be applied on the surface of the soil near the cane. Organic forms of nitrogen, such as meatworks and blood manures, requiring the action of soil organisms to render them available, should be placed in drills and covered.

For ratoons the manures can be applied while working the interspaces. They may be dropped in the furrow, ploughed away from the cane, and then covered.

For the continued successful use of artificial fertilisers, the land should not be acid in reaction. Considerable risk is involved in the continued use of manures such as sulphate of ammonia, sulphate of potash, and acid phosphates unless lime dressings have been previously made.

On given soils, particularly some of the red volcanic type, better results from the use of organic fertilisers, such as bone meal, blood manure, meatworks manure, &c., have been realised. Megasse ash, molasses ash, and filter press cake should all be availed of when they can be procured. The latter should be ploughed in some three or four months before the cane is planted, and the same may be said regarding the application of molasses.

Before applying fertilisers it would be wise to send samples of the soil of the farmer (not less than 5 lb.. in weight) to the Bureau of Sugar Experiment Stations, Brisbane, for free analyses and advice, accompanied by a form giving full particulars. These forms may be obtained from the office of the Bureau, in Brisbane, but many secretaries of the different Farmers' Associations have supplies.

Advice on the kinds of fertilisers to use, prices, &c., may always be obtained from the Sugar Bureau.

The very best of cultivation must always be used to obtain the best results from fertilisers. A moderate to good rainfall is also essential, as without plenty of moisture, manures lie dormant in the soil and are, indeed, often lost altogether in loose and porous soils.

PLATE 29.—SUGAR CANE.

THE SUGAR INDUSTRY.

Stabilisation Proposals.

Conference Favours Pool.

In response to an invitation from the Government, representatives of the Queensland Sugar Industry met in conference with the Premier (Hon. E. G. Theodore) and Minister for Agriculture and Stock (Hon. W. N. Gillies) on the 23rd and 24th January. The Conference decided in favour of a Pool to control all sugar produced in this State during the next five years; the prohibition by the Commonwealth Government of the importation of black-grown sugar, except so much as might be required to make good any Australian shortage; and the retailing of sugar at a price not exceeding 4¼d. per lb. in the larger cities, an agreement to be made between the Pool and the refiners for the refining and distribution of the sugar. It was also decided to place the Conference resolutions before the Federal authorities by delegation. Subjoined is an abridged report of the proceedings.

An important conference to consider the welfare and permanency of the sugar industry of Queensland was opened in the Office of the Minister for Agriculture and Stock (Hon. W. N. Gillies) on the 23rd January, and continued next day.

Mr. Gillies presided. The invited delegates were:—

Standing Sugar Committee of the Council of Agriculture: Messrs. W. J. Short, T. A. Powell, W. G. Batchler, G. H. Pritchard, and C. V. Hives; Australian Sugar Producers' Association: Messrs. A. Adie, F. C. P. Curlewis, Senator T. W. Crawford; United Cane Growers' Association: Messrs. G. Johnson, J. J. Castor, W. H. Doherty; Millers' Representative on Cane Prices Board and Representative of the C.S.R.: Mr. P. H. M. Goldfinch; Cane Growers' Central Board: Mr. W. H. Marshall; Millaquin Refinery: Mr. W. R. Hartnell. There were also four visitors from New South Wales, who were permitted to remain as spectators. These were Messrs. Nudgley, Robbins, Ellis, and C. Farlow. Mr. F. M. Forde, M.P., Capricornia, was also in attendance.

The Chairman's Address—Sugar and White Australia.

Mr. Gillies welcomed the delegates. He said they all recognised the benefits of the sugar agreements since 1915, particularly the last one, whereby the industry increased in value by £5,000,000, and 40,000 more acres were placed under sugar than before. Farmers were able to give better attention to cultivation, and the standard of living of the growers improved. It was for the delegates to endeavour to formulate a policy that would enable the prosperity of the industry to be continued in the absence of a Commonwealth agreement. It was their most important industry, and with it was involved the White Australia policy. From 1907 to 1920, Australia imported sugar to the value of £21,000,000, and seeing that we had the land, the climate, and the rainfall, we ought to be producing all the sugar that Australia required. Under a proper system of control it could easily be done, and the benefits resulting from the agreements justified some sort of Government control. They had to face the situation and endeavour to put before the producers, the people of the Commonwealth, and the Federal Government a scheme which would be acceptable, and which would give permanency to the industry and encourage the clearing of more land and the planting of more cane.

Speech by Mr. Theodore—Facing Plain Facts.

The Premier (Hon. E. G. Theodore) then launched his proposals. He said he did not want to exploit the occasion for any purpose, but wished to put forward plain facts concerning the industry and the situation they were up against. He hoped they would set aside all considerations of politics and differences between

Left to Right—

T. A. Powell.

J. J. Castor.

G. Johnson.

A. Adie.

W. H. Doherty.

W. M. Marshall.

P. H. M. Goldfinch.

W. J. Short.

Hon. E. G. Theodore.

Hon. W. N. Gillies.

A. R. Henry
(Secretary).

W. H. Franklin
(Stenographer).

C. V. Hives.

W. G. Batchelor.

F. C. P. Curlewis.

W. R. Hartnell.

G. H. Pritchard.

Senator
T. W. Crawford.

Plate 30.—Delegates, Sugar Conference, Department of Agriculture and Stock, Brisbane, 23rd January, 1923, Hon. W. N. Gillies Presiding.

associations, realising they were there for the one purpose of fixing up some kind of arrangement to ensure reasonable conditions for some years. In that respect they were a single purpose league. The industry was faced with a crisis. Growers, millers, and everyone concerned had of late got into the habit of hiding their heads in the sand; they had refused to look facts in the face. It was useless assuming that there would be a continuance of the agreement. They knew it would not be renewed by the Commonwealth Government. He said that advisedly, so that they could know what the industry was faced with. What, then, was the next best scheme for the good of the sugar industry and the protection of those who had capital vested in it? The industry was exposed to competition with the whole world, save for that small protection through the tariff duty of £9 6s. 8d. That duty was not sufficient to enable the industry to be carried on with a reasonable degree of prosperity: it was relatively no better protection than they had before the first agreement, if it were as good. The extra cost of freights, sacks, and insurance absorbed the difference between the £6 before the agreements and the £9 6s. 8d. now offered. It would be adequate protection if the price of Java sugar would keep up to its present figure, but there was no guarantee of it, and under the circumstances £9 6s. 8d. left them in the wilderness. Mr. Knox himself had told him that if the protection was not increased, and there was no agreement, they were back to the 1913 conditions.

A voice: Slavery.

Stabilisation Necessary.

The Premier: In the course of a year or two the industry would become extinct. He went on to say that the average pre-war price of imported sugar for eight years was £11 17s. 6d. per ton. They might expect to have to again face such a price in the future. What they wanted was not merely a high price to-day, but something like assured conditions for the future, so that the workers, farmers, and millers could have confidence. In whatever action was taken, Commonwealth co-operation was essential, because the principal factor in securing stability was the price which the consumer would pay and the measure of protection from outside competition. He thought they should ask the Commonwealth Government to prohibit the importation of black grown sugar under conditions which the Government would naturally want to dictate.

Pool Proposed.

His proposal was that they should form a pool in Queensland to take over the raw sugar as had been done under the agreements, and to make agreements with the refineries for the refining and distribution of the sugar. The pool would also regulate with the refineries the price to be charged to consumers and retailers through the distributing agencies. The pool, too, would have to manage whatever importations were necessary to make good any shortage, and to make proposals for financing carry over or surplus production. If they had a pool for five years it would give stability, and if the Commonwealth would prohibit importations, it seemed to him that the pool could so arrange that the consumer would not be charged more than 4½d. per lb. for refined sugar.

The Price of Raw Sugar.

The Premier went on to say it might be thought that they were being asked to sacrifice too much in fixing the price for raw sugar at £27, as against the present £30 6s. 8d., but they had to look the facts in the face, and it was no use holding out for the impossible. If they said £30 6s. 8d. was the lowest they could possibly accept they might have to face the extinction of the industry. The main desideratum was stability, and if they get £27 for five years, it must be a good thing for the industry, even if it meant some small sacrifice on the part of the growers and millers. They would have to cut down the costs between the refineries and the mills. These costs had been going up under all headings, and the costs of distribution had advanced enormously. The cost of shipping freights would also have to come down. He was not suggesting a wholesale attack on wages, because, looking at the special conditions of seasonal employment and working under tropical conditions, the wages were not exorbitant; but costs could be cut down in the mills, and possibly in the fields, to enable £27 to be an economic price. Fortunately, once the price of sugar was fixed, the basis of allocation between the miller and the grower was determined by agreement between the parties—an agreement which had been recognised by the Central Sugar Cane Prices Board. He thought it possible that the Commonwealth Government might have to legislate to give effect to the embargo on the importation of sugar.

Senator Crawford: It would be done under the Customs Act.

The Premier: That simplifies the situation.

New South Wales Sugar and the Pool.

In answer to Mr. Powell, the Premier thought there would be no difficulty with the New South Wales sugar if they had a Queensland pool. The other States would have to recognise mutual obligations. He then submitted the resolutions as set out at the commencement of the report.

Asked as to the constitution of the suggested pool, the Premier thought one representative each of the growers, millers, and Government would be sufficient.

Discussing the first proposal, Mr. Pritchard said that if they were going to establish a pool he thought that the C.S.R. Co. should be asked to include in that pool the whole of the product of New South Wales.

Mr. Goldfinch said that he could not commit the company to anything. He did not understand where the pool started and where it finished. The C.S.R. Company was out to help the industry and place its plant at the disposal of the community with certain safeguards and with a moderate return for its investments. In the meantime he would like more details as to where the pool came in and what responsibilities it had.

Establishing the Pool.

Mr. Theodore said that with reference to the representation of refiners, it had been definitely intimated to Mr. Gillies that the C.S.R. representative would not be able to commit himself. The growers and millers were primarily concerned at the conference, and they should be able to arrive at a definite policy and carry it out. If they started to refer the resolutions to the canegrowers' association, &c., it would be Christmas before they arrived at any decision. He could understand the refiners' qualification, because they came into the negotiations subsequently. With regard to the legal entity of the pool, it was simple to lay down the pooling system. In the past the Commonwealth Government had taken control, because in the first instance this State got the ownership by the Sugar Acquisition Act, and passed it over to the Commonwealth. In the same way the Queensland Government could issue a proclamation, acquire the sugar and pass it on to the pool. At no stage could the Government be disconnected from the pool because of the finance, which had to come from somewhere. That being the case, the Government would be directly associated with the pool when it was formed. There would be no doubt, the Premier concluded, that when they decided on it and the pool was launched it would have the ownership of the sugar and the authority to negotiate with the refiners and carry the whole transaction through.

Effort to Renew Agreement.

Mr. Powell said he did not believe that all the means of renewing the agreement had been exhausted. He said that he thought before adopting the pool system it was their duty to go again to the Commonwealth Government and ask for a renewal.

The Premier: If I thought there was the remotest possibility of getting a renewal, I would go bald-headed for it.

Mr. Powell said he believed the Premier was honestly trying to do something from his point of view. The producers, he said, under existing conditions, could take no less than what they were receiving at present. He then moved the following motion on the understanding that the formation of a pool was to be an alternative:—

"That in view of the fact that the effect of the current sugar agreement has been to substantially assist to stabilise the industry, and having regard also to the very great importance which the industry is economically, industrially, and nationally to the Commonwealth as a whole and to the State of Queensland and New South Wales in particular, this conference strongly urges upon the Commonwealth and State Governments the urgent necessity of renewing the agreement, at the same price, for a period of five years."

The motion was carried unanimously, and all subsequent resolutions were agreed to failing the renewal of the agreement.

Pool Favoured.

The Premier's proposal for the formation of the sugar pool was then placed before the conference, and it was adopted unanimously.

Mr. Pritchard then moved—

"That the Queensland Government be asked to acquire the whole of the Queensland output under the provisions of the Sugar Acquisition Act, and that the Colonial

Sugar Refining Company be asked to include in the pool the whole of the New South Wales output from their three mills.''

This motion was agreed to unanimously.

Mr. Goldfinch (C.S.R. Representative): I do not think there will be any difficulty, because the company would be quite prepared to bring all New South Wales in.

Black Sugar Barred.

Mr. Gillies then moved—

''While the pool is in operation, the Commonwealth Government to prohibit the importation of black-grown sugar, except so much as is required from time to time to make good any Australian shortage, this embargo to be applied subject to the conditions stated in clause (4) relating to price to be charged to the consumers.'' The motion was adopted.

Retail Price of Sugar—4¾d. per lb.

The Conference then considered the proposal which had been moved by Mr. Gillies, as follows:—

''That during the currency of the pool, refined sugar to be retailed at a price not exceeding 4½d. in the metropolitan towns.''

Mr. Doherty moved as an amendment that the price should be 4¾d. a lb.

Mr. Johnson seconded the amendment.

Senator Crawford did not favour the conference saying the price at which sugar could be retailed. The retail price was a matter over which they had no control; in fact, it did not very much concern them. They should say the price at which they would sell their raw sugar. He thought another alternative should be added—that of increased duties.

Mr. Johnson: Not an alternative—an addition.

Senator Crawford said he did not see how they could follow the sugar into the stores.

The Premier: How would you satisfy the Commonwealth if you do not state a price? We put in the retail price for the reason that our interests are largely concerned in what price rules. There was a difficulty in controlling the retail price, he continued, but it did not represent an insuperable difficulty. It was essential that they should be able to tell the Commonwealth what the retail price would be. At a price of £27 a ton, the pool would be left with £15 a ton to cover the whole range of costs. Those costs, some years ago, were covered by half that amount. That meant that the pool would have a fairly large sum on its hands. It was on the basis of £27 a ton for raw sugar that he had suggested a retail price of 4½d. If it were a mere question of asking for 4¾d., he would not oppose the proposal, on the understanding that if the Commonwealth did not agree to it, they would have to give the matter further consideration.

Mr. Goldfinch said, with authority, that his company could not assume control of the retail price.

Mr. Pritchard pointed to the difficulty of fixing prices on the basis of a farthing. When that had been suggested previously, it was stated that the price would be 5d. He questioned whether they should stipulate a retail price, or fix a price for 1A sugar, leaving the States the right of controlling the retail price. Natural competition would prevent the retailers from overstepping the mark.

He suggested that the motion should be altered to read—

''That 1A refined sugar should be retailed at such a price as would ensure consumers securing sugar at 4¾d. a lb. in capital cities.''

Mr. Doherty accepted Mr. Pritchard's proposed amendment, which was agreed to.

The Conference further favoured the making of an agreement between the pool and the refiners for the refining and distribution of sugar.

Allocation of Price.

On the resumption of business on the 24th January the Conference considered a proposal by Mr. Powell.

Mr. Powell proposed that the allocation of the price to be paid for raw sugar should be left in the hands of the Sugar Cane Prices Board. He was supported by Messrs. Batchelor and Aide.

Mr. Goldfinch opposed the various boards making an award, and thought that the Central Cane Prices Board should make a recommendation to whatever authority was appointed to conduct the negotiations with the refiners as to the mode in which the allocation should be made.

The Premier said that it was not necessary for the local boards to meet and make divers awards. The Central Board had power to make a recommendation to the local boards. The boards could then consider the recommendation, and if they were so disposed could make their own awards. There would always be an appeal to the Central Board. The Central Board had previously made an award based on 12 c.c.s. sugar at £21 a ton, and had from time to time allocated the proportions of each £1 a ton over that between the millers and the growers. The Central Board had power to make either a recommendation or give a direction under section 13 of the Act.

Mr. Goldfinch: For how long would the direction hold?

The Premier: The Central Board would not have power to make a direction for the whole period of five years. It would only have its present powers.

Senator Crawford suggested that the Minister for Agriculture might get the Central Board to report as to the value to be placed on the raw sugar.

Mr. Marshall said that the board would be only too happy to do all that it could to assist the industry. Personally, he would sooner the board gave a direction rather than make a recommendation.

Mr. Powell: I hope the Government will not do anything to take away the rights of the growers under the Act.

The Premier: The Government has no intention of interfering in any way. The board has certain powers and the Minister could ask the board to exercise them.

The motion was then carried, and the Conference closed.

THE FRUIT INDUSTRY.

IMPORTANT NEW REGULATIONS.

The regulations under "*The Fruit Cases Act of* 1912" have been repealed and a new set of regulations issued in place of them.

These new regulations are called the "Fruit and Vegetable Grading and Packing Regulations of 1922," and were published in the "Government Gazette" of the 3rd February, 1923.

In these regulations—

"Foreign substance" means any earthy matter, stones, gravel, &c.;

"Inspector" means an inspector appointed under "*The Diseases in Plants Act of* 1916;"

"Matured fruit" means well grown fruit with normal sugar contents;

"Sound" means free from damage or decay and free from abornmal condition in fruit or vegetables due to the presence of or caused by the operations, development, growth, or decay of any insect or fungus.

These regulations provide for the grading, packing, and marketing of fruit and vegetables for sale, and any fruit or vegetables contained in any case intended for sale shall be packed in a case made in accordance with the specific measurements as set out in a schedule in the regulations for such fruit. The regulations provide that the proportion of foreign substances, in any case or package of any fruit or vegetables, shall not exceed 3 per cent. of the total weight of the contents of such case or package, as the case may be. Any person who packs any fruit or vegetables intended for sale or sells in a package any fruit or vegetables, except in accordance with the requirements of these regulations, shall be guilty of an offence.

Again, the regulations provide that where fruit is packed, the packer of such fruit shall obliterate from the case or package within which such fruit is packed all previous markings if any; and further, that he shall mark legibly and durably on the outside of such case or cases—

(*a*) The words "guaranteed by packer to contain one Imperial bushel, or one quarter Imperial bushel," as the case may be.

(*b*) The name of the variety of the fruit and the number of such fruit, and in the case of pineapples, the grade of the fruit according to the standards as set out in Schedule 2 of the regulations.

The above markings do not apply in the case of any fruit or vegetables forwarded for manufacturing purposes to any factory, if the container of such fruit or vegetables has legibly marked on it the words "For factory use."

For any breach of these regulations, the following penalties are prescribed:—

(*a*) For a first offence a penalty not exceeding £2.

(*b*) For a second or subsequent offence a penalty not less than £2 nor more than £10.

The schedules to the regulations give the dimensions of the various approved bushel, half-bushel, and quarter-bushel cases. These are practically the same dimensions that have been in existence for some considerable time past. The schedules also provide for the following grade standards:—

Smooth-leaf Pineapples.

"Large" consist of sound, well-grown, matured specimens, giving eight to twelve fruit to the bushel case.

"Choice" consist of sound, well-grown, matured specimens, running fourteen to twenty-one fruit of even size to the bushel case.

"Firsts" consist of sound, well-grown, matured specimens, running twenty-two to twenty-eight fruit of even size to the bushel case.

"Seconds" consist of sound, matured specimens, running twenty-nine to thirty-six fruit of even size per bushel case.

Rough-leaf Pineapples.

"Choice" consist of sound, well-grown, matured specimens, running twenty-four fruit of even size per bushel case.

"Firsts" consist of sound, well-grown, matured specimens, running twenty-five to twenty-seven of even size per bushel case.

"Seconds" consist of sound, matured specimens, running twenty-eight to thirty-six of even size per bushel case.

Ripley Queens.

"Choice" consist of sound, well-grown, matured specimens, running twenty-one fruit of even size per bushel case.

"Firsts" consist of sound, well-grown, matured specimens, running twenty-four to twenty-seven fruit of even size per bushel case.

"Seconds" consist of sound, matured specimens, running twenty-eight to thirty-six fruit of even size per bushel case.

Cavendish Bananas.

"Choice" means sound fruit, free from blemish and properly packed, having a minimum length of 9 inches and a minimum circumference of 5 inches.

"Firsts" shall mean sound fruit, properly packed, having a minimum length of 7 inches and a minimum circumference of 4 inches.

"Seconds" shall mean sound fruit, properly packed, having a minimum length of 6 inches, and a minimum circumference of 3½ inches.

All measurements for length are to be taken on the outside of the curve from the junction of the fruit at the stem-end to the top of the fruit.

HOW TO KILL A FOWL.

The average person uses the axe and makes a gruesome mess of the job. The proper method, and the most humane, is to hold the two legs and the ends of the wings, passing under the body, tightly in one hand. Place one finger of the other hand across the throat and the other two (index and third fingers) across the back of the bird's head. Bend back the head sharply, and so dislocate the cervical vertebrae of the neck, and then give the head a forward pull. The latter act separates the dislocated parts, and provides a small sac, into which the blood flows. Then, with a sharp-pointed knife, perforate the sac and the blood will flow. No time must be lost, as poultry blood coagulates quickly. Dry-picking is seldom done at home. The scalding method is the quickest, even if there is a waste of feathers. The water should be just off the boil, and the bird should be immersed so as to wet all the plumage to the skin. With young, tender birds, if the water is too hot, much skin comes away with the feathers, and an unsightly result is obtained.—"Poultry."

VITICULTURE IN THE NORTH.

BY W. J. ROSS, Instructor in Fruit Culture.

In the Charters Towers District much confusion as to vine nomenclature has hitherto existed, and in the course of an official visit to that area in December last, when vines were in full foliage and crop, Mr. Ross was of some assistance to the growers in determining and applying the correct names to the principal varieties cultivated in that part of the State.—Ed.

After careful study in the vineyards of the habits and character of several varieties freely grown in the Charters Towers district, and which have been known hitherto to local vignerons by largely incorrect names, success in regard to identification and naming was attained in quite a number of instances. As an example of what confusion in regard to naming means, it might be mentioned that a very excellent grape now making itself noticeable in local vineyards has, to some extent, been deprived of its full measure of credit through being identified wrongly with other comparatively inferior kinds, which have consequently enjoyed a false reputation. The variety referred to is Madresfield Court; a first-class berry, with an excellent muscat flavour and good packing qualities, and which does well in the Charters Towers area. Again, the wrong naming of varieties is likely to result in the inexperienced vigneron, or beginner in the industry, obtaining data concerning the suitability or otherwise, of varieties grown under local conditions, of a very misleading character, and it is important that such errors be corrected whenever opportunity is afforded. Included among the varieties either named wrongly or not identified by many growers are Cinsaut, Black Prince, Snow's Muscat or Muscat Hamburg, Lady Downe's Seedling, Madresfield Court, and one or two others. The most common variety at present in the district is the Royal Ascot, which is very prolific. The only drawback affecting this variety, seemingly, is its tendency to crack, should an excess of moisture resulting from frequent thunderstorms about the harvesting period be experienced. However, by the exercise of judgment in cutting, and care in handling and packing, it will carry to considerably distant markets. As much as 6 tons to the acre of this berry have been produced in the Towers area, and this year there are several crops estimated to yield over 4 tons to the acre. Nevertheless, I am of the opinion that the superiority of other less known kinds at present will displace this variety in many vineyards. Madresfield Court, for instance, bids fair to establish a reputation for Towers-grown grapes throughout the North, as up to the present its characteristics, so far as growth, bearing, and quality are concerned, has been very satisfactory. It was noted to be doing well in a number of vineyards, and the fruit being of an attractive appearance with a somewhat tough skin, constituting good packing qualities, makes it worthy of extensive planting. Another choice variety named Gordo Blanco, considered by vignerons to be one of the best, if not the best, white grape in cultivation, promises to succeed well in the Charters Towers district. Many young vines of this variety were observed making strong growth and carrying fair crops of well-set bunches with large berries in Mr. Mann's garden. Snow's Muscat, another first quality black grape, is also doing well and is entitled to a prominent position in local vineyards. Other valuable additions are:—Alicante, Cornichon, Red Frontignac, Henab Turki, and Black Prince, while from the American varieties for local market Wilder and Goethe may be selected as likely to do best.

As regards flavour and appearance Charters Towers grapes can hold their own with those from the best vineyards, and they are altogether superior to those imported from the South last season. It rests with growers themselves to show that it is not necessary to import this fruit for northern requirements at all. It must be remembered, however, that this will necessitate the exercise of good judgment in respect to the right stage of ripeness for harvesting and the avoidance of cutting bunches when too green, as was done this season by some growers. Placing immature or unripe grapes on the market is damaging to the whole industry, and the practice is therefore condemned. Care in handling and packing is essential, and as much of the bloom as is possible should be allowed to remain on the bunches, thereby improving their appearance when placed in the shop windows.

Grapes, too, must be handled with care during transit from the garden to rail or wharf, and if this is done the district can capture and maintain the whole of the northern trade from Bowen to Cooktown. It is worthy of mention that trial shipments to Cairns this season proved the foregoing contention; while wrapping each bunch in paper separately before packing demonstrated conclusively that this was the safest means of ensuring the landing of shipments in good condition.

Touching on the pruning and training of vines, I noted that there is yet much knowledge to be acquired by many growers, and it is proposed to visit the district again in season with the object of giving instruction in this branch. A tendency on the part of some growers to practice irrigation excessively was also observed, and it is proposed to make this matter the subject of a future paper.

THE MAIN ROADS BOARD.

A Year of Achievement.

On 8th March, 1920, the Main Roads Act, introduced by the Government and passed by the Queensland Parliament, received the Royal Assent. In October of the same year the Chairman, Mr. J. R. Kemp, was appointed. Early in 1921 other members of the Board—Messrs. J. A. Fraser and D. A. Crawford—were appointed. The first meeting was held on the 1st February of that year. The mapping out of an administrative system, the collection of data, and a general survey of rural road requirements had already been made, and the Board proceeded to carry out its plans. To-day the Main Roads Board is a forceful factor in the Queensland Government's general scheme for enriching rural life; its initials, "M.R.B.," are becoming one of the State's best known sign posts, and is already accepted as a symbol of and a synonym for sound and enduring highway construction.

Prior to the institution of the Main Roads Board very little had been done in Queensland by Local Authorities on permanent road construction. The fact that only a very small percentage of shires were able to furnish copies of specifications or drawings of standard road profiles when required by the Board indicated that local road construction hitherto had not been governed by any set plan. Taking a given year, 1918-1919, though the general rate revenue of Queensland shires approximated £450,000, very little sound road construction was done in most of the districts covered by a wide inspectional itinerary.

In the first annual report of the Board, covering the activities of the year ended 30th June, 1922, and which is just to hand, there is much valuable material, and it is worth the study of all interested in vigorous development of the State. The march of the motor vehicle compels greater attention to facilitation of inland transport and all that it means to rural dwellers who have hitherto lived beyond the range of the petrol patrol.

The following notes on the roads of Queensland and plans for their improvement, together with the accompanying illustrations, are taken from the Board's report:—

Condition of Queensland Roads.

With the exception of one or two roads constructed some twenty years ago and roads constructed under Acts of the early sixties, very little attempt has been made to construct roads on a systematic plan, and even where such roads have been constructed, the efforts of the Local Authority to maintain them have, in many instances, been ill-directed. Examples of these old roads exist in the old Gympie and Maryborough road and in the Brisbane-Warwick road.

These roads have rough pitched Telford or corduroy foundations—that is, a foundation of spalls wedged together or of timber logs which originally was capped with broken metal but is now worn away—with the result that traffic will not use the rough foundation. Where the surface has been replaced the metal has been crowned up so high that vehicles side-skid badly. Local Authorities have, in many instances, completely neglected to maintain *through roads;* bridges have been allowed to tumble down and have not been replaced. The reason for this neglect is obviously, in most cases, that no rate revenue is derivable from the adjoining lands, and the Councils have not felt it their duty to maintain roads for traffic whose origin is outside their area, but other cases exist where the road has been superseded by a railway. When such roads become "Main" this state of things will be remedied. The maintenance and reconstruction costs to be borne by the Local Authorities amount to one-half the total, and the Board has power to apportion part of such costs to the Local Authorities benefiting, even though the road is outside their area.

PLATE 31.—BLACKSOIL ROAD ON THE DARLING DOWNS CUT UP BY WHEEL TRAFFIC DURING WET WEATHER.

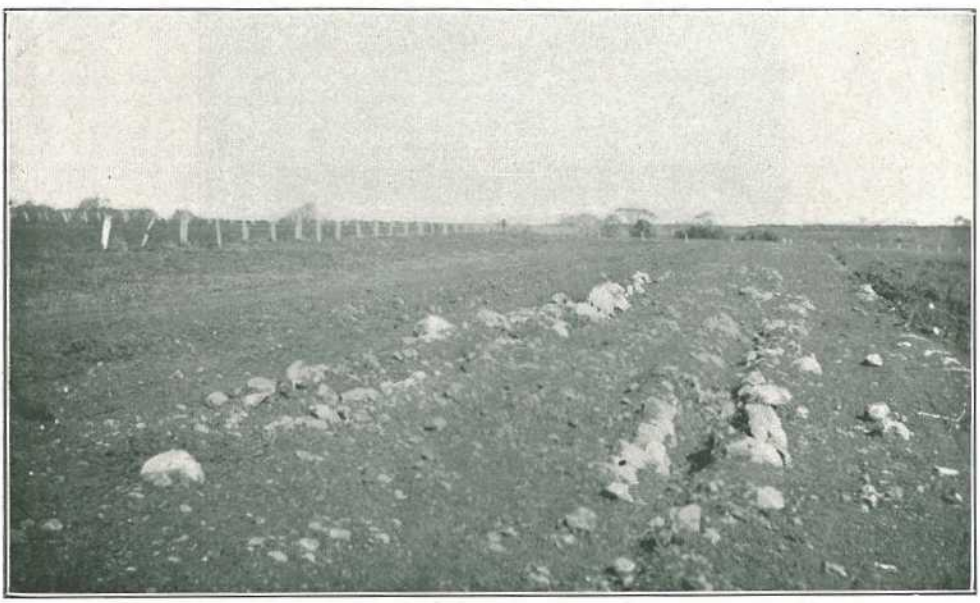

PLATE 32.—BLACKSOIL ROAD ON THE DARLING DOWNS IN A BAD STATE THROUGH NEGLECT OF MAINTENANCE.

Many Local Authorities do not appear to recognise that road making is a specialist's job. Instances may be quoted of long and expensive cuttings having been excavated in an attempt to improve the road. The result has been merely to obtain the same grade as before without any compensating advantage. The employment of a qualified engineer in such a case would have resulted in vast improvement to the grade at a much lessened cost and without restricting traffic to a narrow drain cutting.

No real attempt in the past has been made to locate roads on scientific principles, the result being that numerous deviations are now necessary.

PLATE 33.—SHOWING ONE METHOD OF ROAD CONSTRUCTION AS PRACTISED IN SOME SHIRES.

The pioneer surveyors must not, however, be too severely criticised on that account, as funds were seldom available for conctructing the road on its proper location. The primary consideration of the surveyor was to locate an accessible road which would have a level cross section (irrespective of longitudinal grade) thus, for the time being, obviating any expenditure other than that for grubbing and clearing.

Reciprocity between the Survey Branch of the Lands Department and this Board has now been established which it is hoped will in the future render the re-location of Main Roads unnecessary in country to be opened for settlement. Satisfactory re-location within the boundaries of a surveyed road may be possible at times.

Numerous cases exist in each of the divisions of the State where roads have been laid out on grades of 1 in 10 or thereabout, with pinches as steep as 1 in 6. At a later date attempts have been made to eliminate the steeper portions. The final result has been the spending of large sums of money on roads having grades of 1 in 10. Such grades are the cause of continued heavy maintenance charges, and most severely limit the loads. Metalling quickly disappears on them owing to the heavy tearing action of wheels and horses' hoofs, combined with the rush of water during heavy rains.

The expenditure of not much greater sums of money, in many notable instances, would have resulted in properly located roads with maximum grades of 1 in 20. The Toll Bar road which rises from the lowlands to Toowoomba is an example. Grades not exceeding 1 in 20 could have been obtained in lieu of the present range road (which is steep and expensive to maintain) without increasing the total distance between Toowoomba and Helidon. This would have had the great advantage of also eliminating a section of road along the sticky black soil flats and would have given equally good access.

The effect of steepness of grade upon the life of a macadam or other road is very marked. Roads constructed in Southern Queensland some few years ago on

PLATE 34.—SHOWING DAMAGE TO ROAD BY BAD FOUNDATION AND EXCESSIVE LOADS.

grades of 1 in 10 or 1 in 12 in substantial fashion with broken metal are at the present time in a deplorable condition, whilst other portions not so well constructed but on easy grades are in fairly good order.

The increase in the cost of haulage by animal traction with increases of grade is approximately as follow:—

> If costs on a grade 1 in 60 are 1s. per ton mile, then on grade 1 in 20 they will be 2s. per ton mile, and on grade 1 in 10 they will be 5s. 6d. per ton mile.

It is highly undesirable to construct new main roads on gradients steeper than 1 in 20, unless very special circumstances exist.

The saving in time of travel due to improved roads has the same effect as bringing the producer nearer the market and the traveller nearer his objective.

A recognised principle in land valuation is that, other things being equal, the values decrease as the distance from railway or markets increase. Assuming for the moment that a property 10 miles from a market is worth less than a similar one adjacent thereto by an amount of £3 per acre, it is certain that a reduction in the time of travel by one-half would have the same effect as bringing the market within 5 miles of the farm and raising its value by 30s. per acre.

Some such reduction in the time of travel undoubtedly follows proper road construction.

The black soils of the Darling Downs present conditions after rain which could hardly be worse. The soil when wet has an exceedingly low bearing strength and is particularly sticky. Most of the roads are almost impassable after rain, but occasionally a sound piece of road which has originally been solidly constructed is met. Failure of the previously constructed roads has been due to—

(*a*) Improper selection of material.

(*b*) Insufficient thickness of good stone.

(*c*) Non-regulation of loads.

The existing roads leading to Tambourine, Beechmount, Maleny, Montville, and other rich fruitgrowing or dairying districts are all badly constructed on steep grades, whilst in North Queensland the great dairying and timber areas are almost roadless.

The settlers of these districts undoubtedly suffer hardship and loss by reason of the lack of decent roads, and the Board has therefore devoted special attention to the early alleviation of present conditions.

Proposed Improvements.

The hopelessness of ever constructing and maintaining roads in the hilly and mountainous areas within the existing road boundaries on account of the excessively steep grades was most apparent to the Board, and a similar fact was also noted by the Victorian Roads Board in its first annual report on Gippsland roads.

In *many instances the only construction on Main Roads which at the present day will be warranted* is the improvement of creek and river crossings, as in much of the Western Downs and Plains, or clearing and light gravelled formation, as on the Coastal Plains; but, in others, nothing short of solid construction (as on black soil of the Downs) or of side cutting and metalling in wet mountainous country will suffice.

The funds at the Board's disposal will be expended upon works of an enduring nature, and first and foremost under this heading comes *drainage*. Correct location and proper surfacing is next in importance, for though the surface of a road may wear out, the value of the grade remains.

The subject of drainage is of immense importance, especially in the Coastal and hinterland regions of Queensland, where the annual rainfall varies from 60 to 200 inches per annum, and where over 30 inches in twenty-four hours have been recorded.

It does not follow that with the funds available the best results would be obtained by building a small mileage of wide surfaced roads, but rather that the best economic results to the community would follow the building of greater lengths to a narrower standard; but all loan money should be spent on enduring features.

The effect of improvement of surface in reducing tractive effort (and consequent cost of haulage) is illustrated in the following table (Bulletin 463, Department of Agriculture, U.S.A.):—

Gradient Level.	Load which a 1,200 lb. horse can haul continuously.
Deep sand	760 lb.
Dry earth	1,600 lb.
Firm earth or sand clay	2,285 lb.
Gravel (average)	3,000 lb.
Macadam (first class)	4,365 lb.

The lesser intensity of pressure upon a foundation the greater the strength and lasting qualities of the road. An increase in the thickness of crust from 7 inches to 10 inches results in an increase in the strength of the road by *100 per cent.* for an increase of surfacing cost of *42 per cent.*, which goes to show that it is bad policy to skimp the crust thickness of roads.

Type of Road Surfaces.

The type of surface paving to be adopted depends upon—

(*a*) The class and volume of traffic, and cost of the various materials available.

(*b*) The maintenance costs per mile for each class of material available.

The sweeping statement is often made that this or that class of paving material is the only one which should be used, but the absurdity of using, say, concrete as a paving material on a road carrying a small tonnage per annum in place of a cheaper gravel or macadam is self-evident.

PLATE 25.—SUGAR EXPERIMENT STATION, GORDONVALE, N.Q.

The problem of selection of type of paving material resolves itself into whether the cost of maintenance of the cheaper pavement, plus interest and redemption on the capital cost (based on its lesser life), will exceed the annual interest and redemption on capital cost plus maintenance charges on longer-lived more expensive pavement.

The use of local material should always be first considered.

Road Materials.

The points to be observed in the selection of road metal are—

(1) Hardness.

(2) Toughness.

(3) Cementing value.

In the absence of any practical knowledge of the value of a stone for road-making purposes, microscopic examination will reveal its structure, mineral composition and state of decay, and attrition and crushing tests will determine its possibilities for wear. These tests as occasion demands are being carried out at the Queensland University.

The use of a strong binder with good cementing qualities is as essential as the use of good stone. The use of vegetable debris or clay as a binder results in the early destruction of the surface by ravelling during dry weather, and by formation of mud in wet weather.

For this reason screening plant should always be employed in conjunction with crushers so as to obtain suitable binder.

Quarries are being developed by the Board at the present time on the Atherton Tableland, Darling Downs, Lowood, and Rockhampton Districts.

Maintenance of any type of surface should be extensive enough to at all times keep the foundation or bottom course protected from wear.

For similar volumes of traffic, steepness of grades, efficiency of drainage, and weather conditions, the maintenance of loam surfaces will in general be more costly than gravel, gravel than broken stone, and broken stone more costly than tar macadam or concrete, but the selection of pavement type must be left to the designer, who should consider the factors mentioned in every case.

The tarring of macadam surfaces costs from 2d. to 8d. per square yard, and is an economical form of surfacing where the traffic is dense.

Mountain Roads.

Mountain roads require a great deal of care in fixing the centre line. Unless the question be thoroughly investigated a great volume of earth work may be unnecessarily excavated, hence in very steep broken country contour plans along the trial grade are being prepared in most cases so that the correct position of the centre line (taking into consideration road widths, horizontal curvature limits, &c.) may be determined. The extra survey and drawing office costs are offsetted many times over by the saving in earth work.

Bridges, Culverts, Inverts.

The construction and maintenance of bridges, culverts, and inverts come within the ambit of the Board's functions, and here again the type to be adopted is being considered strictly upon the requirements.

There is a tendency at the present day to almost exclusively utilise reinforced concrete in the construction of highway bridges, but the problem of type resolves itself into—

"What sum of money invested now would build and maintain a reinforced concrete structure having an indefinite life?

"What sum of money invested now would provide for the erection and *maintenance* of timber or steel structures having a limited life, and renew such structure at similar limited intervals, in perpetuity, taking into account possible increments of cost and inconvenience to the travelling public during re-erection?

"Whether a bridge should be high or low level, beam, or truss, depends upon the local conditions."

The widths adopted will be either 12, 16, or 18 clear feet, depending upon the volume and class of traffic and length of bridge.

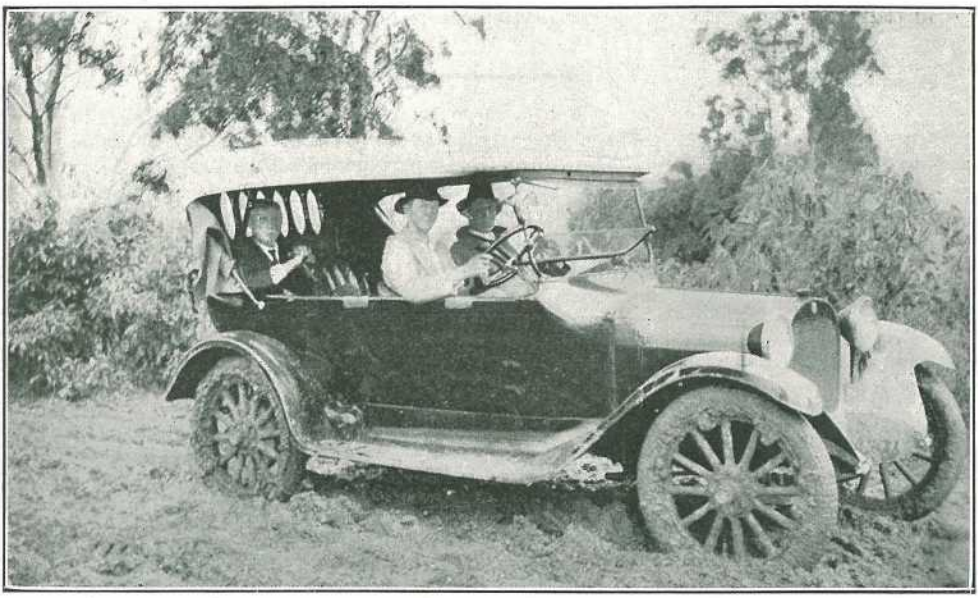

PLATE 37.—METALLING ALL REMOVED BY HEAVY RAINS ON STEEP GRADE.

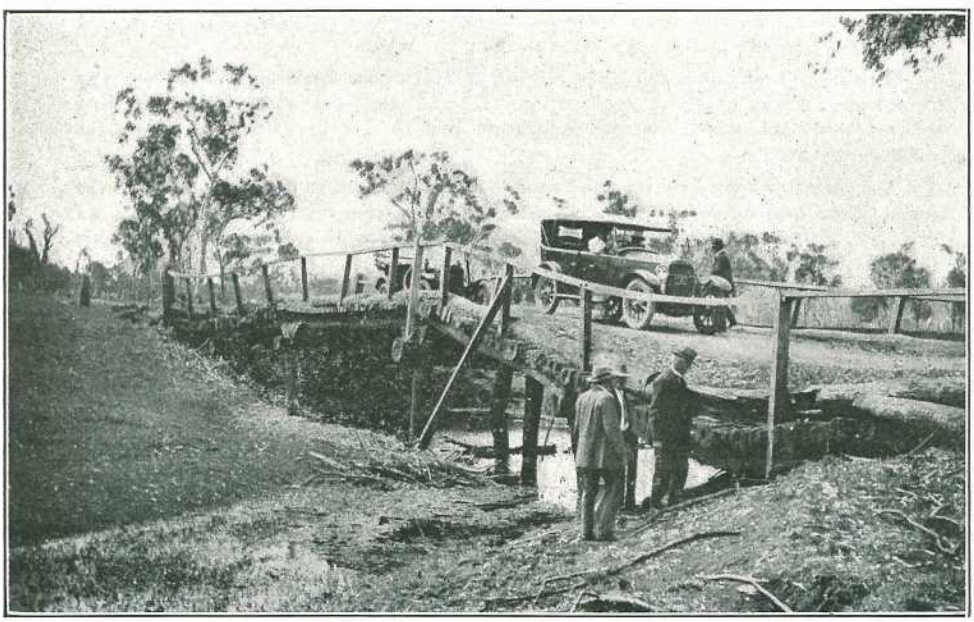

PLATE 38.—BRIDGE IN A BAD STATE THROUGH NEGLECT OF MAINTENANCE.

The high torrential rainfall, in some cases amounting to 33 inches in twenty-four hours in the coastal districts of Queensland, renders the construction of low level bridges a necessity, for often the cost of a high level bridge would be prohibitive. Care in the location of the approaches to low level bridges is very necessary. Most of those in existence have unnecessarily steep gradients.

Road Widths.

As before explained, these will to a large extent, especially in side cutting in steep to moderately steep country, be governed by the amount of money available or likely to be available for construction. This is a function of the likely traffic.

In general, surfaced roads may be divided into two types—single and double tracks. Refuges at frequent intervals are required on single track roads, so that vehicles may pass each other in safety.

Carts vary in width from 5 feet to 6 feet.

Cars vary in width from 6 feet 6 inches to 6 feet 8 inches.

Carts frequently have frames for loading hay, &c., upon them. The minimum width of metalled or gravelled surface for single tracks should be not less than *9 feet* and for double tracks *15 feet.*

The provision of a metalled or gravelled surface requires an extra width for shouldering with selected material and for water tables, otherwise the metal would push outwards, and the road would quickly loose its shape and value.

The designer should always look to the future, and although a road may not be metalled as soon as constructed, it generally will be within a reasonable period. Hence it is desirable that the earthwork should not be narrower on single track roads than *17 feet,* except in special cases, and on double tracks than *23 feet.* Pioneer roads may be as narrow as 12 feet overall.

The clearing and grubbing forms a substantial part of the cost of the work in scrub country. Very little benefit will ever be incurred in increasing the width of hardened surface of a single track road beyond 12 feet or 20 feet overall (in side cutting).

This maximum width is desirable when funds permit, as it gives a wider surface to travel over with less risk of wheel tracking, and also minimises the risk of the wheels getting close to the edge and damaging the metal.

In cases where funds do not permit of 12 feet of hardened surface, 9 feet may be adopted, flanks being of selected material and the total width of side cutting reduced to 17 feet where the road is in earth and 15 feet where rock occurs on the inside watertable.

The great tendency on surfaced roads is for teamsters to get one wheel off the metal when descending a grade in order to brake the vehicle, and this has an especially destructive effect on the narrower roads. For this reason it is desirable to ease the grades so that this will not be necessary. Great saving in the maintenance of metalled roads is the result.

Where the gradients are very easy (from 1 in 30 and easier) and the traffic light, there should not be so much objection to the narrower type of single track metalled road.

Where refuges are provided on a single track metalled road, they should be metalled and the curved approaches to them similarly treated, so that the edges of the metal will not be damaged by vehicles pulling off. The metalling should always be widened out, and should extend to the watertable on the inside of sharp curves for the same reason. By carefully considering these facts, great economy in construction and maintenance may be effected.

Where the earthworks are light, as in flat or slightly *undulating* country, the saving in first cost by the narrowing of the formation is not so great, and in general the width *should* be not less than indicated on the diagram accompanying the Board's specification.

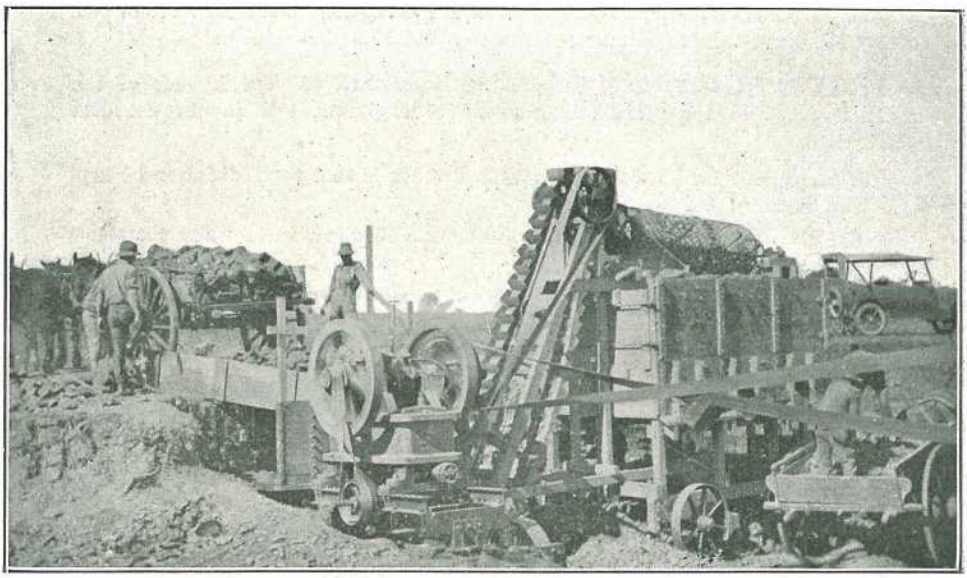

PLATE 39.—PORTABLE METAL-CRUSHING PLANT, DARLING DOWNS.

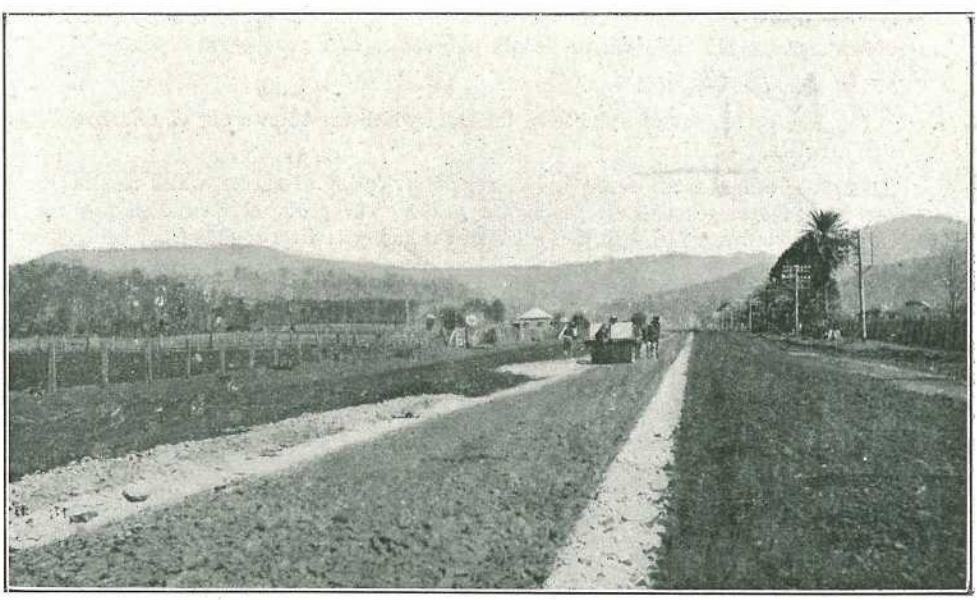

PLATE 40.—SHOWING INTERMEDIATE COURSE OF METAL AND FLANKS BEING ROLLED WITH A 5-TON WATER-BALLASTED ROLLER.

The standards contained therein have been designed to meet each particular case, and the selection of the correct type in each instance must be left to the judgment of the designer.

Pioneer roads or intercommunication routes passing long distances through poor country should be reduced in overall width to about 12 feet on side cutting.

Road Drainage.—This is of the greatest importance, and special note of this matter is made in the general instructions to engineers, and in the Standard Specification.

The first essential of metalled or gravelled roads is that the foundation be kept dry. This is accomplished—

(*a*) By proper catch drains, water tabling, and diversion of water therefrom at frequent suitable points.

(*b*) By open spall mitre drains under the road bed.

(*c*) By filling the voids of the top course with strong binder and rolling to a smooth, nearly waterproof, compact surface.

Proper care must be taken to ensure that material which may become water-logged, such as clay, is not used within at least 6 inches of the underside of the metal or gravel.

Horizontal Curvature Limits.

The limits of curvature on any particular road is bound up with the capital cost for, in the case of mountain roads intersected by gullies and with projecting spurs, the cost rapidly increases with increase of the radii of curves owing to the heavier cuts and fills involved.

The Board has adopted as the irreducible minimum radii of 80 feet around gullies and 100 feet around spurs, for otherwise the risks of accident would be too great and the utility of the road seriously impaired, and has provided that the gradients around curves must be so eased as to make tractive resistance at least not greater than on straights. The case is not quite similar to grade compensation in railroad construction, as upon the length and radius of a road curve depend—

(*a*) Line of sight, and

(*b*) The percentage of animals in the team which are thrown out of effective action.

This grade compensation also provides for future easing of curves, which results in shortening the length and steepening the grade. The grade compensation provided for in the original plan will thus allow of the ruling vertical gradient not being exceeded if future improvements are undertaken. In flat or easy country the radius of curvature should be as great as possible, without incurring heavy expense in land resumption.

It is often argued that the limitation of curvature on mountain roads is unwarranted, and the case of the short radii adopted in cities is quoted. It must, however, be remembered that resumption costs for cutting off all corners in cities would often be prohibitive, and secondly, that the line of sight is very much greater than would be the case with a similar radius around a spur on a mountain road, consequently the cases are not parallel.

On roads where there will be a fair proportion of fast to moderately fast traffic a line of sight of 200 feet is desirable, but this is seldom attainable in mountain roads.

In general, the steeper the grade the greater the necessity for care in this direction, as speed control is more difficult on the steeper grades.

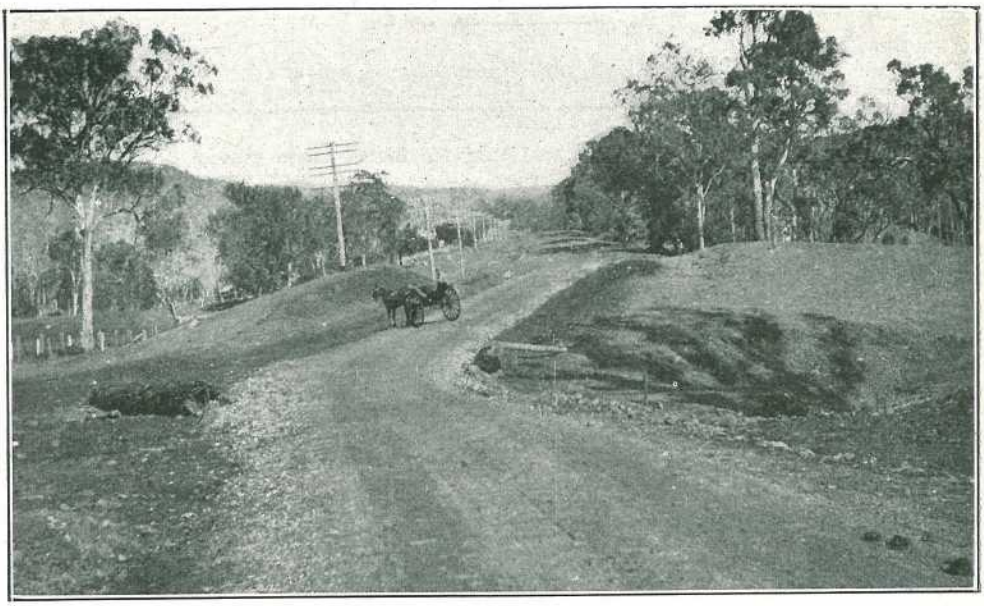

PLATE 41.—MAINTENANCE—RESURFACING RECENTLY DONE ON A MAIN ROAD.

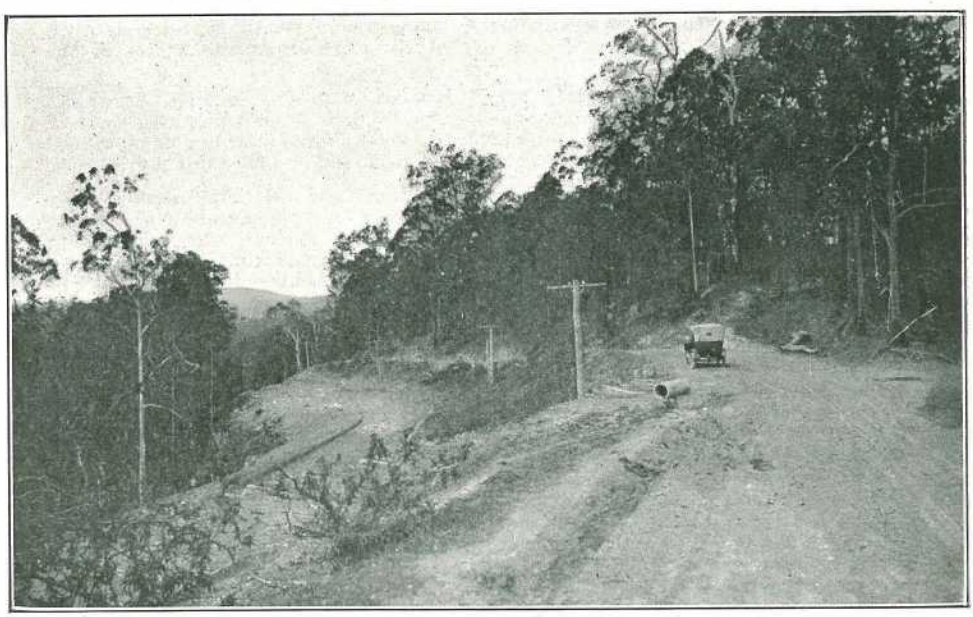

PLATE 42.—SHOWING OLD ROAD AND NEW ROAD BELOW—NOW UNDER CONSTRUCTION.

AGRICULTURAL EDUCATION.

Queensland and California Compared.

"California is one of the few American States whose general conditions resemble those of Queensland; and it is regarded as one of the most progressive States in the Union.

"I have long realised the great necessity in Queensland for a strong and well-organised system of vocational and rural schools, and the desirability of the University playing a much more leading part than it does in the solving of our agricultural problems and the development of our primary resources.

"American vocational schools which specialise on the agricultural side are now conducted on much the same lines as Queensland's rural schools. The system of extensive field work and farm operations at these schools has been discontinued, but the science work has been much strengthened.

"Queensland rural schools largely confine outside work to observation, and American experience proves that this policy is a sound one."

MR. J. D. STORY.

Late in January, Mr. J. D. Story, Public Service Commissioner and Chairman of the Administrative Committee of the Council of Agriculture, returned from California, whither he had gone to investigate on behalf of the Queensland Government, the various aspects of agriculture.

"I had long desired," said Mr. Story, in the course of a Press interview, "to visit California to see the educational and other kindred institutions of that State. California is one of the few American States whose general conditions resemble those of Queensland; and it is regarded as one of the most progressive States of the Union."

Mr. Story added that while being familiar with the leading Australian institutions, he had been particularly anxious to get into closer touch with some of America's vocational schools, and the organisation and ramifications of a typical Union University, which had attached to it a well developed College of Agriculture.

"As to primary and secondary education, I am convinced that Australia holds her own quite well in the essential subjects. In fact, several educators with whom I discussed matters expressed the opinion that Australian students who have gone to California to take special courses in local universities more than held their own in English and mathematics. In Queensland we do not indulge to the same extent in 'extra' subjects that the Americans do, but I think that Queensland would be well advised to continue to adhere to the essentials.

"I have long realised," he went on, "the great necessity in Queensland for a strong and well organised system of vocational and rural schools, and the desirability of the University playing a much more leading part than it does in the solving of our agricultural problems and the development of our primary resources. That the University has not done so to any great extent is not the fault of the University; funds had been lacking. We cannot be unmindful that the maintaining of technical departments and officials, in common with other departments and officials, falls upon the State, and that upon the State also devolves the main burden of the financing of the University. These facts give rise to the feeling that as the University and the State technical departments continue to develop, overlapping and unnecessary expenditure might ensue, unless adequate precautions are taken. The need that this possible overlapping and unnecessary expenditure should be avoided, consistently with the efficient discharge by each section of its proper functions, has come home to me with greater force since I have assumed the duties of Public Service Commissioner.

"These thoughts in turn suggest that in their development technical departments should not forget that the University exists," he went on; "that the University in turn should not forget that the technical departments exist; but that each section should realise that a close and friendly relationship, with clear ideas as to the functions of each section, should be established and maintained."

American vocational schools which specialise on the agricultural side were now conducted on much the same lines as Queensland's rural schools. The system of extensive field work and farm operations at these schools had been discontinued, but the science work had been much strengthened. Queensland rural schools largely confined outside work to observation work, and American experience proved that this policy was a sound one. In California, the home project system had been found to be very effective. Under this system, the lad conducted certain approved work at his home under expert supervision in one of such subjects as the raising of pigs, poultry, the growing of vegetables, potatoes, maize. The work done was spoken of very favourably by the officers of the Department of Agriculture, by the County Farm Advisers, and by many members of the College of Agriculture. The system was said to have many good points; it was economical, inasmuch as it obviated the finding out of public funds of large sums for the acquiring of agricultural sites; for the erection of special buildings; for the providing of equipment; for the cost of upkeep, and other charges. Further, it overcame the difficulty of having to make special arrangements for the field work, care of plant and animals, during the school vacations. It was held also that the system made the lad interested in a project at his own farm home, and tended to make the home interested in the special work of the lad. Certainly the system had much to commend it.

So far as they had gone in their systematic efforts for the training of apprentices, the American Federal and State authorities, after being given an outline of the schemes, had had to admit that Queensland was ahead of them.

Delving for fundamentals, Mr. Story found that in regard to the agricultural industry of the United States, four authorities were concerned:—

1. The Federal Department of Agriculture, which dealt with research and investigation, and the enforcement of Federal laws concerning quarantine, pest control and standardisation.

2. The State Department of Agriculture which was regarded as the State's "watchdog" of agriculture, and whose main functions were the enforcing of the State laws and regulations relating to the industry.

3. The county, which appointed and paid the horticultural commissioners, who dealt particularly with the plant industry of the country.

4. The University College of Agriculture, whose functions were three-fold—namely, research and investigation; resident instruction, and non-resident instruction, popularly known as "agricultural extension." The "extension" work was conducted through representatives of the college known as county farm advisers. The main work of these advisers was educational, and consisted in making available to the farmers information gathered and discovered by the Federal Department of Agriculture through its various bureaux and divisions, and by the College of Agriculture through its experiment stations, research laboratories, and other accessories.

It was somewhat surprising to find that the functions of the University College of Agriculture were so far-reaching; the work embraced the full-degree course in agriculture, farm diploma courses, and periodic weekly and fortnightly courses in special subjects for farmers. As was generally known, California had adopted a high grade of "standardisation." The effective carrying out of this system increased the percentage of "culls." The question then arose as to how to make some commercial use of the culls. The fruit products laboratory was established for the purpose, and it seemed to be doing good work. In Queensland they were now adopting a system of standardisation, and they would be faced with the same difficulties regarding culls. Would their University be enabled to help the primary producers to make some commercial use of their culls, and of present waste products? Therein lay a fine opportunity for good work.

Succeeding issues will contain more detailed accounts of the results of Mr. Story's studies and investigations of Californian conditions, in relation particularly to the organising, administrative, and instructional activities of the agricultural industry.

COTTON CULTURE.

Mr. W. G. Wells (Government cotton specialist), after a prolonged study tour of the Queensland cotton areas, is of opinion that the cotton-growers of this State are not realising the necessity for the proper cultivation of the seed beds and the cultivation of the crops generally. The latter he has found to be true in practically every district he has visited.

Best Methods—Advice to Growers.

In the course of an account of his cotton crop studies to the Press, Mr. Wells said that farm after farm was visited, and in nearly every case where the pigweed and summer grass had been allowed to grow, the cotton plants were suffering from lack of moisture. The growers with such crops complained of the droughty conditions, but did not seem to be inclined to blame their poor methods of cultivation as being contributory causes to the dry condition of the plants. In nearly every district farmers were to be found who had thoroughly cultivated their crops from the time the plants had sprouted through the earth, and, while it was true that several of such crops were commencing to show signs of the effects of the drought, there was no comparison as a rule with such crops and the crops in the adjoining fields where the weeds had been allowed to grow.

Good Cultivation Wins.

The well-cultivated crops were laden with large, well-developed bolls, and only needed good rains to continue the development of the bolls which were ready on the plant, the formation of new flower buds (squares), and new growth of the main stalk and fruiting branches. Many of the growers seemed to have overlooked the fact where the well-laden and cultivated plants were showing signs of suffering from lack of moisture that the crop of bolls and squares was absorbing the available moisture. It was not a case, at all, where the advised methods of cultivation had failed, and the plants were in the same condition as uncultivated fields, because in one case the crop of bolls was taking the moisture, while in the other case it was the weeds. Several crops were inspected which had been cleaned up and well cultivated within the previous week, and the plants were not freshening up and developing as the grower had expected. The fact had been overlooked that the pigweed and grass had been utilising a tremendous amount of the available moisture during the development of their growth, and, while their destruction had left the remaining moisture for the cotton plants, the damage had been done, and a good rain was needed to replenish the supply which the weeds had taken. A few fields were found where even under weedy conditions the plants were developing a fine crop of bolls and squares, and gave promise of producing very fine yields. This was due to the crop having had recent rains, or to the soil being particularly resistant to drought. The growers did not seem to realise that they were not taking advantage of fortunate circumstances to produce a maximum yield under such droughty conditions, but were satisfied that their crops were above the average for their district, and were not suffering from the drought.

Best Methods Necessary.

It should be remembered that under such droughty conditions as had prevailed this year in several of the districts that the very best methods of cultivation were necessary to insure the proper development of the plants, and more particularly the seed cotton in the bolls. The fact that a plant had several large bolls and seemed to be resisting the drought somewhat was no indication that the fibres within the bolls were developing properly.

Unless there was the proper amount of moisture being secured the fibres in all probability would be weak and irregular in length—characters which were very undesirable, and which lessened the value of cotton to a marked degree.

It was only by conserving all available moisture in the soil for the use of the cotton plants that these defects could be hoped to be overcome in seasons when droughty conditions prevailed, and the grower who persisted in following the poor methods of cultivation, which seemed to be in vogue at present, was certainly not going to secure profitable returns, and was doing the cotton industry of Queensland a very serious injury, and one which might severely restrict the industry from developing into the proportions which the natural facilities at present seemed to indicate possible.

Careless Cultivation is Expensive.

It was only by continuous cultivation and chipping of the weeds in the drill that the crop could be kept under control. When the periods of continuous rains set in, such crops were in a condition to go until the rains ceased without any serious damage being done, whereas fields which had not been kept clean before the rains set in presented a serious problem when it was possible to cultivate after the rains were over. The expense was also greater in destroying the older weeds, as much of it would have to be done by hand before a "scarifier" could be used between the rows to work up a good mulch, whereas a crop with young weeds could be quickly cultivated and more of the moisture retained. It was not appreciated, nor did it seem to be understood by the average farmer, that the soil should be cultivated after every rain of enough severity to destroy a good dust mulch. As soon as the rain sealed the mulch, and the surface crust was formed, the sun was apt to draw the moisture from the soil at a remarkable rate, and it was only by establishing a good mulch again at the earliest possible moment that this loss of moisture could be lessened. It could thus be seen that when the cultivation was delayed for a week or more after it was possible to work the soil that an immense damage had been done to the plants—especially in districts where the rains were uncertain and every point of moisture should be conserved.

SHOW DATES FOR 1923.

Stanthorpe: 7th to 9th February.
Warwick: 13th, 14th, and 15th February.
Allora. 20th and 21st February.
Clifton: 28th February and 1st March.
Goombungee: 22nd March.
Herberton: 2nd and 3rd April.
Pittsworth: 4th April.
Chinchilla: 10th and 11th April.
Goondiwindi: 10th and 11th April.
Killarney: 11th and 12th April.
Esk: 11th and 12th April.
Toowoomba: 17th and 19th April.
Taroom: 23rd and 25th April.
Kingaroy: 26th and 27th April.
Maleny: 26th and 27th April.
Miriam Vale: 26th and 27th April.
Dalby: 2nd and 3rd May.
Toogoolawah: 3rd and 4th May.
Nanango: 3rd and 4th May.
Boonah: 9th and 10th May.
Blackall: 9th and 10th May.
Wondai: 10th and 11th May.
Roma: 15th and 16th May.
Emerald: 16th and 17th April.
Murgon: 17th and 18th May.
Wallumbilla: 22nd and 23rd May.
Ipswich: 23rd and 24th May.
Kilkivan. 23rd and 24th May.
Springsure: 23rd and 24th May.
Beaudesert. 29th and 30th May.
Marburg: 2nd to 4th June.
Mackay: 4th and 7th June.
Woombye: 20th and 21st June.
Lowood: 22nd and 23rd June.
Rockhampton: 21st to 23rd June.
Kilcoy: 28th and 29th June.
Ithaca: 29th and 30th June.
Woodford: 11th and 12th July.
Wellington Point: 14th July.
Caboolture: 19th and 20th July.
Mount Gravatt: 21st July.
Barcaldine: 24th and 25th July.
Rosewood: 25th and 26th July.
Pine Rivers: 27th and 28th July.
Crow's Nest: 31st July and 1st August.
Sandgate: 3rd and 4th August.
Brisbane Royal National: 6th to 11th August.
Belmont: 18th August.
Wynnum: 31st August and 1st September.
Zillmere: 8th September
Laidley: 13th and 14th September.
Beenleigh: 20th and 21st September.
Rocklea: 22nd September.
Toombul: 28th and 29th September.
Kenilworth: 4th October.
Ascot: 24th October.
Pomona: 21st and 22nd November.
Millaa Millaa: 23rd and 24th November.

EFFECTIVE PIG FENCE.

A request from a settler for a pig-proof fence leads to the reproduction of the stub fence illustrated herewith. Stub fences, however, are used in timber country, not only for pigs, but for sheep-yards and bull-yards. The stub fence is regarded as the only one which will keep pigs confined with certainty. Stout wire is all right for a certain time, but big sows will eventually worry their way through. The stubs are usually cut from old rails, the height for a pig fence being about 3 feet 6 inches. The posts are put in about 12 feet apart, and a trench dug between them about 6 inches wide and 6 inches to 9 inches deep. No. 8 fencing wire is used at the top and bottom of the stubs at a distance of 9 inches from the top and 9 inches from the ground. Two wires are used at both top and bottom, the wires running through separate holes about 2 inches apart. These wires are fastened to a post at one end and to a heavy stone or logs (fig. 1) at the other end, so that they will always

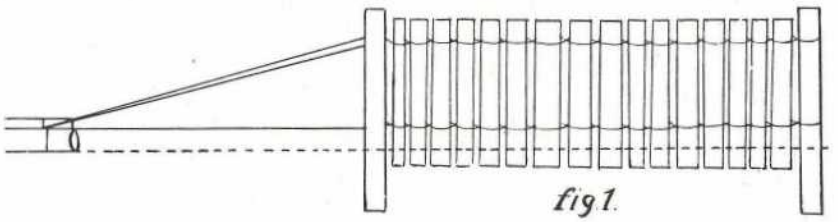

fig 1.

be tight. The stubs are put in the trench, and the wire is twisted with a bar. This is done for every stub, forming a separate loop round each one, and so keeping them tight in position. Stub fences cost more than wire fences, but last longer. One drawback to their use is that they harbour insects. For the two lower wires barbed wire is sometimes used, and is found very effective. Another good style of stub fence is used in timber country for larger stock than pigs. The stubs or saplings are let into the ground about 18 inches in a trench, and rammed tightly while upright. Two wires are then run from the starting post, A (fig. 2), to a

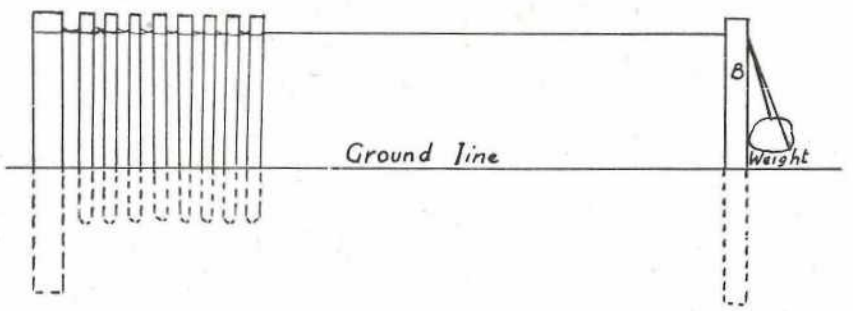

fig 2.

temporary post B, in the alignment. The wires are weighted at the temporary post to keep them taut. As each stub is put between the wires they are twisted tightly three or four times, but in opposite directions, between each stub. The stubs are afterwards sawn off level along the top, on which, if the fence is to hold large cattle, a batten is fastened to prevent stock being spiked if jumping over. The wires are eventually strained as tightly as possible to the end post when finishing off the line.—"Australasian."

REPORT ON EGG-LAYING COMPETITION, QUEENSLAND AGRICULTURAL COLLEGE, JANUARY, 1923.

Owing to the extreme heat, the competition birds experienced a very trying time during the latter part of the month. Owing to the number of birds in moult, there was a falling off in the laying during the month. The laying of the group pens was satisfactory, considering the number of broodies in this section, as compared with the birds in single pens. There were two deaths in January—one in the light breeds from ovarian trouble, and one in the heavies from apoplexy. A number of the leading pens are still laying well. Mr. N. A. Singer made the highest score for the month with 153 eggs, Messrs. W. and G. W. Hindes coming second with 142 in the light breeds, while in the heavy breeds Mr. Burns was first with 140 eggs. The following are the individual records:—

Competitors.	Breed.	Jan.	Total.
	LIGHT BREEDS.		
*N. A. Singer	White Leghorns	153	1,383
C. H. Singer	Do.	138	1,326
*W. and G. W. Hindes	Do.	142	1,246
*Bathurst Poultry Farm	Do.	110	1,156
*R. Gill	Do.	136	1,133
*S. L. Grenier	Do.	121	1,119
*G. Trapp	Do.	121	1,115
*J. M. Manson	Do.	126	1,108
*Mrs. L. Andersen	Do.	119	1,096
*W. Becker	Do.	111	1,095
*H. P. Clarke	Do.	127	1,094
*J. W. Newton	Do.	125	1,078
*W. A. Wilson	Do.	90	1,071
J. H. Jones	Do.	101	1,039
*C. Goos	Do.	117	1,037
*G. Williams	Do.	104	1,030
*R. C. Cole	Do.	110	1,023
*Oakleigh Poultry Farm	Do.	109	1,014
*T. Fanning	Do.	68	1,011
*R. C. J. Turner	Do.	113	1,009
A. G. C. Wenck	Do.	89	1,005
*F. Birchall	Do.	127	994
*Mrs. R. Hodge	Do.	102	992
*O. Goos	Do.	85	985
*H. Fraser	Do.	94	969
N. J. Nairn	Do.	86	943
*Mrs. E. White	Do.	98	941
*J. W. Short	Do.	79	938
*Thos. Taylor	Do.	100	933
*M. F. Newberry	Do.	69	928
T. H. Craig	Do.	111	924
B. Hawkins	Do.	71	914
*C. M. Pickering	Do.	74	907
*E. A. Smith	Do.	94	886
A. Maslin	Do.	79	885
J. Purnell	Do.	59	881
G. F. Richardson	Do.	71	837
B. C. Bartlem	Do.	74	830
E. Stephenson	Do.	82	829
E. Symons	Do.	90	825
H. Trappett	Brown Leghorns	93	812
Brampton Poultry Farm	White Leghorns	80	785
A. Anders	Do.	78	779
Parisian Poultry Farm	Brown Leghorns	61	530

EGG-LAYING COMPETITION—*continued.*

Competitors.	Breed.	Jan.	Total.
HEAVY BREEDS.			
*R. Burns	Black Orpingtons ...	140	1,240
*A. E. Walters	Do.	81	1,072
*T. Hindley	Do.	76	1,020
*C. C. Dennis	Do.	85	993
*E. F. Dennis	Do.	102	972
*R. Holmes	Do.	74	968
Jas. Hutton	Do.	104	966
Mrs. A. Kent	Do.	77	945
Mrs. A. E. Gallagher	Do.	87	928
*H. M. Chaille	Do.	57	918
R. Innes	Do.	96	896
Mrs. L. Maund	Do.	101	876
H. B. Stephens	Do.	90	866
*Jas. Potter	Do.	68	858
Wambo Poultry Farm	Do.	81	817
*Parisian Poultry Farm	Do.	88	816
W. Becker	Chinese Langshans ...	67	816
V. J. Rye	Black Orpingtons ...	75	804
*Rev. A. McAllister	Do.	66	803
C. Doan	Do.	65	800
Jas. Hitchcock	Do.	60	766
C. Rosenthal	Do.	67	727
W. C. Trapp	Do.	66	684
R. Burns	Silver-laced Wyandottes	60	649
*J. E. Smith	Plymouth Rocks ...	38	569
*Miss L. Hart	Rhode Island Reds ...	50	493
Total	...	6,408	65,697

* Indicates that the pen is being tested singly.

DETAILS OF SINGLE HEN PENS.

Competitors.	A.	B.	C.	D.	E.	F.	Total
LIGHT BREEDS.							
N. A. Singer	206	261	213	240	219	244	1,383
W. and G. W. Hindes .. .	211	201	213	200	218	203	1,246
Bathurst Poultry Farm	156	179	209	201	225	186	1,156
R. Gill	206	201	208	195	150	173	1,133
S. L. Grenier	173	152	193	195	202	204	1,119
Geo. Trapp	195	176	192	202	166	184	1,115
J. M. Manson	191	161	188	172	208	188	1,108
Mrs. L. Andersen	210	155	191	178	187	175	1,096
W. Becker	180	150	194	179	189	203	1,095
H. P. Clarke	182	168	184	200	178	182	1,094
J. W. Newton	194	187	208	165	184	140	1,078
W. A. Wilson	185	165	146	191	186	198	1,071
C. Goos	132	160	169	186	217	173	1,037
C. Williams	160	175	193	178	172	152	1,030
R. C. Cole	202	154	189	145	165	168	1,023
Oakleigh Poultry Farm .. .	181	152	182	157	163	179	1,014
T. Fanning	133	171	186	169	219	133	1,011
R. C. J. Turner	182	153	182	174	176	142	1,009
F. Birchall	167	189	138	121	199	180	994
Mrs. R. Hodge	201	135	166	150	206	134	992
O. Goos	164	148	178	189	176	130	985

EGG-LAYING COMPETITION—*continued.*

DETAILS OF SINGLE HEN PENS—*continued.*

Competitors.	A.	B.	C.	D.	E.	F.	Total.
LIGHT BREEDS—*continued*							
H. Fraser	164	185	157	142	146	175	969
Mrs. E. White	180	95	195	129	152	190	941
J. W. Short	154	151	174	146	153	160	938
Thos. Taylor	170	130	167	161	161	144	933
M. F. Newberry	155	130	139	200	136	168	928
C. M. Pickering	180	180	109	146	154	138	907
E. A. Smith	142	137	160	160	138	149	886
HEAVY BREEDS.							
R. Burns	199	203	194	227	202	215	1,240
A. E. Walters	176	150	143	178	225	200	1 072
T. Hindley	146	172	115	220	218	149	1,020
C. C. Dennis	167	172	178	147	168	161	993
E. F. Dennis	144	164	189	98	182	195	972
R. Holmes	122	188	170	159	158	171	968
H. M Chaille	159	167	175	134	177	106	918
J. Potter	142	149	156	142	157	112	858
Parisian Poultry Farm	96	135	160	108	156	161	816
Rev A. McAllister	140	160	157	96	76	174	803
J. E. Smith	72	113	85	76	98	125	569
Miss L. Hart	81	105	64	105	62	76	493

CUTHBERT POTTS, Principal

ORIGIN OF SUPERPHOSPHATES.

The romance of Lyme Regis and the strange story of how its fossils, from which jewellery was once made, were later turned into superphosphates, was recently (says "Mark Lane Express") told by the vicar (the Rev. E. J. Meredith) at the annual dinner of the Yarcombe Agricultural Society. "When our grandmothers were girls," said Mr. Meredith, "a great trade in jewellery, in the form of brooches and earrings, made largely from fossils, was carried on in Lyme Regis, and about that time the then Dean of Westminster (Dr. Blackburn) paid a visit to the town. The dean, being a very inquisitive man with a scientific turn of mind, saw in Lyme a pretty Devonshire girl and took out her earrings—he must have been very close to her. The ear ornament contained a fossil and it occurred to the learned divine that he had discovered in the fossil something by which he could rejuvenate and revive the face of the earth. Collecting as many of these fossils as he could, the dignitary sent them to a great scientist, who pounded them down and discovered that they consisted of phosphate. A German scientist visited Lyme Regis and, as a result of his investigations, a treatise was written on this fossil manure, and the demand for the fossils was subsequently so great that the jewellery trade in the town soon went down with a bang."

General Notes.

A Desirable Vacuum.

Thus Sir William Beach Thomas (London "Times") in the current "Australia To-Day":—

The Australian climate—it seems to me the most perfect winter climate that man or woman could desire—is far the better. It is more sunny, less cold, more promotive of fertility, perhaps also of health. You can only grow food in Old England by stoking the soil with manure. Here it is thought much if 40 lb. of superphosphate—a bagatelle—is used per acre of wheat. But Australia produces little if any more grain than the minute British Isles; few if any more cattle, and very many fewer pigs. It is surely a miracle that, almost automatically, the pressure at Home does not force population into this most desirable vacuum.

The Unexpectedness of Australia—A Tribute to Queensland Workers.

Sir William continues:—

The utter unexpectedness of Australia, and indeed its contradiction of established reputation, came over me "in a flood" (like reformation over Henry V.) at Rockhampton, in Queensland, in the course of a journey to the sheep stations of the interior. At Bundaberg (Q.), where I had stopped a day or two, I saw immensely heavy crops of sugar growing in what seemed to me a temperate zone. The cane was being cut by an amazingly athletic group of men who, I fancy, along with fellow-workers on and about this coast, have the distinction of being the only white men in the world engaged in this occupation. Incidentally, it may be worth saying that on these sugar fields, as later in the shearing sheds beyond Blackall (the terminus of the "Turkey Express"), more effective energy was being exercised, per man per minute, than ever I saw before. Newspapers and talkers had succeeded in creating the impression that, generally speaking, work was at a standstill owing to a prevailing habit of going slow, of striking "on the job" or off the job. It was my particular good fortune to see work of a really athletic or gymnastic quality, performances that might quite fitly be compared with the forceful energy of Patterson on the lawn tennis court. It is at least a curious comment on modern civilisation that all the world should talk with admiration of the game-player, and no one at all of the shearer who was keeping up an average of 214 sheep a day. It recalls the comment of the great historian Thucydides, who recorded that the victorious General, Brasidas, was acclaimed by the people "almost as if he were an athlete." What a land Australia would be, even with its tiny handful of men and women, if those reputations of Patterson and the shearer were reversed.

A Departmental Appointment.

Mr. W. Rowlands, formerly fruit packing and grading expert of the Tasmanian Department of Agriculture, has accepted a similar position with the Queensland Government. Mr. Rowlands, in the course of his term of office in Tasmania, did a lot of good work for the fruit industry by teaching growers better methods of preparing their fruit for overseas and interstate markets, and by arranging classes for growers' children at various schools in fruitgrowing centres. Mr. Rowlands was born in Tasmania, and, after watching the various methods used in the different states of Australia, went to New Zealand to supervise the grading and packing of their apples intended for shipment to South America. It was due to his services that New Zealand apples established the name they have in the Argentine. The industry extended from 1,200 cases in 1909 to 50,000 in 1914. Mr. Rowlands was loaned to the Queensland Government last year to demonstrate to growers here better methods of marketing, and a similar request was made this year, but was turned down by the Tasmanian Minister for Agriculture. Subsequently the Queensland Government secured his services for the orchardists of the State. Mr. Rowlands enlisted in New Zealand during the early part of the war, and fought with the New Zealand Mounted Rifles at Gallipoli and was severely wounded during the evacuation.

The Cotton Industry—Special Legislation Foreshadowed.

"Special legislation for the cotton industry is under consideration."

The Minister for Agriculture (Hon. W. N. Gillies) made this statement recently when the presence of so many pests which attacked cotton plants in Queensland was under discussion. Mr. Gillies said that the necessity for immediate action had not been forgotten, and consideration was at present being given to the question of whether something could not be done by means of the regulations under the Diseases in Plants Act.

The question of special legislation dealing with the cotton industry was also under consideration. The special Bill which would be necessary would be designed to foster and protect the industry, and deal with the whole question of ratoon cotton and pests.

Mr. Gillies thought personally that a lot of the pests thrived in dry weather. Fortunately we had not in Queensland a serious menace to the industry such as the boll weevil.

Ratoon Cotton—Ministerial Announcement.

"Now that the cotton-picking season is approaching, I desire to remind those growers who have retained ratoon cotton and wish to obtain the advance promised by the Government this season only, of 3d. a lb. on seed cotton, that certain conditions apply and must be observed," said the Minister for Agriculture (Hon. W. N. Gillies) in the course of a recent departmental announcement. He added that it was imperative that growers of ratoon cotton should advise the manager of the ginnery of the despatch of such cotton and how it was marked to distinguish it from annual cotton. All bags or bales containing ratoon cotton must be marked with the letter "R" at least two inches long. Any grower mixing ratoon with annual cotton or sending ratoon cotton to the ginnery as annual cotton would forfeit any advance, and such cotton would not be ginned.

It must be understood that the advance of 3d. per lb. for ratoon cotton would only be paid for cotton of good quality as understood before the decision for the discontinuance had been made—that was, the cotton must be clean, free from disease, properly packed, and not immature, stained, dirty, or otherwise damaged. Ratoon cotton that reaches a ginnery and did not comply with the foregoing conditions might be rejected, or if accepted, the advances would be less than 3d.

The Minister desired it to be clearly understood that this was the last season during which any consideration whatever could be given to ratoon cotton, and that all ratoon cotton must be ploughed out or otherwise destroyed before next planting time. By the circumstances under which cotton was grown in this State, and from the knowledge of the danger from ratoon plants that had been gained since the advice of those with thorough knowledge of cotton cultivation had been at the service of the department, it was clear that ratooning had been a great mistake from a cultural point of view, as well as owing to the condemnation of the custom by the manufacturers. So clear had the position become that in the opinion of the Minister there was no hope of reopening the question of ratooning, even if, after experiments, no deficiency be found in the breaking strain of ratoon cotton fibre.

Testing Fertilisers—A Palmwoods Pineapple Plot.

Reporting on the pineapple experimental plot which has been established by the Government in the Palmwoods district, Mr. G. Williams (Instructor in Fruit Culture) said:—

"This plot is situated on the farm of Mr. Biggs, of Palmwoods. Conditions were variable and not altogether satisfactory. There was much variation in growth and condition, but the plants included in the higher ground were found most satisfactory. With the exception of one row, odd unhealthy plants were noted in all lines, the percentage increasing towards the lower row, and more particularly

in that part of the area which suggests a hollow or depression, where there is a possibility of soakage after heavy rains. There was not found to be any appreciable difference in the areas treated with sulphur. The effect of application was now very much less pronounced.

"The effect of the last application of fertiliser has not equalled previous applications, in which dried blood was the principal nitrogen. The soil is of a warm nature, made up largely of very fine sand, and the beneficial effect of ammonia sulphate or nitrate of soda would be modified according to weather conditions succeeding their applications, and more particularly as the soil is very deficient in humus. In view of the condition of the plot, experiments will be conducted further, and light applications of fertiliser will be applied during February, followed by a similar quantity in August. The manure to be used will have dried blood in the place of inorganic nitrogen."

Beerburrum Pineapples—Subsidy to Ex-Service Settlers.

In the course of a reply to a deputation of ex-service settlers at Beerburrum recently the Premier (Hon. E. G. Theodore) said it was a matter of surprise to him that the producers concerned in the pineapple industry should be so hesitant or reluctant to co-operate and utilise their combined resources, thus improving their own prices. The matter of the pool had been turned down—certainly not in Beerburrum, as he well knew—but by others, simply because they were a little more favourably placed. Prices would be stabilised with the establishment of a pool and proper operations would prevent under-selling, such as one firm had recently done in the South. The State Government had an obligation to the soldier settler, but on the other hand, it was not a good thing for the settlers to come to the Government and ask for the market to be subsidised. It was quite understandable for one season, but could not continue as a permanent institution. He was prepared to assist them this year to the same extent as last year, that was 1s. per case. It would cost the Government £3,000 out of consolidated revenue, and he was running the gauntlet of Parliament for appropriating money which had not been provided for. In reply to a question he said he took it that it would apply to all soldiers who gave their supplies to the State cannery.

Stanthorpe Tomatoes.

The Minister for State Enterprises (Hon. W. Forgan Smith), who visited Toowoomba and Stanthorpe recently, said, on his return, that the estimated crop under the pool is 250,000 cases. Of that number, about 80,000 cases will be made into tomato pulp at the Stanthorpe factory, and the balance marketed as fresh fruit.

Mr. Smith was accompanied on his trip by the Trade Commissioner (Mr. Austin). The visitors met the Stanthorpe Tomato Pool Board, and also the directors of the Stanthorpe Co-operative Canning Jam and Preserving Company, Limited.

"The State Government," says Mr. Smith, "has agreed to guarantee the bank in connection with the pulping operations to the extent of £8,000, and the agreement between the Treasurer and the Board in this connection was finalised by the Trade Commissioner during our visit. It is anticipated that pulping will commence within the next two weeks."

The Minister declared that the Stanthorpe tomato pulp bore a very good reputation amongst the canners generally, and no difficulty was anticipated in disposing of the whole of the pulp product at a satisfactory price. As regarded fresh tomatoes, marketing was proceeding very satisfactorily.

"From the whole of the Pool operations," he added, "it is estimated that upwards of £50,000 will be realised from the sale of the tomatoes."

Mr. Smith took the opportunity of visiting the Pikedale Soldiers' Settlement, and with the supervisor he was pleased to be able to meet a number of the growers and discuss matters personally with them. He formed a favourable impression of those settlers and from inquiries made he felt satisfied that the settlement would

eventually be a success. There was no doubt about the capabilities of the soil and the men and women who have set out to make a living there. The whole question was one of efficient marketing of the products in the interests of both producer and consumer.

Export of Apples—Interesting Experiments.

For some time the British Food Investigation Board has been carrying out experiments on various problems connected with the cold storage of apples, and it is expected that the results will be of considerable value to Australian exporters of that fruit. As regards temperatures, the conclusions arrived at are:—(*a*) that 1 degree C. is the most suitable temperature at which to store apples, and (*b*) that there is a critical point in the temperature at about 3 degrees C., below which loss is almost wholly confined to diseases due to physical surroundings and not to infection, whilst above the critical temperature loss is almost entirely due to infection by moulds.

Very valuable results have been obtained by storing apples in an atmosphere containing (*a*) from 5 per cent. of oxygen (as compared with 21 per cent. in normal air), and (*b*) from 12 to 15 per cent. carbon dioxide (as compared with minute traces in normal air). The success of this "gas" storage method depends on the automatic control of humidity and the circulation of the gas.

The Director of the Institute of Science and Industry (Mr. G. H. Knibbs) has received information from England that the Food Investigation Board has organised a small expedition of three highly qualified scientific men which will make the voyage to Australia and back for the purpose of investigating the conditions of transport of apples overseas, and testing different types of instruments for the registration of the temperature, humidity, and carbonic acid contents of the hold. The expedition is travelling by the steamer Moreton Bay, due at Fremantle on 2nd February.

Referring to the matter, Mr. Knibbs said recently that the Food Investigation Board had made a special study of the fungal and physiological diseases of apples in store, with results which are of both scientific and practical interest. Special attention was paid to "scald." This appears to be a physiological disease, the liability of which is intensified by too early gathering of the fruit. Fungal diseases appear to be due to spores present on the surface of the apple at the time of storage. The nature and extent of the "rots," therefore, is determined to a large extent by conditions in the orchard and to infection in the packing shed. The chief source of loss appeared to be due to the latter; therefore, sanitary conditions of handling and the possibility of disinfecting the fruit

A Destructive Beetle.

Recently specimens of a tiny flying beetle, which had been discovered preying on cotton plants in the Beenleigh district, were submitted to the Government Entomologist (Mr. Henry Tryon) for identification. Two farmers in the yellowwood belt of the Beenleigh territory have reported considerable damage to their cotton crops by this insect. The case of one of them is typical, and may be cited. Mr. A. Brauer planted an experimental area of land with Egyptian seed last October. It came up very strongly, and advanced as high as 3 feet, until this leaf-eating beetle made its appearance. They worked from plant to plant in thousands, ate the leaf, also the blossoms, and even the bark off the boll, until there is none left; then the boll burst open, with the result that there is no cotton. Mr. Brauer tried to check them in every way. He lit fires to smoke them out, also tried arsenate of lead (1 lb. to 50 gallons of water), which did no good; and a stronger solution killed the plants. Mr. Brauer had the same beetle attack the blossoms on his fruit trees in a previous year. Mr. Berndt is the other farmer. He also has the beetles in his cotton taking everything before them; three years ago he had the same beetle in his lucerne crop. When it was mowed it had such a strong smell that the stock would not eat it.

Mr. Tryon at once identified the beetles, and declared them to be affecting a very large area of Queensland. In the course of his report Mr. Tryon said the insects

submitted to him are examples of a beetle named *Mono-Lepta rosea*—one that has already been met with this season in injurious relationship to cotton, from the Rockhampton area southwards almost to the border. Moreover, it is not only a depredator of cotton, but damages many other plants quite unrelated to it—*e.g.*, maize, mango (blossoms), grape (young fruit), plum (young fruit), orange, peach, rose, mulberry, and even dahlias. It also occurs on many native plants. The fact of lucerne being one of its food plants was, however, new to him.

It apparently lays its eggs in the soil, and there are some reasons for concluding that in grass lands amongst other places. However, the life history of the insect, which presents some technical difficulties in unravelling, has not been fully elucidated. Each female may deposit about fifty eggs about ¼ millimetre in length (H. Jarvis). And there are at least two broods here during the summer months.

This prolificness of the insect, and the fact that it is somewhat gregarious in its habits, accounts for the enormous numbers—with corresponding damage to plant life—that characterises its presence.

It may be killed by spraying with an arsenic containing compound—*e.g.*, Paris green or arsenate of lead, or either of these administered in a dry form. However, this involves consuming some leaf-tissue, and as fresh comers readily replace those that have succumbed, much foliage destruction may still result, so that little if any control in its ravages is exercised.

Even dense smoke only operates in banishing the insects from any spot, temporarily, since they are wont to repair to their former feeding grounds as soon as the smoke clears.

As was discovered some years since by Mr. Lamont, of Taringa, the *Mono-Lepta rosea* is attracted to light, and may be lured to its destruction. The employment of light suggests the use of a special trap; but the description of the procedure in making one of these light traps cannot be entered upon on this occasion, and the apparati are not obtainable by purchase here at present.

An ordinary bright fire, or fires, in the field, as has already been demonstrated in the Rockhampton area, has proved the best procedure so far devised for its destruction, but one is loath to recommend resort to its use generally, as unless great care be exercised the risk of setting alight to the crop, too often grown amidst weeds, is one not to be ignored, especially where several of these fires have to be attended to.

Cotton Pests—Entomologist's Report.

Recently some insect-damaged cotton plants, together with specimens of the predatory insects, came to this Office from Mr. J. Bell, of Pine Mountain. The Government Entomologist and Vegetable Pathologist (Mr. Henry Tryon), after examination of the specimens, reported as follows:—

The principal insect implicated is the caterpillar of a small moth, a species of Earias, probably *E. Huegeli*, that is not an uncommon pest of our cotton fields. This not only feeds on the pith of the young green wood, especially at the base of the shoots, but, when a second generation is taking place, mines into the developing bolls and both penetrates the seed and cuts through the developing lint. The moth itself measures about 1½ inches across the wings, the front pair of which are creamy-white with a brown band of green down their centres. It lays its eggs singly amidst the tender growth of its host plant, and the caterpillars hatching therefrom soon gnaw inwards into its soft tissue, and, feeding voraciously, arrive at full growth in about two weeks. These caterpillars are pale-green, conspicuously mottled with brown in patches, and are remarkable in possessing series of boss-like projections along their bodies, each terminating in a long bristle. This feature has led to the Earias caterpillar being termed the spiky or spiney cotton boll worm.

The nature of injury experienced by the young cotton plant from its attacks is thus described by Mr. W. A. T. Summerville: "The plants were about two months old and 1 foot 6 inches high. The field was damaged to the extent of about 3 per cent. The injured plants showed the younger growth and lateral shoots wilted, withered, and crumpled up, or even dead and darkened, and the young buds and shoots heavily falling off. On examining these more closely, it was noticed that the main stems were gnawn into and tunnelled through. Also that two kinds of caterpillars were present, one a mottled brown insect with blunt spines along its body, and the other a smaller smooth-bodied creature."

The caterpillar described as that of *Earias Huegeli* spins a peculiar close-woven, smooth brown cocoon, with steep sides, and projects to a point above—at one end. This is fastened low down upon the stem of the cotton plants or even on lumps of soil, the caterpillar making its exit from its food plant before fabricating it. Changing to a chrysalis within this, the insect, after about ten days or a fortnight since this metamorphosis has taken place, emerges as a moth. This injurious insect has at least two broods during the summer months in Southern Queensland, possibly three broods.

The second insect mentioned—"the smaller smooth-bodied caterpillar"—has not been so far identified, but there are some grounds for concluding that it is a scavenger named Pyroderces, which elsewhere frequents the parts of the cotton injured by the "spiny boll worm," and is represented in Queensland by an indigenous species.

The boll worm that is now being considered is best controlled by the systematic examination of the affected cotton patch, when the earliest symptoms of injury are being manifested, and then cutting out the affected shoots. (Note.—At the time the occurrence was noticed, it was already too late to do this with effect.) Later on, when the first crop has been harvested, the plants as a whole should be taken and burnt, and the ground ploughed, so as to bury any chrysalises and the cocoons harbouring them, that may occur from any earth clods or smaller objects that may occupy the soil surface. Probably in Queensland, as occurs also in India and Egypt, where species of this Earias cotton boll worm are met with, the plant depredator under notice is held in check to some extent by parasites that are especially operative against it when associated with one or other of the native plants whence the cotton has received it as a harmful insect.

Natural Enemies of Sugar-Cane Beetles in Queensland.

Supplementing the Sugar Notes in this issue is a series of coloured plates depicting some of the natural enemies of sugar-cane beetles in Queensland. These illustrations are taken from *Bulletin No.* 13 *of the Division of Entomology, Bureau of Sugar Experiment Stations, Queensland* (Dr. J. F. Illingworth), 1921. We are indebted to the Director of Sugar Experiment Stations (Mr. H. T. Easterby) and the delineator (Mr. Edmund Jarvis, Entomologist, Bureau of Sugar Experiment Stations, North Queensland), for permission to reproduce them in the Journal.

Answers to Correspondents.

"Roup (or Worms) of the Eye in Poultry."

J.W.M. (Mareeba)—

The Poultry Instructor (Mr. J. Beard) advises equal parts of tinct. of aloes and water. Instil a few drops three times daily. After three or four days the worms become absorbed. Or try—

One part argyrol in ten parts water. Instil a few drops once a day, and you will get the same results as above.

From my own experience, I find the following, if carried out properly, a sure thing:—As soon as you notice the inner membrane partly covering the eye get the bird and place the head on your knee and hold it firm, then place your thumb or index finger well back behind the eye, use pressure and work gradually forward and you will notice the worms appear in a bunch. Get them away and burn them, clean the eye well, then apply a few drops of kerosene, and they won't appear again if done properly. Don't neglect them until the cheesey matter adheres to the eye, and then expect to effect a cure. Attend to it in its first stages, and you may stamp it out altogether. Let me know results.

The Government Entomologist (Mr. H. Tryon) replies to queries as follows:—

White Ants.

Personally, I have concluded from my observations that in the cases of termites or white ants occurring in a house, and their access to the soil being prevented, they would succumb after not many days. To assure myself that this was what really happened under those circumstances, I consulted Mr. W. Street, whose knowledge of the habits of our South Queensland white ants is quite exceptional. He informed me then that these insects on their means of access being quite cut off die when isolated in houses, within six or eight days, but that the presence of a nest or "termitarium" within the house, and still intact, might make a slight difference in this respect. Should they continue to live after this period, the possibility of their still possessing some road by which they were reaching the soil might be anticipated. The existence of this, however, would be indicated by their manifesting their usual active habits when disturbed. The change in demeanour on their part—a sluggishness and inertness (taking the place of this) would, on the other hand, whilst as yet they were not dead, be a sign, especially to the trained eye, that their death would soon be realised. I should like to receive specimens, including the soldiers of the white ants that your correspondent has in his dwelling. They may belong to a species distinct from any one of those whose habits I have in view.

Beetle *(Isodon puncticalle)* Attacking Asters.

The insects submitted as possibly damaging the parts of the aster plants beneath the soil surface are undoubtedly capable of inflicting injury through gnawing the stem-axis or in larger roots arising from it. They are the adults of a rather common beetle named Isodon puncticalle, and the aster is not alone in being the victim of their depredations. Although met with beneath the surface it is only during the day that they effect a subterranean abode. With regard to remedial measures this small brown beetle is rather difficult to cope with. It was formerly anticipated that as they are to a slight extent attracted by light, they could be captured by trap-lanthorns. However, experiments in which these have been used (a lamp suspended over a shallow dish of water having a film of kerosene on it) have given very poor positive results. Apparently, manure used in dressing the soil either before or after planting seems—by attracting the beetles with the odour it disseminates—to be to some extent responsible for their presence in numbers. Should this invariably be the case the use of a body whose odour would tend to mask that of the fertiliser might be indicated, especially one containing crude naphthalene (moth ball). Such a body we have in "vaporite" stocked by Messrs. Webster and Co. The use of this body for the purpose in view could then be assayed.

Farm Notes for March.

Land on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that the young weeds will not make such vigorous growth during the next few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where blight has previously existed, or where there is the slightest possible chance of its appearing, preventive methods should be adopted—*i.e.*, spraying with "Burgundy mixture"—when the plants are a few inches high and have formed the leaves; to be followed by a second, and, if necessary, a third spraying before the flowering stage is reached.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Weevils are usually very prevalent in the field at this time of the year and do considerable damage to the grain when in the husk.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in all dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bag or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which were too far advanced to benefit by the recent rains, and which show no promise of returning satisfactory yields of grain, would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of sudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reach a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full eave and held in position by means of weighted wires.

Orchard Notes for March.

THE COASTAL DISTRICTS.

As soon as the weather is favourable, all orchards, plantations, and vineyards that have been allowed to get somewhat out of hand during the rainy season should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

The cooler weather will tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become overdeveloped before it is packed, otherwise it may arrive at its destination in an overripe and, consequently, unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality should be packed. Smaller or inferior fruit should never be packed with good large fruit, but should always be packed separately.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of, plantations which are apt to become somewhat dirty during the gathering of the crop must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green. Citrus fruits of all kinds require the most careful handling, as a bruised fruit is a spoilt fruit, and is very liable to speck or rot. The fungus that causes specking cannot injure any fruit unless the skin is first injured. Fruit with perfect skin will eventually shrivel, but will not speck. Specking or blue mould can therefore be guarded against by the exercise of great care in handling and packing. At the same time, some fruit is always liable to become injured, either by mechanical means, such as thorn pricks, wind action, hail, punctures by sucking insects, fruit flies, the spotted peach moth, or gnawing insects injuring the skin. Any one of these injuries makes it easy for the spores of the fungus to enter the fruit and germinate. All such fruit must therefore be gathered and destroyed, and so minimise the risk of infection. When specky fruit is allowed to lie about in the orchard or to hang on the trees, or when it is left in the packing sheds, it is a constant source of danger, as millions of spores are produced by it. These spores are carried by the wind in every direction, and are ready to establish themselves whenever they come in contact with any fruit into which they can penetrate. Specking is accountable for a large percentage of loss frequently experienced in sending citrus fruits to the Southern States, especially early in the season, and as it can be largely prevented by the exercise of the necessary care and attention, growers are urged not to neglect these important measures.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits, does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case recommended by the writer when he came to this country from California in 1892,

and which again proved its superiority in the recent shipment of oranges from South Australia to England. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is, in the writer's opinion, the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. No matter which case is used, the fruit must be sweated for seven days before it is sent to the southern markets, in order to determine what fruit has been attacked by fruit-fly, and also to enable bruised or injured fruit liable to speck to be removed prior to despatch.

Fruit-fly must be systematically fought in all orchards, for if this important work is neglected there is always a very great risk of this pest causing serious loss to citrus growers.

The spotted peach-moth frequently causes serious loss, especially in the case of navels. It can be treated in a similar manner to the codlin moth of pip fruit, by spraying with arsenate of lead, but an even better remedy is not to grow any corn or other crop that harbours this pest in or near the orchard. Large sucking-moths also damage the ripening fruit. They are easily attracted by very ripe bananas or by a water-melon cut in pieces, and can be caught or destroyed by a flare or torch when feeding on these trap fruits. If this method of destruction is followed up for a few nights, the moth will soon be thinned out.

Strawberry planting can be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

The advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be carefully followed. The later varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been given in the Granite Belt area in the course of the present season by Mr. Rowlands, the Tasmanian Fruit Packing Expert, whose services the Queensland Government have been fortunate in securing, and whose practical advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes, and it is pleasing to note that some growers are packing their fruit very well. Those who are not so expert cannot do better than follow the methods of the most successful packers.

Parrots are frequently very troublesome in the orchards at this time of the year, especially if there is a shortage of their natural food. So far, there is no very satisfactory method of combating them, as they are very difficult to scare, and, though shooting reduces their numbers considerably, they are so numerous that it is only a subsidiary means.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of requiring water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening state, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much water is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light irrigation is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S.

TIMES OF SUNRISE AND SUNSET.

AT WARWICK.

1923.	JANUARY.		FEBRUARY.		MARCH.	
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.
1	5·1	6·49	5 25	6·46	5·45	6·24
2	5·2	6 50	5·26	6·46	5·46	6·23
3	5·3	6·50	5·27	6·45	5·47	6·22
4	5·3	6·50	5·28	6·44	5·47	6·21
5	5·4	6·50	5·29	6·43	5·48	6·20
6	5·5	6·51	5·30	6·43	5·48	6·19
7	5·5	6 51	5·30	6·42	5·49	6·17
8	5·6	6 51	5 31	6 41	5·49	6·16
9	5·6	6 51	5 32	6 40	5·50	6·15
10	5·7	6·51	5·33	6·39	5·50	6 14
11	5·8	6·51	5 33	6·39	5·51	6·13
12	5·9	6·51	5·34	6·38	5·51	6·12
13	5·10	6·51	5·35	6·38	5·52	6·11
14	5·11	6·51	5·36	6·37	5·53	6·10
15	5·12	6·51	5·36	6·36	5·54	6 9
16	5·12	6 51	5 37	6·35	5·54	6·7
17	5·13	6·51	5·38	6·35	5 55	6·6
18	5·14	6 50	5·38	6·34	5·56	6·5
19	5·15	6·50	5·39	6·33	5·56	6·4
20	5·16	6·50	5·40	6·32	5·57	6·3
21	5·16	6·50	5·40	6·32	5·57	6·2
22	5·17	6 50	5·41	6·31	5·58	6 0
23	5·18	6·49	5·41	6·30	5·58	5·59
24	5·19	6·49	5·42	6·29	5·59	5·58
25	5·20	6·49	5·42	6·28	5·59	5·57
26	5·20	6·48	5·43	6·27	6 0	5·56
27	5·21	6·48	5·44	6·26	6 0	5·55
28	5·22	6·47	5·45	6·25	6 1	5·53
29	5·23	6·47	...	...	6·1	5·52
30	5·24	6·46	...	...	6·2	5·51
31	5·25	6·46	...	...	6·2	5·50

PHASES OF THE MOON, ECLIPSES, OCCULTATIONS, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania when "Summer" Time is not used.

3 Jan.	○	Full Moon	12 33 p.m.
10 „	☽	Last Quarter	10 55 a.m.
17 „	●	New Moon	12 41 p.m.
25 „	☾	First Quarter	1 59 p.m.

Perigee on 8th at 9.54 p.m.
Apogee on 23rd at 11.24 p.m.

On 3rd January at 9 a.m. the Earth will be in perihelion, its least distance from the Sun about 91,300,000 miles. Three days later Venus will be in perihelion, and will be about 17,000,000 miles further from the Earth than it was on 25th November when in perigee.

On 29th January Mercury will be passing to the west of the Sun about 4 degrees on its northern side.

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2 Feb.	○	Full Moon	1 53 a.m.
8 „	☽	Last Quarter	7 16 p.m.
16 „	●	New Moon	5 7 a.m.
24 „	☾	First Quarter	10 6 a.m.

Perigee on 4th at 5.18 p.m.
Apogee on 20th at 6.18 p.m.

On 4th February Venus, apparently on the western border of Sagittarius, will be at its greatest western elongation, about 47 degrees from the Sun. On the 6th, soon after sunset, Saturn will be occulted by the Moon when below the horizon, but about four hours later the Moon, Saturn, and Spica will be apparently near to one another low down in the east.

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3 Mar.	○	Full Moon	1 24 p.m.
10 „	☽	Last Quarter	4 31 a.m.
17 „	●	New Moon	10 51 p.m
26 „	☾	First Quarter	2 42 a.m.

Perigee on 4th at 8.48 p.m.
Apogee on 20th at 6.24 a.m.

The Moon will be partly eclipsed on the afternoon of 3rd March, and there will be an annular eclipse of the Sun on the 17th, but neither will be visible in Australia.

Saturn will be occulted by the Moon about 2 a.m. on 6th March, when apparently near to the bright star Spica in the constellation Virgo. This fine combination of celestial objects will be then high up in the sky, nearly overhead.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter, and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhere about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.