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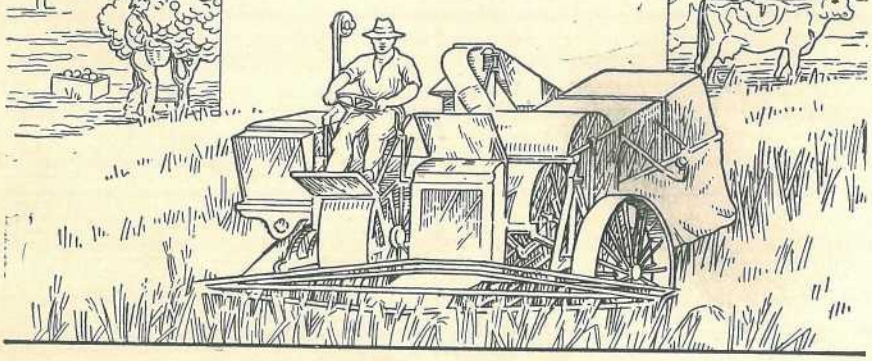

JULY TO DECEMBER, 1938.

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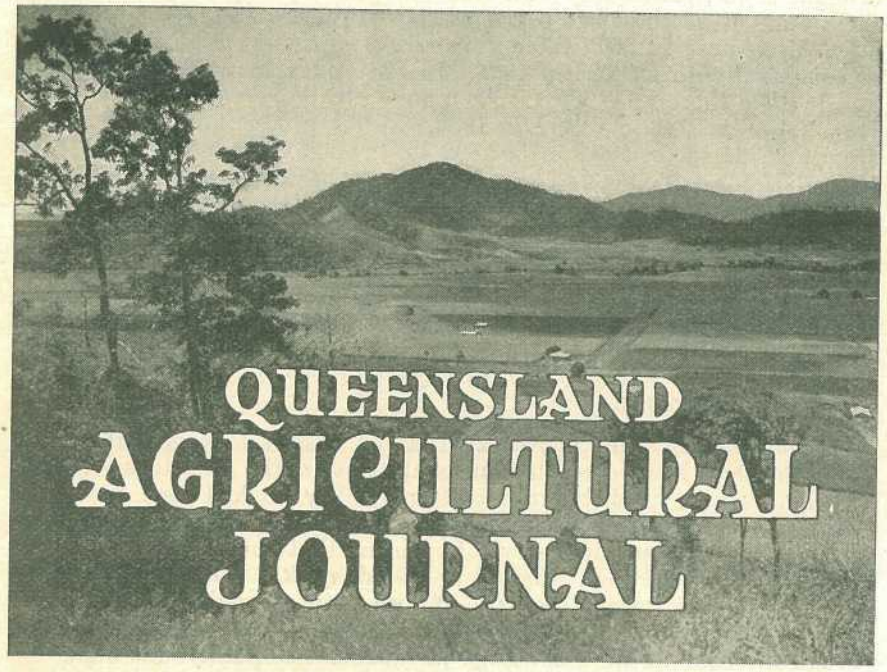

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Event and Comment

Agricultural Development in the North.

IN opening the Mackay Show, the Premier, Hon. W. Forgan Smith, LL.D., said that no district that he knew of could excel Mackay in its rapidity of development and the increase in population and real wealth production. Real wealth was the result of human effort applied to the natural resources and the potential wealth of the country was bound up indissolubly with its people and their industry and capacity to carry on. In that respect Mackay stood pre-eminent in all the qualifications he had mentioned.

The Premier said that the remarkable progress in the development of the rich agricultural areas of Mackay, especially during the last 20 years, was a striking tribute to the splendid pioneers to whose courage, industry, and resource the district owed much. For instance, the area of land under crop had advanced from 42,339 acres in 1916, the year he had first opened the Show, to approximately 95,000 acres last year. The area under cane had advanced from 41,611 acres in 1916 to 92,007 acres in 1936. The area harvested in 1937 totalled 67,958 acres, and in 1936 the total was 64,675 acres. The quantity of sugar-cane crushed in 1916 was 321,965 tons as compared with 948,139 tons in 1937.

In 1916 there were 35,143 tons of sugar made as against 148,047 tons in 1937. The value of the cane produced in the Petty Sessions district of Mackay for 1937 was £1,620,000 and of sugar £2,248,000. That, he added, represented a very great increase in material wealth

production in the sugar industry alone. It also showed the development brought about, principally as a result of public policy over the twenty-three years of which he had been speaking. Progress also was indicated in other directions. In 1917 there were 87,279 cattle in the Mackay district as compared with 159,026 in 1936. In 1931 there were 982 dairy farms and in 1936 there were 1,234. The number of dairy cows had increased from 7,431 in 1931 to 13,474 in 1936. Butter production had increased from 288,794 lb. in 1931 to 597,892 lb. in 1936. New lands had been opened up for dairying, and keen interest was being taken in the improvement of grass lands and fodder conservation in the form of silage and winter and summer growing crops. The growing of English potatoes and onions also was receiving attention.

The tobacco industry was one that also showed promise, and since its commencement in the district marked progress had been shown. For the current season, it was anticipated that the crop would yield 120,000 lb. from 253 acres. The fruit and vegetable exhibits showed remarkable possibilities.

The Premier went on to say that he wished to comment on the fact that they had very fine representatives in the live-stock exhibits. The horses were probably the best in quality he had seen for many years in Mackay, while the cattle parade indicated the growing importance of the dairying industry. It showed that they realise the value and importance of high quality well-bred stock. Good breeding and scientific feeding formed the basis of success in any dairying enterprise. He also noticed that the pig industry was coming into prominence, and though the exhibits were not large in number the quality was high.

"There is a great future for the pork industry. Not only is there a market in Australia, but a large overseas market is available, so I look forward to the growth of the dairying industry side by side with the growing of pork to be converted into various products."

Referring to the sugar industry, he remarked, "I also am naturally interested in the exhibits of sugar-cane. An inspection of the exhibits caused me to reflect upon the history of the present method of paying for sugar-cane. I can remember when the question of payment by analysis was just as keenly contested as the various schemes that have been put forward to deal with the peak year problem to-day.

"That, like other problems, can only be settled in one way; that is the right way."

"No one to-day," he proceeded, " would ever dream of going back to the old method of selling cane by weight, and weight only, so that having solved that problem, it is an indication of our capacity and determination to solve all others and take them in our stride as we go along."

In conclusion, Mr. Forgan Smith said he wished to stress the fact that difficulties had been encountered in all periods of history, and that each age had its own problems. Every generation was called upon to do its own share of pioneering and if they were going to be worthy citizens of the great Commonwealth of Australia they would have to face manfully all their difficulties. They would have to use their intelligence and sober common sense and so help in the development of the great Commonwealth yet to be. Those things had been done in the past and were being done at present. He had every confidence that if after the next

twenty-three years he was called upon to open the Show he would be able to bring under review even a greater increase than he had indicated over the past generation.

The Dairy Industry.

SURVEYING the position of the dairy industry in the course of his opening address at the annual conference of the Australian Institute of Dairy Factory Managers and Secretaries, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said that there had been material improvement in practice, in technique, and in the economic stability and security of the industry. So far as the overseas market position was concerned, the quality question was the most important one that confronted the industry, and as a result of improvements in qualities Australia had been placed in a good position in regard to the trade negotiations which were now taking place in London.

Speaking particularly of the position in Queensland, the Minister said that in January, 1936, this State produced about half its total volume of butter as choice. In May, 1938, the State, out of 81 per cent. of the butter which went to the graders, produced 77·86 per cent. of choice grade. If Queensland could hold that percentage its position on the markets of the United Kingdom was reasonably secure.

Striking a note of criticism of the factories, the Minister recalled that in the drive for quality a differential payment basis for cream was laid down after conferences had been held, but for a variety of reasons many factories had departed from that basis. As a result the position to-day was not nearly so satisfactory as it was in the early days after the system had been introduced.

The Minister went on to say that during recent years he had seen the very negation of co-operation in this State. He had seen co-operation in name but not in practice. There were two or three phases of this co-operation to which they should direct their attention to see if they could make it a truly co-operative movement for the industry, and not for the individual or group.

"One of the greatest difficulties I have to contend with is this insenate striving for the other fellow's supply," said the Minister. He had passed a Cream Transport Act, which, in effect, was designed to secure to individual factories continuity of supplies and to do away with roving suppliers who were always a threat to the industry. Yet he had been informed from reputable sources that some organisations were not keeping their contractors up to the terms of their contracts. He suggested that attention be given to the observation of the conditions of contract.

"We set out to give every area an economic supply," said Mr. Bulcock. "In the main that was achieved, but having done that surely it would be reasonable to ask factories which have territory vested in them to make the most of that territory."

Mr. Bulcock said that a committee which had been inquiring into the cheese industry had stated that certain alterations in practice were necessary if the industry were to be built up on a lucrative basis. He asked the cheese industry to give very careful consideration to the position and to co-operate with him in an endeavour to put it on a level keel and on the right course.

Further Experiments on Mildew Prevention in Calico with Special Reference to Tobacco Seed-bed Covers.

T. McKNIGHT, Assistant to Research Officer.

WITH the vapour treatment of tobacco seedlings, necessitating the use of calico tents, came a greater appreciation of the need for a simple and effective means for preventing the darkening and destruction of calico due to mildew. As an outcome of this initial experiments were carried out in 1937, with the result that alum-lead acetate and Shirlan treatments were provisionally recommended.* Certain proprietary dressings, however, were not included in these experiments and it was to test these, to investigate more thoroughly other processes already tried, and to ascertain whether it was possible to improve or to cheapen the methods already recommended, that the work now under review was commenced. The advice and assistance of Mr. T. H. Simmonds, Senior Research Officer, is acknowledged.

Procedure.

Sixteen treatments in all were tested, observations on the mildew development being supplemented by determinations of the waterproofing qualities and the resultant strength of the calico in the case of each treatment. Two field trials were carried out, one at Mareeba where three seed-beds 17 feet in length were available and one at Bowen with a seed-bed 51 feet in length. A third trial was instituted in Brisbane where the treated calico was used to cover cold frames instead of as tents.

For the field trials at Bowen and Mareeba only seven of the more promising treatments were tested. Strips of heavy calico approximately 2 feet in width were treated and sewn together to form the complete covers. In this way three separate covers 17 feet in length were prepared for the Mareeba experiment, each being located on a different farm. A composite cover 51 feet in length was made for Bowen, consisting of three component covers in each of which occurred the seven treatments and two controls. In each instance a randomisation of the treatments was made. Officers of the Agricultural Branch were responsible for arranging for these covers to be used on seed-beds on suitable farms.

In the Brisbane trial fourteen treatments and two controls were included. The facilities available permitted of two series, each of the treatments and controls occurring once in each series. Cold frames, 3 feet 3 inches square, were used allowing four different treatments to each frame. The time of exposure embraced summer and autumn months and included periods of considerable rainfall.

In all treatments, with the exception of the proprietary products where the method of application was in accordance with the instructions accompanying the preparations, the procedure adopted was to immerse the strips of calico of the requisite dimensions in the solutions prepared and to knead them until the fabric was thoroughly wetted. The time of immersion was ten minutes in all cases other than the alum-lead acetate treatments when the calico was allowed to remain immersed in

* Simmonds, J. H. and L. F. Mandelson: The Treatment of Tobacco Seed-bed Covers to Prolong their Useful Life. Queensland Agr. Journ., XLVIII., 2, 112-115, 1937.

the solution for twenty-four hours. On removal from the solution surplus liquid was removed and the calico hung up in a suitable position to dry.

Treatments.

With the exception of Shirlan none of the five proprietary products tested proved satisfactory for the purpose required. A solution of gelatin, soap and alum was also unsatisfactory and gave inconsistent results. Accordingly these treatments need not be referred to further.

Shirlan was given a more extensive trial than in previous experiments, Shirlan W.S. being used at the strengths of 1 per cent. and 0.25 per cent. and Shirlan AG. at the strength of 1 per cent.

The standard schedule for the alum-lead acetate process was included, this involving the preparation of two solutions with separate immersions, as previously recommended (loc. cit.). Modifications of this include combining the two solutions with and without the addition of glue size, both of which are based on suggestions originally made by Mr. N. E. Goodchild, Senior Instructor in Agriculture. Three per cent. of gelatin was included in a single immersion alum-lead acetate treatment to ascertain whether an improvement in the waterproofing properties of the calico might be obtained.

Colloidal copper, as used for the spraying of tobacco seedlings, with the addition of Agral II. as a spreader was tested at a strength of 1 of stock solution to 8 of water.

The two controls differed in that one had the sizing removed by washing in hot water.

Discussion of Results.

The results obtained from these experiments are summarised in the accompanying table.

The Brisbane trial extended over six months while the covers at Mareeba and Bowen were exposed for approximately three months when they were returned and an examination made. For comparative purposes the table includes the mildew development for both three months and six months periods. In the former case as there were no essential variations in the relative amount of mildew developing in the respective treatments of each series the value given in the table represents an average estimate for the five localities. The results after six months refer to the Brisbane trial only. It will be observed that with some of the treatments a substantial increase in mildew development occurred over the second three months period.

The strength of the calico after treatment and exposure is a factor of considerable importance and determinations were obtained of this quality by submitting duplicate samples to the Government Analyst for testing on the Avery testing machine. The figures in the table represent the average of the composite strengths (the sum of the strength of the warp and the weft) expressed as pounds pressure to cause a fracture of the cloth, and serve to indicate the relative strengths following the six months exposure.

The waterproofing qualities were also determined after the lapse of the six months period and were evaluated by the methods adopted in the previous trials, the figures in the table representing the number of minutes taken for 90 c.c. of water to percolate through a standard depression made in the calico tied over the mouth of a jar.

TABLE 1.

RESULTS OF THE 1937-38 EXPERIMENTS FOR THE PREVENTION OF MILDEW IN TOBACCO SEED-BED COVERS

Treatment.	Mildew Development* (3 months).	Mildew Development (6 months).	Strength (lb. per sq. in.)	Water-proofing (Mins.)
Shirlan W.S. (1 per cent.)	−	+ to ++	57	3
Shirlan W.S. (0.25 per cent.)	+	+++	73	3
Shirlan AG. (1 per cent.)	+	++ to +++	87	3
Alum-lead acetate (stan dard schedule) ..	+	+	96	6
Alum-lead acetate (single immersion) ..	+	+	93	5
Alum-lead acetate (single immersion plus glue size 1 per cent.)	+	+	91	10
Alum-lead acetate (single immersion plus gelatin 3 per cent.)	+ to ++	+ to ++	95	210
Colloidal copper (1 stock to 8 water) plus Agral II.	−	−	66	3
Control (sizing removed)	+++	++++	58	9
Control (untreated)	+++	++++	66	3

*Symbols : − No developement of mildew. +++ Serious developement of mildew.
+ Slight development of mildew. ++++ Very serious development of mildew.
++ Moderate development of mildew.

A review of the results obtained from these experiments shows that over an extended period the Shirlan treatments appear to be inferior to the alum-lead acetate treatments.

Colloidal copper, at the strength tested, gave excellent results as far as mildew prevention is concerned, no discoloration that could be attributed to mildew being observed. Compared with the alum-lead acetate treatments a loss in strength of the calico after exposure was noted, but the results indicate that further work might evolve a dilution retaining its fungicidal value but unaccompanied by this disadvantage.

The removal of the sizing from one of the controls produced no significant difference from the untreated.

The processes involving the use of alum with lead acetate on the whole were outstanding. There was no discernible difference in the mildew prevention between the standard schedule, the single immersion and the single immersion with glue size. As the single immersion process is simpler there is no reason why it should not be substituted for the method previously recommended. The addition of glue size in the amount used did not appear greatly to increase the waterproofing quality of the calico. On the other hand, the addition of 3 per cent. gelatin had a very marked effect in this respect and while this treatment is not quite so effective in preventing mildew it appears to have distinct possibilities for the waterproofing of calico. As the waterproofing quality is not considered essential for tobacco seed-bed covers the additional expense involved in the use of gelatin precludes its recommendation.

Following on their experiments in New Zealand Neill and Travers* show a decided preference for Shirlan W.S. over an alum-lead acetate treatment. With the latter treatment a loss of strength of the calico is also reported. The explanation of the greater efficiency of the Shirlan treatment may lie in the extension to one hour of the period of immersion, while it would appear that the increased concentration of the chemicals added, 12 per cent. as against a concentration of 3 per cent. used in Queensland, may have been the cause of the reduction in strength by the alum-lead acetate. These authors speak favourably of an iron-

*Neill, J. C. and E. Travers: Prevention of Deterioration of Tent Calico. New Zealand Journ. Sci. & Tech., XIX., 10, 646-51, 1938.

chromium method which gave complete protection from mildew, but apart from its prohibitive cost, the darkening of the treated calico renders it unsuitable for tobacco seed-bed covers.

As a result of this additional work it has not been possible to indicate a treatment superior to the two previously recommended. Of these the alum-lead acetate appears to be the better. Furthermore, as the two solutions involved in the standard schedule may be satisfactorily combined the method of treatment is thus simplified. The amended recommendation for carrying out the alum-lead acetate process is as follows: Dissolve 2 lb. alum and 1 lb. lead acetate each in 1 gallon of boiling water, then add these solutions to 8 gallons of cold water, making a volume of 10 gallons. The calico to be treated is immersed in the solution and worked well with the hands until it is thoroughly wetted, and then allowed to stand for 24 hours, after which it is removed and hung out to dry.

It is advisable to note that as all lead compounds are poisonous caution should be exercised in the use of water collected from calico treated by the alum-lead acetate process.

BINDWEED—A SERIOUS WEED PEST.

One of the most serious weed pests so far introduced into Queensland is the European Bindweed. This plant first made its appearance on the Darling Downs about ten years ago, or perhaps earlier, and little trouble has been experienced, in a general way, until the present season; but, judging by the number of specimens sent in to the Department of Agriculture and Stock, it has become very widely spread.

Farmers seeing small plots of it in their areas are advised to use every means of getting rid of it, for once it attains serious proportions eradication becomes almost impossible.

It may be described as a slender twiner with long creeping white underground stems, any part of which when broken off may form a new plant. The leaf is about an inch long, the flowers are white or pink—mostly white in the Queensland specimens—bell or broadly funnel-shaped and ½ to 1 inch across.

Any method for eradication must be designed to destroy the underground parts. This is best done by starvation, and if the top green growth can be kept down by cultivation or by sprays, the underground parts will eventually become exhausted.

Pigs are fond of bindweed, and have been found useful in keeping the weed in check, both in Australia and abroad.

It is a much more serious pest at the present time in the Southern States than in Queensland, but unless small plots are destroyed as soon as they appear, the plant will multiply rapidly.

—*C. T. White.*

Queensland Weeds.

SHRUBBY OR UPRIGHT MIST FLOWER

(*Eupatorium adenophorum*).

By C. T. WHITE, Government Botanist.

DESCRIPTION.—Weed of shrubby growth, usually 4-6 feet high, with numerous upright branching stems. In sheltered situations it is sometimes of more straggling nature. Stems rough to the touch due to a clothing of bristles. Leaves 2-3 inches long, 1-2 inches broad, broadest near the base; leaf-stalk slender, ¾-1 inch long. Flowers white, the individual flowers very small and borne in small dense heads, the heads arranged in terminal sprays or corymbs, 1-3 inches across; the whole effect is highly ornamental. Seeds (achenes) slender, angular, about 1 line long, blackish in colour, except at the apex and very base, surmounted by several fine white hairs (pappus); the hairs themselves very finely barbellate or plumose.

Distribution.—A native of Southern Mexico and Costa Rica, now established as a weed in New South Wales and South-east Queensland. It grows mostly along watercourses and in rather wet places.

Botanical Name.—Eupatorium commemorates Eupator, King of Pontus, who is said to have used a plant of this genus in medicine; adenophorum, from two Greek words, *aden,* a gland, and *phoreo,* I bear, in allusion to the rough gland-like hairs on the stems and to a lesser extent on the leaves.

Properties.—It is not known to possess any poisonous or harmful properties. It was probably introduced into Australia as a garden plant, as several species of Eupatorium are cultivated abroad as florists' flowers. A variegated form is said to be grown in Europe and North America.

Eradication.—So far as I have observed, personally, the plant is confined to creek banks and wet situations generally. From its nature I do not think it likely to become as aggressive a weed as the allied species, *Eupatrium riparium.* In most cases I think it can, where necessary, be dealt with by grubbing out.

Botanical Reference.—Eupatorium adenophorum Spreng. Syst. iii., p. 420. This species was originally recorded under the name *Eupatorium glandulosum* H. B. and K. (non Michx) as naturalised about Sydney by W. F. Blakely, in 1920. These names are synonymous. I have recently been in correspondence about the plant with the authorities of the Royal Botanic Gardens, Kew (England), and as they employ the former name it is recorded under it here.

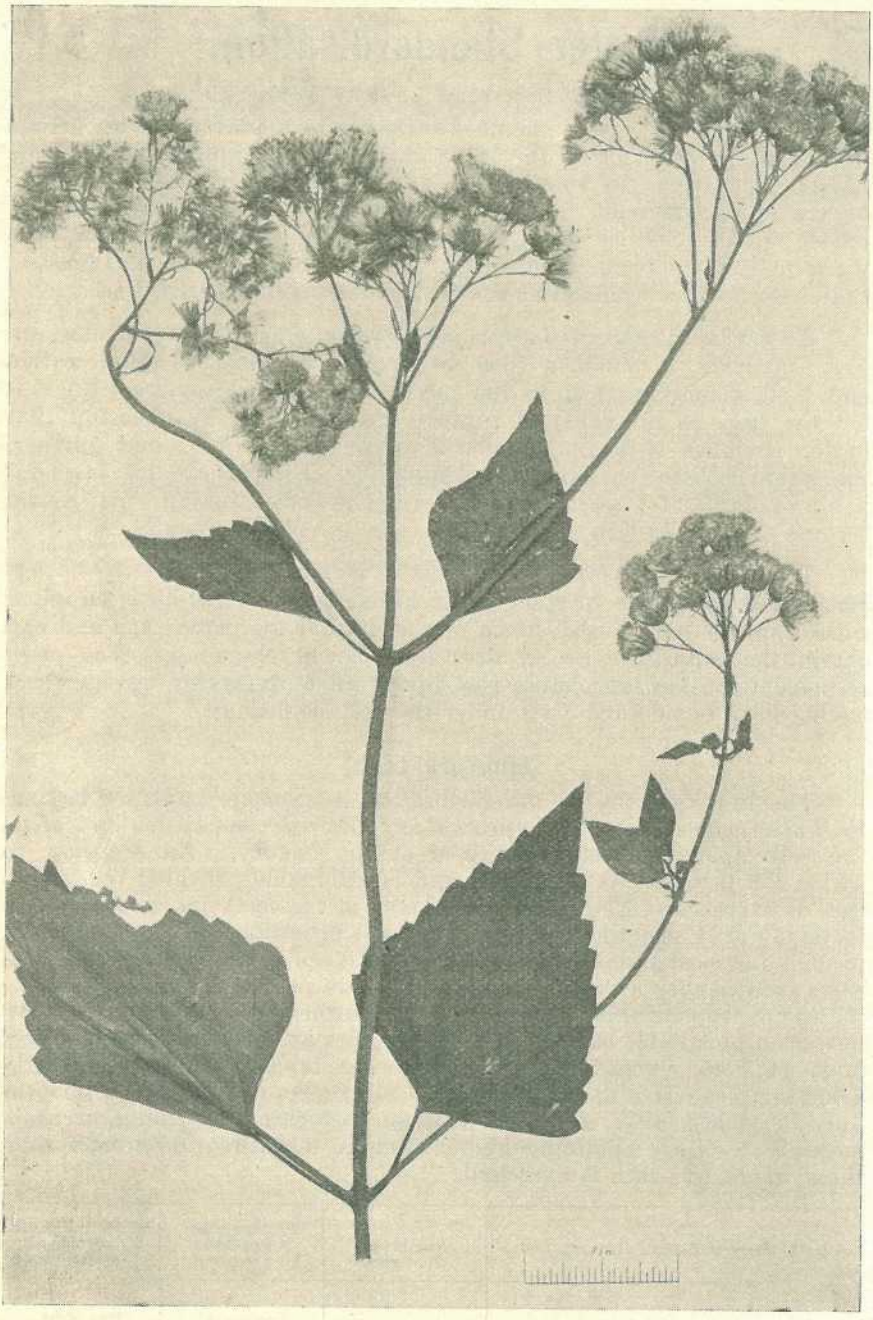

Plate 1.
Shrubby or Upright Mist Flower, *Eupatorium adenophorum*.

Butter Standardisation.

L. A. BURGESS, A.A.C.I., Dairy Technologist.

THE purpose of butter standardisation is to manufacture an article with approximately the same composition throughout the year. Large fluctuations in composition affect palatability and may cause buyers to refrain from the regular purchase of a particular brand of butter. This may be fairly successfully avoided by control of both water and salt percentages to within certain ranges which also ensures that butter of an economical composition is manufactured.

A misconception of butter standardisation appears to exist in some quarters, a common idea being that it involves adulteration and is therefore inimical to the interests of the consumers. Such is not the case, as in reality it protects the consumer by ensuring that butter complies with the standards prescribed by law, and further, that there is little variation in palatability. From the dairy farmers' point of view, it ensures that he receives full value for his cream, because standardisation is only possible in an efficient factory.

Team work is essential for successful standardisation, as the buttermaker will be unable to standardise his methods unless he is supplied with correctly neutralised cream of the desired fat percentage and can obtain the conditions he requires for efficient churning. The main responsibility, however, must rest upon the buttermaker, as incorrect methods can be adopted even under the best conditions.

Moisture Tests.

The first essential to standardisation is accurate moisture testing. No buttermaker can even approach any desired composition unless he can rely upon the tests performed at the factory. An accuracy to within 0·2 per cent. is necessary, and is attainable provided reasonable care is exercised. The moisture balance is the most important in the factory, but it sometimes receives the least attention. Managers should provide the most suitable balance, irrespective of price, and see that complete facilities for accurate moisture tests are provided. If this is done, the entire responsibility is placed on the buttermaker and his assistants, but, if an unsuitable balance or poor facilities are provided, the manager must be held responsible. The following table, representing nearly 8,000 samples tested at the Hamilton Cold Stores during the six months July-December, 1937, shows how those factories performing accurate moisture tests are obtaining higher average moisture percentages than those where less care is exercised.

Average Error of Factory Moisture Tests.	Number of Factories.	Factory Tests Accurate to ±0·2 per cent.	Moisture in Butter (Average of Official Tests.)
		Per cent.	Per cent.
Up to 0·10 per cent.	15	73	15·32
0·11 per cent. to 0·20 per cent. ..	12	62	15·09
Over 0·20 per cent.	11	42	14·98

In the fifteen factories where the average error was no higher than 0·10 per cent. the average moisture was 15·32 per cent., and nearly three-quarters of the factory tests were accurately performed. In distinct contrast are the figures for the eleven factories where the average error was greater than 0·20 per cent., the average moisture being less than 15 per cent., and less than half of the factory tests were accurate. One of these factories had an average error of 0·50 per cent., an average moisture of only 14·79 per cent., and only 43 out of 230 tests (19 per cent.) were accurate to $\pm$ 0·2 per cent. Such tests are useless and might just as well not be performed. If moisture tests are worth performing at all, they should be done accurately.

Salting.

The salting of butter has a big influence on its palatability, and to some extent affects the keeping quality. Consumers naturally dislike being supplied with a lightly salted butter one day, and a highly salted butter the next. Evenness of salting is only obtainable by standardised methods which have been proved satisfactory. Only regular analyses of butter will show whether the salt percentage is being evenly maintained. The keeping quality of butter is controlled to a certain extent by the concentration of the brine incorporated in it. Salt is used more as a flavouring substance than as a preservative, but, when present in sufficient concentration, it has a depressing influence on bacteria which are unable to multiply to any great extent. The salt present in butter is dissolved only in the water. As bacterial growth also occurs in the water it follows that if there is sufficient salt present in each droplet of water to suppress the growth of undesirable bacteria, the keeping quality of the butter will be improved. The required salt concentration is obtainable when the butter contains not less than 1·3 per cent. of salt. The range of salt recommended is from 1·3 to 1·7 per cent., as not only will this prevent excessive bacterial growth, but the palatability will be quite satisfactory, and butter of an economical composition can be manufactured without infringing the legal standards. The table given below shows how the keeping quality is affected by the salt percentage. The figures represent 849 samples tested at the Dairy Research Laboratory under the Butter Standardisation Service being conducted for factories which have no laboratories of their own.

SALT PERCENTAGE AND ITS EFFECT ON THE KEEPING QUALITY OF BUTTER.

Percentage of Salt in Butter.	Number of Samples.	Keeping Quality (Bottle Test).	
		Good and Fair.	Poor and Bad.
Less than 1·3 per cent. ..	347	163 (47 per cent.)	184 (53 per cent.)
1·3 per cent. and higher ..	502	397 (79 per cent.)	105 (21 per cent.)

Unsalted Butter.

The keeping quality of unsalted butter depends entirely upon attention to cleanliness during its manufacture. Only the best cream can be used and the greatest care must be taken to prevent contamination at any stage. Considering the extra attention which must be given to its

manufacture and the lesser quantity of butter which can be manufactured owing to its higher fat content, a premium of at least 3 per cent. should be required by a factory contemplating its manufacture. The reasons for this are that while 100 lb. of salted butter can be made containing 82 lb. of fat, only about 97½ to 98 lb. of unsalted butter can be made containing the same weight of fat—a direct loss of 2 per cent. to 2½ per cent. in the butter production. Add to this the cost of the extra attention to grading and manufacture and it is understandable that a premium of 3 per cent. would provide no more than cover. The only constituent of unsalted butter which can be standardised is the water, while in salted butter standardisation of other constituents ensures the maximum quantity of butter being manufactured.

Laboratory Control.

Partial standardisation may be performed in the factory by the intelligent use of moisture and salt tests provided they are accurately performed, but complete standardisation is only possible with laboratory supervision. In Queensland there are two associations which have laboratories of their own, and the efficiency obtained is well exemplified in the average moisture in butter from the factories concerned. One association attained an average moisture of 15·5 per cent. for all of its factories, the lowest factory average being 15·42 per cent., and the accuracy of the factory moisture tests was very high indeed. The other association did not attain quite such a high standard, the average moisture from all of its factories being 15·3 per cent., only one factory, however, having an average lower than 15·24 per cent., and the accuracy of the factory moisture tests was reasonable. The percentage of salt was also successfully standardised, and the two associations have reason to be satisfied.

There is only one place where standardisation of butter should be performed, and that is in the butter factory. Inefficient factories which manufacture butter with low percentages of water or salt, or both, are depriving their suppliers of the money which blenders and large distributors obtain by incorporating additional water and salt before selling the butter to the consumers. Standardisation in the factory means that the consumer receives the butter in the condition in which it leaves the factory, and the full value of the butter is thus returned to the dairy farmer.

SCUMMY CREAM.

It frequently happens that when cream is being put through the strainer into the vat at a factory, a quantity of thick greasy substance is retained by the strainer. In most cases, this is due to the inclusion of the thick scum from the interior of the separator bowl with the cream. This is a practice which cannot be condemned too severely, and results frequently in the cream being graded down.

The Determination of Water in Butter.

L. A. BURGESS, A.A.C.I., Dairy Technologist.

THE method used for the determination of water in butter—commonly known as the moisture test—may be summarised as follows:—

> A known weight of butter in a weighed metal dish is heated until all water is expelled as steam. The dish and its contents are then cooled to atmospheric temperature and again weighed. The loss in weight is the water in the particular weight of butter taken and the percentage may be calculated by simple proportion.

There are quite a number of modifications in technique mainly due to various types of balances, but the principles of the test remain the same.

The equipment required is—

1. Balance and necessary weights.
2. Metal cup.
3. Spatulas to transfer butter to the cup.
4. Heater.
5. Tongs for handling the hot cup.
6. Cooling bath.
7. A number of clean dry cloths.

Facilities and Precautions.

A balance sensitive to at least 0·01 ($\frac{1}{100}$) gram is necessary for accurate moisture tests. It is an instrument of precision and should be treated as such. It must not be placed in a position exposed to air currents as accurate tests would be impossible under those conditions. Splashing water, steam, heat radiations and poor lighting are other factors which must be guarded against.

The bench or shelf on which the balance stands must be level and absolutely rigid so that vibrations from machinery, &c., do not interfere with the balance. So important are accurate moisture tests that a small laboratory or test room should be built as an integral part of every butter factory in which real efficiency is desired. This room, which, for chemical tests, need be only about 8 ft. by 6 ft., must be quite distinct from the room in which the fat tests are performed and close to the churning room. The size suggested offers ample bench space for moisture, salt and acidity tests which the butter-maker may desire to perform from time to time. A plan of such a laboratory is shown in Figure 1. Even in a room such as this, the balance should be protected from dust and chance currents of air by a case, preferably with a sliding glass door at the front.

The type of heater used in most factories is a spirit lamp. This certainly serves the purpose, but it has the great disadvantage that the bottom of the cup becomes covered with a deposit of carbon and the weight of the cup is thereby altered. As most factories generate electricity, the spirit lamps in such cases should be replaced by a suitable electric heater which is clean and equally rapid. Suitable types

SMALL LABORATORY FOR A BUTTER FACTORY.

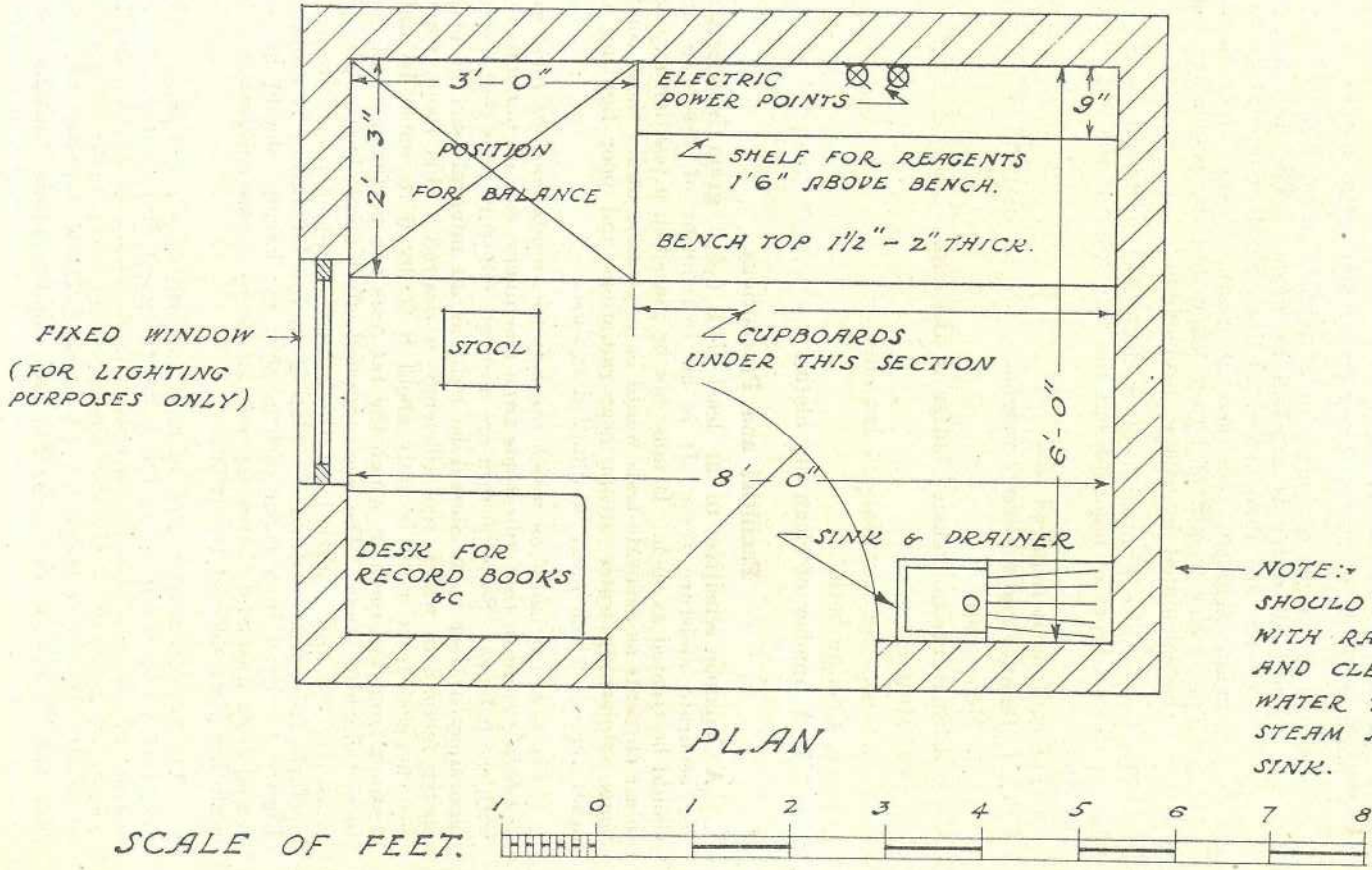

Plate 2.

are shown in Plate 3. The adapted electric radiator (A) has a heating element of about 500 watts and the hot plate (B) is of the three-heat type. Spare heating elements should be kept on hand for emergencies and only require to be screwed into place. Whatever type of heater is used, it should be placed *outside* the balance case and at least 1 ft. away.

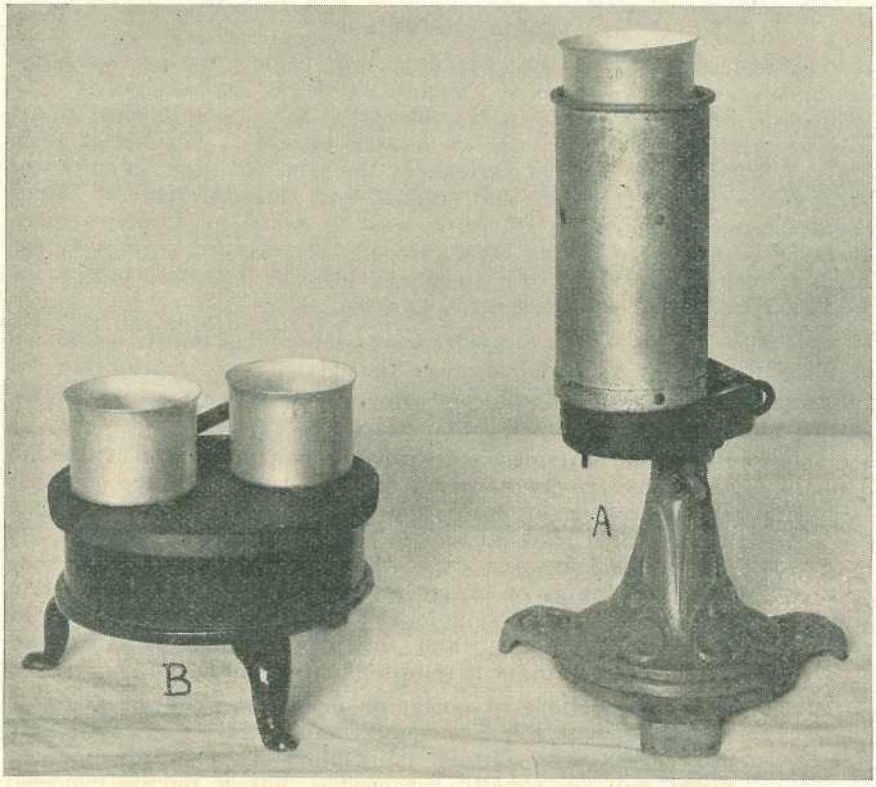

Plate 3.

ELECTRIC HEATERS.—A. Adapted electric radiator. B. Three heat hot plate.

Another important piece of equipment is a cooling bath in which the hot dish may be rapidly cooled to atmospheric temperature. A dish of cold water is very satisfactory for this purpose. A supply of clean, dry cloths must be available, as the dish must be wiped perfectly dry before being placed on the balance. *The dish must never be placed on the balance whilst hot,* as the heat transferred to one side of the balance immediately puts the balance out of adjustment and an inaccurate weighing or reading results, which may be perpetuated in following tests. The practice of making "hot weighings" is probably the principal reason of inaccurate factory tests.

Weights should never be handled with the fingers, but always with a small pair of forceps. The balance should always be brought to rest before adding weights or altering their position, as rough treatment will quickly wear away the sharp knife edges of the balance and destroy its sensitivity.

The remainder of the equipment requires little discussion. The metal cup is usually of aluminium, which is quite suitable for the purpose. Spatulas for the addition of butter to the dish should be of bone or some non-scratching material. One spatula should be ground to a fine point to facilitate the final adjustment. Tongs for handling the hot cup may be either the ordinary hand type or the spring type.

Taking the Sample.

In all chemical work the most important part of the process is the taking of the sample. One of the first axioms of the analyst is *"An analysis is only as accurate as the sample,"* and a sample must therefore be as representative of the whole as is possible. The butter from one end of the churn has not necessarily the same composition as butter from the centre or the other end, and *at least three portions of butter from various positions in the churn must be taken* to obtain a representative sample. In taking these portions the exposed surface of the butter with its adhering free moisture, must be removed before the portion is taken by using a spatula or trier.

Having obtained a representative sample this must be mixed thoroughly so that the analysis may be carried out in duplicate, if required, with the same result. There are several ways of preparing the sample, the main methods being—

(*a*) Place the butter in a dry glass jar with a tight-fitting lid, and place the jar in warm water at a temperature of about 100 degrees Fahr. until it is thoroughly softened, and may be mixed, by shaking, into a homogeneous creamy mass. If this method is used care should be taken to see that no unmelted lumps of butter remain. It is equally important not to overheat the sample, as this causes a separation of the serum from the fat, and in this condition it is almost impossible to obtain a representative sample.

(*b* Place the portions of butter on a slab of glass, or a glazed tile, about 6 to 8 inches square, and quickly and thoroughly mix with a bone spatula. A wide-mouthed cup of china or metal will be equally serviceable, but a narrow-mouthed vessel should be avoided, as it is difficult to mix the sample in a vessel of this type.

For factory use the latter method (*b*) is recommended, as it is much quicker, and the very small amount of moisture lost by evaporation during the mixing is not sufficient to cause a noticeable error.

The weighing of the ten grams of butter should be carried out immediately after the sample is prepared. If it is not convenient to weigh immediately, the sample should be placed in a glass jar with a tight-fitting lid, and mixed just prior to weighing.

Correct Method of Weighing.

With all balances, except the Avery balance, the weighing should be performed by allowing the balance to swing freely and noting the number of divisions reached by the pointer on each side of the centre line of the scale. When the balance is in equilibrium the pointer swings the same number of divisions on either side. *Do not accept a weighing in which the pointer remains stationary,* as the beam or pointer may be stuck.

The various techniques to be followed when using the better known types of balance are as follows:—

The Physical Balance.

The physical balance is one which can be used for many other purposes than the determination of water in butter. It can be used for general analytical purposes where extreme accuracy is not required, because a good physical balance may be sensitive to 0·001 ($\frac{1}{1000}$) gram. The balance shown in Plate 4 is the cheapest type, and requires a set of weights down to 0·01 gram.

Two methods may be used with this type of balance—

1. (*a*) See that the pointer swings an equal number of scale divisions on either side of the centre line with the pans empty.

   (*b*) Weigh the clean dry cup as accurately as possible by placing the cup on the left pan and the weights on the right pan.

   (*c*) Add ten grams to the weights already on the right pan and record the total weight (A).

   (*d*) Place butter from the well mixed sample into the cup until the balance is again in equilibrium.

   (*e*) Place the cup over the heater and shake gently during the evaporation of the water to prevent spurting. During the final stage, the butter froths up in the cup, then subsides and the fat may be seen boiling quietly. The colour will then be a light brown.

   (*f*) Remove the cup from the heater and cool to atmospheric temperature in the cooling bath.

   (*g*) Wipe the outside of the dish perfectly dry and replace on the left pan of the balance.

   (*h*) Weigh again as accurately as possible and record the weight (B). Subtract the second weight (B) from the first weight (A). The difference is the weight of water in the ten grams of butter taken.

   Percentage of water = (A—B) x $\frac{100}{10}$
   = (A—B) x 10

Example—

1st weight (A)	=	38·54 grams
2nd weight (B)	=	37·02 grams
Difference (A—B)	=	1·52 gram
Percentage of water	=	1·52 x 10
	=	15·2 per cent.

2. The second method eliminates the use of a number of weights, the determination being performed by the use of a 10 gram, 1 gram, and the eight fractional weights from 0·5 down to 0·01 gram. Prepare a counterpoise from a piece of lead, brass, or copper to weigh exactly

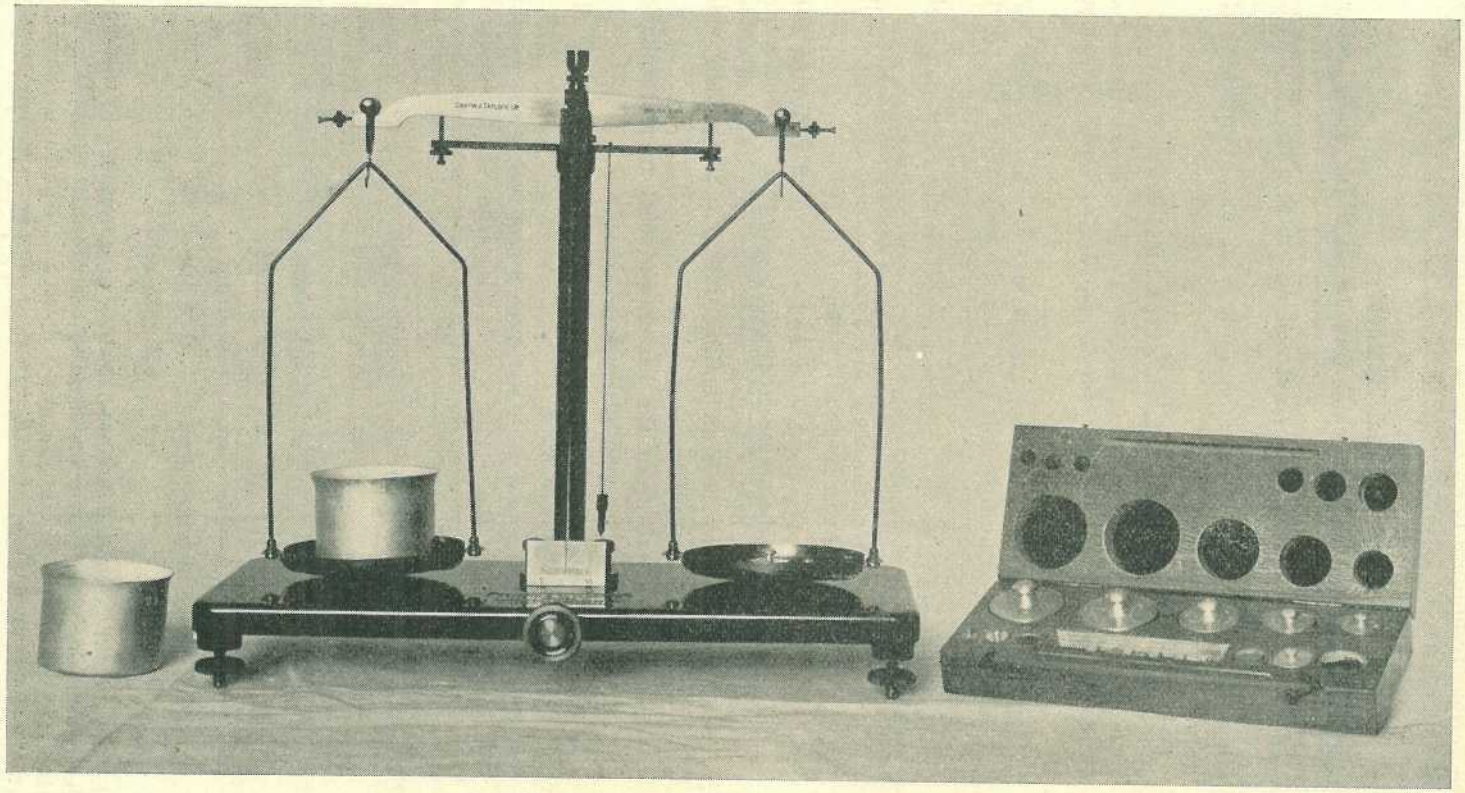

Plate 4.
The Physical Balance with set of weights and metal cups.

the same as the clean dry cup. If there are two or more cups available, a counterpoise for each may be made so that a number of tests may be performed at the same time. Then proceed as follows:—

(*a*) See that the pointer swings an even number of scale divisions on either side of the centre line with the pans empty.

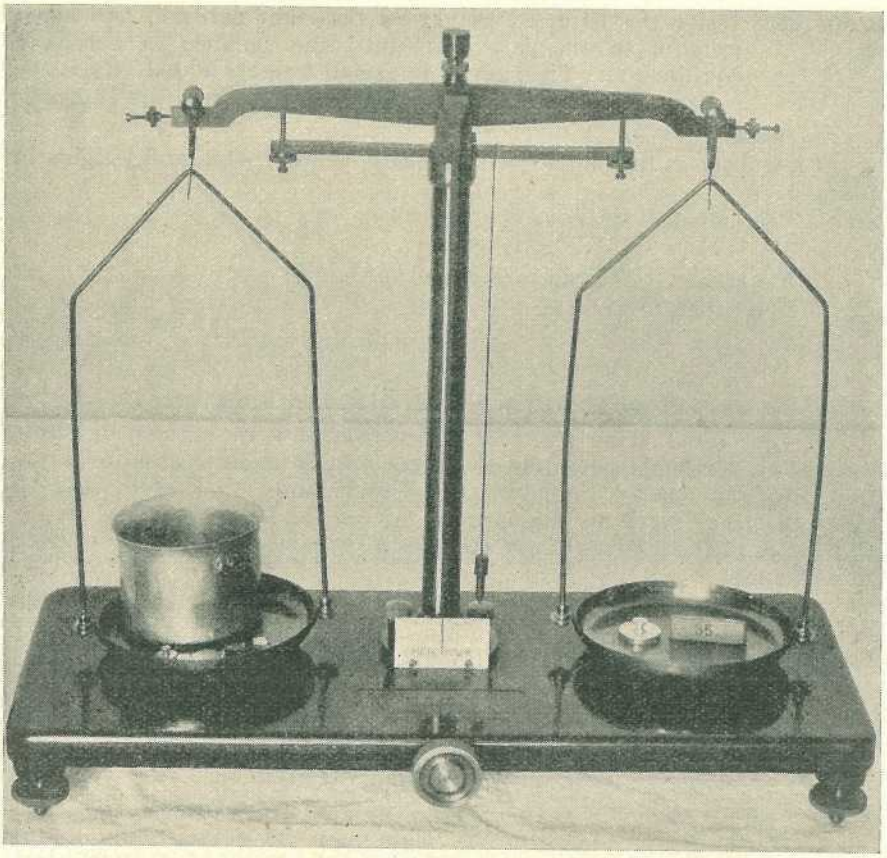

Plate 5.

The Physical Balance with cup, counterpoise and weights in position. The sum of the weights on the left pan is 1.57 grams, indicating 15.7 per cent. of water.

(*b*) Place the clean dry cup on the left pan and the corresponding counterpoise on the right pan and see that the balance swings evenly. If not, adjust the counterpoise to the correct weight.

(*c*) Place a 10 gram weight on the right pan with the counterpoise.

(*d*) Place butter from the well-mixed sample into the cup until the balance is again in equilibrium.

(*e*) Place the cup on the heater and shake gently during the evaporation of the water to prevent spurting. During the final stage the butter froths up in the cup, then subsides, and the fat may be seen boiling quietly. The colour will then be a light brown.

(*f*) Remove the cup from the heater and cool to atmospheric temperature in the cooling bath.

(*g*) Wipe the outside of the cup perfectly dry and replace on the left pan of the balance.

(*h*) Leave the 10 gram weight on the right pan and add small weights to the *left* pan until the balance is again in equilibrium. The sum of the small weights added (C) is the weight of the water which was evaporated from the 10 grams of butter.

Plate 5 shows the balance with the cup, counterpoise, and weights in place.

Percentage of water $= C \times \frac{100}{10}$

$= C \times 10$

Example.—1·57 gram was added to the left pan.

Percentage of water $= 1{\cdot}57 \times 10$

$= 15{\cdot}7$ per cent.

Physical Balance With Attached Rider.

A more satisfactory type of physical balance is that shown in Plates 6 and 7. A rider attached to the beam of this balance eliminates the use of weights smaller than 1 gram. This balance is adjusted with the rider on the O mark on the extreme left of the beam. The technique of the two methods given above requires a little modification when using this balance.

1. (*a*) See that the pointer swings an even number of scale divisions on either side of the centre line with the pans empty and the rider on the 0 mark of the beam.

(*b*) Weigh the clean dry cup by placing the cup on the left pan and weights down to 1 gram on the right pan until an extra 1 gram makes the weight too heavy. Then slide the rider along the beam until equilibrium is attained.

Example.—If the cup weighs 28·28 grams, 28 grams would be placed on the right pan (29 grams would be too heavy) and the rider slid along the beam to the 0·28 mark showing a total of 28·28 grams. (See Plate 6.)

(*c*) Leaving the rider in the same position, add 10 grams to the weights on the right pan and record the total weight (A).

Example.—28·28 + 10 = 38·28 (A).

(*d*) Place butter from the well mixed sample into the cup until the balance is again in equilibrium.

(*e*) Place the cup on the heater and shake gently during the evaporation of the water to prevent spurting. During the final stage the butter froths up in the cup, then subsides and the fat may be seen boiling quietly. The colour will then be a light brown.

(*f*) Remove the cup from the heater and cool to atmospheric temperature in the cooling bath.

(*g*) Wipe the outside of the cup perfectly dry and replace on the left pan of the balance.

(*h*) Weigh again as described in (*b*) above, and record the weight (B). Subtract the second weight (B) from the first weight (A). The difference is the weight of water in the 10 grams of butter and the percentage is obtained by multiplying the difference in weight by 10.

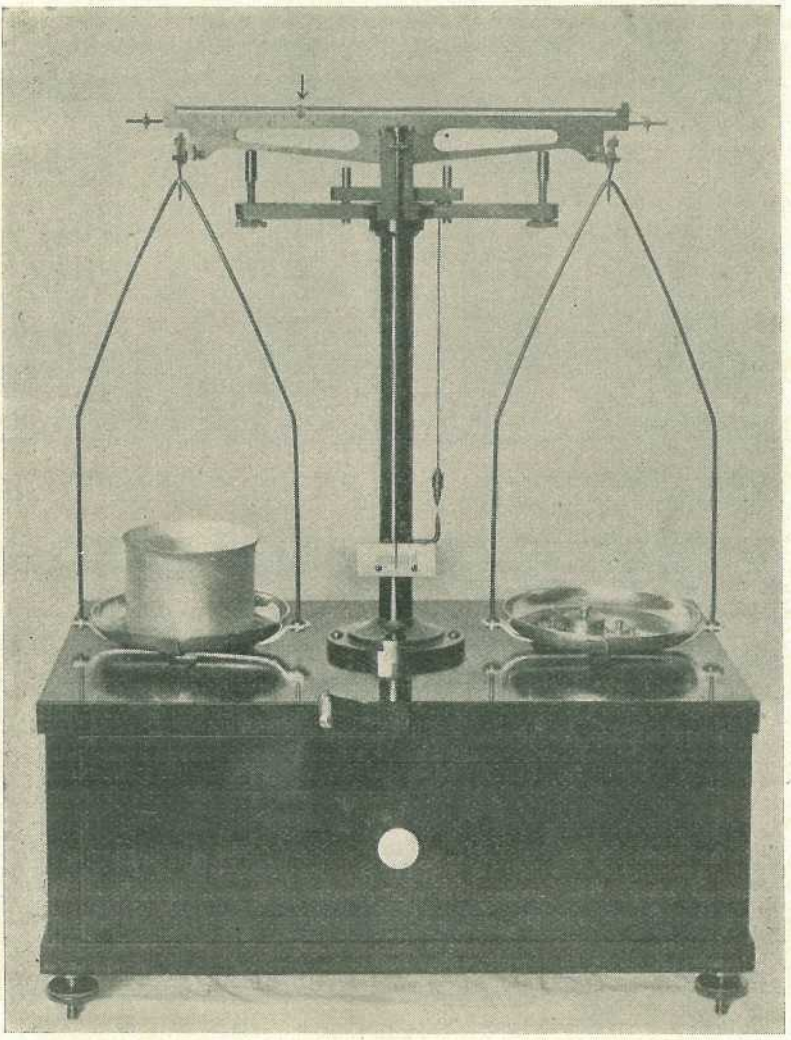

Plate 6.

The Physical Balance with attached rider showing a weight of 28.28 grams. Note that weights smaller than 1 gram are not required. The rider is indicated by an arrow.

Example.—

1st weight (A)	=	38·28 grams.
2nd weight (B)	=	36·72 grams.
Difference (A—B) ..	=	1·56 grams
Percentage of water ..	=	1·56 × 10.
	=	15·6 per cent.

2. Prepare a counterpoise for the cup as described previously.

(*a*) See that the pointer swings an even number of scale divisions on either side of the centre line with the pans empty and the rider on the 0 mark of the beam.

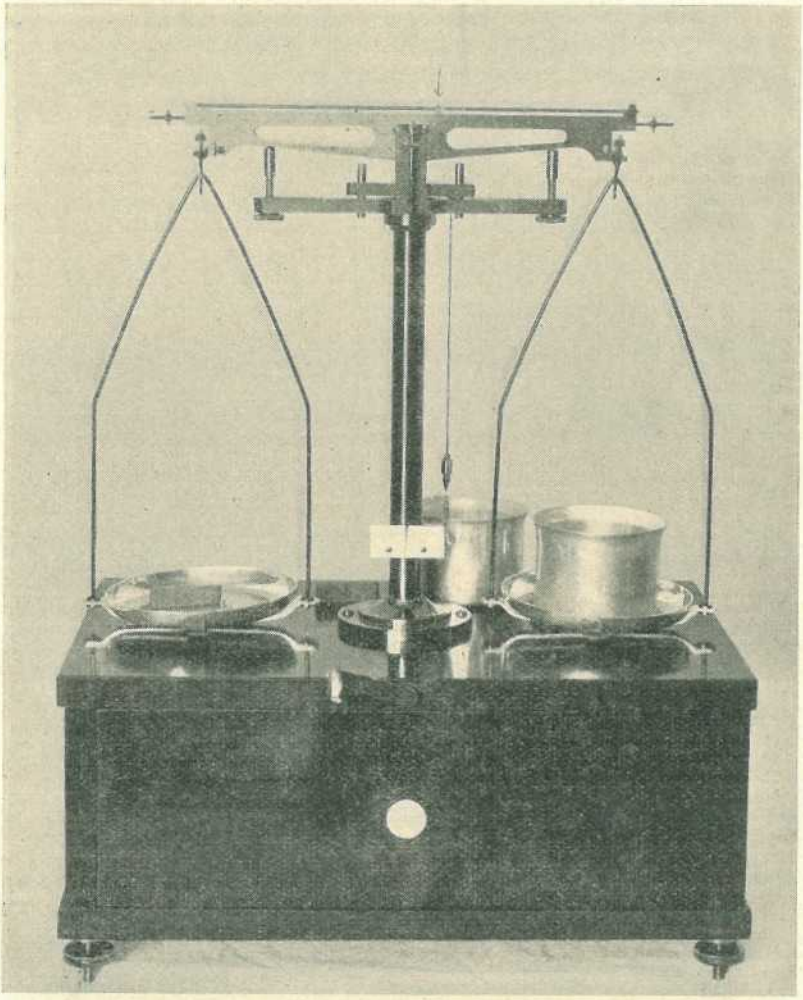

Plate 7.

PHYSICAL BALANCE WITH ATTACHED RIDER.—The cup, counterpoise, and 1-gram weight are in position, and the rider is on the 0.57-gram mark, indicating 15.7 per cent. of water.

(*b*) Place the clean dry cup on the *right* pan (note the change from the usual left pan) and the corresponding counterpoise on the left pan, and see that the balance is in equilibrium. If not adjust the counterpoise to the correct weight.

(*c*) Place a 10-gram weight on the left pan with the counterpoise.

(*d*) Place butter from the well mixed sample into the cup until the balance is again in equilibrium.

(*e*) Place the cup on the heater and shake gently during the evaporation of the water to prevent spurting. During the final stage the butter froths up in the cup, then subsides, and the fat may be seen boiling quietly. The colour will then be a light brown.

(*f*) Remove the cup from the heater and cool to atmospheric temperature in the cooling bath.

(*g*) Wipe the outside of the cup perfectly dry and replace on the left pan of the balance.

(*h*) Leave the 10-gram weight on the left pan and place a 1-gram weight on the right pan and slide the rider along the beam until the balance is in equilibrium. The weight of water in 10 grams of the butter amounts to 1 gram plus the fraction of a gram shown by the rider. This sum is recorded as C.

Percentage of water = C x 10.

Example.—Plate 7 shows the balance with the cup and 1-gram weight on the right pan, the counterpoise and the 10-gram. weight on the left pan, and the rider on the 0·57 gram mark.

Weight of water in 10 grams of butter = 1 gram + 0·57 gram = 1·57 gram.
Percentage of water = 1·57 x 10.
= 15·7 per cent.

By following this technique the position of the rider will give what almost amounts to a direct percentage reading—i.e., the rider on the 0·57-gram mark denotes 15·7 per cent., the 0·5 and 0·6-gram marks denote 15·0 and 16·0 per cent. respectively, and so on. For this reason, and because of its sensitivity and general utility, this type of balance is strongly recommended for use in a control laboratory or wherever reliable and accurate tests are required.

The Torsion Balance.

The Torsion balance, illustrated in Figs 7 and 8, is a robust, reliable balance specially designed for the determination of water in butter. With a set of weights it can also be used for other work where an accuracy of less than 0·01 gram is not required. The balance has four beams fitted with non-detachable riders. One beam is fitted with a large tare or counterpoise weight (A) with which the metal cup can be roughly counterpoised. Another graduated beam has attached to it a small tare weight (B) with which the final counterpoising of the cup is performed. Two beams, each having an attached rider, are graduated in percentages, the larger (D) being from 0 to 20 per cent. in 0·2 divisions and the smaller (C) being from 0 to 10 per cent. in 0·1 divisions. The balance is used as follows:—

(*a*) Place the percentage riders (C and D) on their respective zero marks (the left side of the rider coinciding with the 0 line at the left side of the scales), the small tare weight (B) on the zero mark in the centre of its scale and the large tare weight (A) as far to the right of its beam as it will go. Level the balance by adjusting the levelling screws so that the pointer swings an even number of scale divisions on either side of the centre line. Do not again touch the levelling screws.

(*b*) Place the cup on the right pan. Roughly counterpoise it by sliding the large tare weight (A) to the left and screwing it in place and then counterpoise it accurately by sliding the small tare weight (B) to the right or left as required. When a number of tests are being made a number of cups of approximately the same weight (within a range of 0·5 gram) are required, and the exact position of the small tare weight (B) for each cup should be noted.

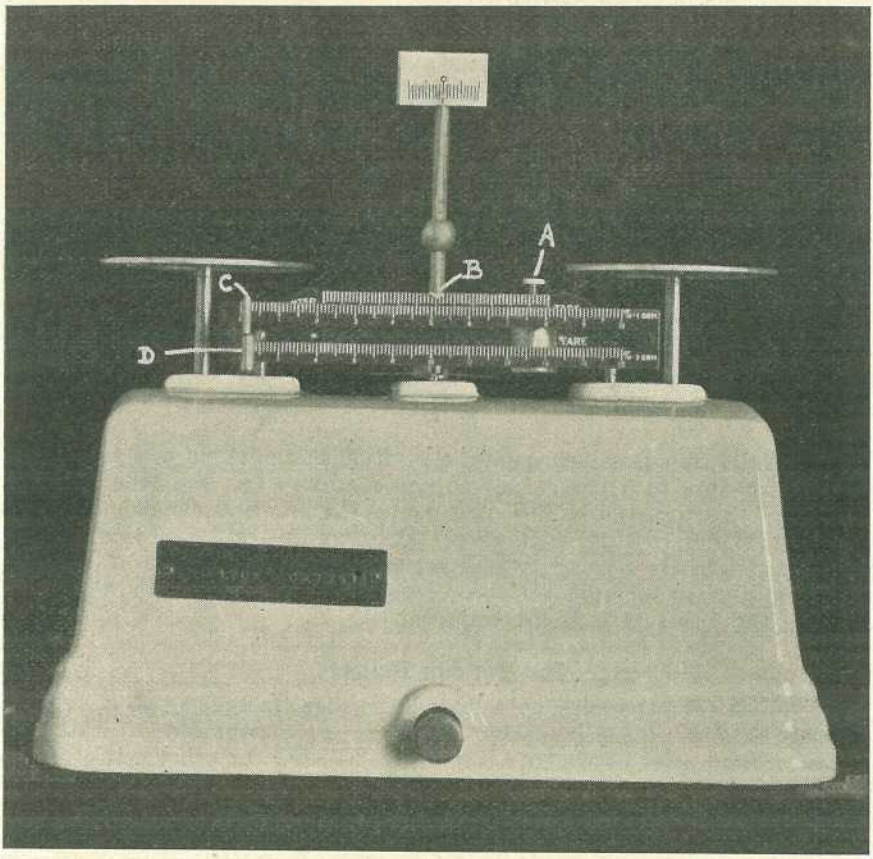

Plate 8.

THE TORSION BALANCE.—A. Large tare weight. B. Small tare weight. C. Smaller percentage rider on the 0 to 10 per cent. scale. D. Larger percentage rider on the 0 to 20 per cent. scale.

(*c*) Place the 10-gram weight on the left pan.

(*d*) Place butter from the well mixed sample into the cup until the balance is again in equilibrium.

(*e*) Place the cup on the heater and shake gently during the evaporation of the water to prevent spurting. During the final stage the butter froths up in the cup, then subsides and the fat may be seen boiling quietly. The colour will then be a light brown.

(*f*) Remove the cup from the heater and cool to atmospheric temperature in the cooling bath.

(*g*) Wipe the outside of the cup perfectly dry and replace on the right pan of the balance.

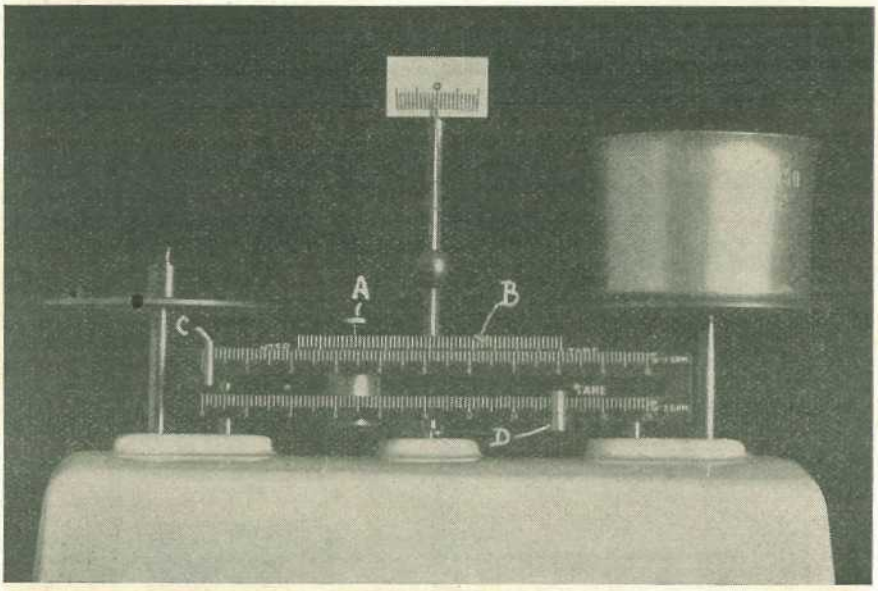

Plate 9.

BEAMS OF THE TORSION BALANCE.—Note the altered positions of the tare weights A and B. The larger percentage rider D indicates 15.6 per cent. of water.

(*h*) Leave the 10-gram weight on the left pan and slide the larger percentage rider (D) along its scale to the right until the balance is again in equilibrium. The percentage of water in the butter is obtained by taking the reading on the scale corresponding to the left-hand side of the rider. If desired, this rider may be slid along to the 10 per cent. or other mark and the smaller rider (C) used to obtain the final reading in which case the two readings must be added together. When a number of tests are made together, the small tare weight (B) must be replaced in the correct position for each cup as determined in (*b*) above.

Example.—Plate 9 shows a close up view of the scales showing a reading of 15·6 per cent. using the larger rider (D) only.

The One-pan Balance.

This type of balance is a one-purpose balance as it can only be used for the determination of water in butter. It also has a number of other disadvantages when compared with the physical and torsion balances, not least amongst them being the loose weights of a special design which can only be handled with the fingers, no forceps being provided with the balance. Another disadvantage is that only one test at a time can be performed unless a number of cups of *exactly* the same weight are available. Fairly reliable results are obtainable if the balance is kept

clean and the cup and weights handled only with clean dry hands. A typical balance of this type is illustrated in Plate 10. The weights supplied with the balance are a 10-gram hooked weight, a 2-gram rider, and a 0·2-gram rider. Working directions are as follows:—

(*a*) Place the clean dry cup on the pan.

(*b*) Suspend the 10-gram weight from the hook above the pan, allow the balance to swing and adjust, by means of the screw on the right of the beam, until the balance pointer swings the same number of scale divisions on either side of the centre line.

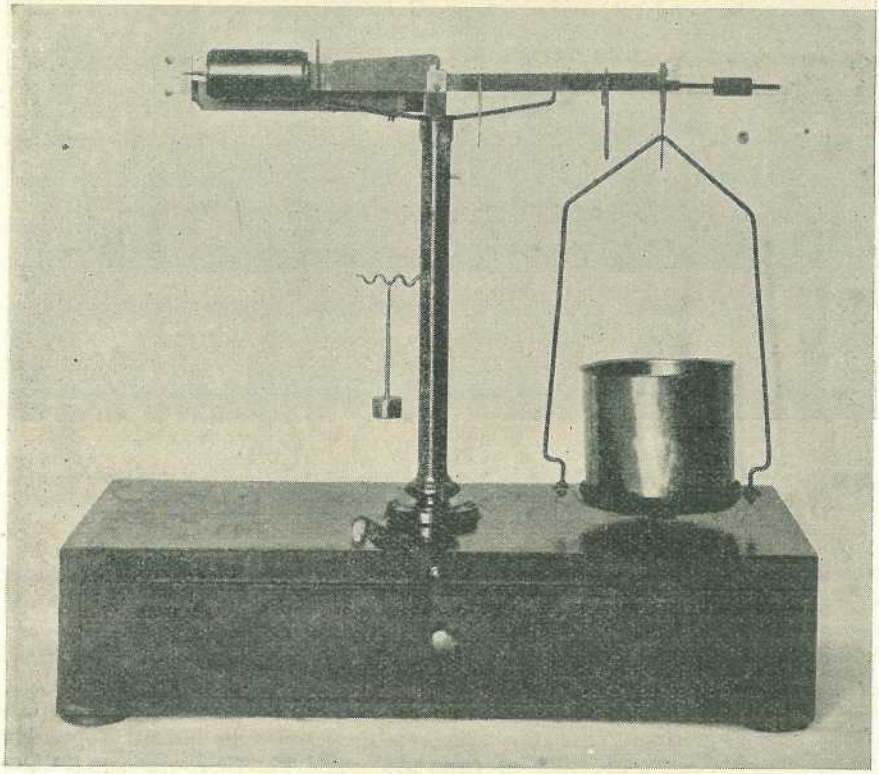

Plate 10.
THE ONE-PAN BALANCE.—The riders show 15.4 per cent.

(*c*) Remove the 10-gram weight.

(*d*) Place butter from the well mixed sample in the cup until the balance is again in equilibrium.

(*e*) Place the cup on the heater and shake gently during the evaporation of the water to prevent spurting. During the final stage the butter froths up in the cup, then subsides and the fat may be seen boiling quietly. The colour will then be a light brown.

(*f*) Remove the cup from the heater and cool to atmospheric temperature in the cooling bath.

Plate 11.

THE AVERY BALANCE.—A. Compensating weight. B. Lock nut. C. Adjusting screw (behind bar.) D. Sampler.

(*g*) Wipe the outside of the cup perfectly dry and replace on the balance pan.

(*h*) Place the 2-gram rider on one of the percentage marks on the graduated beam taking care that the rider is seated properly in the groove and does not touch the beam supports. If necessary, alter the position of the rider until the percentage mark lower than the true percentage is found. Then place the 0·2-gram rider on the beam in the various grooves until the balance is again in equilibrium. The percentage is obtained by noting the positions of the riders, the larger giving the whole per cent. and the smaller giving the tenths of 1 per cent.

Example.—In Plate 10 the larger rider (A) is on the 15 per cent. mark and the smaller rider (B) is on the 4 per cent mark. The butter would contain 15·4 per cent. of water.

The Avery Balance.

A comparatively recent introduction is the Avery oil damped balance in which the pointer is rapidly brought to a stationary position by means of a paddle immersed in an oil bath. It is a one-purpose balance capable of being used only for the determination of water in butter. A compensating weight enables any quantity of butter between 8 and 12 grams to be taken and the percentage of water is obtained direct from the scale. It has a serious disadvantage for butter standardisation purposes, as no salt test can be performed unless the exact weight of butter taken is known. To weigh out a definite quantity of butter on this balance requires a radical modification of technique as the balance is designed to make such a weighing unnecessary. If more than one test is to be performed, a number of cups of *exactly* the same weight are required. Constant skilled attention is required to obtain consistently accurate results. The balance is supplied with a 12-gram weight for adjustment purposes. The balance is used as follows:—

(*a*) Screw down the compensating weight (A) as far as it will go. Plate 11 shows the correct position. Do not shift the lock nut (B) under any circumstances.

(*b*) Place the clean dry cup and the 12-gram weight on the pan. The pointer should come to rest exactly on the 0 mark on the right of the scale. If not, adjust to the 0 mark by rotating the screw C (behind the bar) with a turn screw, clockwise or anti-clockwise as required.

(*c*) Remove the 12-gram weight.

(*d*) By means of the butter sampler (D) take a portion of the well mixed sample and place in the cup. Alter the position of the compensating weight (A) until the pointer again rests on the 0 mark.

(*e*) Place the cup on the heater and shake gently during the evaporation of the water to prevent spurting. During the final stage the butter froths up in the cup, then subsides and the fat may be seen boiling quietly. The colour will then be a light brown.

(*f*) Remove the cup from the heater and cool to atmospheric temperature in the cooling bath.

(*g*) Wipe the outside of the cup perfectly dry and replace on the balance pan.

(*h*) Read off the percentage of water from the scale.

Another article describing methods of determining the percentage of salt in butter will appear in a later issue of this Journal.

FOOD REQUIREMENTS IN A MAINTENANCE RATION.

All livestock rations are divisible into two parts—the part used for maintaining the body in a healthy condition, and the part used for production, whether it be for hair, wool, fat, meat, milk, or progeny. Under severe winter or drought conditions, the livestock owner is more concerned with a maintenance standard of feeding, and it becomes important to know where economies may most effectively be introduced.

A short consideration of an animal's reactions to starvation will supply the answer. Take the dairy cow in full lactation: the first defence which nature attempts is a conservation of material and the milk yield falls rapidly. Supplies to the body covering are restricted, and a dull, shaggy, lustreless coat develops. The body reserves of fat are called on and the animal becomes thinner. Horns and hooves become brittle. As starvation advances, some encroachment is made on the last defences—the muscles and vital organs. At this stage, the animal weakens rapidly and collapse followed by death results. It is, therefore, clear that the last defences of the body—i.e., the muscles and vital organs—must be protected. For this purpose, the animal must be supplied with protein. In other words, drought feeding should centre round protein rich foods. Where the stock are close to the source of such foods, the relative merits of each should determine which is to be fed, but on distant properties where freight charges are high it becomes important to buy the most concentrated and most digestible preparations.

Producers often remark that nature gave the sheep a commodious intestinal tract which must be filled, and they usually buy roughage of only moderate protein content. The argument is fallacious when the question is one of maintenance for limited periods only. It is surprising how well sheep can keep their condition on as little as 2 oz. of cotton seed meal and 4 oz. of maize daily.

The mineral requirements of stock should be provided for, but the excessive quantity of salt in many licks is unnecessary. Animals are capable of retaining enough salt for normal body functions from a very restricted intake, but lime and phosphate are continuously excreted and must be supplied in greater quantities. More than 30 per cent. of salt in a lick is rarely necessary, and in most cases it could well be less. Lime and phosphate are supplied in a number of forms, but on current prices well prepared sterilized bone meal containing about 20 per cent. protein is, apparently, the best.

Dusting Preparations for Pest* Destruction.

LABELLING AND EVALUATION.

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DUSTING preparations or mixtures for the destruction or control of agricultural or horticultural pests are sold in great variety in Queensland.

Owing to the complexity of the ingredients used in the manufacture of these materials, considerable difficulty has been experienced in the past in evolving a method of labelling that would be satisfactory to both the user and the officers of the Department of Agriculture responsible for controlling the quality of pest destroyers.

The principal ingredients used in these dusts are:—Arsenate of lead, copper carbonate, copper sulphate, derris powder, nicotine sulphate, nicotine, sulphur.

Less common ingredients are pyrethrum powder, creosote, and tobacco dust.

Certain "inert" materials are often included for two main reasons —to dilute the ingredient or ingredients used to the required strength, and to improve the dusting properties.

Stickers to improve the adhesive properties of the dust are also sometimes present.

The obvious method of labelling dusting preparations would be to declare the percentages of the respective pest-destroying ingredients used—such as: 30 per cent. arsenate of lead, 20 per cent. copper carbonate, 30 per cent. derris powder.

There are two serious flaws in this system, however. The first is that the ingredients used are not all of uniform composition, and the second is that it is an extremely difficult matter to estimate by chemical analysis the percentage of ingredient present.

All of these ingredients may be evaluated and analysed chemically, however, by reference to their "active constituents"—which in the case of inorganic preparations are either elements or their oxides (such as copper (Cu) or arsenic pentoxide (As_2O_5)) and in the case of organic preparations are compounds of known formula (such as nicotine $C_{10}H_{14}N_2$).

A brief description of the ingredients is as follows:—

Arsenate of Lead.

Commercial arsenate of lead cannot definitely be set down by chemical formulæ, but contains varying proportions of "chemical" acid lead arsenate $PbH(AsO_4)$ and/or "chemical" basic lead arsenate $Pb_5(OH)(AsO_4)_3$. Acid and basic commercial arsenates of lead are both recognised as pest destroyers. Impurities associated with the manufacture are present in the commercial article. Naturally, the ratio of arsenic pentoxide (As_2O_5) to lead oxide (PbO) varies in different samples. Arsenate of lead is standardised in Queensland on a minimum

* In the Queensland Pest Destroyers Act, the definition of pest destroyer includes any insecticide or fungicide.

arsenic pentoxide (As_2O_5) content of 30 per cent. As "basic" arsenate of lead contains less than 30 per cent. arsenic pentoxide, the material on the Queensland market is limited to the "acid" form. In a dust the only reasonable method of evaluation would be on an arsenic pentoxide basis with a proviso that the lead oxide be present in equivalent proportion.

Copper Carbonate.

This is easiest analysed and compared on a copper (Cu) basis, as it is not a chemically-pure copper carbonate, but an impure basic copper carbonate ($Cu(OH)_2CuCO_3$) containing, when manufactured from copper sulphate and carbonate of soda, traces of basic copper sulphate. It also contains other impurities, such as moisture. If chemically pure, the percentage of copper (Cu) would be just over 57; in actual practice a minimum of 50 per cent. is set as a standard.

Copper Sulphate.

This is usually in the "dehydrated" form when used in dusts, and consists chiefly of monohydric copper sulphate ($CuSO_4 \cdot H_2O$).

The actual percentage of copper (Cu) present depends on its preparation and its proper storage prior to mixing—as it readily reverts to crystalline copper sulphate ($CuSO_4 \cdot 5H_2O$) on exposure to the atmosphere. Owing to its variable composition, it should always be evaluated on a copper (Cu) content basis. The usual percentage present in fresh material is around 35.

Derris Powder.

This is a natural product obtained by grinding the roots of certain plants of Derris spp. The quality varies considerably, and although methods of evaluation on a basis of rotenone or "Tuba toxin" percentages may not be perfect, they are of far greater value than a declared percentage of derris powder. Much work is being carried out on this subject by research workers at the present time, and it seems possible that a collective evaluation of the active constituents may be made by measuring the optical rotation of a benzene extract of the material concerned. Preliminary experiments have shown that, with certain plants at least, toxicity to insects is proportionate to the optical rotation.

Nicotine Sulphate.

This is the usual source of nicotine in dusting mixtures, and is a mixture of nicotine sulphate and water—together with commercial impurities—standardised on a minimum of 40 per cent. nicotine ($C_{10}H_{14}N_2$) by weight. The declared percentage of "commercial nicotine sulphate" would be almost a valueless factor unless the nicotine content of such nicotine sulphate were known.

Nicotine.

Commercial nicotine (approximately 90 per cent. purity) is sometimes used in dusting mixtures. It is a liquid which takes in water from the air, requiring to be stored in airtight containers to avoid deterioration.

Sulphur.

The forms usually in dusting preparations are ground and sublimed (Flowers). These materials are as near to chemical purity as can be

expected commercially, but even so, the full 100 per cent. of commercial sulphur is not usually recovered as the element sulphur (S) on analysis. It is necessary to declare on the labels the percentage of sulphur (S) and the form of sulphur used (ground or sublimed). The percentage declared would naturally be based upon the chemical purity of the commercial sulphur used.

It will be seen from the above that owing to the complexity, variability, and impurity of the commercial ingredients used in dusting mixtures, it would be very difficult to ascertain by chemical analysis the actual weights of the original ingredients used; and even if these weights were ascertained the value of the dust would be still dependent upon the percentages of the active constituents present in these original ingredients.

Thus, although it is essential that the names of the ingredients be stated, it is obvious that a declaration on the label of a dusting mixture of the percentages of the ingredients would be very vague without the percentages of the active constituents also.

For instance, two mixtures could each include, say, 40 per cent. of copper sulphate, but if the copper (Cu) content of the copper sulphates used analysed 30 per cent. and 35 per cent. respectively, it will be seen that one mixture would contain 12 per cent. copper (Cu) and the other 14 per cent. copper (Cu).

The difficulty in supplying the necessary information is overcome by declaring on the label the percentages of the active constituents and the names only of the ingredients in which such active constituents occur. The method is similar to that used in the labelling of fertilizers. For example—

"3·0 per cent. Nitrogen as Sulphate of Ammonia."

If the percentages of the original ingredients are also declared on the label, they should be located on some part of the label well away from the percentages of the active constituents and names of the ingredients—so as to avoid confusion.

The following sets out the general method of expressing the active constituents of the materials above mentioned:—

.....per cent. Copper (Cu) as dehydrated copper sulphate.
.....per cent. Copper (Cu) as copper carbonate.
.....per cent. Arsenic pentoxide (As_2O_5) as arsenate of lead.
.....per cent. Nicotine ($C_{10}H_{14}N_2$) as nicotine sulphate.
.....per cent. Sulphur (S) as ground sulphur.

The "per cent." refers to the active constituent and the word "as" may be taken as meaning "present in the form of."

To illustrate the practical application to a complete dusting mixture, let us consider the labelling of a mixture made from, say—

20 per cent. arsenate of lead
5 per cent. nicotine sulphate
20 per cent. copper carbonate
55 per cent. hydrated lime.

Now, taking the arsenate of lead as containing a minimum of 30 per cent. arsenic pentoxide (As_2O_5), the nicotine sulphate as containing a minimum of 40 per cent. nicotine ($C_{10}H_{14}N_2$), and the copper carbonate as containing a minimum of 50 per cent. copper (Cu), the label should read as follows:—

6 per cent. Arsenic Pentoxide (As_2O_5) as Arsenate of Lead.

2 per cent. Nicotine ($C_{10}H_{14}N_2$) as Nicotine Sulphate.

10 per cent. Copper (Cu) as Copper Carbonate.

The hydrated lime is not added for pest-destroying purposes but as a "carrier to improve the physical condition," and need not be declared.

All pest-destroyer labels should, of course, bear the net contents, full directions for use, and the name and address of the Queensland wholesale (primary) dealer as well as the particulars set out above.

Summary.

The ingredients used in dusting mixtures for pest-destroying purposes cannot readily be represented by definite chemical formulæ and are not capable of accurate estimation by chemical analysis on a "100 per cent. return" basis when present in mixtures in conjunction with ingredients of the same type. Even if the percentages of the ingredients were ascertained, it would still be necessary to know the percentages of the active constituents they contained, before evaluation or comparison of the dusting mixture could be made.

Therefore, dusting mixtures should be labelled with the percentages of the active constituents present and the names only of the ingredients in which such active constituents occur.

If the percentages of the ingredients are shown they should be located on a portion of the label away from the active constituents so as to avoid confusion of the percentages concerned.

QUEENSLAND SHOW DATES.

July.

Cleveland	8th and 9th
Ayr	8th and 9th
Townsville	11th to 14th
Rosewood	15th and 16th
Esk	15th and 16th
Charters Towers—Show and Rodeo	19th to 21st
Laidley	20th and 21st
Maleny	21st and 22nd
Cairns	26th to 28th
Gatton	28th and 29th
Caboolture	29th and 30th

August.

Atherton	2nd and 3rd
Pine Rivers	5th and 6th
Home Hill	5th and 6th
Royal National, Brisbane	15th to 20th

September.

Imbil	2nd and 3rd
Ingham	2nd and 3rd
Pomona	9th and 10th
Tully	9th and 10th
Beenleigh	16th and 17th
Southport	24th

Banana Growing in Queensland.

H. J. FREEMAN, Senior Instructor in Fruit Culture and Chief Inspector, Banana Industry Protection Board.

(*Continued from page* 643, *June issue*, 1938.)

VARIETIES.

LITERATURE published by authorities on this subject claims that in some tropical countries up to sixty distinct varieties are grown. In Queensland, probably twenty types are recognised as different varieties, but commercially, fourteen of these may be discarded; and when it is considered that on the chief banana markets throughout the world Cavendish (and mutants of the Cavendish) and Gros Michel predominate, six marketable varieties here may be regarded as satisfactory. Following is a brief description of the principal varieties grown in Queensland:—

(Reference made to well-grown plants only.)

Cavendish—

Pseudostem: Height, 6 feet. Green, heavily splashed with brownish purple.

Leaves: Length, 5 feet; breadth, 16 to 24 inches. Deep green. Petioles short and sturdy; edges form deep and wide trough.

Bunch: Large, compact, irregular conical shape. Average, 10 to 15 dozen. Sheds fruit bracts sometimes.

Remarks: Extensively grown in Queensland. Represents, approximately, ten-elevenths of the total area under bananas in the State. Its dwarf habits, hardiness, and indifference (within reason) to climatic changes make this variety a general favourite. Production approximates 120 cases (1½ bushels) per acre per annum.

Mons Marie—(A Cavendish mutant of 1908. Now recognised as a variety in Queensland.)

Pseudostem: Height, 10 feet to 16 feet. Green, heavily splashed with brown. Diameter, slightly less than well-grown Cavendish.

Leaves: Length, 7 feet; breadth, 24 inches. Green. Petioles short and sturdy, similar to Cavendish.

Bunch: Typically long and cylindrical, well-spaced fruit, distinct upward curve. Average, 15 dozen, individuals up to 23 dozen. Sheds the fruit bracts readily as compared with Cavendish.

Remarks: Resembles Cavendish in bunch habits. Fruit is of very even grade, superior to Cavendish in size and possesses better carrying capacity. This variety requires abundant shelter, deep cultivation and a generous and even rainfall. The popularity of this variety is increasing each year and, in suitable districts, its culture is recommended in preference to the Cavendish. Production approximates 200 cases (1½ bushels) per acre per annum.

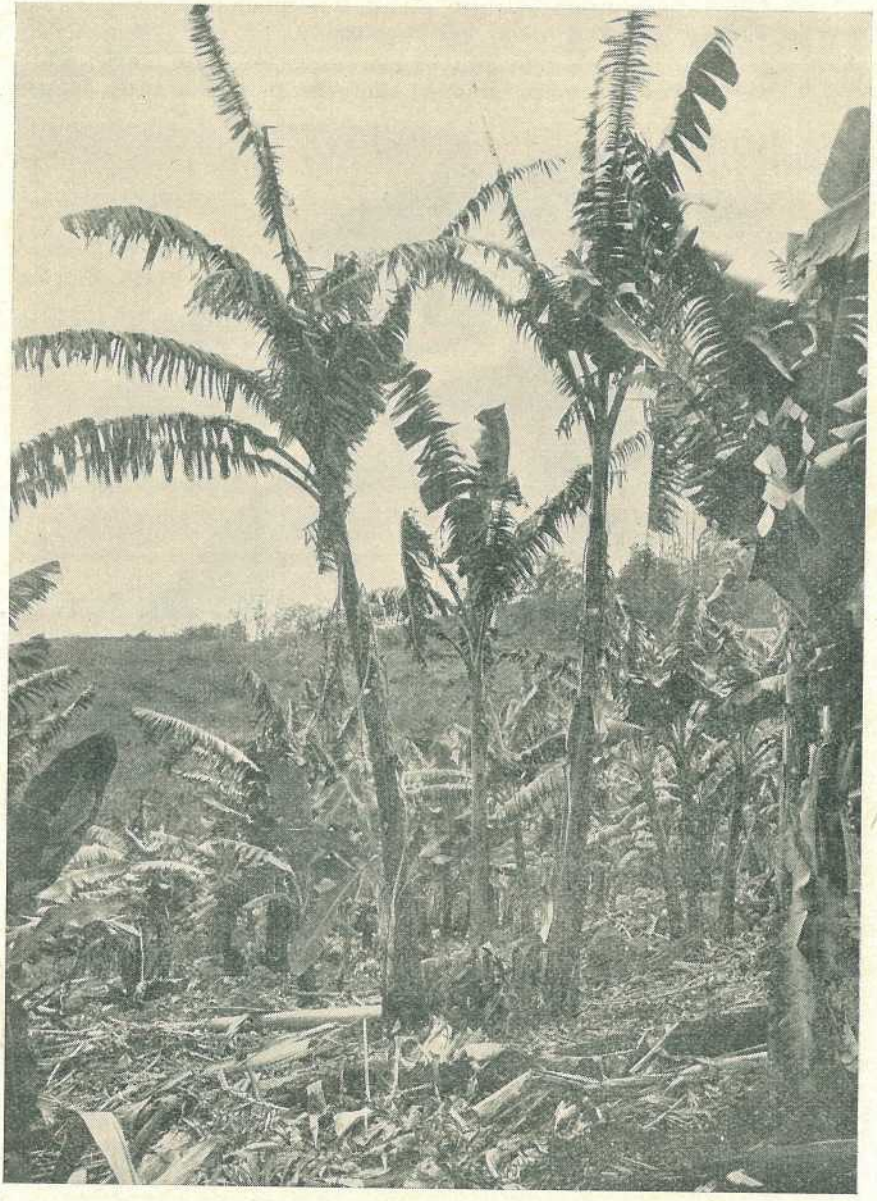

Plate 12.
Embul-Hondarawala bananas at Currumbin, South Coast.

Veimama—(Mutant of Cavendish recorded in Fiji, 1912, and now recorded in Fiji as a variety.)

A few hundred plants were imported from Fiji in 1934. Later distribution of these plants was made and, to date, this variety is looked upon very favourably.

Both pseudostem and bunch resemble Mons Marie, while the leaves are more drooped and the petiole a little longer.

Plate 13.
Fruit of the Embul-Hondarawala.

Gros Michel—

Pseudostem: Height, 16 to 18 feet. Clear green, with dark purple patches.

Leaves: Length, 9 feet. Green, rising upwards and outwards in graceful curves. Petioles 16 to 18 inches, green, pink flush on underside, edges pinkish brown. One side of leaf blade attached to petiole much lower than other. Petiole forms deep trough with edges spread outwards.

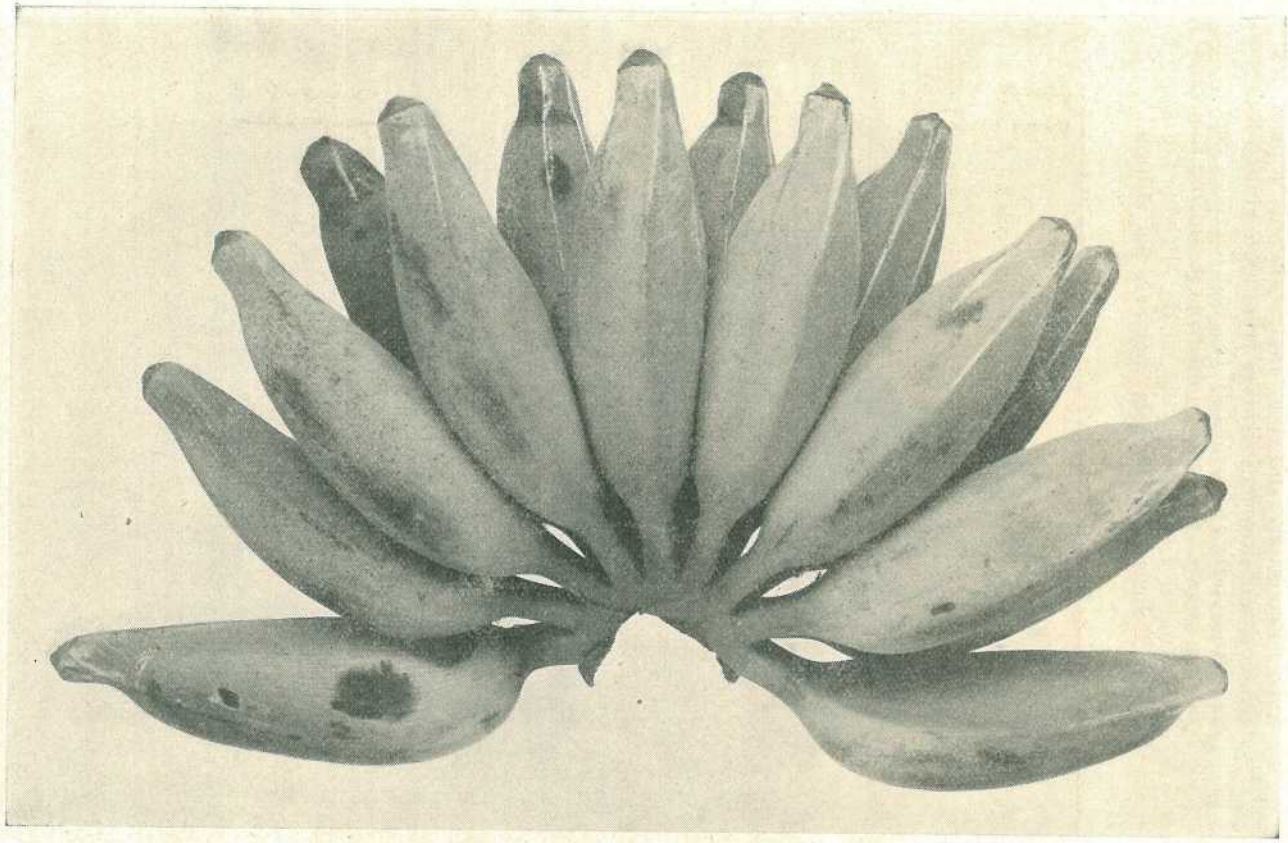

Plate 14.
Fruit of the Ducassis Hybrid (showing similarity to that of the Blue Java).

Bunch: Large, long cylindrical. Well-spaced fruit curved upwards, finger tips pointed. Average about 15 dozen.

Remarks: An excellent variety when conditions are most suitable. Essentially suited to well sheltered tropical areas. Prone to suffer serious damage from high winds. Excellent fruit to handle and probably the best carrying commercial banana grown. Queensland districts producing this variety are situated from Townsville north. Production approximates 200 cases (1½ bushels) per acre per annum.

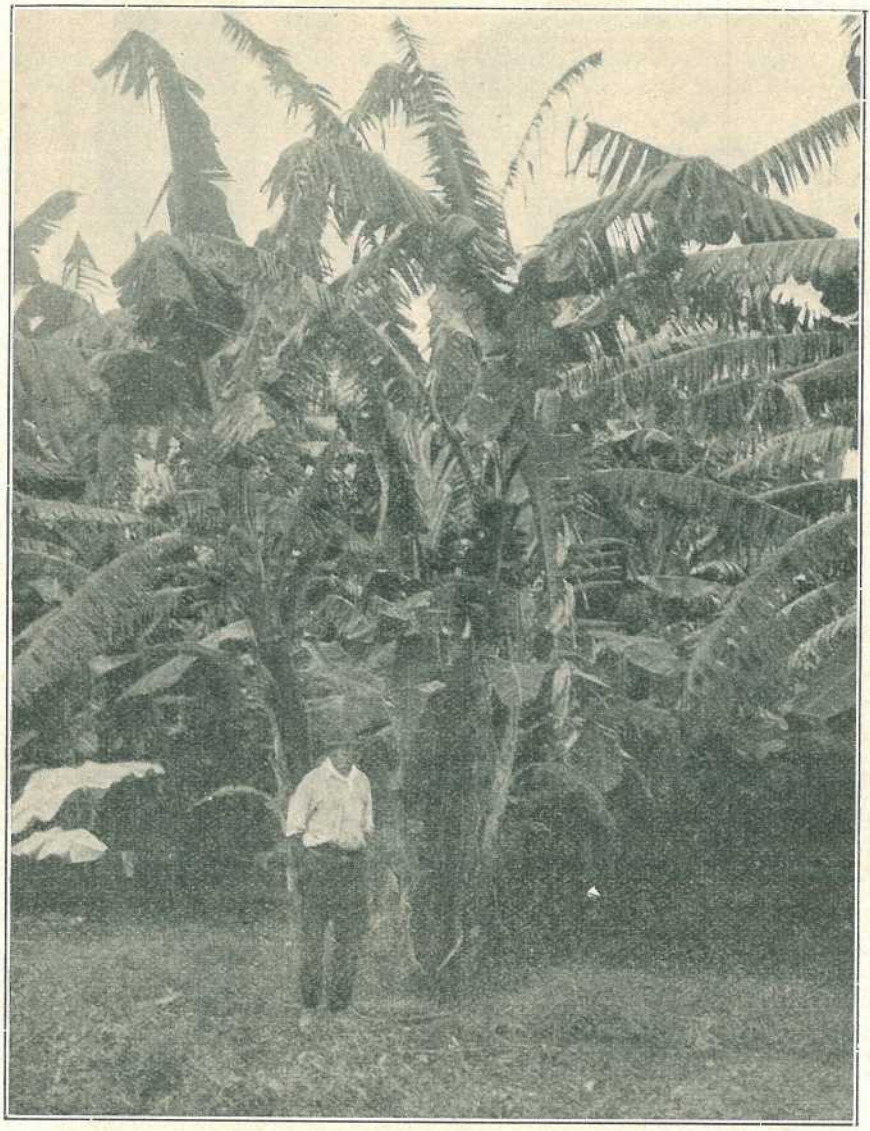

Plate 15.
"Lady Finger" bananas grown at Pinkenba, near Brisbane.

Lady Finger—

Pseudostem: Height, 14 to 18 feet. Stout and sturdy. Bright green, splashed with dark purple and brown patches.

Leaves: Length, 8 feet. Width 25 to 27 inches. Bright green. Petioles very stout, light green, edges form deep, narrow trough. Usually carried more upright than other varieties.

Bunch: Stands well out. Sheds bracts rapidly. 6 to 10 dozen Fruit short, thick and somewhat angular. Flavour piquant and slightly acid. Ripens well.

Remarks: A very robust variety not so subject to damage from pests and diseases as the other commercial varieties. It is highly probable that there are two types grown under this name in Queensland. Plants are often seen with leaves forming a greater angle with the pseudostem and with fruits carrying a light bloom. This variety is grown for and marketed as a bunch product on local markets. The plant's resistance to low sub-tropical temperatures allows for its productiveness on alluvial land within reasonable transport distance of city or country centres. Production approximates 2,000 dozen per acre per annum.

Sugar—

Pseudostem: Height, 10 feet. Rather slender. Green tinged with light pink, especially in the younger plants.

Leaves: Length, 6 to 7 feet. Width, 24 inches. Green. Carried in very graceful curves on long slender petioles. Edges of petioles just meet. Midrib very faintly tinged with pink on underside.

Bunch: 6 to 8 dozen. Fruit short, thin skinned. Ripens well to pale yellow. High sugar content.

Remarks: A very popular variety for a local market bunch trade, and an excellent dessert fruit. Unfortunately, this variety is very susceptible to disease and this has restricted its extension to a considerable degree.

These six varieties comprise the recognised commercial bananas of Queensland.

Other varieties grown in this State include Colombo, Red Dacca, Green Dacco (or Raja), Lubin (or Bookabooka), Common Plantain, Andalusian, Blue Java, Ducassis Hybrid and Embul-Hondarawala, all of which find favour in some localities.

Of these, the Embul Hondarawala is outstanding, attaining a height similar to the Lady Finger and producing a bunch somewhat similar to the Gros Michel and almost as large. Its slender pseudostem renders it very liable to wind damage, hence its slow acreage increase.

While the Blue Java is little known in Queensland, there are those who claim it to be an appreciable dessert fruit. In growth, it is similar to the Ducassis Hybrid and both fruits carry a heavy bloom and ripen with the same colour.

The Lubin (or Bookabooka) is probably the best cooking variety grown. Of tall growing habit, this hardy variety produces a bunch averaging 5 to 6 dozen very large fruits. When ripe, the fruit is very

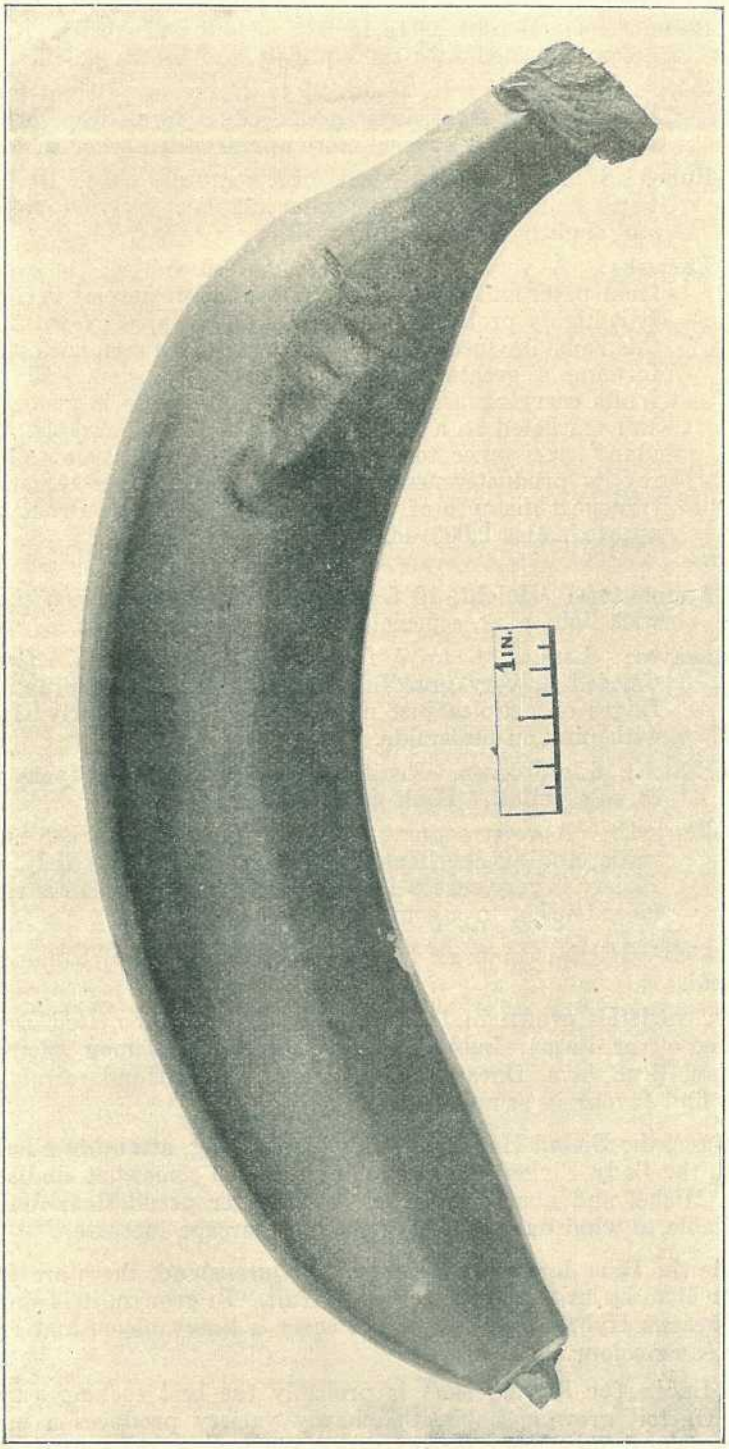

Plate 16.
The Cavendish Banana.

thin skinned and the flesh slightly pink in colour. Its quality as a cooking banana is known throughout the islands of the Pacific.

Of the others, little need be said apart from a distinct variety point of view.

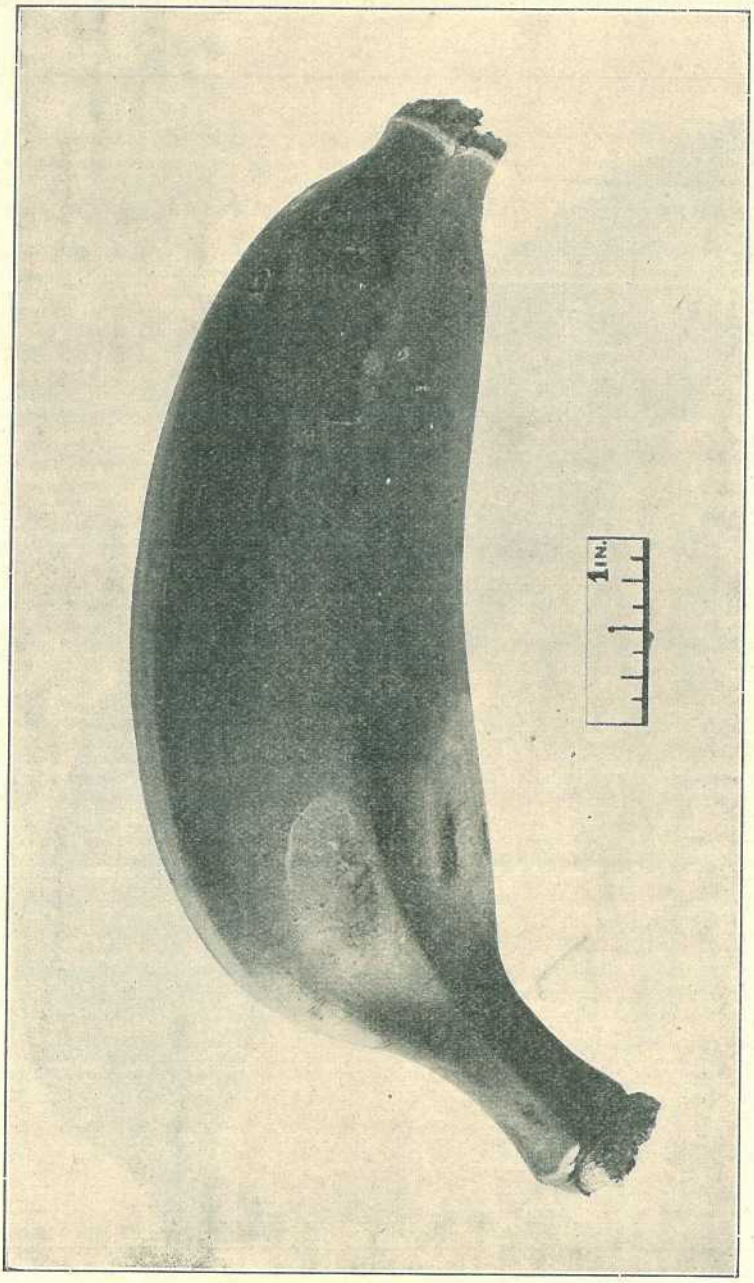

Plate 17.
The "Lady Finger" Banana.

PESTS AND DISEASES OF THE BANANA.

The chief pests of the banana in Queensland are the Weevil Borer and the Banana Thrips, and the most important diseases are Bunchy Top and Leaf Spot. Advice and guidance on these matters from departmental field officers are available to growers. Banana pests and diseases are further controlled by the restriction of planting to healthy material.

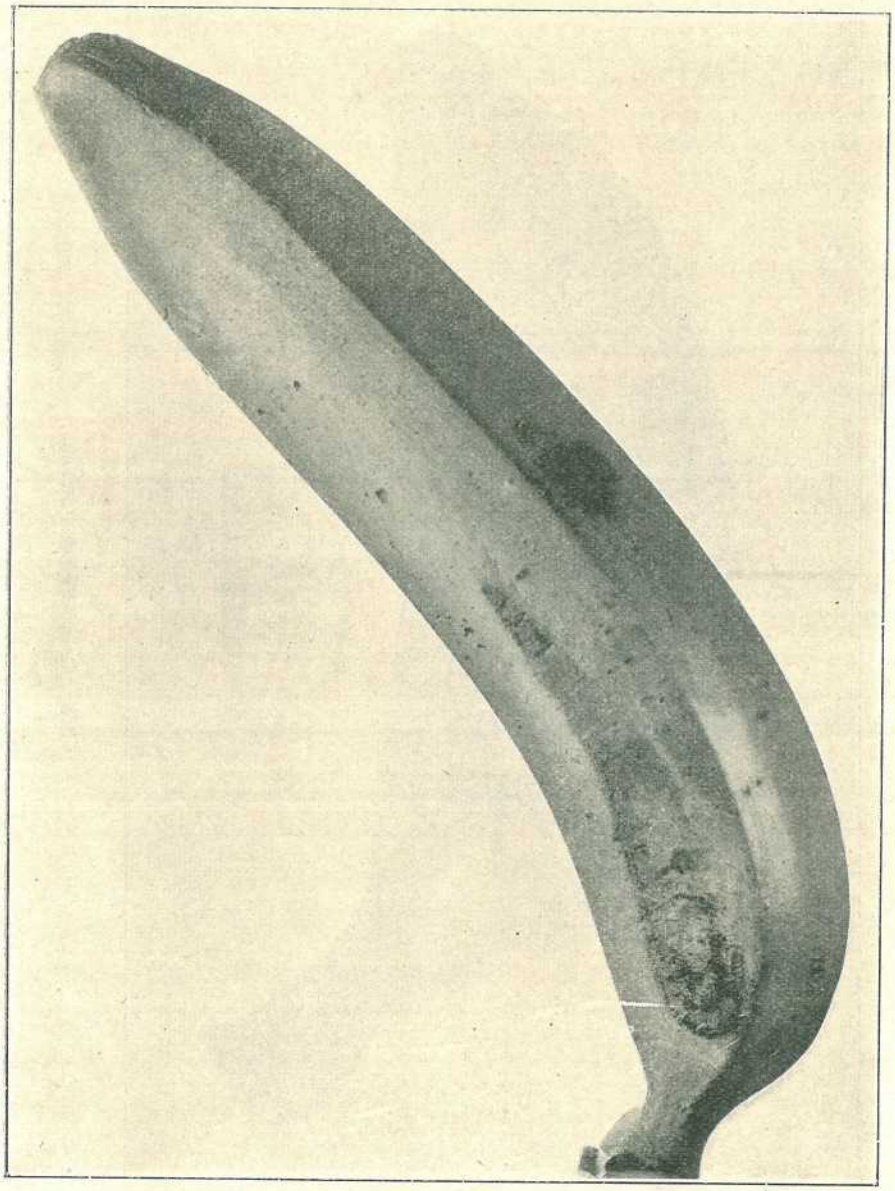

Plate 18.
The Gros Michel Banana.

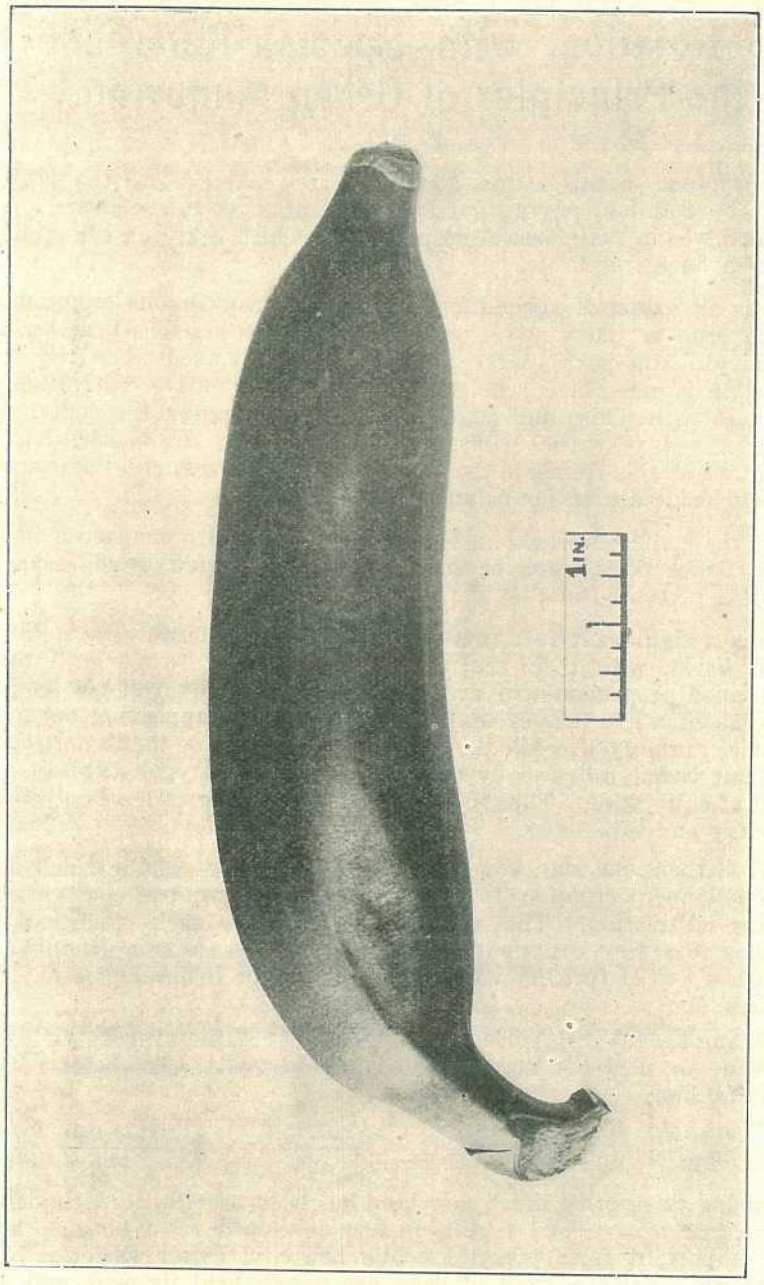

Plate 19.
The Sugar Banana.

Departmental literature on all matters appertaining to banana growing in Queensland also may be obtained free of charge on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

[CONCLUDED.]

Crop Rotation, with Special Reference to the Principles of Green Manuring.*

A. F. BELL.

IT is proposed in this lecture to discuss in general terms the subject of crop rotation, paying particular attention to the scientific principles involved in that form of crop rotation which is known colloquially as "green manuring."

It is an axiom of agricultural science that continuous cropping to the one crop is likely to be one of the worst possible practices of husbandry. And particularly is this to be condemned when the crop in question is one which requires constant and intensive cultivation as is the case with maize and sugar-cane. When opening the conference in Cairns last year the Minister for Agriculture drew attention to certain undesirable trends in the direction of soil erosion and impoverishment and made a plea for balanced agriculture.

At the conference held in Bundaberg in 1935 I submitted a paper entitled "Sick Soils," and at this stage we will review briefly some of the points presented in that paper:

It is a significant fact that the permanent agricultural systems of the old world, with their centuries of experience, are all built upon well-planned programmes of crop rotation. Such programmes usually involve about a five-year cycle, any particular crop appearing not more than twice in the cycle, while the succession is planned so that a particular crop plant is not followed by one of similar habit, type, diseases, and method of cultivation. Thus in a planned rotation corn would not follow sugar-cane and *vice versa*.

What then, one may now ask, are the unhappy results which may follow continuous cropping to a crop plant which requires constant and intensive cultivation. The answer is that under such conditions as prevail in these dry, unirrigated areas the soil will suffer a gradual but remorseless loss of fertility while at the same time it develops a chronic "sickness."

During the 40-year period from 1898 to 1937 the average yields of sugar-cane in tons per acre in the Bundaberg-Gin Gin district have been as follows:—

1898-1907	1908-1917	1918-1927	1928-1937
14·6	15·3	14·4	15·9

During this period much new land has been brought under cultivation, the use of artificial fertilizers has developed from nothing to a highly important farm practice, while new and better varieties have been grown. Yet the yield of cane has barely held its own, and one might well ask why it has not progressed.

In an exhaustive analysis of rainfall data made by Mr. Norman King and published in the "Canegrowers' Quarterly Bulletin" for October, 1936, we find that (many opinions to the contrary) the seasons

* Address to the Queensland Society of Sugar Cane Technologists, Bundaberg Conference, 25th February, 1938.

have not changed; the average annual rainfall has been maintained. Obviously, then, the explanation of this static position must lie in a gradual loss of the inherent fertility of the soil, which is balanced by improved varieties and otherwise improved farm practice.

Now it has so happened, through the fortunate foresight of one of the old pioneers of the Woongarra, that there was left standing a patch of the original virgin scrub. Some few years ago we carried out comparative tests on this virgin soil and a field immediately adjacent which had been cultivated for twenty-two years. Of course, a great deal of this land has now been cultivated for over fifty years, and a comparison with this would without doubt be even more depressing, but it is bad enough as it is. Figures observed from some of the tests were as follows:—

	Virgin Soil.	Adjacent 22 years cultivated.
Moisture Equivalent*	38%	30%
Organic Matter (or Humus)	7·8%	3·6%
Nitrogen	0·48%	0·22%

In short, the native fertility is being rapidly lost as a result of growing continuously a crop which is a gross feeder and which requires that constant cultivation which brings about fertility depletion and soil erosion; the soil is becoming "dead."

We pass now to another side of the picture—the development of a "sick" condition of soil. The normal fertile soil literally teems with countless numbers of minute, invisible plants known as bacteria and fungi; they are so small that 15,000 or 20,000 bacteria laid out end to end would only stretch about an inch. These lowly microscopic plants include both benefactors and enemies of the plants we cultivate. The great majority, fortunately, have a beneficial effect or at least do no harm; they are concerned in the decay and rotting of vegetation, making the enclosed plant-foods available to the growing crop, assisting in the weathering of the soil, converting nitrogen to forms suitable for the plant, and so on. Generally speaking, the more fertile the soil the greater will be the numbers of these beneficial and harmless little organisms.

It is possible to count these organisms with reasonable accuracy by means of a very simple process: A small amount of the particular soil under investigation is taken and gently shaken with a measured quantity of water so that the bacteria and fungi become evenly distributed through the water. A known fraction of the watery suspension is then drawn off and mixed with a substance known as nutrient agar. This agar is poured into a glass plate, where it solidifies like gelatine and, in the course of a few days, the bacteria and fungi multiply, and each forms a colony which later becomes visible to the naked eye. We are then able to count the numbers poured into the plate, and so, by multiplication, the numbers in the amount of soil taken. Such numbers

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* This soil contains a high proportion of so-called "hygroscopic" moisture which is not available to the plant; therefore about 20 per cent. should be subtracted in each case, giving *effective* moisture-holding capacities of 18 and 10 per cent.—a decline of nearly 50 per cent. Small wonder then that cane on these soils now commences to show distress a fortnight after good rain. Similarly the humus, nitrogen, and other plant foods have declined to low levels.

are usually given as the numbers per gram of soil—an amount equal to about a quarter of a teaspoonful of soil.

We made counts of this type on two soils which were separated by only a headland, but, while one farmer has allowed his soil to run down and become dead, the other has consistently practised trash conservation and green manuring for many years, and so has largely maintained the fertility of the soil. The counts were—

Organisms per gram of soil.

	Bacteria.	Fungi.	Total.
Fertile Soil	16,800,000 ..	2,200,000 ..	19,000,000
Worn-out Soil	3,100,000 ..	50,000 ..	3,150,000

But in addition to these beneficial and harmless bacteria and fungi the soil contains parasites which attack the roots of the plant, and the less beneficial or harmless organisms there are the better chance the parasites have. Now, soil which is virgin soil in so far as a particular type of crop is concerned will contain few, if any, parasites which will attack it. However, as successive plantings of a particular crop are made, so do the parasites which will attack it increase in numbers, and ultimately are present in sufficient numbers to distress the plant and stunt its growth. Many root parasites will attack a large number of closely related plants, and the planting of corn, for example, in "sick" cane land will only serve to further increase those parasites which attack members of the grass family generally. On the other hand, during the period of continuous planting to sugar-cane, the parasites which might attack, say, a legume are left without a host, and so they diminish greatly in numbers and may even become extinct.

This, then, is a basic point in the planning of rotational programmes. No one plant is left in the ground long enough for its particular parasites to build up in great numbers; it is displaced by a second crop plant, and the numbers have diminished before the first crop is returned to the soil again.

That a condition of soil sickness has been brought about in at least some of our older cane lands will be readily appreciated by reference to Plate 20. In this case cane was grown in "sick" soil and in soil which had been "cured," so to speak, by sterilizing. As can be seen, the sick condition of the soil has caused a very marked loss of vigour as a result of root rot.

The agricultural phase of the Queensland cane-sugar industry is based upon the practice of continuous cropping to this one crop, a crop which, moreover, requires extensive cultivation and which has little protective influence on the soil. We say continuous cropping because a possible green-manure crop every four years cannot be regarded as crop rotation. The time has come when the trends resulting from this unfortunate combination of circumstances must be recognised and faced, even though farmers do not control two important factors which have largely determined the adoption of this practice. These are (*a*) the almost complete absence of payable alternate crops and (*b*) the existing system of cane land assignment, whereby a farmer must restrict cane production to a certain certified area, precludes the adoption of a rotational programme if a farmer is growing up to his full assignment.

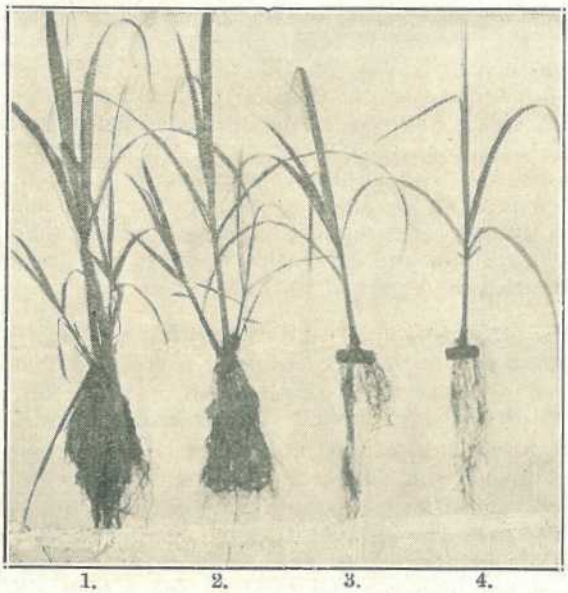


Plate 20.

Reading left to right—(1) Sterilized soil, (2) Sterilized soil, (3) 75 per cent. Sterilized soil, 25 per cent. unsterilized soil, (4) Unsterilized soil. Variety—Q. 813. Note failure of cane to stool in 3 and 4.

It does not appear probable that there will be developed in the near future any extensive production of alternate crops which can be marketed as such, although there does seem to be some scope for the utilization of land for intensive grazing and fodder production. In this connection we might make passing reference to the very successful experiment in lucerne production at the Bundaberg Station and the interesting fat lamb raising experiment which is being carried out at the Mackay Station.

There is, however, another aspect of crop rotation which warrants your consideration and attention, and that is rotation to crops which may not in themselves be directly payable propositions, but which will help to restore the fertility of the land to such a level that the same amount of cane may be grown more profitably on a reduced area of land. We have in progress at the Bundaberg Station a long-range experiment which will test the economics of this proposition over a number of years within the limitations of the assignment system. In this experiment part of the field will be cropped according to usual practice, that is, we will take off a plant and two ratoon crops, the second ratoon crop being harvested at the end of the season, ploughed out, and prepared for planting in the following autumn. In the other portion of the field a plant and one ratoon crop only will be taken off, and the field will then be planted to a succession of leguminous crops for a period of sixteen months. We are now carrying out trials to find additional legumes which will be suitable for this type of rotation, including types which may be either ploughed in or grazed if the occasion warrants.

The reason for the advocacy of legumes as a rotational crop is twofold. Firstly, they are very widely removed from sugar-cane in so far as plant relationships are concerned, and it therefore follows that

parasites of legumes are most unlikely to attack sugar-cane and *vice versa*; therefore a prolonged period of cropping to legumes will see a vast reduction in the ranks of the army of sugar-cane parasites. Secondly, a legume possesses the peculiar power of obtaining its nitrogen requirements from the nitrogen of the air instead of drawing them from the soil, as do other plants. Consequently, when a leguminous crop is ploughed into the soil, the soil may be enriched in nitrogen to an amount equivalent to a substantial dressing of sulphate of ammonia, but for which no account will be rendered at the end of the month. The explanation of the manner in which this free nitrogen supply is obtained will constitute the second part of the talk.

It has long been recognised by farmers that the growth of leguminous crops tends to enrich the soil. Later it was found that this was due to the fact that in some way or another these plants could actually add to the store of nitrogen in the soil. Consequently legumes came to be more and more used as rotational crops, particularly when soils showed a tendency to become run down, or immediately preceding the growth of a crop which needed large amounts of nitrogen for its proper growth. Trial and experience showed that it often happened that a particular legume would not grow when planted in fields which had never grown legumes or had not been planted to them for a long time. In other cases a variety which did well in one part of the world was for some unexplainable reason practically a complete failure when taken to another country with a similar climate. Observant farmers had, however, discovered the fact that they could often improve yields in a new field by "inoculating" it with a few loads of soil taken from a field in which the particular crop grew well; doubtless many of you have seen this practised by old lucerne growers.

Investigation of these phenomena by trained agriculturists has removed the veil of mystery, and we are now able to present a pretty clear picture of why and how legumes assist in the regeneration of soil, why there are fluctuations in growth, and why there may be almost complete failures.

Leguminous crops planted in a soil rich in nitrates and other plant-foods will grow vigorously in the same way as do other crops. It so happens, however, that, unlike other crops, they would also grow vigorously, and possibly even more satisfactorily, if the same soil were very deficient in nitrates. The reason for this somewhat contradictory performance lies in the fact that leguminous plants, in association with a certain type of bacterium, can draw their supplies of nitrogen from the atmosphere instead of being forced to take it in the form of soil nitrates as is the case with other plants.

As you know, some four-fifths of the atmosphere in which we live is composed of nitrogen, and, of course, this atmosphere diffuses into the soil, so that in a well-aerated soil there is always atmospheric nitrogen in contact with plant roots. This atmospheric nitrogen, however, exists in the form of an inert gas, and in that form it cannot be absorbed and utilised by man, animals, or crop plants. It may, however, be "fixed" and converted into forms suitable for such use, and in various overseas countries there are vast works for capturing this nitrogen and converting it into the sulphate of ammonia which you

apply to the soil, and which is converted into nitrates in the soil. As suggested above, it may also be captured and converted into suitable forms by legumes working in association with bacteria.

Upon digging up a legume and washing the roots free of soil, it will be noticed that in most cases there are small galls or nodules attached to the roots. These nodules represent the tiny workshops within which the fixation and conversion of the nitrogen of the air is carried out by bacteria of the genus *Rhizobium*. The relationship is a mutual benefit society, since the plant supplies the bacteria with free board and lodging, while the bacteria, on the other hand, help the plant to free supplies of nitrogen. This nitrogen is not stored in the nodules, as many people seem to think, but is immediately distributed over the rest of the plant for use in making new growth.

In Plate 21 are reproduced the root systems of two soybean plants, and attached to the main roots of these will be seen a cluster of these galls or nodules. Countless numbers of bacteria exist within the nodule; they are small, rod-like creatures about $\frac{1}{10000} - \frac{1}{15000}$ inch long (*see* Plate 22). These bacteria may readily be grown or cultured in the laboratory in tubes of agar or gelatine, where they form a yellowish-white glistening, slightly raised growth. In this condition they cannot use atmospheric nitrogen, and we have to feed them artificial forms of nitrogenous food.

In the normal course of events these *Rhizobium* bacteria live in the soil, obtaining their plant-foods, including nitrogen, from the soil. When the seed of a legume germinates in their vicinity these minute bacteria attach themselves to the very fine hairs on the young rootlets and work their way into the roots. Here they commence to multiply greatly in numbers, stimulate the plant to produce the galls or nodules, and the work of nitrogen fixation proceeds. After the crop has been harvested or ploughed in the nodules break up and decay and the bacteria are distributed into the soil again, where they can continue to live for considerable periods (sometimes years) and await the growing of another suitable legume.

It will readily be seen that if the land has never grown legumes before, or over a long period, there may be none of this type of bacterium left in the soil; in such a case, of course, there will be no nodules formed, no atmospheric nitrogen fixed, and the plant will have to depend on the nitrogen supplies of the soil. Even when the necessary bacteria are present, if there should be a high reserve of nitrates present in the soil, this will depress or prevent the activities of the bacteria, and there will be little or no gall formation and nitrogen fixation; in such a case the ploughing in of the green manure crop would merely result in returning to the soil the nitrogen which had been taken out by the crop, and would not increase the nitrogen stocks one little bit. Obviously, then, the time for the planting of a green-manure crop (as distinct from a mere cover crop) is when the nitrate stocks are low—but more of this later.

Up to the present we have spoken as though there were just a single species of this *Rhizobium* or nitrogen-fixing bacterium. Actually there are a large number of strains, which are each limited in their activities to certain plants or groups of plants. It has been found that

there are a certain number of so-called "cross-inoculation" groups of plants, and any one *Rhizobium* can only work in association with plants within one particular group. For instance, the cowpea, poona pea, velvet bean, and lima bean lie within one group, while lucerne, the sweet clovers, the trefoils, and melilotus constitute another group, and so on. Now, the *Rhizobium* species which forms nodules on the roots of the members of the first group, will not form them on members of the second group, and *vice versa*. Therefore the fact that land has grown an excellent crop of poona pea does not mean that it contains the right bacteria for the growth of, say, New Zealand Blue Lupin.

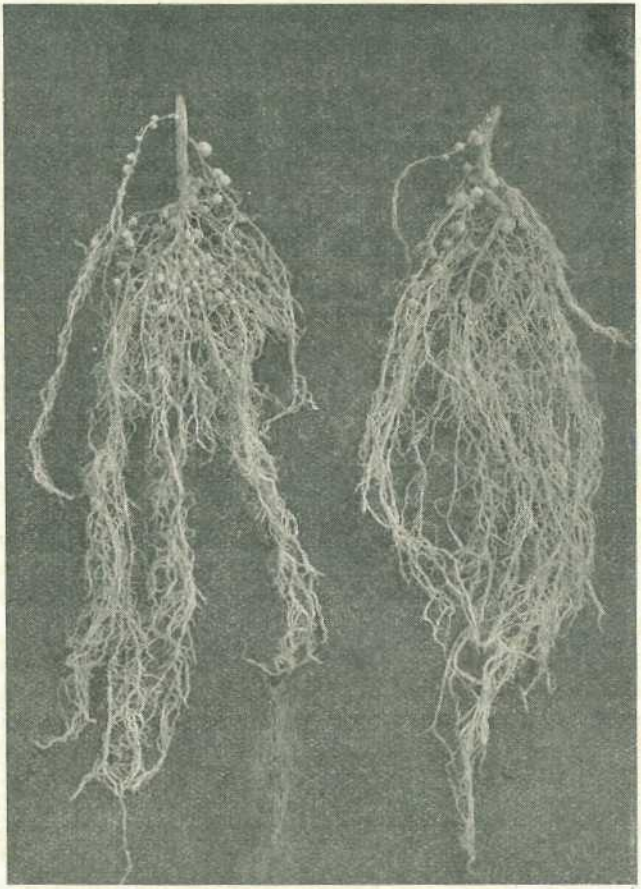


Plate 21.

Roots of soybean plants showing nodules produced by nitrogen-fixing bacteria.

But not only do we have different groups of bacteria which will not work in association with other groups of leguminous plants, but there is a great variation in the efficiency of the strains within any one group. The meaning of this statement will best be illustrated by summarising some experiments with poona pea and soybeans, which were the right bacteria for the growth of, say, New Zealand blue lupin.

In view of what we believe to be the increasing importance of legume culture it was considered desirable to initiate some experimental work with a view to finding highly efficient strains of *Rhizobium* which could be used for the inoculation of crops at planting time. Consequently, cultures were collected from laboratories in various parts of the world, and, in addition, some cultures were isolated from the nodules of very well-grown Queensland crops.

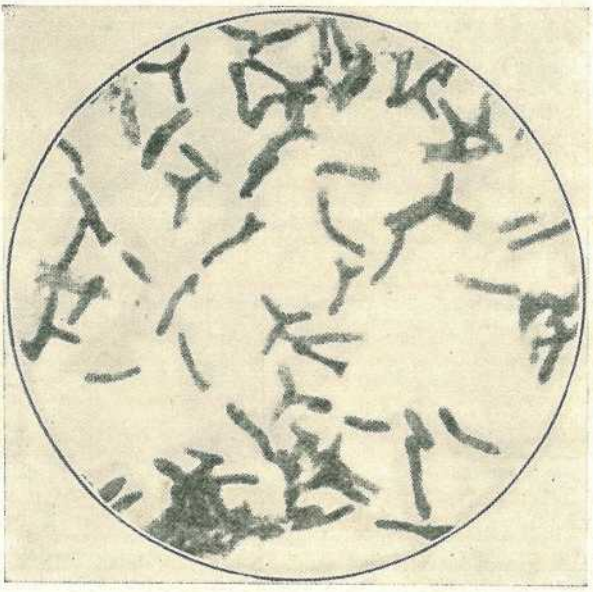


Plate 22.

Nitrogen-fixing bacteria taken from a root nodule. Magnified about 1,500 times.

In order to test the efficiency of the various strains the seeds are inoculated and then planted in sterilized sand which is free of plant-food. We use medium-sized earthenware pots, of the type exhibited, waterproofed to prevent evaporation. The plants are grown in a glass-house, and every care is taken to prevent contamination with bacteria which might blow in with dust. The plants are watered with a sterilized solution of plantfoods from which nitrogen is missing—that is to say, they are forced to get their nitrogen from the air.

Cultures for the Poona pea group were obtained from Western Australia, South Australia, Victoria, New South Wales, and Queensland, while soybean group cultures came from England, Canada, United States, and Australia. It is of interest to note that as far as these two crops are concerned the most efficient strains were isolated in Queensland from very well-grown crops at Cairns and Lawnton respectively.

In Plate 23 will be seen a reproduction of Poona pea plants which were inoculated with a good strain (Cairns) and a medium strain (New South Wales) and the check uninoculated pot. Although these plants are young, it will be seen that the inoculation with the right strain has made a wonderful difference in growth—a difference which will become

more marked with increasing age. While the differences in actual growth are not so marked in the case of the soybean it will be seen (Plate 24) that the smaller plants are also light in colour, showing nitrogen deficiency, while chemical analysis showed that the better strains produced a considerably higher nitrogen content.

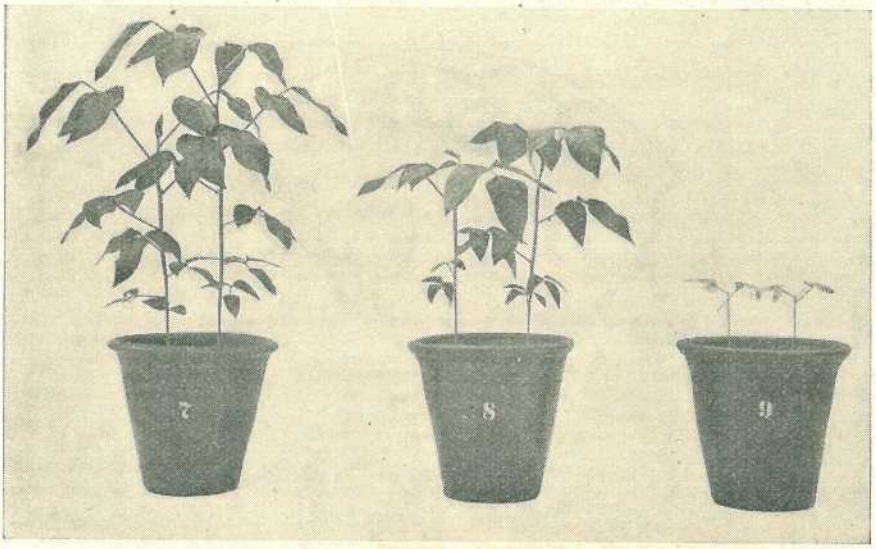


Plate 23.
Poona pea plants grown in sterilized sand. No. 7 inoculated with a good strain of nitrogen-fixing bacteria. No. 8 medium strain, No. 9 not inoculated.

We would also direct attention to the formation and distribution of nodules in both Poona pea and soybeans. In the case of the highly efficient strains the nodules are concentrated around the crown of the plant, while with the less effective strains the nodules may be equally or more numerous, but they are scattered through the root system. The roots of the uninoculated plants bear no nodules, and neither did the roots of a Poona pea plant which was inoculated with a strain specific to the New Zealand blue lupin.

So much, then, for the theory of green manuring; we will pass now to the consideration of a few points of field practice. We have seen that while legumes will grow in soils containing adequate nitrates they will also grow vigorously in nitrogen-starved soils provided they can make contact with an efficient strain of the proper species of nitrogen-fixing bacteria. For the full development of the plant it is not only necessary that the particular strain be present but that it be present in large numbers in order to ensure early and complete nodulation. When planting any legume, therefore, the wisest course to take would be to inoculate the seed with the appropriate culture immediately before planting. This is a very simple operation, and is now widely practised in the United States, where there are several commercial organisations which culture and sell inoculum for various crops. In Australia, both the Western Australian and New South Wales Departments of Agriculture sell for a nominal price cultures for the inoculation of seeds of

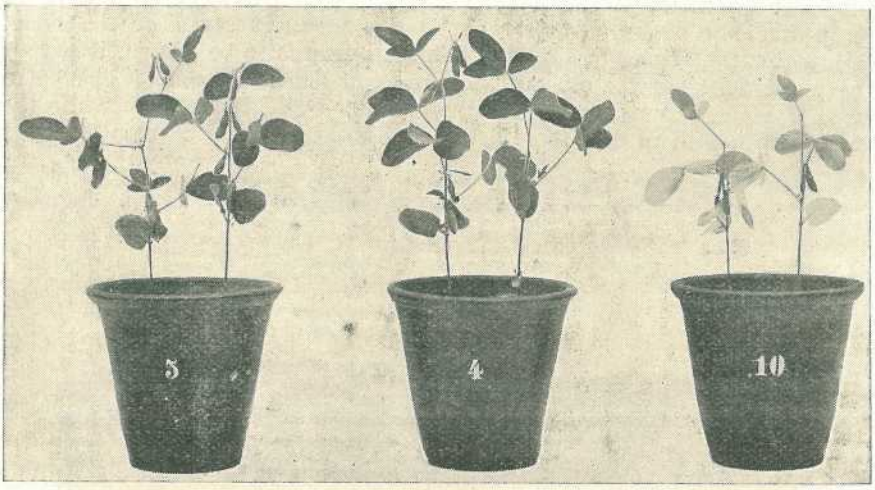


Plate 24.

Soybean plants grown in sterilized sand. Nos. 5 and 4 were inoculated with nitrogen-fixing bacteria, while No. 10 was not inoculated. Note white sickly leaves of uninoculated plant.

some eight to ten groups of leguminous plants. It is proposed to continue our search for highly productive strains, and, on completion of this work, it will be possible for us to set up a similar service for Queensland cane farmers should they so desire it. Of course, the provision of the right strain of *Rhizobium* is only part of the story, and the crop will not grow if seed bed, moisture, and general plantfood balance are not right.

These nitrogen-fixing bacteria require that soils shall not be too acid, and they also like phosphates. Thus, farmers on land which requires liming (as tested by Bureau officers) should apply lime before planting, and a dressing of phosphate should be made where this plantfood is deficient.

However, one of the most important factors in the restriction of the activities of these bacteria is the presence of considerable amounts of nitrates in the soil. When there is sufficient nitrate present for the good growth of the plant without any nitrogen fixation taking place, the bacteria slow down on the job, and may form no nodules and actually become parasites of the plant. Under these conditions you may get an excellent crop, but it has only been a cover crop, and has not netted you the equivalent of a few hundredweight of sulphate of ammonia, which it should have done. Therefore, the right time to plant a green manure crop is when the nitrate supplies of the soil are low—that is, as soon as practicable after harvest, and while rotting of roots, trash, &c., is still going on.

Under the influence of moisture and warmth the organic matter of the soil is converted into nitrates by other forms of bacteria, and if a field is ploughed out and fallowed before or early in the rainy season there will usually be considerable nitrate reserves available by late autumn. If, then, a winter-growing legume is planted a good crop will result if weather conditions are favourable, but there will have been

little or no nitrogen fixation. Thus the crop will have been a cover crop but not a green manure crop in the strict sense of the term. Consequently, if only a single leguminous crop is to be grown, it should be planted before the old stubble and crop debris has had a chance to rot; if a second crop is to be planted, then it should be sown while the first crop is still in a state of decomposition.

Plate 25.

Summer crop of *Crotolaria goreensis* grown on the Bundaberg Sugar Experiment Station.

Green manuring, then, should be done with one eye on the future, but with at least half an eye on the past history of the field.

MOLASSES FOR FATTENING LAMBS.

In a recent publication received from the State of Washington, U.S.A., are interesting details of an experiment to determine the value of beet molasses as a feed for lambs. The molasses, which was fed in quantities varying from ½ to 1 lb. per lamb daily, was diluted with three parts of water and poured over the solid feed of maize and hay.

From the data obtained it is calculated that 2,000 lb. of beet molasses are equal in feed value to 1,704 lb. of maize and 978 lb. of hay. The market grade of the lambs fed various rations showed that those which received supplementary molasses were very little inferior to those which were fed maize only, and it was concluded that the value of the two feeds was dependent upon the relative price of maize and molasses.

Under Queensland conditions molasses in the coastal areas would be by far the cheaper feed, and the possibilities of this by-product in supplementing the ration of fattening lambs is evident.

—H. W. K., in "The Cane Growers' Quarterly Bulletin."

Further Notes on Spray Irrigation.*

H. W. KERR.

INTRODUCTION.

THE subject of spray irrigation for cane has been brought before this Society on a previous occasion, when an experimental system installed by the Bureau of Sugar Experiment Stations was described. A new type of sprinkler was later described, and the officers of the Bureau have constantly been on the watch for a spray system which could be regarded as suitable for the cane farmer, while being free from the objection of high installation cost or high working pressure; both of these factors have operated against the systems hitherto discussed.

The notes here presented represent an attempt to keep this subject before growers on irrigated lands, in the hope that it may be possible to devise a scheme which would be practicable, or adaptable to Queensland conditions. Flood (or furrow) irrigation has been the standard practice of the canegrower, but it is fully appreciated that certain shortcomings attend this method, notably its unsuitability for broken country, or very sandy soils, while the unavailability of skilled field hands for this duty, particularly when watering is performed but intermittently, is no small problem in itself.

During recent months the writer has learned of the development both of new sprays and modified methods of application of water, and these will be described and discussed briefly.

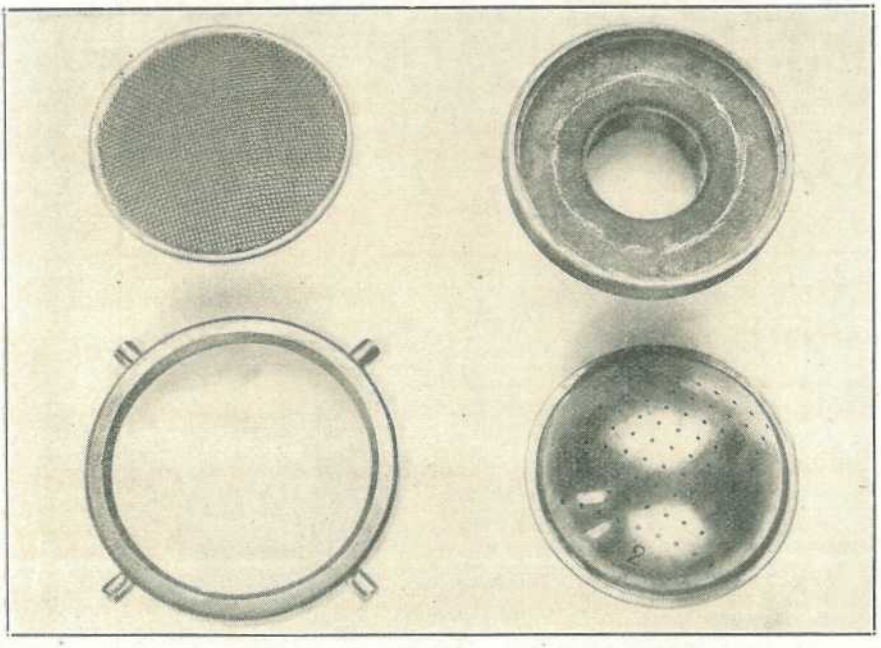


Plate 26.
Illustrating the separate parts of the spray described.

* Paper presented at the Bundaberg Conference, Queensland Society of Sugar Cane Technologists, 25th February, 1938.

NEW SPRAY NOZZLE.

In Plates 26 and 27 is illustrated a spray nozzle which appears to possess some definite advantages over similar low-pressure devices. The major features of the spray are the accompanying strainer, to eliminate most of the dangers of chokage, and the disposition of the holes on a hemispherical distributor to provide even watering over a *square* plot, instead of the customary circle. The holes have been drilled in such a manner that the outer rows deliver more than those more centrally placed, and an even distribution results. Plate 28 illustrates the spray in action.

The operating nozzle pressure is 15 lb. per square inch, and at this pressure the volume of water delivered may be varied by selecting the appropriate distributor. The distributors are made in three grades, as follows:—

	Application per hour (acre-inches)
8 rows of 8 holes	1·00
9 „ „ 9 „	1·26
10 „ „ 10 „	1·56

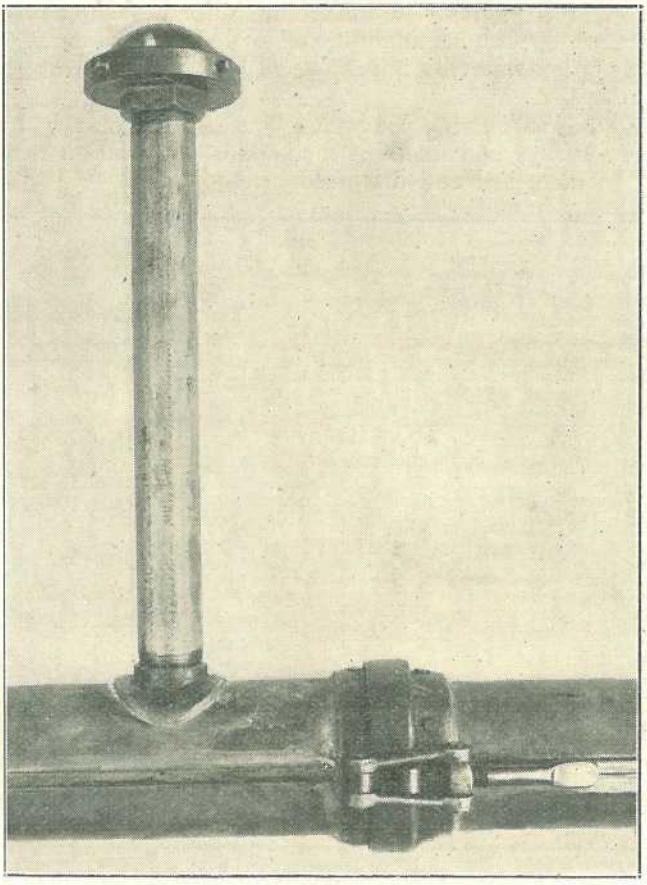


Plate 27.
Showing the assembled spray and short standpipe attached to clip-jointed fluming.

The coverage of each spray is a square of 35 feet side, when attached to a standpipe 1 foot high. This necessitates about thirty-six sprays to cover an area of 1 acre at a time.

With a crop such as cane it would be necessary to place the spray on a standpipe of greater height than that suitable for, say, lucerne. The increased height would give substantially greater coverage for the spray, but also adds to the difficulty of transportation if a portable system is desired. In certain areas of Queensland where farmers are desirous of irrigating only during the (normally) dry spring and early summer, it would be possible to use a 6-foot standpipe, and this should not introduce any trouble during transportation.

The adaptation of the height of standpipe to stage of development of the crop could also be considered. It would be neither very costly nor troublesome to employ, say, 3-foot standpipes for young cane and 6-foot pipes when the height of the cane demands it.

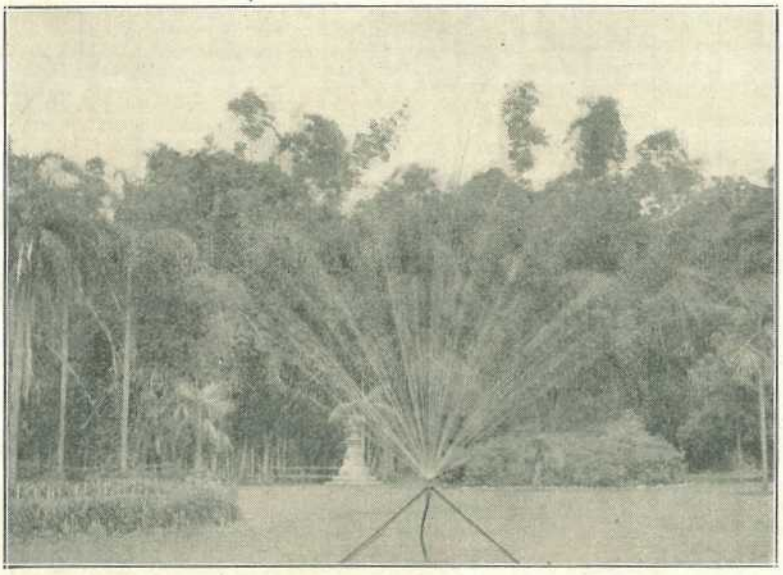


Plate 28.
The spray operating at 15 lb. nozzle pressure.

SUITABLE LAYOUT.

To illustrate how such a spray system could be employed as a portable unit, a layout will be described in which a particular enquiry is dealt with. The grower in question has an area of sandy loam soil, approximately 20 chains in width, and divided into two almost equal parts by a permanent creek which runs through the length of the farm. By damming the creek, it would be possible to bring the water within, say, 8 feet of the level of the fields, which are virtually flat. A schematic layout which would involve the use of a tractor, with pump attached, is shown in Plate 29, for which the following description applies:—

By means of a flexible hose, the water is drawn from the creek, through a footvalve and strainer, and forced by the centrifugal pump through, say, three lines of sprays, set at intervals of 35 feet, for use

with the unit already described. The field is 10 chains in length, and each spray line would therefore require nineteen sprinklers. Each sprinkler (say, sixty-four-hole type) delivers about 10 gallons of water per minute, so that fifty-seven sprays, in three lines, will distribute

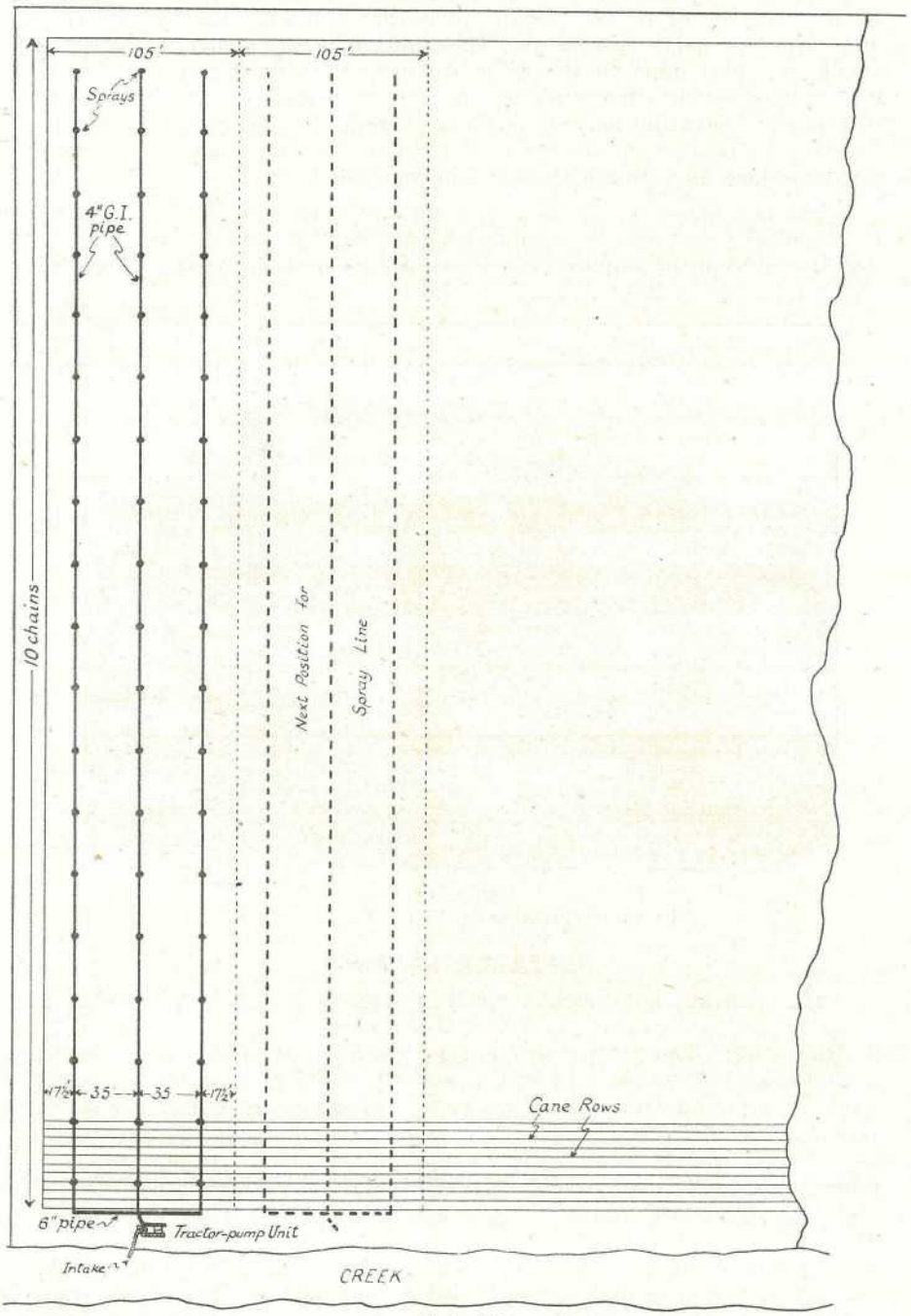


Plate 29.
Schematic layout of portable spray system for sugar cane (*see* text).

approximately 35,000 gallons of water per hour. This quantity would be delivered by a 5-inch pump. The headland main fluming could be 5 or 6 inches in diameter, while for the three laterals 4-inch round fluming would suffice.

The total head against which the pump would operate, with the above layout, would be approximately 70 feet, and the power required, 20 b.h.p. By employing 5-inch fluming for one-third the length of laterals, friction losses would be minimised, and the power required reduced by about 15 per cent. Such a layout (Plate 29) would apply 3 acre-inches to 1·6 acres in 3 hours, when the system would be uncoupled and transferred 105 feet across the field. By using clip-jointed fluming (*see* Plates 27 and 30), fitted with compression rubber rings, this would present no difficulty with the lateral fluming. The tractor could be employed, if desired, to transport the four 17-foot 6-inch lengths of larger main, as well as the flexible hose coupling and intake pipe, when moving to its new position. Assuming that three strips (or 4·7 acres) can be sprayed in a 12-hour day, the system could take care of 47 acres where fortnightly waterings are desired.

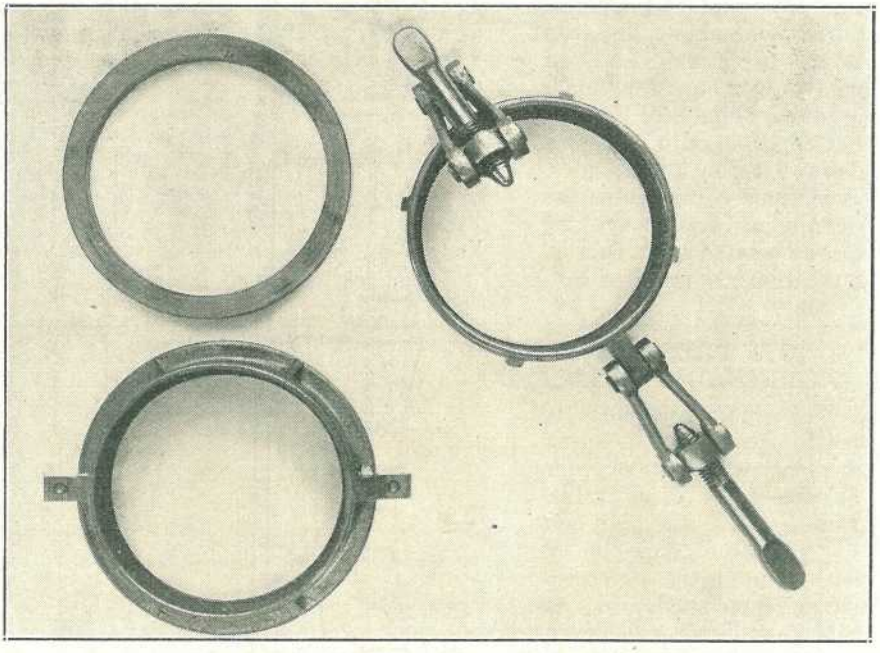


Plate 30.

Illustrating the separate units used in an effective clip-joint for fluming.

The cost of the complete distribution unit (but *excluding* tractor and pump) would be about £200. Care should be taken to obtain heavy gauge fluming (say, 22 gauge) and, before use, protect it with a coating of tar or similar preparation if it is to be employed with water of a corrosive nature.

SOUTH AFRICAN SPRAY SYSTEM.

Recently we read of a new system of spray irrigation which has been developed for cane in South Africa. Although further details were sought, these have not been received to date; but it would appear that a tractor-pump unit is employed, operating on the headland and drawing water from a ditch which is supplied by gravitation from the neighbouring hills. The pump forces the water through a nozzle, mounted on an elevated platform, and it is claimed that the water is distributed "for about 70 yards in all directions, and, in windy weather, for much greater distances." The device appears to possess a definite value on hillsides, as it largely eliminates the danger of washaways, as are associated with furrow irrigation under these conditions.

LOW PRESSURE OVERHEAD SYSTEM.

The chief drawbacks to most overhead spray systems which have been advanced for cane irrigation are—(*a*) the high cost of pipe-line capable of withstanding the high pressures developed, in an attempt to give wide coverage to each spray, and (*b*) the increased pumping costs involved due to the nozzle pressure required.

The writer recently inspected a model of an overhead distribution system which, it is claimed, will effectively overcome

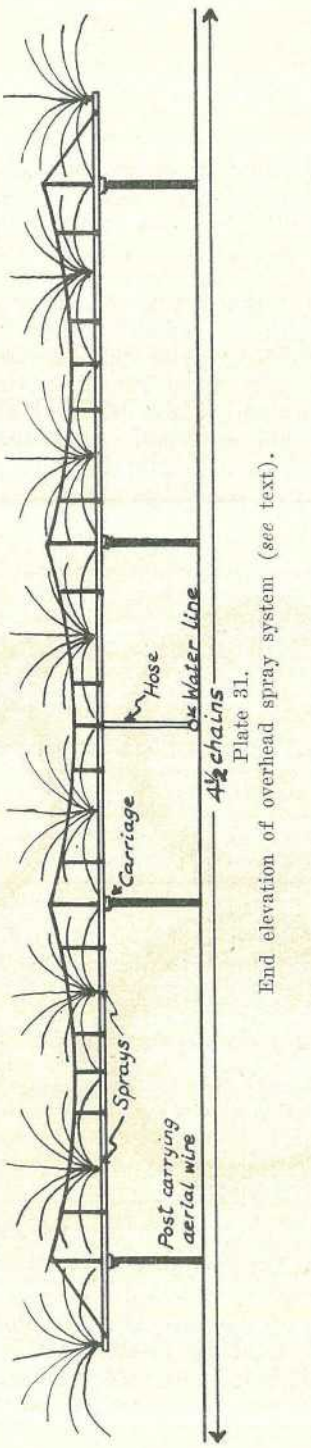


Plate 31.
End elevation of overhead spray system (*see* text).

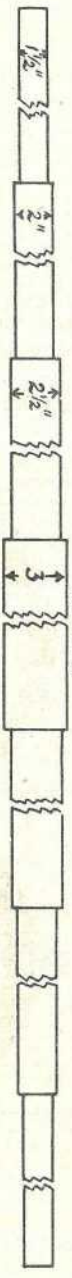


Plate 32.
Illustrating how the weight of the distributor and load could be minimised by a progressive reduction in diameter of pipe.

these drawbacks. The unit consists essentially (Plate 31) of a pipe-line (up to 4 or 5 chains in length), mounted on simple carriages, with grooved wheels, to allow the pipe-line to be drawn across the field on heavy gauge overhead wires. It is proposed that one tightly-stretched wire per chain of distribution line will be adequate. The pipe-line would be fitted with suitable sprays, and that already described (*see* Plates 26 and 28) should be quite satisfactory. The distribution unit would be supplied with water from a centrally placed pipe-line, laid on the ground and running the length of the field. This would deliver the water under the necessary pressure by means of a flexible connection to the distributing unit.

Certainly such a system is decidedly unique in character, but it does possess some definite advantages, if it should prove to be practical. It would be necessary to construct this distributor rigidly but lightly, and 22-gauge galvanized iron could be used. To ensure a minimum of water load, consistent with ample dimensions to eliminate undue friction losses, progressive reduction in diameter of pipe (*see* Plate 32) would be desirable. Such a distributor would hold about 50 gallons of water, and the total load on each wire should not exceed 200 lb. The length of aerial wire (10 chains) would demand a number of intermediate supports, to avoid the undue tension which would be necessary to keep the wire taut. Most of these supports need be only temporary, and these could be moved to a new position each time the position of the distributor is altered. The even movement of the carriages over the wires might give some trouble, unless two suitably spaced cables attached to one windlass be employed.

Perhaps a better plan would be to support the distributor on 14 lb. (portable) rails, instead of wires. To equip the field permanently in this way would be, of course, prohibitive; but if three lengths (each 35 feet long) were available in place of each wire, it would be possible to transport one to its new position while the distributor rested on the remaining pair. Permanent posts to carry the rails would, however, be necessary; on the other hand, it should be possible to make two, or at most three, rails do the work of four wires. Double-flanged wheels for the carriages should then eliminate possible difficulties in the regular and even movement of the distributor. It is evident that such a system would require very accurate installation, in respect of distance between wires (or rails) and care to ensure even distribution of the load over all wires. Topographical irregularities would introduce difficulties also.

The patentee claims that the carriages could be kept in continuous slow motion, while watering, by employing a sufficient length of flexible hose to connect the distributor to the pipe line. Detachment of the hose and re-connection at a new point in the line could be made at intervals of 100 feet, thus requiring about 45 feet of hose. It is felt that the cost of the 4-inch hose required, and difficulties for the distributor in "dragging" this with its load of water, could best be avoided by having direct connecting points at 35 feet intervals, and changing the position of the distributor intermittently, say, every 3 hours, where a 3 acre-inch application is desired.

It will be noted that the layout described and illustrated would water only 4½ acres, with fields 10 chains in length; to water the adjacent strip of 4½ acres, it would be necessary either to transport the distributor

to a new series of aerial wires, or have a separate unit for each strip of the field. Transportation of the empty unit should not prove a difficult matter, particularly if built for rapid dissembling.

It should be stressed that the writer has not seen this ingenious device operating under field conditions, and no data are available for actual installation costs. Such posts and supports as are necessary for the aerial could probably be found on or near the farm, and installed by the farmer. Aerial wire of 6-gauge would cost about £2 for 9 chains —the amount required per acre on the layout described. Portable rails would, of course, be more costly; twelve 35-foot lengths (using four lines to carry the distributor) would cost about £15. These would be sufficient for the entire area served by one distributor, so that the cost *per acre* would be little more than for the wire.

If the pipe-line feeding the distributor were of galvanized wrought iron pipes, laid permanently, the cost would be excessive. But by employing portable 4-inch clip-jointed fluming, of 22-gauge galvanized iron, the system would be cheapened very considerably. The cost of 10 chains of 4-inch fluming would be approximately £50.

On the proposed plan (Plate 31) eight sprays would deliver about 5,000 gallons per hour, thus requiring but a small pump (say 2-inch), driven by a 4 h.p. engine. An irrigation of 3 acre-inches could be applied to nearly 1 acre per 12-hour day. For a large area it would therefore be necessary to install, say, four such units, fed by a portable main pipe-line of greater diameter (7 inches) laid on the headland. By this means it would be possible to operate three units at a time (while the fourth is being set up in its new position), and an area of 30 acres could be watered per fortnight. A substantial increase in area covered could also be effected by using the nozzle which applies 1½ acre-inches per hour, and/or by operating for a longer period each day.

CONCLUSION.

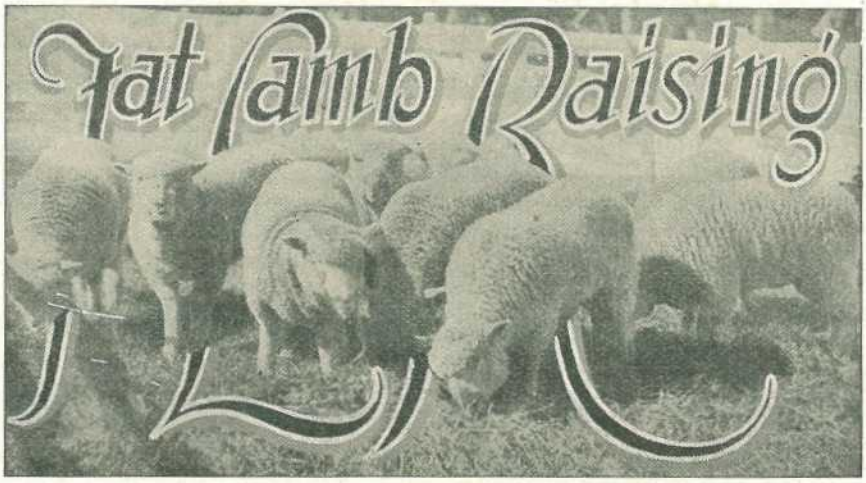
It is hoped that the sketchy details presented will stimulate further thought on the subject of spray irrigation. Any system will necessarily require adaptation to meet local conditions; the question is not a simple one, but the inventive mind of our canegrowers, who have solved so many cultivation and other farming problems in the past, should ultimately result in the evolution of a system which will prove both effective and economical.

WHAT SOIL ANALYSIS MEANS.

Many farmers are under the impression that in finding out the fertility of their soil, all that is necessary is to hand a small sample of soil to the agricultural chemist for him to say what that particular type of soil will grow. In other words—that when we know the percentages of plant food in a soil sample we can decide straightaway whether the soil will grow a good, bad, or indifferent crop, and that if we make up any deficiency in the plant food the soil lacks we can rest assured of a bumper harvest. It is not so simple as all that, however, but nothing worth while is easy, on the land or anywhere else.

What chemical analyses give us is an idea of the total amount of plant food a soil contains, but it does not indicate the amount available for different crops. Other factors—such as location, mechanical condition of the soil, bacterial life, and so forth—have an influence in determining the suitability of soils for various crops. The best way of finding out what fertilizer and how much is required, is by actual trials. The instructor in charge of any local experiment plot will be a good guide in these matters.

Soil samples, taken according to printed instructions issued by the Department of Agriculture and Stock, may be forwarded for examination for acidity and physical consistency. When such an examination is made, in conjunction with a report of an extension officer of the Department, the information desired by the sender can be given.



Sheep-drenching.

REPORTS have been received from sheep owners at various times of ill-effects following the use of the nicotine sulphate and bluestone drench, which is advised for the removal of hair worms from sheep. This drench is perfectly safe providing the sheep owner knows when and how to use it. Where it is followed by ill-effects, these are usually due to:—

1. *Careless Mixing.*—Nicotine sulphate is a highly poisonous drug; therefore the mixing of the drench should be given every care. The nicotine sulphate is measured in fluid ounces and not in ounces weight.

2. *Careless Administration.*—The majority of ill-effects which have followed the use of this drench are due to careless administration. The dose given depends not only upon the age, but also upon the condition of the sheep. The recommended doses are for sheep of various ages in fair to good condition. If the condition of the sheep is low, the dose should be reduced about one-fourth.

If the drenching is hurried, a portion of the fluid may enter the lungs of the animal with fatal results. It requires only a very small quantity of nicotine sulphate to kill a sheep should it reach the lungs. In hurried drenching, which is most frequently the case where automatic drenching guns are used, the tissues of the mouth and throat may become cut or bruised. The nicotine sulphate is rapidly absorbed through these wounds with frequently disastrous results.

While the nicotine sulphate and bluestone drench is highly effective against stomach worm, it should not be employed where a heavy stomach worm infestation is present. Under such circumstances this drench becomes dangerous, as it may be rapidly absorbed into the body.

In sheep which are suffering from stomach worms, bluestone alone should be used.

It is always wise before drenching a flock to find out which species of worm is responsible. This can be readily determined by killing and examining one of the most affected sheep.

Bugle Sheep Drafting Yards.

J. L. HODGE, Instructor in Sheep and Wool.

The accompanying plan of sheep drafting yards gives every satisfaction.

Two men and a good dog can, without difficulty, draft three ways as many sheep as the yards will hold.

In addition a race is supplied for jetting sheep for blowfly.

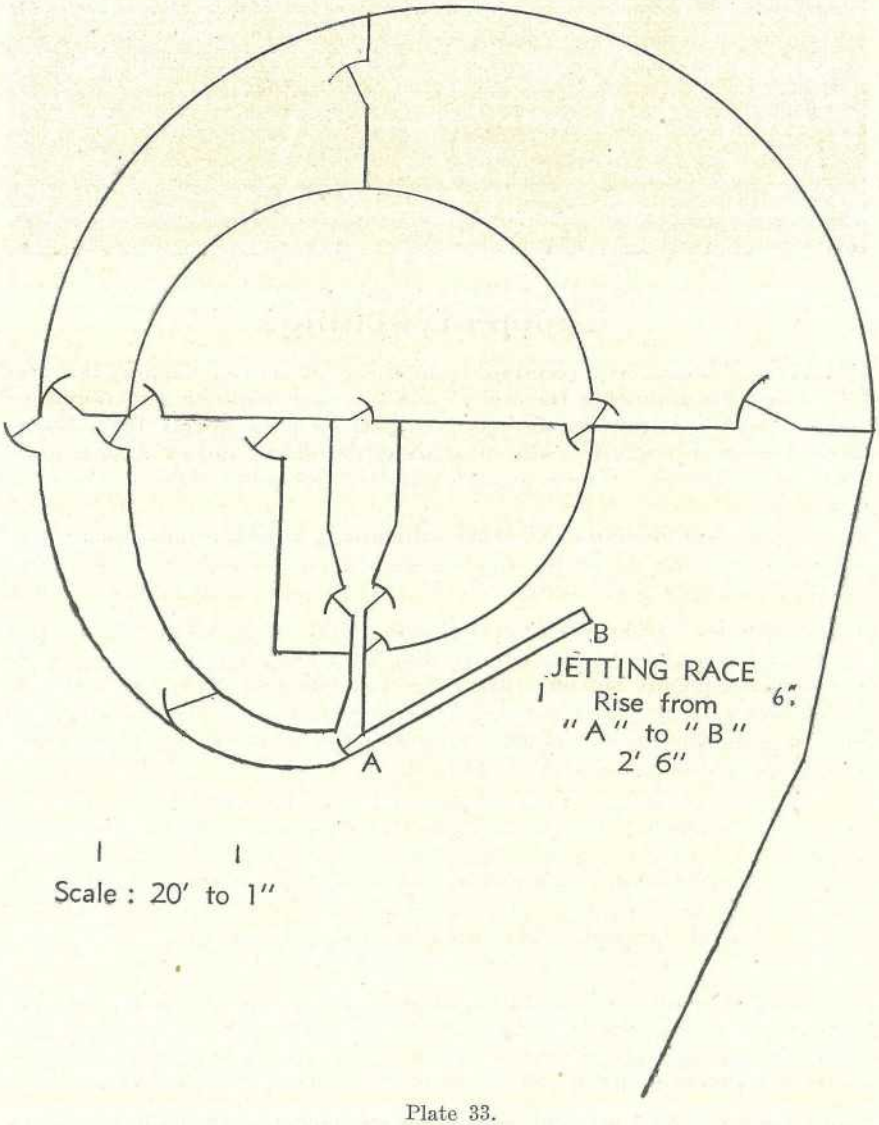


Plate 33.

The yards were erected by Mr. George Wheeler, Speeling Point, Cunnamulla.

This set of yards is confidently recommended for adoption by graziers planning similar improvements.

CLASSING THE EWE FLOCK.

Many grazing properties in Queensland are now stocked well up to their carrying capacity, and, with the coming crop of lambs to be provided for, some reduction in numbers will be necessary. Besides being more profitable, it should give the owner far more satisfaction to have a flock as near as possible to uniformity in type and which will cut a heavy fleece of good quality wool.

On most large holdings, classing the ewe flock forms part of the station routine, and there is no reason why smaller flocks should not be classed in the same way.

Just before shearing is the most suitable time to do the classing and, usually, the flock can be classed in three groups to advantage. The tops should consist of all the large-framed deep-bodied ewes carrying a covering of even type, well grown, and showing the character and colour typical of the breed. Ewes selected for the main flock should be as free from fault as possible, but need not be so even or up to the standard of the tops. The third class will be the culls, including light cutters, ewes producing inferior wools in quality or colour and ewes rejected for defective frames, weak constitution, or objectionable folds or wrinkles. The rams to be mated with them should be classed in the same way, the best being selected for the top line. All culled ewes should be fattened, and sold as soon as possible; the same may be said of those cast for age.

—*Jas. Carew.*

PREPARATION FOR SHEARING.

The shearing season will soon commence, and it behoves graziers to give that necessary attention to the shed, plant, and yards in plenty of time before the start.

Starting is often delayed, because everything has been left to the last minute. The shed itself should be clean, and all pen gates and hinges seen to to ensure convenient working. Grating floors, also, should be attended to where necessary.

The down shoots should be carefully repaired, if necessary, thus ensuring that shorn sheep are not ripped by outjutting nails, splinters, or other projections. Counting-out pens nearly always need repairing. The branding race and the gates at both ends should be in good working order.

Inside the shed, all machinery should be overhauled, belts examined, hand-pieces attended to, and oil cans ready.

The wool bins may need a nail or two, new rungs may be required in the wool-rolling, piece-picking, and classing tables.

The wool press should be overhauled thoroughly and the ropes examined, for if new ropes are necessary, rigging them is a long job.

Have wool packs placed conveniently near the press, and all tools used in pressing in their places. Scales should be tested and every other detail attended to. If this work is neglected until the commencement of shearing, delays and frayed tempers are inevitable.

—*J. L. Hodge.*

Pastoral Notes.

LUNG WORMS IN CATTLE AND SHEEP.

Lung worms in cattle and sheep may become serious during late winter and spring. As a rule only the young animals are affected and lung worms should be suspected in any animal showing loss of condition, accompanied by spasms of coughing, signs of suffocation, and scouring. Such symptoms may also be shown by animals which are suffering from a disease of the lungs brought about by some cause other than lung worms. In calves, for example, there is a type of pneumonia caused by bacteria, in which the symptoms are very similar to those associated with lung worm infestation. As the pneumonia due to lung worm infestation and that caused by the bacteria require entirely different treatments, it is always wise to kill an animal in which the disease is far advanced, and examine the lungs. If lung worms are present they will be seen readily, as they occur in bunches in the air tubes of the lungs surrounded by a blood-stained froth.

If the diagnosis is confirmed, the remainder of the animals affected with lung worms should be removed immediately to warm dry quarters, and drenched in order to remove other species of worms which might be present in the stomach. This procedure, whilst it does not affect the lung worms directly, increases the animal's resistance to them. Infested animals should be given plenty of nourishing food to build up the animal's strength.

In very severe cases, an injection of certain drugs can be made through the windpipe to expel the worms. This operation is not without risk, and in cases where an injection is desirable the assistance of the local stock inspector should be sought.

Further details regarding the drugs to be used for drenching and for injection into the windpipe may be had on application to the Animal Health Station, Yeerongpilly.

—*Dr. F. H. S. Roberts.*

TRUCKING YARDS.

Some bruising of stock occurs in the trucking yards, and it is quite commonly held that this is unavoidable. Suitable design of yards and races and quieter working of stock are the answers to this fallacy.

In moving cattle from yard to yard or pen to pen, there is some congestion just before, during, and just after passing gate or race. It is obvious that at such places rails should be flush with the posts and padding used where the fence makes sharp angles. It is equally obvious that working must be very steady to avoid jamming and, consequently, bruising—more particularly with the outside beasts. To prevent undue crushing at the approach, it is best to have the fences funnel- or V-shaped. If the wings are long and the gate wide the working is not slowed up and the number that can pass through is regulated well back, so that a jam does not occur at the actual place of passage. After passing through, there should be no obstructions to prevent fanning out. For this reason, a straight fence forming a side of two yards is not desirable when a corner gate is used.

When working cattle through one yard to another, gates should be opposite each other—i.e., in a direct line with the direction in which the beasts are streaming. The wings to a crush should both converge. It is bad practice to have one wing in a direct line with one side of the crush. This is often the case when an existing fence is used for one wing. As cattle work better uphill, the loading-out race or crush should be slightly inclined upwards to the truck.

TREATMENT OF CATTLE AFTER TICK FEVER INOCULATION.

Inoculation of cattle for tick fever is widely practised in Queensland, and it is not realised by many owners that unless reasonable care is exercised, unsatisfactory and, maybe, disastrous results can follow. For this, there are many reasons.

In the first place, it has to be recognised that one is using a vaccine containing "live" organisms—that is, parasites that, given a chance, may exert themselves and produce death of the animal inoculated. The risk of the parasite overcoming the animal depends largely on the treatment the animal receives.

It is known that aged fat animals, bulls particularly, are more susceptible. Were it not for the fact that young cattle are usually more resistant, cattle raising would be almost impossible where ticks are present, because in the young newly-born animals the mortality would be far too high. As the animal grows older its resistance decreases, and when fully mature its susceptibility may be very high. Notwithstanding this general rule, instances occur where young cattle do suffer severely when inoculated.

During the "reaction" to inoculation, there is, as it were, a battle between the invading parasites and the organs of the inoculated beast. In most cases the animal wins, and then becomes what the owner describes as "immune." In this "immune" condition, there is a nicely adjusted balance between the animal and the tick fever parasite whereby the parasite lives in the animal, but causes no injury to it. In other words, there is a compromise—the animal and the parasite both continuing to live, neither doing the other any harm.

Should, however, any other factor be introduced which will debilitate or weaken the animal, particularly during the "reaction" stage, then the tick fever parasites may win the contest and the animal dies.

For this reason, cattle must be carefully treated after inoculation. They must not be driven or disturbed—no long train journeys, no driving and no hardships of any kind. Bulls must not be worked. Cows carrying calves must have especial care, particularly those advanced in pregnancy. Of course, it is not advisable to inoculate such cattle, but an owner may find this unavoidable if, say, he has bought mixed lines and is obliged to shift them as early as possible.

The drug caprin which is now used throughout Queensland is of very great value in controlling tick fever. It must, however, be used in time. The evidence in regard to its use is overwhelming and many valuable animals are now saved which a few years ago would have died.

Two things are therefore important. Firstly, the animals inoculated must be kept under careful supervision during the first few weeks after inoculation; and, secondly, obviously sick animals must be given a dose of caprin.

—Dr. John Legg.

CARE OF THE DIP.

Cattle owners in ticky country often neglect their dipping vats. Consequently, they often unconsciously lose money, for cattle dipped recently in a dirty vat lose their bright, clean appearance, which helps the seller when the bidding in the sale ring is brisk.

In the course of time a dipping vat will accumulate a considerable quantity of filth which settles slowly on the bottom as a deposit of sludge. It may become so bad that an owner is forced to empty the vat, and is then put to the expense of recharging.

This can be avoided by cleaning the vat periodically. For this purpose a kerosene tin is cut in half diagonally to make a scoop, which is attached to a handle with wire. Small holes are cut in the bottom and sides. After dipping cattle the surface of the fluid may be skimmed with the scoop and floating hair and dirt removed. This helps to keep the vat clean for a long time.

After dipping, the sump should also be cleaned and dirt prevented from accumulating.

A white mark should be placed on the side of the vat to show the height of the fluid. It will be noticed, particularly in hot weather, that evaporation is very rapid, and the surface of the fluid will fall far below this mark. Before next dipping, water can be added until the dipping fluid is again at the correct level. It is only the water that evaporates—not the concentrates.

—Dr. John Legg.

VEALER CALVES.

Provided a calf is kept on the mother to allow it to reach a live weight of about 80 lb., a satisfactory return is assured when marketed. Large numbers of calves are being slaughtered annually for export as boneless veal, and the trade has reached such proportions that buyers are usually operating in all dairying districts. It is well worth while to keep the calf for a few days before selling for slaughter. A calf responds quickly to a few days' suckling, and this can quite easily mean the difference between an underweight and overweight calf—a matter of at least 5s. in its value.

A Substitute for Milk in Pig Feeding.

L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

IT is known generally that meatmeal is a good substitute for separated milk in the pig's diet, but unless it is used carefully meatmeal may prove an expensive food.

Meatmeal, which is a by-product of abattoirs and meatworks, is sold under several trade names and some varieties contain a small percentage of bonemeal. It is wholesome food, convenient to use, and costs from 9s. to 10s. 6d. per 100-lb. bag, Brisbane, the higher-priced brands containing a higher percentage of protein.

As meatmeal is expensive in comparison with pig foods grown on the farm, it should not be used more freely than is necessary.

Separated milk, which meatmeal replaces, is used according to its availability, pigs sometimes receiving milk as their sole diet, but pigs will thrive on small quantities of milk used in combination with grain and other foods such as pumpkins and sweet potatoes; the milk supplies a part of the protein necessary to balance the ration. Each pig from weaning until baconer stage and each dry sow should receive a minimum of three-quarters of a gallon of separated milk daily, and each sow with a litter double that quantity.

When these minimum quantities of separated milk are not available, meatmeal may be substituted, using about ½ lb. of meatmeal to replace each three-quarters of a gallon of separated milk.

Pigs thrive on a mixture of milk and meatmeal, or meatmeal alone as the protein-rich portion of the diet. The quantities used should not exceed from ¼ to ½ lb. daily per pig from weaning to baconer stage, according as to whether good lucerne is available or not; and ½ lb. for each dry sow and 1 lb. daily for each sow with litter.

By feeding a constant quantity of separated milk or meatmeal, and increasing the grain and other foods according to the pig's appetite, the nutritive ratio is widened automatically as the pig grows and satisfies its requirements.

In cases where pigs have access to good young pasture or green crops, the minimum quantity of separated milk or meatmeal stated above may be reduced by up to 50 per cent., depending on the quality of the green foods.

Meatmeal may be fed dry or mixed with milk or water.

HINTS ON FEEDING.

Grain feeding enters largely into successful pig raising; consequently, the form in which it is fed is important. Pigs which have been fully fed with corn through their growing period usually make good use of the whole grain, and corn-in-cob feeding may be adopted. Animals fed with corn only occasionally may not masticate it thoroughly, and a waste is incurred. For these, a preliminary cracking is advisable.

Well-ground grain is usually fed only to stud animals or stock for exhibition.

The appearance of whole grain in the dung may induce pigs to eat excreta. This is a clear-cut case for grinding.

Milling by-products are usually fine, and this may be a disadvantage when the pens are in an exposed position or during windy weather. The waste may be considerably reduced by wetting.

There is no need to prepare pumpkins or squashes, beyond the breaking of hard-skinned varieties—e.g., ironbark pumpkins.

Most tubers may be fed as harvested, or the pigs may be allowed to harvest them for themselves. It is advisable to cook potato "culls."

Milk, milk products, seed cake preparations, meat and blood meals, and cereal by-products require no preliminary treatment.

Lucerne or other roughages are usually well masticated by older pigs, and young pigs eat such small quantities that there is no point in chaffing.

KEEPING PIGS HEALTHY.

By the general practice of hygiene and sanitation in the piggery, coupled with sound feeding methods, the incidence of most pig diseases can be considerably reduced.

Moisture is necessary for the free living stages of nearly all worm parasites; in its absence very few of them can survive for any length of time. Therefore, pig keepers who wish to avoid losses from worms must have dry, well-drained piggeries.

Unhygienic conditions are predisposing causes of rheumatism, catarrh, and some of the more serious bacterial infections—such as supurative otitis and pneumonia.

Correct feeding and watering, together with adequate housing and paddocking, are undoubtedly most important factors in the preservation of the health of the pig.

THE KEEPING OF BREEDING RECORDS.

On every farm where the farmer breeds his own pigs some form of breeding record should be kept, for a record of the productivity of each sow, as well as a herd average, will contain information of much value to the observant breeder. Such records are not difficult to set out, and but a few minutes would be required each week to keep the book up to date. Therefore, a very small expenditure of time and money will ensure a supply of information which may be the means of adding materially to the income from the piggery.

A simple record may be prepared in the following way:—Take an ordinary exercise book or card, and across the top of two facing pages, or the card, rule two lines, between which the breed, name, and date of birth of the sow may be written. Then rule vertical lines to the bottom, and in the spaces between these lines there should be written such information as date of service, date of farrowing, number born, number weaned, pigs sold or killed for meat, gross returns, and remarks. In the remarks column, a note should be made of any pigs born dead, the causes of losses up to weaning, and deaths after weaning, as well as remarks concerning the type and growth rate of the litter.

When a complete breeding record is kept for each sow on the farm, the owner can, by studying the individual records, note the sows which have had small litters, or have not reared litters well, and so on. Therefore, if a sow's performance is not good, she should be replaced. By doing this, the average for the herd is raised, to the ultimate benefit of the owner.

Another use for records is to compare the results obtained from different foods. By feeding different rations to groups of pigs, and keeping a record of the amount of food eaten and the weight increases made on different rations, the farmer can determine for himself the foods which will give the greatest gain in weight for the least cost or labour.

The useful information to be gained from breeding records does more than merely compensate for the brief time and light expense involved.

—*T. Abell.*

MAN AND GRASS.

Dr. R. G. Slade is reported to have declared before the British Association for the Advancement of Science that it is possible to obtain 700 lb. of crude proteins from an acre of grass which would make useful food for pigs and also, in an emergency, a nutritious and palatable ration for the people. He added that all arable land in Britain, if sown with grass, could provide enough food to feed forty million people. There is nothing very wonderful about that. As a matter of fact the human race literally lives on grass to-day. The flesh foods we eat and the milk we drink are really grass once removed. If there were no grasses, all stock would perish, and mankind would perish with them. It is quite possible, therefore, that science may discover a better way of utilising grass and making it fit for food than by raising stock. Vegetarians like Bernard Shaw will hail the new discovery with loud applause. It may be that in the future science will succeed in transforming grass into the most delicious of foodstuffs and enable the glutton to revel in seductive dishes without having to resort to the wholesale slaughter of the pig, the sheep, and the bullock.

—*The Australian Dairy Review.*

YIELD OF CARCASE IN PORK AND BACON PIGS.

The loss of weight in transit of a pig from farm to factory, and then during dressing, varies greatly, and it is not possible to say exactly what weight a pig will lose.

Factors which affect the amount of loss are:—The size of the pig (the larger pig will lose a lower percentage); the manner in which the pig had been fed; the distance of the journey from farm to factory; the conformation and condition of the pig and the amount of food contained in its alimentary tract when it is weighed alive.

In tests it has been shown that under conditions similar to those ordinarily ruling in Queensland, pigs weighing 150 lb. to 200 lb. alive on the farm lose about 10 per cent. of this weight in transit to the factory, and then another 20 per cent. in dressing. Lighter pigs, weighing 100 lb. to 140 lb. alive, usually lose approximately 33 per cent. by the time they are dressed. Whilst these figures possibly are a fair average, individual pigs vary considerably according to the factors already mentioned.

As a rough guide in estimating dressed weight from live weight, farmers usually take seven-tenths of the live weight for baconers and two-thirds of the live weight for porkers.

—*L. A. Downey.*

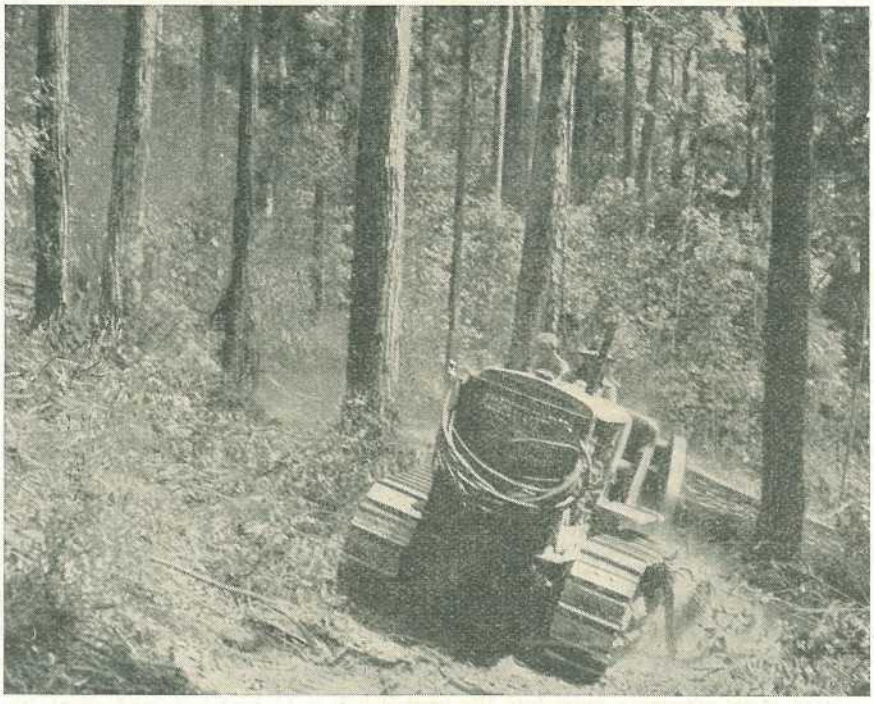


Plate 34.
Timber hauling with a tractor in a Queensland forest.
[*Photo.: Foresty Service.*

Feeding Dairy Cattle in Winter.

MANY farmers conserve enough roughage to last their dairy herds through a severe winter, but few understand why the milkers fail to keep up production. Mastication and digestion of dry roughage use up at least 60 per cent. of the energy value of the feed. With concentrates, less than 20 per cent. is used. It follows that very often on poor quality roughage a cow is either unwilling or unable to consume enough to meet the requirements of full lactation. The trouble might be met in two ways. Extra consumption can be stimulated by increasing the palatability of the food. Molasses thinned out with water is excellent for this purpose. Bran and other milling by-products may also be used when prices are reasonable, but it appears unlikely that, for this year, cereals or their by-products will be able to compete with other concentrates.

Seed cake preparations are excellent for dairy cattle. On account of its slightly laxative nature, linseed has found greatest favour. There is a growing tendency to replace vegetable proteins by animal protein. Meat and animal protein meals are used extensively when analyses and prices are sufficiently attractive. By consulting the registered analyses and comparing costs, the farmer can determine which product is the cheapest to buy. All farmers who have overcome the cow's natural dislike for meat and animal protein meals have been amply repaid by the money saved and by the increased production. Under certain conditions, however, it may be uneconomical to feed such concentrates. This is usually the case with poorer milking herds.

The farmer should add a mineral supplement to the ration of all milkers, as well as heavy-in-calf cows. A mixture of two parts sterilised bone meal and one of salt should be kept in a convenient place, or about one eggcupful mixed in each feed. With heavy milkers, the allowance might be doubled.

LOW PRODUCTION COST.

Many dairy farmers supplying milk have cows capable of giving more than the one or two gallons they produce, but the owner is generally sceptical as to whether the extra food required will be paid for out of increased production.

A simple trial lasting a fortnight will show how to rearrange both feed and production. Arrange for those cows which can be reasonably expected to produce more to get the extra feed. It should take the form of concentrates. A simple mixture for the production of an extra gallon is 3 lb. of maizemeal and 1 lb. of high-quality meat meal. Gradually bring the animals under test on to the full feed—usually a week is adequate. Test over a further week.

The cost would not exceed 7d. daily per cow. The increased yield in terms of cash then determines whether the particular cows under test are worth the extra feed. If they are, then it will pay to pension off low producers and apply the cost of their food to the purchase of concentrates for the proved animals.

In practically all cases the food for two half-gallon cows or one one-gallon cow costs more than the extra feed which is to produce an extra gallon from a better milker.

The saving in labour is also worth consideration.

COMFORT FOR COWS ON COLD NIGHTS.

The dairy farmer who rugs his cattle during wintry weather usually reaps the advantage of an undiminished cream return. Many other farmers would like to follow suit, but are deterred by the cost of buying a good warm rug. There is no reason, however, why a farmer so placed should not make his own cow rugs. All that is required are the necessary number of corn sacks, a ball of twine, a packing needle, and ordinary ingenuity.

A warm rug can be made out of two corn bags, but for a big beast three bags might be necessary. Split the bags down the seams, sew them together, and place on the cow. After getting the right fit, cut off a strip of bagging so that the rug will not hang too low. This strip cut off may then be folded and sewn to the rug as a thigh strap. The front of the rug is then fitted by turning up the corners and sewing them to the sides of the rug. This strengthens the rug and obviates the necessity for cutting off the spare portion, which the cow would otherwise tread on. Neck and other fastenings may be easily fashioned to make the rug complete.

This home-made rug will keep the cow warm, and after a few days' wear will become practically waterproof. The rug can be slipped off and on quite easily, and it is advisable to remove it every day, except in bleak or rainy weather. Each cow's name may be painted on its own rug. Rugging will certainly increase winter milk production.

STERILIZATION OF DAIRY UTENSILS.

More bacteria are added to milk and cream from improperly washed and ineffectively sterilized utensils than from any other source. While the methods of washing on some farms are reasonably sound, the sterilization practised is frequently ineffective.

Steam sterilization is very satisfactory, but unfortunately, it cannot be done on every farm.

Boiling water, however, can be made available in every dairy; and, if effectively used, will annihilate all but the most resistant micro-organisms. A common, but undesirable practice is to obtain the boiling water from the kitchen stove. While the pouring of boiling water on utensils is to be commended in ordinary circumstances, the effectiveness of the sterilization is reduced considerably when the boiling water has to be removed from the kitchen to the dairy, with a consequent drop in temperature.

The best results are achieved by the provision of a boiler in the vicinity of the separator room or dairy house. For this purpose, a 12-gallon boiler has been stipulated under the Dairy Produce Acts. To obtain thorough sterilization, the utensils should be immersed in the boiling water for at least ten minutes.

The time and trouble taken by the farmer in the regular sterilization of his milk and cream utensils will be repaid amply in the consistently good grading and keeping quality of his product.

BORDER LINE CREAM.

Every factory manager must formulate a policy in regard to the lowest quality cream that can be manufactured into choice quality butter at his particular factory. Modern methods of manufacture and factory equipment have done much to enable the utilisation of cream, which a few years ago would have been discarded. Nevertheless, the dairying industry still offers no exemption to the general rule—that the quality of raw materials directly influences the character of the manufactured product. The addition of a few faulty cans of cream to a vat may thus cause the spoilage of otherwise choice quality butter. Only a thorough knowledge of the origin and nature of a given defect can help in determining the fate of doubtful cream.

There is a limit to the capability of machinery and manufacturing technique to offset defects in cream quality, and no factory can afford to slur over defects in the cream received. Any laxity in this respect is really doing the farmer a disservice, for he may remain unaware that better quality cream is required, and takes less instead of more care on the farm.

First-quality butter can only be obtained when the farmer realises that the remedy for cream defects is essentially his responsibility.

—*J. D. W. Ogilvie.*

Registered Hatcheries.

OBJECT OF REGISTRATION.

THE registration of hatcheries has for an object the distribution of healthy chickens, the progeny of parent stock of good type and production ability.

The following clauses of Regulation 29 of "*The Diseases in Poultry Acts*, 1923 *to* 1937," will indicate the obligations of owners of Registered Hatcheries:—

(iv.) He shall have all poultry at or upon or kept at or upon such hatchery tested for pullorum disease at the times and in the manner from time to time required by the Chief Poultry Expert. He shall pay to the Minister the cost of every such test.

(v.) He shall not place, permit, suffer, or allow to be placed in any incubator at such hatchery for the purpose of incubation, any egg which shall be less than 2 oz. in weight.

(vi.) He shall not sell or offer for sale any chickens other than chickens which are healthy and normal and shall not sell or offer for sale any chickens which are deformed or injured in any way, or which have weak navels.

(vii.) He shall at all reasonable times permit the Chief Poultry Expert, any Inspector, or any officer to enter into or upon such hatchery and inspect the same.

Following is a list, giving the name of the owner of the hatcheries registered up to and including 30th June, 1938:—

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire ..	White Leghorns, Australorps, Rhode Island Reds, and White Wyandottes
F. J. Akers, Eight Mile Plains ..	Elmsdale ..	White Leghorns and Australorps
J. Cameron, Oxley Central ..	Cameron's ..	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps
J. L. Carrick & Son, Manly road, Tingalpa	Craigard ..	White Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
T. G. Crawford, Stratford ..	Rho-Isled ..	Rhode Island Reds
Rev. E. Eckert, Head street, Laidley	Laidley ..	Australorps, White Leghorns and Langshans
Elks & Sudlow, Beerwah ..	Woodlands ..	Australorps and White Leghorns
W. H. Gibson, Manly road, Tingalpa	..	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros. ..	White Leghorns
J. W. Grice, Loch Lomond ..	Quarrington ..	White Leghorns
C. & C. E. Gustafson, Tannymorel	Bellevue ..	Australorps and White Leghorns
F. J. Lambert, Acacia Vale, Townsville	Lamberts ..	Australorps and White Leghorns
J. McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Australorps, and Brown Leghorns
A. Malvine, junr., The Gap, Ashgrove	Alva	White Leghorns and Australorps
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Black Leghorns
J. A. Miller, Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, Brown Leghorns, and White Leghorns
F. J. Mottram, Ibis avenue, Deagon	Kenwood Electric Hatcheries	White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshans, White Wyandottes, Sussex, Rhode Island Reds, and Brown Leghorns
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
E. E. Smith, Beerwah	Endcliffe ..	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's Poultry Farm	White Leghorns and Australorps
T. Westerman, Handford road, Zillmere	Zillmere ..	Australorps and White Leghorns
P. A. Wright, Laidley	Chillowdeane ..	Brown Leghorns, White Leghorns and Australorps
R. H. Young, Box 18, P.O., Babinda	Reg. Young's ..	White Leghorns, Brown Leghorns and Australorps

Following is a list of persons who have applied for registration :—

Name and Address.	Name of Hatchery.	Breeds Kept.
J. W. Moule, Kureen	Kureen ..	White Leghorns and Australorps
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns

PREPARED POULTRY FOODS.

The domestic fowl appears to have no sense of smell and but little of taste. The senses of sight and touch, however, are very keenly developed, so that it becomes important to prepare poultry foods in attractive form. The fowl relies largely on past experience in accepting food, and for that reason feeding problems must be always a subject of close study.

Excessively fine, dusty foods—e.g., some biscuit meals—should never be fed without some preliminary treatment. They tend to cause clogging in the month, and fine particles lodged in the respiratory tract are a source of irritation. There also is the additional danger of distended crops. Such dry foods should be incorporated carefully in a mash and, if necessary, moistened.

A food which is flaky but not brittle is well taken by fowls—hence the popularity of bran in mashes. Hard grains should be crushed or ground coarsely. Soaking is an alternative method of helping the gizzard to cope with hard foods.

Predigested, fermented, or malted foods are actually lower in nutritive value than the material from which they are derived, and, in normal circumstances, should not be purchased.

BREEDING FOR EGG PRODUCTION.

In breeding poultry, the farmer should exercise the utmost care in order to establish and maintain a high quality flock. Considerable progress has already been made in the improvement of breeding practice. Egg production has been increased from about sixty eggs to over 200 eggs per bird per annum, many individual pullets laying over 300 eggs in a year.

In dealing with the egg production in a flock of birds consisting of an equal number of pullets and hens, many authorities quote twelve dozen as a fair average annual production. It is doubtful, however, whether there are many poultry farmers in Queensland who obtain an average production per bird of less than thirteen dozen eggs yearly. In some experiments conducted at the Animal Health Station, using White Leghorns purchased from a poultry farmer as day-old chickens, the average production over the two years was 181 eggs per bird, the variations being—pullet year, from 194 to 209 eggs; second year, from 155 to 162 eggs. In these experiments, 116 pullets were used, and the average of the two years was over fifteen dozen eggs, and even these birds in their second year laid over thirteen dozen. The birds were kept under poultry farm conditions.

The poultry farmer should be able to obtain an average production at least equal to those figures. A constant high average production is only obtainable by good breeding, in conjunction with good management and feeding.

The chief considerations in establishing standards of good breeding are:—Type, constitutional vigour, action, and laying characteristics. Having selected birds reasonably true to type, care must be taken to see that they are of strong constitutional vigour. This is indicated by the vitality, stamina, health, brightness, and alertness of the bird, and is of equal importance to the knowledge of the actual number of eggs laid.

As an example, some years ago the first three birds in a laying test laid 302, 296, and 294 eggs, respectively. An examination of these birds at the conclusion of the test showed that the first and second birds were weak in constitution, whereas the third bird was very strong. All these birds were used as breeders, but while the progeny of the first and second hens were disappointing layers, the descendants of the third bird have performed very well in laying tests every year since. That example should emphasise very clearly the necessity for rejecting birds that are weak constitutionally.

Admittedly, it takes courage not to breed from a 300-egg bird. If such a bird produced the eggs without a heavy drain on her body, she would be constitutionally strong. If, however, the bird rapidly loses condition during the year, she is obviously weak in constitution and, consequently, would probably be an indifferent breeder. Any bird that is unable to stand up to a heavy season's laying without losing condition cannot be expected to give high-laying progeny, and should be discarded, irrespective of other characteristics.

—*J. J. McLachlan.*

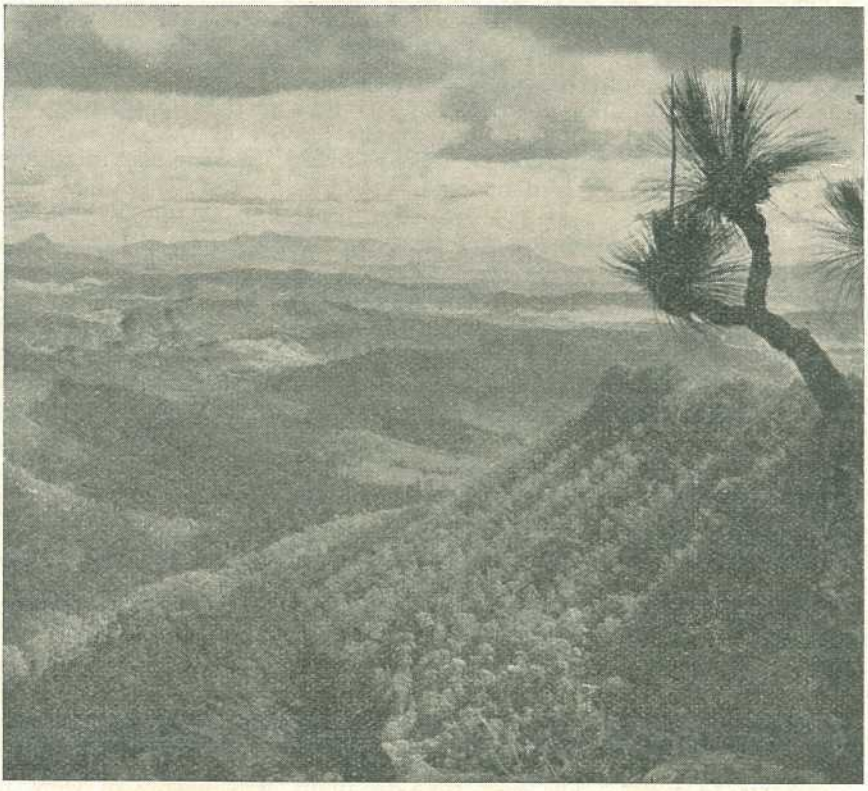
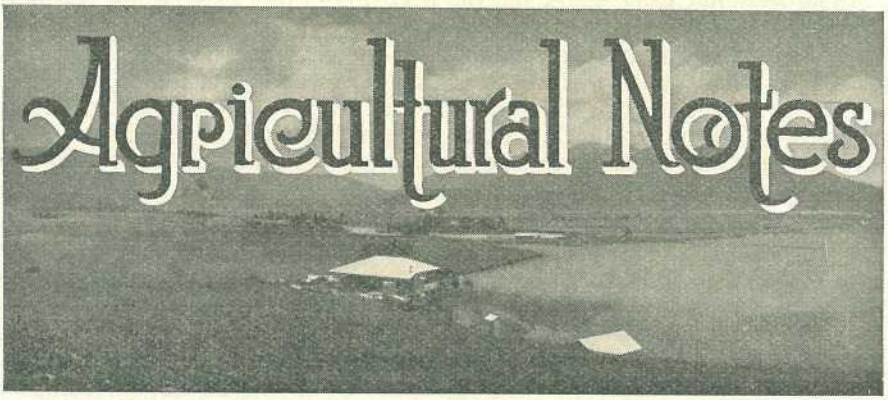


Plate 35.
Outlook over the New South Wales border from a spur of the Macpherson Range.



Winter Preparation of Land for Maize.

TO get the best results, maize requires a good soil in which a plentiful supply of plant food is available—a condition which can only be brought about by an early and thorough preparation of the land before planting, attention to the cultivation of the crop itself, and to the eradication of young weeds during its early growth.

The land should be ploughed to a depth of at least 9 inches during winter and allowed to lie in the rough until early spring. The action of frost and rain will improve the texture of the soil and will leave it in a mellow condition. In early spring, the land should receive a second ploughing which, if possible, should be a cross ploughing. This should not be so deep as the first ploughing, and should be followed immediately by a harrowing and cross harrowing to work the surface soil into a fine tilth.

If a crop of weeds is turned under during the second ploughing, planting should not be carried out for at least a few weeks to allow decomposition to take place. On land which is not too heavy and moist, rolling is desirable as it consolidates the soil and helps to make a good firm seed-bed. Rolling should always be followed by a light harrowing.

Preparation of Seed-beds.—The preparation of the seed-bed is one of the most important points in the production of maize. No amount of after cultivation will undo the damage that has been caused by planting in a badly prepared piece of land.

One has only to see the difference, not only in the growth but also in the colour of the foliage between a crop grown on thoroughly prepared and another on hastily prepared land, to realise how great the effect is.

Give the young crop a chance to become well established in a well prepared seedbed—in which the young plants will not have to battle with a host of weeds—and the increased return will more than compensate for the extra time and labour spent.

Time to plant.—The best time to plant will naturally vary in different districts. In districts which have a long growing season and a comparatively regular rainfall, planting can be done whenever weather conditions are suitable, from August to late December.

Two very important points are—firstly, to choose a variety which is suitable for the district; and, secondly to plan to have the crops tasselling, if possible, during periods in which rain can usually be expected. Maize must have moist conditions when tasselling, and if hot, dry winds occur during this period, the pollen is shed too early and fertilization cannot take place.

Seed should be sown in drills spaced 3 ft. 6 in. to 4 ft. apart. The wider spacing is essential for the tall-growing, late-maturing varieties. As a general rule, single spacing in the rows gives the best results, the grains being dropped singly, with a distance of approximately 12 inches between the grains for the quick maturing varieties, and from 15 to 18 inches for the late maturing varieties.

From 9 lb. to 12 lb. of seed is sufficient to plant an acre, when sown in this way.

The seed drill is the best implement for sowing maize, as it ensures a good even spacing and no loss of moisture occurs during planting, as is often the case where furrows have to be opened up for hand planting.

THE PRESERVATION OF CONCRETE ON THE FARM.

Concrete floors and feeding troughs on the farm often show signs of wear soon after being laid down, a fault which is often due to the action of various acids in milk and some other foods. If the farmer does not take steps to prevent further wear, the concrete becomes pitted and quickly breaks up.

This deterioration of the concrete may be delayed successfully by the correct use of a special type of silicate of soda, which is cheap and easy to apply. When mixed with water the solution thus obtained is sprinkled on the surface of the concrete to be treated, is absorbed, and combines with the concrete, forming a tough coating which is impervious to water and acids under ordinary farm conditions.

One gallon of the special silicate of soda is thoroughly mixed with 4 gallons of water. The 5 gallons of solution will suffice for three applications to an area of 300 square feet of average concrete. Very dry or porous concrete will require a fourth application.

In making new concrete floors, the work should be finished off so that the surface is not very smooth, otherwise the stock will be liable to slip when it becomes wet. When the concrete is firm and nearly dry the solution of silicate of soda in water is applied by means of a spray pump, a watering-can with a fine sprinkler or a mop. Do not flood the solution on, but apply just as much as the concrete can absorb readily. A second and later a third application of the solution should be made as the surface dries out each time. For new concrete, three coats should be sufficient.

Worn floors and troughs may be renovated in the following manner:—First, the surface should be thoroughly scrubbed with soap and hot water to remove grease and dirt. Then the area is coated over with a mixture of one part cement to three parts clean, fine sand. When the concrete is firm and drying, treat with the silicate of soda solution as for new concrete.

Floors and troughs in sound condition will benefit by treatment with silicate of soda. The surface should be freed from grease as before mentioned; four applications of solution will probably be necessary, and twenty-four hours after the last application any solution remaining on the surface should be removed with a mop.

Concrete floors and troughs treated in this way last longer, are easier to clean, and dry more quickly than untreated concrete. For best results, the concrete should receive a light treatment once each year following the initial treatment.

When purchasing silicate of soda for conditioning concrete, farmers should definitely state the purpose for which it is to be used to ensure his obtaining the correct material.

—*T. Abell.*

GROW MORE FODDER CROPS.

Every year, producers in the Maranoa and Western Darling Downs districts are confronted with the difficulty of maintaining the condition of stock during the winter months, when pastures are short and harsh. There is only one way out, and that is to take advantage of the better types of soil available and grow fodder crops—not in a haphazard, casual way, but by using a system by which land is given a fallow period prior to the planting of each crop.

The recent bountiful rains throughout these districts provided an opportunity for making a commencement with a fodder programme, and, in view of the erratic seasonal conditions usually encountered, every advantage should be taken of the moisture now in the ground. Many settlers have winter crops—such as wheat, oats, or barley—germinating now, and an excellent practice, particularly after the heavy rains experienced, is to give the crop a light harrowing as soon as the plants have a good hold in the soil. This should be done at right angles to the direction of sowing to check weed growth, prevent evaporation, and give plants a better chance to stool.

Following planting and harrowing, attention should be given to land intended for summer fodders such as Sudan grass, sorghums, Japanese millet, and cowpeas. There is every temptation at present to utilise every acre of available cultivation for sowing winter crops now, whether the ground is ploughed or not. In the very rare years when good winters are experienced plough and plant methods may work out to some advantage, but far better results, on the average, will be obtained if a systemised cropping programme—including rotation of crops and fallowing—is adopted. Wherever possible, therefore, land which has not been prepared for winter crops should be ploughed and left in the rough state for early spring planting. In this way, moisture at present in the ground will be retained, and even light rains in spring will permit planting at that time. Apart from moisture conservation, the aeration of soil by fallowing oxidises plant foods and makes them more readily available to the growing crop.

—*C. H. Defries.*

MANAGEMENT OF WINTER PASTURES.

The choice of a pasture mixture for winter grazing has to be based on a number of factors, including the average winter rainfall of the district, the chemical and physical characters of the soil, the cultivation treatment the land has received, the length of time the pasture is expected to remain, and the aggressiveness of weeds. Once a suitable mixture has been established it must not be considered "fool-proof," but should be managed with due regard to the pasture itself.

The temptation to overstock paddocks during winter when the "broad acres" are unproductive must be resisted. Such pastures should as far as possible be reserved for cows in milk, for breeding ewes, or for fattening stock. The pasture should not be stocked too early in the growing season but should be allowed to make good growth before grazing. When a paddock is ready for grazing the animals should be permitted to graze on it for about an hour each day and they should be removed sooner if they begin to lie down. Camping on the area should be prevented, as the pasture becomes fouled and distasteful to the stock. Sufficient stock should be put on to eat a paddock down within ten days or so, but the pasture must not be too closely grazed. "Flogging" a pasture of winter grasses and clovers will certainly be harmful. After the completion of a grazing, the harrows or wooden drag should be run over the paddock to scatter the droppings. The pasture must be given ample time to recover and produce good growth before being grazed again. Sufficient paddocks of winter pasture should be provided to permit rotational grazing and to supply green, nutritious feed continuously throughout the cooler months of the year.

Certain of the annual winter pasture plants—e.g., Italian ryegrass, Wimmera ryegrass, and prairie grass—are self-seeding, and towards the end of the growing season pastures of these grasses must be left unstocked in order to permit the seed to ripen and shed. Areas which have been so treated should be lightly harrowed in early autumn to make a seedbed for the establishment of seedlings produced by the self-sown seed.

—C. Winders.

SHRUBBY OR UPRIGHT MIST FLOWER.

The common Mist Flower, a decumbent plant bearing numerous sprays of small white flowers, is a very abundant weed of some of the wetter areas in South-East Queensland and Northern New South Wales. Recently, specimens of an allied kind have been received from several localities in South-East Queensland, particularly in the Nerang Valley.

It is an upright plant of shrubby growth, usually with numerous branches. The stem is four to six feet high. The Department of Agriculture and Stock advises that, fortunately, it does not seem to be of as aggresive a type as the more decumbent and weaker species, and, where necessary, it can, usually, be eradicated by grubbing it out.

Species of Mist Flower are grown in Europe and United States of America for florists. They are rather ornamental and because of this, may be left standing or sometimes even fostered.

Neither the common Mist Flower nor the shrubby species is known to possess any poisonous or harmful properties at any stage of growth.

—C. T. White.

VARIETY P.O.J. 2878 AND DOWNY MILDEW DISEASE.

With its many virtues, the Java Wonder cane (P.O.J. 2878) possesses two very distinct weaknesses—susceptibility to Fiji and downy mildew diseases. Although these were relatively unimportant diseases in Queensland a few years ago, they assume quite a different aspect in the Bundaberg and Mackay areas with the continued planting of a susceptible variety.

Our recent inspections of certain parts of the Mackay district show that a high proportion of the fields of this variety carry downy mildew disease. The widespread character of the disease has therefore necesitated the removal of the cane from the variety lists supplied to local boards this year in the Farleigh, Racecourse, Pleystowe, and Marian mill areas, with the exception of those lands lying north of The Leap.

This precaution has been taken in the interests of other susceptible canes now grown as major varieties. With a continuance of plantings of diseased P.O.J. 2878, the situation could become very serious.

Though the cane has been retained in the lists for North Eton, Cattle Creek, and Plane Creek, similar action will be taken should the disease be found subsequently in these areas. Growers should remember that P.O.J. 2714 is also susceptible to the disease, though P.O.J. 2725 is resistant.

It is felt that, with the full co-operation of all growers in reporting the existence of the disease on their farms, the district could be rid of this trouble, and P.O.J. 2878 re-introduced in a few years' time in a healthy condition.

—H. W. K., in "The Cane Growers' Quarterly Bulletin."

PERMITS FOR TRANSFER OF SUGAR-CANE PLANTS.

In order to reduce the possibilities of carrying sugar-cane diseases from one district to another in which those particular diseases do not exist, it is necessary that strict precautions be taken in the matter of transferring cane plants from one area to another. In futherance of this object the State of Queensland has been divided into a number of quarantine districts, and under the provisions of the Diseases in Plants Acts the transport of sugar-cane plants from one such district to any other is prohibited unless a permit has been issued by an inspector under the Acts. The boundaries between these quarantine districts consist of imaginary lines drawn east and west through Cardwell, Townsville, Bowen, Alligator Creek (south of Mackay), Rockhampton, Burrum, the southern end of Great Sandy Island, and Brisbane. Any person desirous of sending cane plants across any of the above boundaries at any time during the current season, should make an early request for the necessary permit, to the Director, Bureau of Sugar Experiment Stations, Brisbane.

THE NEW SEEDLING Q.2.

The following notes have been compiled for the guidance of North Queensland farmers, who will soon be commencing the 1938 planting programme.

A further year's experience with Q.2 has confirmed its promise of a vigorous plant crop with satisfactory sugar content if cut in the latter half of the season; it definitely is not an early-maturing cane. It has proved somewhat disappointing as a ratooner, and it should not be harvested early in the season, although when cut late some excellent ratoon crops have resulted.

For the guidance of farmers we have collected data on eleven experimental plots harvested in the far North. The time of harvest was recorded, and later the plots were inspected and the crops classified according as they appeared to be good, fair, poor, very poor, or a failure. For the purposes of enabling ready comparison we have constructed a graph (see Fig. 43) to show the relation between vigour of ratoon crop and time of harvesting. It will be seen that there is a gradual improvement in the ratoons as the harvesting is delayed, and these results strongly suggest that this operation should *not* be carried out before mid-September.

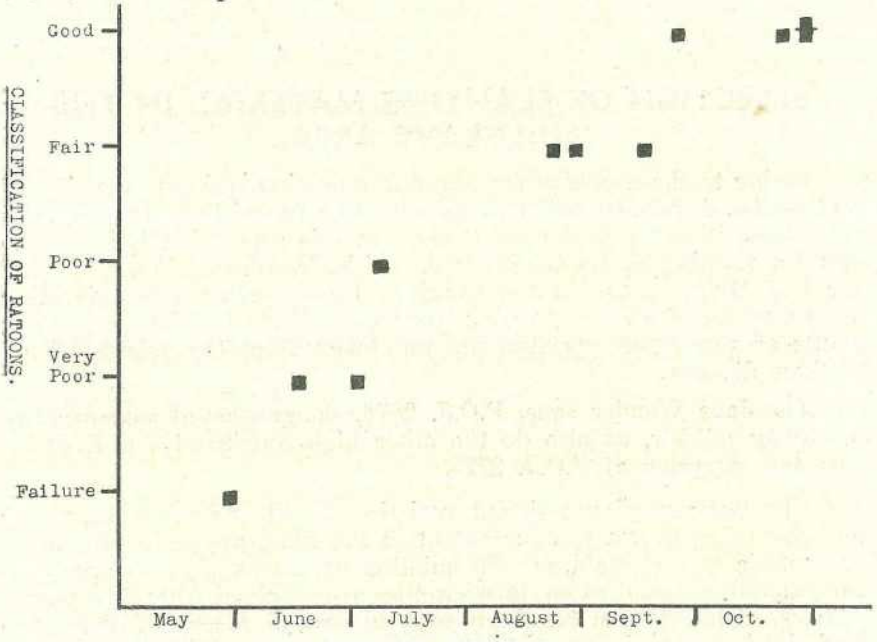


Plate 36.

Showing that Q. 2 gives a good ratoon crop if the plant cane is harvested after mid-September.

Several series of observations of flooded cane made in the Johnstone area by Mr. Knust indicate that this cane is considerably more "resistant" to flood damage than Badila. Doubtless this is mainly due to the fact that, Q.2 being considerably taller than Badila, the growing point is submerged for a shorter period of time than would be the case with Badila.

The previous season's indications of resistance to top rot and borer attack were again in evidence.

—*G. B., in "The Cane Growers' Quarterly Bulletin."*

DWARF DISEASE IN P.O.J. 2878 AT MACKAY.

Farmers in the Rosella area of the Mackay district will recall that some years ago some alarm was caused by an outbreak of an entirely new disease—Dwarf Disease. Fortunately, later experience showed that the disease remained restricted to low-lying farms or low-lying portions of farms in that area, and with the almost complete elimination of P.O.J. 2714 the disease virtually disappeared. Recently a few farmers in this "dwarf country" have tried plantings of P.O.J. 2878, but inspections carried out early this year have indicated that some of these crops have contracted dwarf. As a result farmers in this area are warned against making extensive plantings of P.O.J. 2878, and are urged to make no such plantings whatever in low-lying fields. The area has been very closely surveyed by Mr. McDougall, who should be consulted regarding proposals for planting P.O.J. 2714 or P.O.J. 2878 in this locality.

—A. F. B., in "The Cane Growers' Quarterly Bulletin.

SELECTION OF PLANTING MATERIAL IN THE MULGRAVE AREA.

Owing to the necessity for planting gumming resistant varieties to replace S.J. 4, farmers will to some extent be forced to go outside their own farms in order to obtain plants. In this connection it is well to sound a warning that a small amount of leaf-scald and downy mildew (or leaf stripe) exist in the district. Consequently, when deciding upon a source of supply of plants, great care should be taken to see that plants of susceptible varieties are not taken from the neighbourhood of these diseases.

The Java Wonder cane, P.O.J. 2878, shows marked susceptibility to downy mildew, as also do the other high numbered P.O.J. canes, with the exception of P.O.J. 2725.

The two gumming resistant varieties, Korpi and Oramboo, which are now being grown to some extent in the Mulgrave area, are rather susceptible to leaf scald, and in building up stocks of these two canes care should be taken to see that supplies are obtained from disease-free sources. This disease has been seen in several blocks of these two varieties in the Mulgrave district, and hence the need for greater care. As this disease is spread by the cane knife it follows that the cutting of only a few diseased stalks can infect a large number of future stools when cutting plants.

Farmers in doubt as to the suitability of particular fields are urged to get in touch with the Experiment Station at Meringa, or Mr. G. Bates, Instructor in Cane Culture, Cairns.

—A. F. B., in "The Cane Growers' Quarterly Bulletin.

WIREWORM DAMAGE IN MACKAY.

Forecast for 1938 Season.

Summer rainfall conditions in 1936 and 1937 were extremely favourable to the development of young wireworms of the "lowland" type, with the result that damage to newly planted fields was both widespread and severe; in many cases wholesale ploughing out and replanting was rendered necessary. Rainfall conditions during the current year have not been favourable, however, and it is confidently expected that wireworm damage to this season's plantings will be comparatively scarce and will be confined to very low-lying areas. Most of the "dips," hollows and lower ends of fields situated in the better type of river bank soils should be free of the pests, while moderately well improved forest country should yield satisfactory strikes unless some factor other than wireworms operates.

—W. A. McD., in "The Cane Growers' Quarterly Bulletin."

VARIETAL TRIAL.

A varietal trial was set out on the farm of Mr. A. Grieve, Pine Creek, Bundaberg, with a view to determining whether P.O.J. 2714 is superior to P.O.J. 2878 under the local conditions.

Unfortunately, the crop suffered rather much from adverse growing conditions, and the yield results from the plant crop are therefore presented with reservations:—

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
P.O.J. 2714	11·9	**14·0**
P.O.J. 2878	**12.8**	13·1

It will be observed that there is nothing decisive about the results. While P.O.J. 2878 gave a slightly higher tonnage per acre, the c.c.s. of P.O.J. 2714 was somewhat superior.

—H. W. K., in "The Cane Growers' Quarterly Bulletin."

BUTTER EXPORT.

The leader of the British Delegation at the Empire Producers' Conference in Sydney has given an assurance to the Australian Dairy Produce Board that the Dominions need not fear restrictions of exports of dairy produce to the United Kingdom. The conference decided to ask Empire Governments to pass legislation for the setting up of marketing boards on the request and by vote of the producers concerned.

Because of the falling off in butter production in Australia, the Australian Dairy Produce Board has decided to restrict exports of butter to 1,500 tons weekly, for the present. Our export quota is 2,000 tons weekly.

How to Plant a Deciduous Fruit Tree.

H. ST. J. PRATT, Senior Instructor in Fruit Culture.

FROM the time trees leave the nursery until they are permanently planted, they should never be left exposed to sun, wind, or air, when it can be at all avoided.

Trees waiting for planting should be heeled-in with moist earth about the roots, and only taken out of the ground when actually needed for setting. The hole dug for a tree should be large enough to permit the roots to spread out naturally in all directions. It is unnecessary to dig wide holes if the trees are heavy-rooted, for the roots must be trimmed back at transplanting time.

All broken, torn, and dead roots should be cut back to fresh living wood. When the clean cut surfaces come in contact with moist soil, new roots are formed very readily.

Filling in the holes is most important in planting the tree. To get the best results, moist soil must be placed closely around the roots, preferably by hand, so that no air holes or crevices are left.

When the trees are placed in position, the roots are spread out and a shovelful or two of fine earth thrown in upon them. The soil should be carefully worked in between the crevices and, when the hole is about one-third full, the soil about the roots of the tree should be tramped down firmly. Moving the tree up and down, while the earth is being filled in, will assist materially in eliminating air holes and in bringing the soil into close contact with the roots. There is little danger of the earth being over-packed, but trees often die for lack of tramping.

After the roots are all covered and packed in tightly, the hole may be filled in with loose soil. Tramping the top of the ground after completely filling the hole is undesirable.

When planting the tree allowance must be made for the looseness of the ground in deciduous fruit areas in the Stanthorpe district. If the tree is set only as deep as the collar, it will be well out of the ground twelve months later, when the land has settled down. Hence, to ensure

the best results, the collar of the young tree should be from 4 to 6 inches below the surface of the ground. In twelve months' time, the collar will be at the proper depth—namely, level with or just under ground level.

If possible, trees should be planted not later than the end of July. The root system will then be established before the buds start to shoot. Later planting is apt to be too great a tax on the tree's resources.

Since the roots have been cut back prior to planting, it is necessary to cut back the top of the tree proportionately in order to maintain a balance between the top and the root. If this is not done, the tree, when it comes into leaf, will lose moisture faster than the reduced root system can supply it, and death may result.

A tree should be headed low—the best height being 18 inches to 2 feet. The most uniform orchards are made by setting whipsticks in preference to headed trees. With whipsticks, the grower can form any desired type of head, whereas trees headed in the nursery often possess badly formed heads which have to be cut off and re-formed in the orchard.

Three, or at most, four main limbs at the start are enough for any fruit tree. If properly placed on the trunk, it will never be necessary to cut out a large limb, a practice which is undesirable except in the most extreme cases.

The main limbs should not all start at the same height from the trunk, for if all the weight of limbs and of fruit is directed at a single point, the tree is liable to split. Opposite crotches should be avoided.

The after cultivation of freshly-planted trees, as well as all other trees, is most important. It is a loss of both time and money to plant trees unless the orchardist is prepared to look after them. Young trees left to struggle against weeds, drought, and a poverty-striken soil suffer severely. If, by chance, they do survive, they become stunted, and are never of much value. Great care is necessary in cultivating an orchard, for the careless use of horses and implements can do very great harm to the trees.

CULTIVATING NEW BANANA LAND.

The benefit to be derived from a thorough breaking-up of the soil in new land should not be overlooked, especially as so much forest country is now being used for banana-growing. If possible, breaking-up should be done before planting, but, with new land, time may not permit of this being done between burning-off and planting. Therefore, growers are advised to do this work during the first winter at the very latest, otherwise much damage may be done to the rooting system of the banana plants. Mattocks or fork hoes are the implements best suited for this work.

The land should be dug up to a depth of not less than 8 inches. A great improvement in the physical and mechanical condition of the soil will be observed soon afterwards. Increased root development, making possible the drawing of plant food from a much greater area, will result in vigorous plant growth and the production of larger bunches and fruit of higher grade.

On many farms, small crops, such as peas and beans, are planted between the rows of young bananas, and the thorough breaking-up of the

soil will also benefit these crops, inducing quicker growth and greater bearing capacity.

The need of improving the humus content of the soil, particularly our forest soils, should be recognised. Humus can be added to the soil by burying the pea and bean plants after the pods have been picked. Shallow trenches should be dug across the slope of the land at convenient intervals, and the crop residues buried in the trenches under a covering of at least 2 inches of soil. The formation of these trenches across the slopes assists in preventing surface soil erosion.

Legumes such as beans and peas extract nitrogen from the air, and some of this nitrogen is returned to the soil in a readily available form when the roots and vines of these plants are turned under. The soil is thus enriched with this valuable plant-food. In addition, the humus content, fertility, and moisture-retaining capacity—a very important factor in successful banana-growing—of the soil is increased or, at least, maintained.

Where the soil has been well dug, less chipping is required, because the rapid growth of the banana plant soon controls weed growth; besides, mechanical condition of the soil is improved, making chipping easier and thus reducing cultivation and production costs.

—*J. M. Wills.*

RED SPIDER ON PAPAWS.

The red spider is a mite known to attack a variety of hosts. The name is rather misleading, for the colour is seldom red, greyish-green being dominant, although the actual shade varies greatly even within a single colony.

The foliage of affected papaw plants shows symptoms comparable with dry weather effects. The leaf margins curl, the upper surface of the leaves turns yellowish, particularly near the main veins, and the corresponding under surface is a darker green than normal. Reddish-brown blotches may appear in the final stages of an attack. Normally, infestation commences in the older leaves, and then spreads to the younger growth. These symptoms are the result of mass feeding by very large numbers of mites on the under surface of the leaves. The fruit may also be infested, but this type of injury is of slight importance compared with the impoverishment associated with extensive leaf injury.

When infested leaves are closely examined, all stages of the mite from the microscopic egg to the very minute adult can be observed on the under surface. Silken threads are spun by the adult and illustrate a characteristic habit of this and some related species, from which they have acquired the name "spinning mites."

Growth is very rapid, particularly in summer, when the period between egg and adult is approximately only a fortnight. Because of its high reproductive rate, an attack may develop very quickly. Red spider outbreaks are, however, usually sporadic, acute one month and negligible the next, but a whole season's growth may nevertheless be disturbed by a single attack.

Although predators are frequently active on red spider infested plants, they cannot be relied upon to keep the pest in check, and control measures are often necessary. Fortunately, the red spider is by no means difficult to control, and either a lime sulphur spray or a sulphur

dust can be used. Lime sulphur is, perhaps, the more effective, and as the spray gives good control of powdery mildew this treatment is frequently preferred. Although a lime sulphur spray can be used at a concentration of 1 in 35 during winter and early spring, weaker solutions will be necessary in warmer weather if injury to the plant is to be avoided. For large-scale work, particularly in hilly country, the sulphur dust is more easily applied, and where mite control is the main objective, reasonably good results are achieved. No matter which treatment be adopted, thoroughness in application is essential and particular attention should be paid to the under surface of the leaves, where the pest is more numerous. If the mites are plentiful, some may survive a single spray or dust application. More than one treatment may then be necessary to give adequate control.

—J. Harold Smith.

PRUNING DECIDUOUS FRUIT TREES.

The pruning of deciduous fruit trees has commenced, and this very important work should be done as well as it is possible for the operator to do it.

To make a good job of pruning, good, clean, sharp tools are very necessary. Pruners will find it useful to provide themselves with a light box—fitted with a strap to make carrying easy—for holding secateurs, pruning saw, sharp pruning knife, oil-stone, oil-can, pot of coal tar, a brush and a bottle of disinfectant.

A good pair of secateurs is essential and they must be kept sharp and smooth. Every pruning cut causes a wound, but wounds of small diameter soon callus over provided the secateurs are sharp and clean. Many pruners try to cut with their secateurs some of the larger limbs, and thus strain both the secateurs and their own wrists, while generally hacking the limb off and leaving rough edges which harbour pests, and facilitate the entry of fungous diseases. All large cuts should, therefore, be made with a saw which, like the secateurs, should be both sharp and clean.

A sharp pruning knife is necessary for trimming the rough edges left by the saw, for, if they are not pared, callus formation is slow and the wound may not heal.

The need for an oilstone and oil is obvious. A rub of the secateur blades on the oil-stone now and again keeps them keen and sharp, and makes the work much easier.

Pruners should always have with them a pot of coal tar, for tar is a disinfectant as well as a wood preservative, and being pliable, makes a good surface covering. After pruning one tree and before going on to the next it is advantageous to paint all large cuts over with coal tar. The operation takes only a couple of minutes, and will help the tree considerably.

Both secateurs and saw often require disinfecting, for many diseases can be transferred from tree to tree by these implements. A strong solution of either formalin or corrosive sublimate rubbed over the blade with a rag will reduce any risk.

The foregoing suggestions are valuable, as fruit trees on which a man depends for his living and which he expects to keep him for many years deserve the best treatment possible in regard to pruning as well as to cultivation and manuring.

—R. L. Prest.

TALL-GROWING VARIETIES OF BANANAS.

At present, the standard commercial banana is the Cavendish, of relatively low-growing form.

Although some of the tall-growing types—such as the Gros Michel, Williams' Hybrid, Vernon, and Mons Marie—have been in cultivation in small areas for a long period, the demand for suckers of these varieties has only recently become of any consequence. In certain favoured localities, they may yet become as popular as the shorter-growing Cavendish.

The fruit of some tall-growing varieties compares favourably with the Cavendish in both size and quality, while their carrying capacity is frequently superior.

Under ordinary conditions, cultural methods applicable to the Cavendish banana can be used for tall varieties. They respond to approved desuckering systems used for the Cavendish and, generally speaking, yield a greater weight of fruit per acre. The returns per acre from tall varieties are thus sometimes better than those received from the more widely grown Cavendish.

WINTER ACTIVITIES IN THE ORCHARD.

Clean up all orchards and vineyards, destroy all weeds and rubbish around the trees likely to harbour pests of any kind, and keep the surface of the soil well stirred, so as to give the birds and predaceous insects every chance to destroy any fruit fly pupæ which may be harbouring in the soil. If this is done, many pests that would otherwise find shelter and thus be able to live through the winter will be exposed to both natural enemies and cold.

Pruning can be started on fruit trees which have shed their leaves towards the end of the month, as it is a good plan to get this through as early in the season as possible instead of putting off until spring. Early-pruned trees develop their buds better than those pruned late in the season. These remarks refer to trees—not vines. (The later vines are pruned in the season the better in the Granite Belt District, as the late-pruned vines stand a better chance of escaping injury by late spring frosts.) All worthless, badly diseased, or worn-out trees that are no longer profitable, and which are not worth working over, should be taken out and burnt, as they are both valueless and a harbour for pests.

Land intended for new orchards should be got ready at once. The preparation of the land should be thorough. All stumps and roots should be removed to a depth sufficient to ensure their not impeding cultivation by coming in contact with implements The preliminary cultivation should consist of a light ploughing of a depth sufficient to turn the weeds or grasses so that their roots are exposed, followed by cross ploughing and harrowing, whereby light roots, &c., are collected and removed. When perennial weeds, of which couch grass is a fair sample, are eliminated, the land should be ploughed and cross ploughed as deeply as possible, and the soil reduced to a fine tilth. Where subsoiling can be practised, it is a decided advantage in admitting root penetration and conservation of moisture.

PREPARING LAND FOR SPRING PLANTING OF PINEAPPLES.

The early preparation of land for the spring planting of pineapples is desirable, and areas to be planted should be ploughed now, as deeply as the implements available and the depth of the surface soil will permit. If possible, this ploughing should be followed by at least one subsoiling. On no account should the subsoil be brought to the surface. The land should be left in the rough for some time; and, later, ploughed and cultivated to an even tilth. It will then be in good condition for planting at a favourable opportunity in the spring. It should be borne in mind that a stand of pineapples remains in the ground for several years, and, consequently, deep cultivation should be done before planting.

Adequate preparation, as suggested, improves both the aeration and moisture-holding capacity of the soil and thus enables root growth to develop under the most favourable conditions. This is most important, since the first few months of the life of a pineapple plantation largely determine its productivity. Furthermore, as has been amply demonstrated, vigorously growing plants are highly resistant to disease.

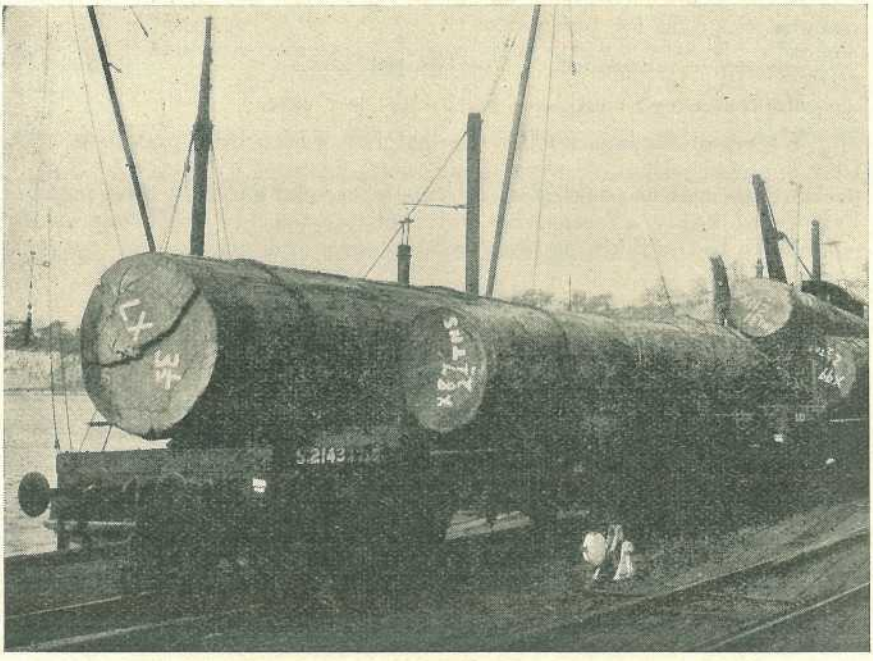


Plate 37.
Mill logs at the waterside at Brisbane awaiting shipment.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

JUNE was remarkable for some of the coldest weather experienced in Southern Queensland for a long time. This has had a very adverse effect on the fruit prices, particularly for citrus fruits. This year an exceptionally large crop of custard apples also affected the citrus fruit demand. Prevailing prices during the last week of June:—

Bananas.

Brisbane.—Cavendish: Sixes, 5s. to 11s. 6d.; Sevens, 7s. 6d. to 13s. 6d.; eights and nines, 10s. 6d. to 14s. 6d.; per dozen 1¼ to 5d.

Melbourne.—Cavendish: Sixes, 11s. to 13s.; sevens, 13s. to 15s.; eights and nines, 15s. to 17s.

Sydney.—Cavendish: Sixes, 10s. to 14s.; sevens, 14s. to 16s.; eights and nines, 16s. to 19s.

Brisbane.—Lady Fingers, 2d. to 6d.

Brisbane.—Sugars, 1½d. to 2½d.

Growers will have to exercise care in the selection of well-filled fruit before packing.

Pineapples.

Brisbane.—Smoothleaf, 4s. to 6s. per case, 1s. to 5s. per dozen; Roughs, 4s. to 5s. 6d. per case.

Sydney.—Smoothleaf, 7s. to 10s. per case.

Melbourne.—Smoothleaf, 6s. to 10s. per case.

Water blister has, during the last few weeks, been prevalent. The time has come when, to avoid heavy loss, growers will have to take all precautions such as packing-shed hygiene, careful handling, and packing. Periods of heavy affection by water blister tend to make buyers lose confidence in the fruit, causing reduced sales and prices.

Custard Apples.

Brisbane.—2s. 6d. to 4s. 6d. per half-bushel case.

Sydney.—4s. to 7s. per half-bushel case.

Melbourne.—4s. to 6s. per half-bushel case.

Supplies have lessened and the prices of this fruit should remain firm.

Passion Fruit.

Brisbane.—First grade, 7s. to 8s.; seconds, 4s. to 6s.

Sydney.—First grade, 4s. to 10s.

Melbourne.—First grade, 10s. to 12s.

Papaws.

Brisbane.—Yarwun, 4s. to 7s. per tropical case; Gunalda, 4s. to 5s. per bushel case; Locals, 2s. to 3s. 6d. per bushel case.

Sydney.—Yarwun, 7s. to 11s. per tropical case.

Melbourne.—Yarwun, 8s. to 12s. per tropical case.

Too many green papaws are being supplied to all markets. Under winter conditions the fruit should be allowed to ripen to show half colour.

Strawberries.

Brisbane.—5s. to 9s. per dozen boxes; Specials, to 14s.

Sydney.—Trays, 4s. to 6s.; Boxes, 12s. to 15s.

Care should be exercised to exclude all berries showing the effects of the weather.

CITRUS FRUITS.

Oranges.

Brisbane.—Navels, 4s. to 7s.; commons, 3s. to 5s.

Mandarins.

Brisbane.—Gayndah Glens, 6s. to 10s. per bushel case; Scarlets, 2s. 6d. to 6s., a few special higher; Emperor, 2s. 6d. to 6s.

Grape Fruit.

Brisbane.—Locals, 4s. to 7s. per bushel case; Gayndah, 11s. to 13s. per bushel case.

Lemons.

Brisbane.—Gayndah, 7s. to 12s. per bushel case; Locals, 4s. to 6s. per bushel case.

Cold weather is having a very adverse effect on prices. Growers are well advised to send regular small consignments instead of large irregular ones.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Stanthorpe (Granny Smith), 7s. to 10s. 6d. per bushel case.

Brisbane.—Southern Apples, Jonathan, 7s. to 11s.; Cleo, 7s. to 8s. 6d.; Scarlets, 6s. to 8s.; Sturmer, 5s. to 7s.; other varieties to 7s. 6d.

Many lines of apples, obviously not out of cold stores, are showing signs of sleepiness, making sales hard.

Quinces.

Brisbane.—7s. to 8s. per bushel case.

Pears.

Brisbane.—Winter Cole, 10s. to 13s.; Josephine, 7s. to 12s.; Beurre Bose, 6s. to 8s.; Packhams, 7s. to 9s.; W. Nietis, 6s. to 11s.

OTHER FRUITS.

Gooseberries.

Brisbane.—6d. per lb.

Rosellas.

Brisbane.—Rosellas, 2s. 6d. to 3s. per sugar bag.

Tomatoes.

Brisbane.—Ripe, 6s. to 9s. per half-bushel case; Green, 3s. to 6s. 6d. per half-bushel case; Coloured, 6s. to 10s., a few specials higher.

Sydney.—Queensland, 6s. to 8s. per half-bushel case.

VEGETABLES.

Cauliflowers.—Small, 1s. to 3s. dozen; large, 5s. to 8s. dozen.

Cabbages.—Small, 2s. to 4s. dozen; large, 5s. to 7s. 6d. dozen.

Chokos.—6d. to 1s. 3d. dozen.

Marrows.—3s. to 4s. per case.

Cucumbers.—6s. to 7s. per case.

Beans.—6s. to 10s. sugar bag.

Peas.—5s. to 10s. sugar bag.

Lettuce.—9d. to 2s. per dozen.

PARSNIP-GROWING.

Although the parsnip is a native of England, and must therefore be classed as a temperate climate vegetable, it may be grown with reasonable success in the tropics during the winter season.

Soil for growing this vegetable should be deep, rich, and free. A good sandy loam gives excellent results. The soil should be prepared some months previously by trenching or cultivating deeply and incorporating a heavy dressing of stable manure. Organic manures should never be applied in considerable quantities immediately before planting this crop, as they frequently induce forking of the roots. At the end of the wet season the ground should be thoroughly worked up and reduced to a very fine tilth. The seed is then sown thinly and very lightly raked over, after which the soil should be rolled or well packed down with the back of a spade along the drills. The packing is necessary to ensure close contact between the seeds and the soil. A light covering of old horse manure well crumbled or old sawdust will assist germination by preventing the caking of the surface soil.

As soon as the seedlings are well up, thin them out where they are overcrowded, and when about 4 to 6 inches high thin out finally to about 8 inches apart.

Parsnip seed is usually of rather poor germinating capacity, and is practically useless unless quite fresh.

—*S. E. Stephens.*

Stock Licks and Mineral Feeds Registered for 1938.

F. B. COLEMAN, Officer in Charge Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch.

IT is required by the provisions of the "Stock Foods Acts" that every stock lick and mineral feed that is being offered for sale within the State of Queensland shall be registered annually during the month of January.

The objective of that portion of the "Stock Foods Acts" relative to this subject is to ensure that the buyer shall receive attached to each package of stock lick or mineral feed a label setting out in uniform terms the Acts' requirements—the materials being subject to check analysis by the Department of Agriculture and Stock to ensure that the guarantees are lived up to.

A list of the various preparations that have been registered up to the date of publication, is attached. This sets out the name of the preparation, the maximum percentage of salt and the minimum percentages of phosphoric acid (P_2O_5), Lime (CaO), Magnesia (MgO), Iron (Fe), Sulphur (S). Where these are present in more than one form the respective minimum percentage of each form is shown. The proportion of iodine present is declared in terms of ounces of potassium iodide per ton. The maximum percentage of any meal and percentage of molasses are shown—also the names of any other materials that may be present, and the name and address of the Queensland wholesale seller.

It will be observed that the method of labelling licks and mineral feeds includes the stating of the percentages of the various chemical constituents contained in the ingredients used therein—the percentage of the actual material used is not shown except in the case of meals, molasses and salt. For instance, with bone, bone char, dicalcium phosphate, Nauru phosphate and superphosphate the percentages of phosphoric acid and lime are shown; with magnesium sulphate (Epsom salts) the percentage of magnesia; and with iron sulphate and limonite the percentage of iron.

In other words as sterilised bone is supplied to animals for its phosphoric acid and lime content, the percentages of these constituents are declared on the label.

At present there are some licks upon the market, upon whose labels the percentage of lime—contained in the phosphoric acid carrying materials has not been shown; also there are some labels that show the proportion of magnesium sulphate and iron sulphate instead of the percentage of magnesium and iron. In such cases the figures quoted in the table have been calculated and inserted in terms of lime (CaO), magnesia (MgO), and iron (Fe).

These labels are in the transition stage and as they are reprinted will be brought into line.

When a lick or mineral feed contains over 50 per cent. of food materials the percentages of crude protein, crude fat, and crude fibre are shown.

In the table it will be found that the block licks have been grouped together at the end.

Purchasers would be well advised to never accept delivery of any licks or mineral feeds to which the necessary labels are not attached.

In the event of any complaints they should *at once* communicate with the Department in order that the necessary investigation may be undertaken.

STOCK LICKS AND MINERAL FEEDS.

PURPORTING TO COMPLY WITH SECTION 3 OF "THE STOCK FOODS ACTS" FOR THE YEAR 1938—COMPILED TO 15TH JUNE, 1938.

Sold under Name of—	Sellers Guarantee.									Queensland Wholesale Seller.
	Phosphoric Acid (P_2O_5.)	Lime (CaO)	In the Form of—	Maximum Salt.	Magnesia (MgO)	Iron (Fe)	Sulphur (S)	Potassium Iodide Oz. to ton	Other Ingredients(Maximum).	
	%	%		%	%	%	%			
"Acco" Salt Lick ..	6·2	8·9	Sterilised bone meal	60·0	0·1	*0·2	4·8	33½	Molasses .. .. 2·5	Australian Chemical Co. Ltd., Brisbane
	..	5·0	Calcium carbonate						Sodium bicarbonate	
Aminac Concentrated Sheep Lick	15·0	20·8	Sterilised bone meal	..	..	..	..	..	Flavouring matter	J. Kitchen and Sons Pty. Ltd., Brisbane
	8·0	8·0	Di-calcium phosphate							
"Austral" Medicated Pig Lick	12·0	14·5	Sterilised bone flour	16·0	..	..	..	16	Meat meal .. .. 5·5	Taylors Elliotts Veterinary Co., Brisbane
	..	15·9	Carbonate of lime							
"Austral" Medicated Stock Lick	3·0	3·0	Di-calcic phosphate	39·0	0·7	*0·3	1·7	1½	Cotton seed meal .. 8·6	Taylors Elliotts and Australian Drug Pty. Ltd., Brisbane
	13·0	17·0	Nauru phosphate							
"Austral" Medicated Stock Lick (with Molasses)	2·7	2·1	Di-calcic phosphate	33·0	0·6	*0·3	1·7	1½	Cotton seed meal .. 8·0	Taylors Elliotts Veterinary Co., Brisbane
	11·2	13·3	Nauru phosphate						Molasses .. .. 18·0	
Blue Cross Di-calcic Concentrated Stock Lick	18·5	26·9	Sterilised bone flour	..	..	†1·5	..	..	..	Dalgety and Co. Ltd., Brisbane
	7·4	6·8	Di-calcic phosphate							
	5·6	7·8	Nauru rock phosphate							
Bone and Salt Lick	15·0	18·0	Sterilised bone meal ..	36·0	..	..	..	..	..	Central Queensland Meat Export Co. Ltd., Rockhampton
Borthwicks Bomo Poultry Tonic	14·0	16·0	Sterilised bone meal	36·0	0·2	*0·2	2·8	30	..	Thos. Borthwick and Sons (Aust.) Ltd., Brisbane
	..	5·3	Calcium carbonate							
Borthwicks Iodised Poultry Tonic	12·0	16·0	Sterilised bone meal	35·0	0·3	*0·2	3·0	30	..	Thos. Borthwick and Sons (Aust.) Ltd., Brisbane
	..	7·0	Hydrated lime..							
Borthwicks T.B. and S. Moreton Bonolik for Stock	12·0	16·0	Sterilised bone meal ..	46·0	0·2	*0·2	2·8	30	..	Thos. Borthwick and Sons (Aust.) Ltd., Brisbane
Borthwicks T.B. and S. Moreton Salbolik	8·0	11·0	Sterilised bone meal ..	66·0	..	..	..	..	..	Thos. Borthwick and Sons (Aust.) Ltd., Brisbane
Chic-A-Vite	2·7	3·6	Bone flour ..	..	1·4	*1·8	1·8	12	Meal from rice .. .. 16·5	Webster Bros. Pty. Ltd., Brisbane
	18·0	24·0	Bone char ..						Cod liver oil .. .. 2·0	
Dalco Stock Lick 1 ..	13·0	17·5	Rock phosphate	35·0	0·6	*0·5	2·5	16	Molasses .. .. .. 5·0	Dalgety and Co. Ltd., Brisbane
	3·5	4·6	Sterilised bone meal							
Darling Downs Iodised Phosphate Lick	1·5	2·0	Sterilised bone meal	78·0	..	..	..	3	Pollard .. .. .. 12·5	Darling Downs Stock Feed Factory, Mackay
	2·5	3·0	Nauru phosphate							
"Emu" Medicated Pig Lick	12·0	14·5	Sterilised bone flour	16·0	..	..	..	..	Meat meal .. .. 5·5	Campbell Bros. Pty., Ltd., Brisbane
	..	15·9	Carbonate of lime							
"Emu" Medicated Stock Lick	3·2	2·5	Di-calcic phosphate	39·0	0·8	*0·3	1·7	1½	Cotton seed meal .. 9·5	Campbell Bros. Pty. Ltd., Brisbane
	13·0	15·5	Nauru phosphate							
"Emu" Medicated Stock Lick (with Molasses)	2·5	2·0	Di-calcic phosphate	34·0	0·7	*0·20	1·4	1½	Cotton seed meal .. 7·5	Campbell Bros. Pty. Ltd., Brisbane
	11·0	13·2	Nauru phosphate						Molasses .. .. 17·0	
Eucalick Medicated Sheep Lick	4·0	5·0	Bone char	78·0	..	..	1·0	..	Molasses .. .. 5·0	McGlew and Co., Brisbane
									Fish oil	
									Eucalyptus oil	

F.D.L. Nutro-Lik	12·5 ..	15·0 12·5	Bone Lime carbonate	24·0	..	*0·30	..	..	Glaubers salt	Fertilisers Distributers Pty. Ltd., Brisbane
G.B.A. Lick No. 1	3·4	4·1	Bone char	70·0	..	*0·15	0·7	..	Molasses 5·0 Cod oil Eucalyptus oil	Graziers Benefit Association, Brisbane
G.B.A. Lick No. 2	3·5	4·2	Bone char	71·0	..	*0·16	0·8	..	Molasses 5·0 Char coal	Graziers Benefit Association, Brisbane
G.B.A. Lick No. 3	4·0	4·8	Bone char	81·0	..	*0·18	0·9	..	Molasses 5·0	Graziers Benefit Association, Brisbane
G.B.A. Lick No. 4	4·0	4·8	Bone char	80·0	..	..	0·8	..	Molasses 5·0 Cod oil Eucalyptus oil	Graziers Benefit Association, Brisbane
Gilmour's Poultry Powder	1·6 5·7 ..	2·2 6·8 8·5	Sterilised bone meal Nauru phosphate Shell grit	12·0	1·4	*0·4	2·0	..	Meal from meat Linseed and wheat germ 16·0 Charcoal, cayenne, quassia, ginger, fenugreek	J. F. Finn, Brisbane
Hibiscus National Stock Lick	14·5	19·6	Nauru phosphate	40·0	0·8	*0·8	2·0	..	Molasses 6·0	Queensland Pastoral Supplies Ltd., Brisbane
Hibiscus Special Bone Meal Lick	8·2	10·0	Sterilised bone flour	50·0	0·9	*0·5	2·8	..	Molasses 8·0	Queensland Pastoral Supplies Ltd., Brisbane
Hibiscus Special Ewe Lick	8·0	10·6	Bone meal	30·0	0·7	*0·4	5·0	..	Molasses 8·0 Cotton seed meal 25·0	Queensland Pastoral Supplies Ltd., Brisbane
D. Iodolik Mineral Supplement for Cattle	0·4 16·5	0·7 19·0	Sterilised bone.. Nauru phosphate	34·0	0·6	*0·2	1·2	20	Peanut meal 11·0	Denhams Pty. Ltd., Brisbane
D. Iodolik Mineral Supplement for Pigs	11·1 1·2 ..	13·2 1·5 5·0	Nauru phosphate Sterilised bone.. Calcium carbonate	16·0	0·3	*0·2	4·9	20	Meat meal 11·0 Bicarbonate of soda Charcoal Glaubers salt	Denhams Pty. Ltd., Brisbane
Kwik-Lik	8·0 6·0	10·8 7·9	Rock phosphate Sterilised bone meal	45·0	0·3	*0·4	2·0	..	..	A.C.F. and Shirleys Fertilizers Ltd., Brisbane
"Lix-All" Vitality Stock Lick	11·0	13·0	Bone char	53·0	0·2	*0·3	1·8	2	Molasses 5·0 Wheat by-product 5·0	Queensland Primary Producers Co-operative Association Ltd., Brisbane
Mactaggarts No. 1 Concentrated Lick	7·5 4·5 4·0	9·0 5·5 3·0	Bone flour Bone charcoal Di-calcic phosphate	..	..	*1·0	5·0	..	Cotton seed meal 30·0 Soda bicarbonate 5·0	Mactaggarts Primary Producers Co-operative Association Ltd., Brisbane
Mactaggarts No. 2 Lick Dry Time and Ewe Lick	12·5	15·0	Bone flour	37·0	..	..	..	..	Cotton seed meal 10·0 Molasses 5·0	Mactaggarts Primary Producers Co-operative Association Ltd., Brisbane
Mactaggarts No. 3 Medicated Tonic Lick	4·5	5·5	Bone char	75·0	0·3	*0·2	2·0	..	Molasses 3·0 Dugong and cod oils Eucalyptus and flavouring matter	Mactaggarts Primary Producers Co-operative Association Ltd., Brisbane
Osmonds "Concentrated" Lick for Cattle	9·0 ..	12·0 6·6	Sterilised bone meal Calcium carbonate	..	1·3	*0·4	2·2	15	Peanut, linseed, pea, rice, and locust bean 31·0 Bicarbonate of soda, fenugreek, caraway, cod liver oil, liquorice and colouring matter	Flynn Bros., Brisbane
Osmonds "Toneca" Stock Lick	6·0 ..	7·9 2·5	Sterilised bone meal Calcium carbonate	75·0	0·1	*0·2	2·5	14	..	Flynn Bros., Brisbane

* Iron as sulphate. † Iron as limonite.

Except with respect to Salt, Meals, and Molasses, all percentages declared are minima.

STOCK LICKS AND MINERAL FEEDS—*continued.*

PURPORTING TO COMPLY WITH SECTION 3 OF "THE STOCK FOODS ACTS" FOR THE YEAR 1938—COMPILED TO 15TH JUNE, 1938.

Sold under Name of—	Sellers Guarantee.									Queensland Wholesale Seller.
	Phosphoric Acid (P_2O_5)	Lime (CaO)	In the Form of—	Maximum Salt.	Magnesia (MgO)	Iron (Fe)	Sulphur (S)	Potassium Iodide Oz. to Ton	Other Ingredients (Maximum).	
	%	%		%	%	%	%			%	
Our Salt Lick for Dairy Herds	3·0 6·5	3·6 7·8 2·0	Sterilised bone meal Nauru phosphate Burnt lime ..	58·0	0·7	*0·4	1·3	16	Saltpetre		Atherton Tableland Co-operative Butter Association Ltd., Atherton
Pegalick (Concentrated) ..	14·4	19·2	Bone meal	35·6	..	*0·2	4·7	19	Cupric sulphate		Bryce Ltd., Brisbane
									Molasses	4·4	
Por-Co-Vite	6·0 13·2	8·0 10·7	Bone flour .. Bone char ..	12·8	0·83	*0·3	10·0	24	Cod liver oil	3·0	Webster Bros. Pty. Ltd., Brisbane
	..	5·6	Calcium carbonate								
Prophylactic Blue Cross Stock Lick	..	0·28	Calcium sulphate ..	86·0	0·4	*0·4	2·6	..	Molasses	4·0	Dalgety and Co. Ltd., Brisbane
									Soda carbonate		
"Red Comb" Minlik	13·8	16·5	Sterilised bone flour ..	..	3·4	*3·1	5·2	48	..		Poultry Farmers Co-operative Society Ltd., Brisbane
"Red Comb" Iodised Stock Lick	1·2	1·5	Sterilised bone flour ..	95·0	0·3	*0·3	0·5	4·4	..		Poultry Farmers Co-operative Society Ltd., Brisbane
"United" Lick No. 1	15·0	18·0	Bone flour	38·0	..	..	..	..	Molasses	5·0	United Chemical Co. Pty. Ltd., Brisbane
"United" Lick No. 2	12·5	15·0	Bone flour	36·0	..	..	..	..	Cotton seed meal ..	10·0	United Chemical Co. Pty. Ltd., Brisbane
									Molasses	5·0	
Vic-Lic Concentrated Cattle Lick	11·2 16·8	11·2 21·0	Di-calcic phosphate Bone char ..	5·0	..	†2·45	..	16	Rice meal	16·0	Wilcox Mofflin Ltd., Brisbane
Vic-Lic Concentrated Sheep Lick "D"	11·2 16·8	11·2 21·0	Di-calcic phosphate Bone char ..	..	..	†2·45	..	16	Sodium sulphate		Wilcox Mofflin Ltd., Brisbane
									Rice meal	18·0	
Vic-Lic Concentrated Sheep Lick "G"	11·2 16·8	11·2 21·0	Di-calcic phosphate Bone char ..	..	..	†4·9	..	16	Rice meal	18·0	Wilcox Mofflin Ltd., Brisbane
Vic-Lic Mixed Sheep Lick "D"	2·2 3·3	2·2 4·1	Di-calcic phosphate Bone char ..	75·0	..	†0·49	..	3	Sodium sulphate		Wilcox Mofflin Ltd., Brisbane
									Rice meal	4·0	
									Molasses	5·5	
Vic-Lic Mixed Sheep Lick "G"	2·2 3·3	2·2 4·1	Di-calcic phosphate Bone char ..	75·0	..	†0·98	..	3	Rice Meal	4·0	Wilcox Mofflin Ltd., Brisbane
									Molasses	5·5	
Vita-Lick Cattle Lick Concentrated "D"	4·1 11·2 0·47	5·5 15·0 0·5	Bone flour .. Bone char .. Meat meal ..	..	1·33	*0·9	2·1	16	Meal from rice	27·2	Webster Bros. Pty. Ltd., Brisbane
									Meal from cocoa ..	7·8	
									Meat meal	3·6	
Vita-Lick Cattle Lick Concentrated "G"	2·5 17·5 0·55	3·3 23·4 0·6	Bone flour .. Bone char .. Meat meal ..	..	1·33	*1·8	2·1	16	Meal from rice	5·3	Webster Bros. Pty. Ltd., Brisbane
									Meal from cocoa ..	10·6	
									Meat meal	4·5	

Vita-Lick Cattle Lick Mixed "D"	0·75 2·0 0·09	1·0 2·7 0·1	Bone flour .. Bone char .. Meat meal ..	74·0	0·24	*0·17	0·39	3	Molasses .. .. Meal from rice .. .. Meal from cocoa .. Meat meal ..	5·2 5·0 1·4 0·7	Webster Bros. Pty. Ltd., Brisbane
Vita-Lick Cattle Lick Mixed "G"	0·46 3·2 0·1	0·61 4·3 0·1	Bone flour .. Bone char .. Meat meal ..	74·0	0·24	*0·35	0·39	3	Molasses .. .. Meal from rice .. .. Meal from cocoa .. Meat meal ..	5·3 1·0 2·0 0·8	Webster Bros. Pty. Ltd., Brisbane
Vita-Lick Concentrated "D"	4·2 8·8	5·6 11·7	Bone flour .. Bone char ..	..	1·3	*1·7	8·0	16	Meal from rice .. .. Meal from cocoa ..	26·0 10·0	Webster Bros. Pty. Ltd., Brisbane
Vita-Lick Concentrated "G"	2·5 17·0	3·3 22·6	Bone flour .. Bone char ..	..	1·3	*1·7	8·0	16	Meal from rice .. .. Meal from cocoa ..	4·4 10·8	Webster Bros. Pty. Ltd., Brisbane
Vita-Lick Extra Strength Mixed "D"	1·3 2·7	1·75 3·6	Bone flour .. Bone charcoal	62·0	0·4	*0·55	2·5	5	Molasses .. .. Meal from rice .. .. Meal from cocoa ..	4·7 8·0 3·1	Webster Bros. Pty. Ltd., Brisbane
Vita-Lick Extra Strength Mixed "G"	0·8 5·3	1·1 7·0	Bone flour .. Bone char ..	62·0	0·4	*0·55	2·5	5	Molasses .. .. Meal from rice .. .. Meal from cocoa ..	1·4 3·4 2·2	Webster Bros. Pty. Ltd., Brisbane
Vita-Lick Mixed "D" ..	0·8 1·6	1·1 2·1	Bone flour .. Bone char ..	75·0	0·25	*0·33	1·5	3	Molasses .. .. Meal from rice .. .. Meal from cocoa ..	4·0 5·0 2·0	Webster Bros. Pty. Ltd., Brisbane
Vita-Lick Mixed "G" ..	0·47 3·2	0·63 4·3	Bone flour .. Bone char ..	75·0	0·25	*0·33	1·5	3	Molasses .. .. Meal from rice .. .. Meal from cocoa ..	3·5 0·85 2·0	Webster Bros. Pty. Ltd., Brisbane
V.M.M. Vita-Lick Mineral Mixture	1·4 8·0	1·9 10·7	Bone flour .. Bone char ..	4·5	0·53	*0·45 ‡0·15	1·2	..	Meal from rice .. .. By-product of cocoanut Min. crude protein .. Min. crude fat .. .. Max. crude fibre ..	50·0 8·8 7·5 7·8 3·1	Webster Bros. Pty. Ltd., Brisbane
Wagstaffs Medicated Stock Salt	3·1 1·6 3·5	3·1 2·2 4·7	Di-calcic phosphate Sterilised bone meal Nauru phosphate	62·0	..	*1·5	1·5	20	Molasses .. .. Bicarbonate of soda .. Bitter aloes .. Oil of aniseed ..	5·2	Australian Disinfectant Co., Brisbane
Wagstaffs Medicated Stock Salt (New Formula)	3·4 4·0 2·8 ..	4·1 4·5 2·2 4·2	Sterilised bone meal Nauru phosphate Di-calcic phosphate Limestone ..	41·0	..	*0·3	1·5	20	Bran .. .. .. Cotton seed meal .. Bran .. .. .. Bicarbonate of soda .. Bitter aloes .. Oil of aniseed ..	5·0 10·5 5·0	Australian Disinfectant Co., Brisbane
Wagstaffs Medicated Stock Lick No. 3	5·0 3·7 ..	6·6 5·0 2·5	Sterilised bone flour Nauru phosphate Pulverised limestone	53·0	..	*0·3	1·5	20	Bran .. .. .. Molasses	6·0 6·0	Australian Disinfectant Co., Brisbane
Woolgro	13·0	14·0	Sterilised bone flour ..	..	..	..	..	..	Cotton seed meal .. .. Meat meal .. .. .. Cobalt chloride .. .. Min. crude protein .. 36·0 Min. crude fat .. .. 5·0 Max. crude fibre .. 5·0		Queensland Pastoral Supplies Pty. Ltd., Brisbane

* Iron as sulphate. † Iron as limonite. ‡ Iron as oxide.

Except with respect to Salt, Meals, Crude Fibre, and Molasses, all percentages declared are minima.

STOCK LICKS AND MINERAL FEEDS—*continued.*

PURPORTING TO COMPLY WITH SECTION 3 OF "THE STOCK FOODS ACTS" FOR THE YEAR 1938—COMPILED TO 15TH JUNE, 1938.

Sold under Name of—	Sellers Guarantee.									Queensland Wholesale Seller.
	Phosphoric Acid (P_2O_5)	Lime (CaO)	In the Form of—	Maximum Salt.	Magnesia (MgO)	Iron (Fe)	Sulphur (S)	Potassium Iodide Oz. to Ton	Other Ingredients (Maximum).	
	%	%		%	%	%	%	Oz.		
BLOCKS.										
Carbofos Mineralised Block (Black)	2·4	3·2	Bone char ..	77·0	0·8	*0·1	..	..	Flavouring matter	Webster Bros. Pty. Ltd., Brisbane
	1·2	1·6	Superphosphate							
	0·7	0·95	Rock phosphate							
	..	2·0	Calcium hydrate							
Hibiscus Salt Block (Iodized) ..	..	..	..	99·0	..	..	..	7	..	Queensland Pastoral Supplies Pty. Ltd., Brisbane
Hibiscus Salt Block (Sulphurized)	..	..	..	97·0	..	..	1·5	..	..	Queensland Pastoral Supplies Pty. Ltd., Brisbane
"J.J." Salt Lick	..	..	..	100·0	..	..	..	..	..	J. Jackson and Co. (produce and Seeds) Pty. Ltd., Brisbane
Ram Stock Lick	..	..	..	100·0	..	..	..	..	..	T. McWilliam and Co. Ltd., Brisbane
Vita-Lick Mineralised Block (White)	1·4	1·9	Superphosphate	82·0	0·83	*0·1	..	..	Flavouring matter	Webster Bros. Pty. Ltd., Brisbane
	0·75	1·0	Rock phosphate							
	..	2·0	Calcium hydrate							
Vita-Lick Red Blocks ..	1·4	1·9	Superphosphate	82·0	0·83	*0·05	..	4	..	Webster Bros. Pty. Ltd., Brisbane
	0·75	1·0	Rock phosphate			‡0·5				
	..	2·0	Calcium hydrate							

* Iron as sulphate. † Iron as limonite. ‡ Iron as oxide.

Except with respect to Salt, Meals, and Molasses, all percentages declared are minima.

From the preceding table it will be observed that the chief sources of Phosphoric acid and Lime are Bone, Di-calcic phosphate and Nauru phosphate.

The following table sets out the guaranteed contents of these materials being offered for sale within Queensland.

Sold under Name of—	Minimum Phosphoric Acid P_2O_5.	Minimum Lime CaO.	Minimum Crude Protein.	Minimum Crude Fat.	Maximum Salt.	Queensland Wholesale Seller.
	%	%	%	%	%	
Bone (Sterilised)—						
A.C.F. Sterilised Bone Meal	24·0	31·5	13·0	..	..	A.C.F. and Shirleys Fertilizers Ltd., Brisbane
Calphos	25·0	30·0	20·0	..	..	Queensland Meat Industry Board, Brisbane
Hibiscus Sterilised Bone Flour	25·0	30·0	20·0	..	..	Queensland Pastoral Supplies Pty. Ltd., Brisbane
Sterilised Bone Meal	28·0	32·0	12·5	..	..	Central Queensland Meat Export Co. Ltd., Rockhampton
Tri-Cal-Os Sterilised Bone Flour	32·5	40·0	5·0	..	..	Glues and By-Products Pty. Ltd., Brisbane
Bone (Green)—						
Borthwicks Ground Green Bone for Poultry	19·0	27·0	30·0	3·0	..	Thomas Borthwick and Sons, Australia, Ltd., Brisbane
Di-Calcium Phosphate—						
Commonwealth Di-Calcic Phosphate	38·0	38·0	..	..	..	A.C.F. and Shirleys Fertilizers Ltd., Brisbane
Nauru Phosphate (Feeding)—						
Finely Ground Nauru Phosphate	37·0	43·0	..	..	..	Gibbs Bright and Co., Brisbane
Shirleys Finely Ground Nauru Phosphate Rock	37·0	43·0	..	..	..	A.C.F. and Shirleys Fertilizers Ltd., Brisbane
Meat and Bone Meals—						
Borthwicks Mebo Meal	8·0	9·6	52·0	10·0	..	Thomas Borthwick and Sons, Australia, Ltd., Brisbane
Excelsior Meat and Bone Meal	16·0	19·0	37·5	9·0	..	Denhams Pty. Ltd., Brisbane
Meat Meals—						
Hibiscus Phosfomeat	2·5	2·5	63·0	8·0	4·0	Queensland Pastoral Supplies Pty. Ltd., Brisbane
Protein Meal	..	..	62·0	8·0	4·0	Queensland Meat Industry Board, Brisbane
"Red Comb" Poultry Food No. 2	2·5	3·0	63·0	10·0	4·0	Poultry Farmers Co-operative Society Ltd., Brisbane
Sterilised Liver Meal	..	..	60·0	15·0	..	Central Queensland Meat Export Co. Ltd., Rockhampton

Farmers' Winter School.

THE students at the school of instruction in pig raising and dairying at the Queensland Agricultural College in June were an uncommonly keen group of practical farmers. But, as one of them remarked, there is always something more to be learned in these days of scientific farming methods. And so they had attended the annual school at Lawes to hear what the lecturer-experts of the College and the Department of Agriculture and Stock had to say on the theoretical side, to see what they had to show in practical demonstrations, to observe how some theories have worked out in practice at the College, and to decide for themselves just how much of what is new can be applied with profit in the working of their own farms and in the improvement of their own stock.

An interesting personality at the school was the Rev. Father E. A. Brill, chaplain and member of the staff of the Abergowrie Christian Brothers' Agricultural College near Ingham, North Queensland. That college has been in existence for about five years, but this was the first time a representative of it had attended the winter animal husbandry course at the Queensland Agricultural College.

Father Brill, who was reared on a farm in New Zealand and who is a practical agriculturist, speaks enthusiastically of the remarkable results of experiments his college has made with Para grass, more commonly known as *Panicum muticum*. This grass, by the way, promises to be a very valuable fodder grass for dairy farmers and graziers in North Queensland. Referring to the school, he said: "It is all very well to read about things in books. To see those things being worked out in actual practice as we are seeing them at the College is what counts."

Another interesting student at the winter school was Adjutant D. V. Bignell, who is in charge of the Salvation Army Training Farm at Riverview, near Brisbane. "You can always learn something more about livestock and that is why I am attending this school," he said. In attendance also were many young farmers, and so there was a useful blend of youth and experience.

The school, as in previous years, was organised conjointly by the Departments of Public Instruction and Agriculture and Stock, with Mr. E. J. Shelton, Senior Instructor in Pig Raising of the latter department, and Mr. N. W. Briton, veterinary surgeon of the College, taking a major part in the instructional programme. The course covered the most important phases of the pig-raising industry and dairying. The College has every facility for giving detailed instruction. The piggery, dairy factory, laboratory and workshops were used for practical instruction and demonstrations, while the cinematograph and lantern were used to illustrate lectures.

A particularly useful session was the "question period" each night from 7 to 8 o'clock, when questions on the pig-raising industry and farm life generally were propounded by the students for general discussion.

On arrival, an inspection of the College activities was made by members of the school, and an inaugural address was delivered by Professor J. K. Murray.

The lecture course was opened by Mr. R. R. Keats, the College instructor in dairying, who dealt with "Milk Secretion." He also lectured on hygiene and milk products, and milk and cream testing.

Professor J. K. Murray lectured on agricultural education and bacteriology.

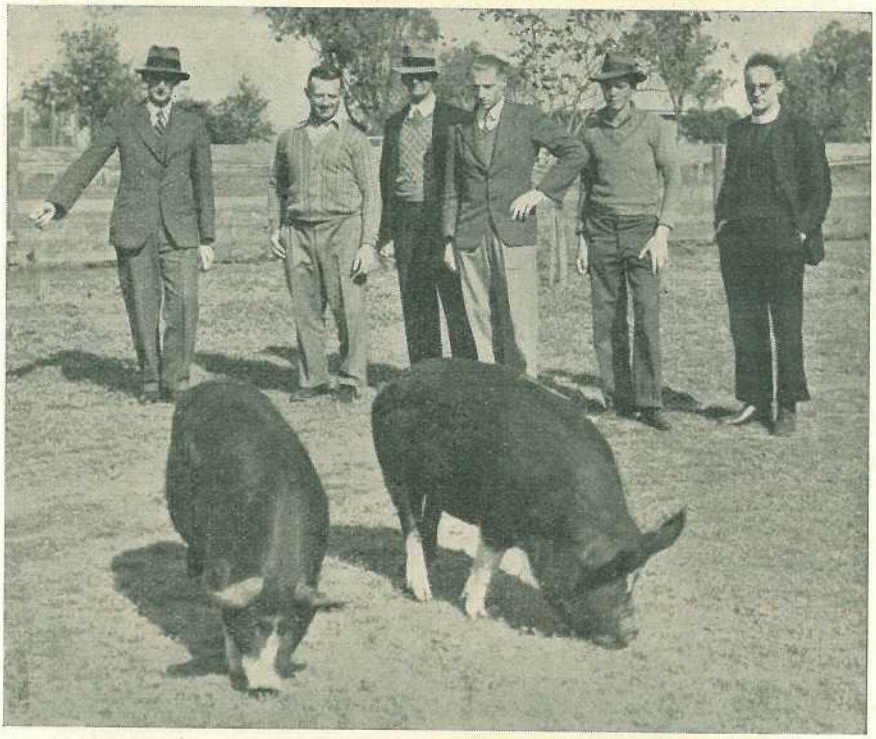


Plate 38.

AT THE FARMERS' WINTER SCHOOL AT THE QUEENSLAND AGRICULTURAL COLLEGE.—Mr. Shelton, Senior Instructor in Pig Raising, lecturing on Berkshire points.

In the picture (from left to right) are: Mr. E. J. Shelton, H.D.A.; W. L. Wolff, Adjutant W. Bignell (Principal, Salvation Army Training Farm, Riverview); Neil Briton, B.V.Sc. (Lecturer in Animal Husbandry, Queensland Agricultural High School and College); W. F. Kirkwood, and Rev. Father E. A. Brill (Chaplain and Lecturer, Abergowrie Agricultural College).

Mr. E. J. Shelton's lectures covered economic phases of the pig industry, selection and judging of pigs, identification of pigs, marketing, and project and pig clubs.

Mr. L. A. Downey, Instructor in Pig Raising, lectured on the appraisal of pig carcases.

Mr. N. W. Briton's subjects were the principles of feeding and breeding, common ailments of cattle and pigs, stock judging, and anatomy and physiology of cattle and pigs, and minor surgical operations.

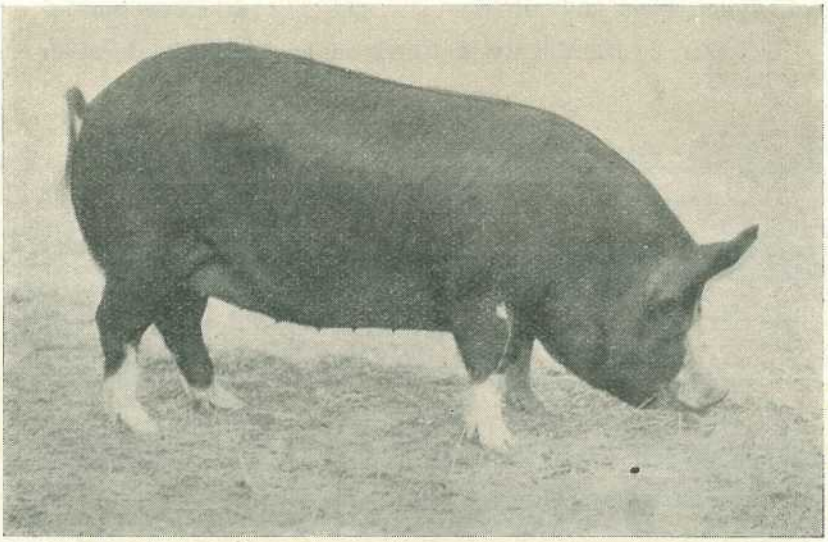


Plate 39.

"ROSELOCK LADY."—First in her class at Murgon Show. The property of Mr. Mat. Porter, Roselock, Wondai.

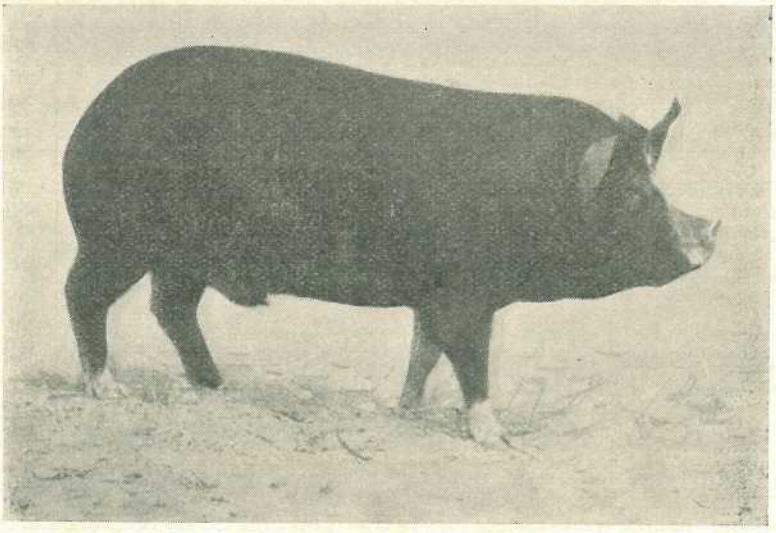


Plate 40

"QUEEN STATE PYGMALION."—First and Champion in his class at the Wondai Show, and first at Murgon. This boar, the property of Mr. Mat. Porter, was bred from stock imported by direction of the Minister for Agriculture and Stock.

Mr. R. Holmes, of the College staff, dealt with poultry breeding; Mr. P. J. Skerman, the growing of crops, soil formation, and composition of soils; Mr. S. Marriot, maize improvement; and Mr. W. T. Davis, farm book-keeping. Messrs. C. S. Christian and T. B. Paltridge lectured on subjects connected with plant breeding and pasture improvement.

Of the visiting lecturers, Dr. F. H. Roberts, of the Animal Heatlh Station, who has since gone to the United States of America on research work, talked for a session on animal parasites and their control. Dr. M. White, who is associated with the Meat Industry Board, also addressed the school on the meat industry and stock nutrition.

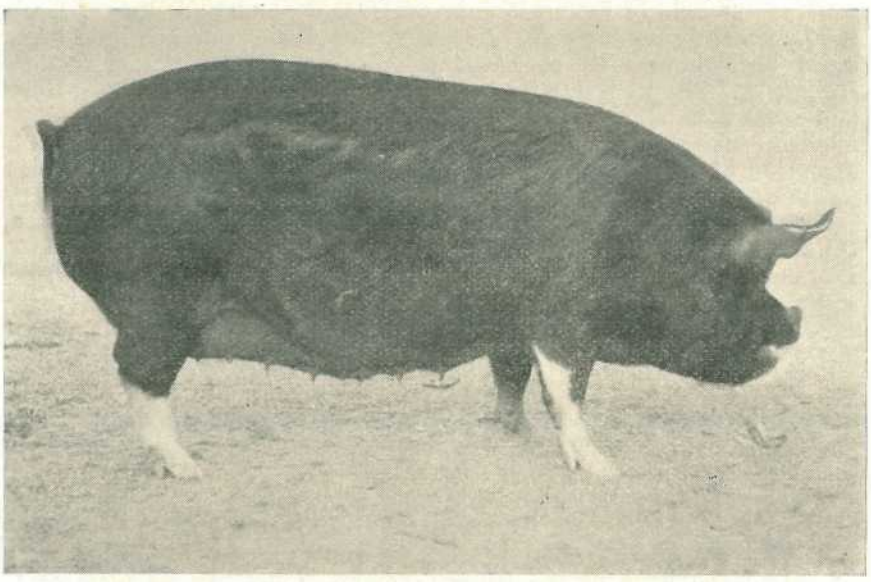


Plate 41.

"ROSELOCK ROSEY."—First and Champion in her class at the Wondai Show. This is the type of sow with which the imported boar, "Queen State Pygmalion," will be mated at Mr. Porter's Roselock Stud, Wondai.

Mr. L. Anderson, herd tester, who returned recently from a visit to Great Britain, Denmark, and other European countries, lectured on dairying and pig raising abroad. Mr. J. Ogilvie, instructor in dairying of the Department of Agriculture and Stock, lectured on various phases of the dairy industry, and Mr. G. B. Galway, inspector of accounts of the same department, discussed various aspects of agricultural economics. Other departmental lecturers were Mr. J. F. F. Reid, Editor of Publications, who spoke on "The Functions, Organisation, and Extension Services of the Department of Agriculture and Stock"; Mr. C. T. White, Government Botanist, who dealt with economic botany; and Mr. T. Abell, who talked on pig housing. Cinematograph films dealing with agricultural and other educational subjects were screened by Mr. W. J. Sanderson, official photographer, as part of the course. This year's school of instruction was one of the most popular and successful yet held.

A New Book on Plant Pest and Disease Control.

PESTS and diseases are responsible for considerable damage to valuable crops in Queensland. There is therefore a definite need for some reference publication, written in terms intelligible to the farmer or fruitgrower, containing information necessary for the diagnosis of the cause of the damage and for its effective control. This need was recognised by the Department of Agriculture and Stock some years ago in publishing "Pests and Diseases of Queensland Fruits and Vegetables" by Messrs Veitch and Simmonds, a profusely illustrated work in the field of economic entomology and plant pathology, adapted to Queensland requirements. Recently, this publication has been superseded by Volume III.* of *The Queensland Agricultural and Pastoral Handbook*. The new publication breaks a great deal of fresh ground and covers the whole field of plant pest and disease problems of any moment to agriculturalists and fruitgrowers in the State, with the exception of the problems associated with sugar-cane. As the Department sponsoring the publication is responsible for most of the entomological and plant pathological advisory and research services in Queensland, the volume constitutes a summary of the latest available information and is noteworthy for the clarity of presentation of the subject-matter.

Much of the fruitgrower's time is nowadays taken up in spraying for pest and disease control, and the farmer is also being compelled to recognise the inroads made by pests and diseases into both cultivated crops and pastures. To be successful, no one interested in fruitgrowing or agriculture can afford to be ignorant of the cause of his losses and the means of eliminating or at least reducing them. This is particularly so in Queensland, a tropical and sub-tropical State where pests and diseases are sometimes an important limiting factor to both production and development.

With the issue of the present volume, there can be little or no excuse for the mishandling of pest and disease control problems on the farm or orchard. The purchase cost is remarkably low; the presentation is as simple as the subject-matter permits, and the 254 pages contain scarcely a superfluous word. The binding is neat and serviceable, fit to ensure a place for the book on either library shelves or on a fruitgrower's packing bench for ready reference.

The subject-matter in the first part—"Insect Pests and their Control"—deals with insecticides, fruit pests, agricultural and grassland pests, vegetable pests, and general and household pests. Part II.—"Plant Diseases and their Control"—discusses fruit diseases, diseases of field crops, vegetable diseases, and the preparation of fungicides.

Altogether, the volume summarises the fund of knowledge possessed by an extensive staff of officers familiar with pest and disease problems and with the fruitgrowers' and farmers' difficulties in coping with them. It is therefore indispensable to anyone who aims at the maximum production from his property and the lessening of natural hazards in agricultural and fruitgrowing pursuits.

* *The Queensland Agricultural and Pastoral Handbook*, Volume III; Price, 3s., post free; Department of Agriculture and Stock, Brisbane.

The Apiary.

The lowest temperatures of the year usually occur during July, and the hives should not be opened, nor should any handling or manipulation of colonies be attempted at present. Disturbance of any kind in winter induces undue activity and greatly increases the consumption of stores, while the entrance of cold air not only disorganises the cluster of bees, but also may have the effect of chilling some of the brood.

The bee-keeper has an opportunity of cleaning up the apiary during this slack month. For instance, there is probably an accumulation of old cappings or faulty combs to be melted down and processed for market. Clean tins and plenty of water should be used when melting wax. The addition of an ounce of sulphuric acid to each five gallons of wax and water when boiling will help to precipitate dirt and other impurities. In the absence of sulphuric acid a small quantity of vinegar may be used. After boiling, the tins should be covered with bags in order to cool the wax slowly to prevent it from cracking. The impurities may afterwards be scraped off the bottom of each block of wax.

Another job which may be undertaken at this time is to give each hive a coat of paint. As some bees will be flying during the day, it is advisable to wear a veil. The sides, back, and top of each hive may be painted during the day and towards evening, when flight has ceased, the front of each hive may be done and the paint will be dry before the bees commence their flight on the following day.

During late winter or early spring bee-keepers often notice many dead bees lying about the entrance to the hives. This condition is usually called spring dwindling. Strictly speaking the term should only be applied to the loss of bees in the spring due to the fact that the adults have been weakened by poor wintering and die faster than they can be replaced by the emerging brood. The consumption of late gathered honey is said to be one of the contributing causes of this trouble. This late honey is often of poor quality and may be consumed in an unripe (uncapped) condition. Losses in affected colonies have been prevented by feeding the bees for a week or so with sugar syrup, which was given warm and inside the hives. If the hive population is much depleted the bees should also be made warm and comfortable by removing supers and taking away all comb not clustered upon.

The souring of honey is also prevented by the removal of surplus combs. Generally a mild change in the weather occurs in July, accompanied by some rain, which causes a small flow of new honey, after which the trouble usually disappears.

FEEDING OF CONCENTRATES.

Farmers are often averse from feeding concentrates, which impart a flavour or "taint" to the butterfat. Peanut products are a typical example. In many cases the difficulty may be overcome by feeding the material immediately after milking. The animal then is assured of sufficient time, before the next milking, in which it can utilise the constituents liable to give the off flavours.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the advanced register of the herd books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Ayrshire Cattle Society, and the Friesian Cattle Society, production charts for which were compiled during the month of May, 1938 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
Mature Cow (Standard, 350 lb.).				
Alfa Vale Gem 4th	W. H. Thompson, Manumbah road, Nanango	17,475·65	695·72	Reward of Fairfield
Sunnyside Honey 8th	P. Moore, Wooroolin	13,700·4	561·712	Bruce of Avonel
Lynthorne Mabel	G. A. Meyers, Imbil	10,460·4	420·505	Plumstone of Blacklands
Senior, 4 Years (Standard, 330 lb.).				
Folkestone Pearlie	N. Bidstrup, Warra	11,426·47	457·323	Dinkum of Thorndale
Trevor Hill Bluebell	Geo. Gwynne, Umbiram	10,237·61	422·0	Viceroy of Wilga Vale
Folkestone Mona	N. Bidstrup, Warra	8,047·65	330·936	Dinkum of Thorndale
Senior, 3 Years (Standard, 290 lb.).				
Rhodesview Biddy 12th	W. Gierke and Sons, Helidon	10,207·14	434·955	Blacklands Prospector
College Stately 6th	Queensland Agricultural High School and College, Lawes	9,398·05	389·631	College Robin
Junior, 3 Years (Standard, 270 lb.).				
Sunnyview Irene II.	J. Phillips, Sunnyview, Wondai	18,835·4	668·921	Burradale, Byron
Rhodesview Queenie 19th	W. Gierke and Sons, Helidon	10,300·23	385·174	Blacklands Prospector
Chelmer Angeline	E. O. Jeynes, Raceview	8,029·25	322·655	Chelmer Douglas
Trevor Hill Mermaid	Geo. Gwynne, Umbiram	7,744·91	320·287	Viscount of Corunna
Senior, 2 Years (Standard, 250 lb.).				
Fairvale Judy	J. H. Anderson, Southbrook	7,879·96	357·081	Blacklands Stately Major
Trevor Hill Dove	Geo. Gwynne, Umbiram	7,374·91	313·413	North Glen Emblem
Rubyvale Marina	J. Redhead, junr., Indooroopilly	6,923·59	307·619	Blacklands Proud Monarch
Rhodesview Nancy 16th	W. Gierke and Sons, Helidon	7,991·32	294·553	Blacklands Prospector
Junior, 2 Years (Standard, 230 lb.).				
Trevor Hill Gloria	G. Gwynne, Umbiram	7,859·08	313·97	North Glen Emblem
Barwin's Queen	G. A. Meyers, Imbil	7,740·65	297·276	Blacklands Jewel

JERSEY.

MATURE COW (STANDARD, 350 LB.).

Oxford Joyful Maid	E. Burton and Sons, Wanora	10,110·83	570·549	Trinity Ambassador
Fauvic Rejoice	H. Cochrane, Kin Kin	7,514·5	449·294	Zingara King
Glenview Starlight	F. P. Fowler and Son, Glenview, Coalstoun Lakes	9,637·8	416·716	Trinity Officer
Oceanview Wait-a-while Fairy	J. Sigley, Millaa Millaa	7,803·05	406·465	Rocky Glen Wait-a-while

SENIOR, 3 YEARS (STANDARD, 290 LB.).

Trinity Marshall's Coronada	C. W. Barlow, Blaxland, *via* Dalby	7,191·2	408·121	Trinity Field Marshall
Oxford Fawn	E. Burton and Sons, Wanora	7,262·4	403·001	Oxford Golden Lad
Bellgarth Buttercup 3rd	W. E. Lewty, Winera, Leyburn	5,111·75	360·317	Airlie Thorn

JUNIOR, 3 YEARS (STANDARD, 270 LB.).

Kathleigh Royal Melba	F. W. Kath, Malakoff, Dalby	6,246·94	348·713	Retford Royal Atavist
Pineview Lorna	J. Hunter and Sons, Borallon	5,971·08	332·237	Oxford Jeweller

SENIOR, 2 YEARS (STANDARD, 250 LB.).

Pamist of Calton	E. Burton and Sons, Wanora	7,415·68	394·475	Student of Calton
Kathleigh Royal Fashion (259 days)	F. W. Kath, Malakoff, *via* Dalby	6,166·72	385·965	Retford Royal Atavist
Kathleigh Leda's Lass (259 days)	F. W. Kath, Malakoff, *via* Dalby	6,265·0	371·814	Retford Royal Atavist
Oxford Thelma	J. Sigley, Millaa Millaa	6,078·05	313·121	Overlook Nancy's Remus

JUNIOR, 2 YEARS (STANDARD, 230 LB.)

Oxford Melody	E. Burton and Sons, Wanora	6,798·11	375·545	Oxford Peer
Oxford Flora 2nd	E. Burton and Sons, Wanora	5,589·1	328·888	Oxford Peer
Carnation Peerless Hope	W. Spresser and Son, Redbank	4,654·46	285·576	Oxford Peer
Pineview Peerless	J. Hunter and Sons, Borallon	5,152·12	272·114	Oxford Peer
Lermont Silver Bell (Twin)	J. Schull, Lermont, Oakey	4,959·1	269·926	Woodside Golden Volunteer

AYRSHIRE

JUNIOR, 3 YEARS (STANDARD, 250 LB.)

Myola Lady Tina	R. M. Anderson, Southbrook	9,125·77	387·826	Benbecula Bonnie Willie

JUNIOR, 2 YEARS (STANDARD, 230 LB.).

Myola Gem 2nd	R. M. Anderson, Southbrook	12,578·23	472·052	Benbecula Bonnie Willie
Myola Opal 2nd (176 days)	R. M. Anderson, Southbrook	6,662·61	244·53	Benbecula Bonnie Willie

FRIESIAN.

MATURE COW (STANDARD, 350 LB.)

St. Athan Gipsy 11th (Black and White)	W. H. Grams, Upper Tent Hill, *via* Gatton	16,978·87	625·014	Glenvale Dutch Oak

The Tropics and Man

Some Aspects of the Racial Problem in the East.

DOUGLAS H. K. LEE, Professor of Physiology, University of Queensland.

Introduction.

WHEN you asked me to address you upon racial problems in the East, particularly as they affected Australia, I experienced a momentary panic, as my opinion upon the problem as a whole is very far from being well-defined. When I came to think over the matter, however, I saw that to feel otherwise with the very small amount of evidence before me, and for that matter, the very small amount of reliable disinterested evidence available, anywhere, would be a totally erroneous procedure. This attempt at intellectual honesty I am going to force upon you. Any candid scientist could indicate to you innumerable occasions in the history of human endeavour, when the broad outlook so essential to real progress has been completely buried under a vain commotion of assiduous argument concerning the rival merits of artificially demarcated aspects of the problem at issue. If such is possible in fields in which a definite effort is made to keep the argument in a plane above individual interests and emotions, what chance in the ordinary course of events, does the wider concept have in a field so charged with individual and racial desires and prejudices? We need attempt no more than the most superficial analysis of the volumes of heated debate on the recent Italo-Abyssinian conflict to realise with despair the entire submergence of such principles in the muddy turbulence of self-interest.

Discussion of racial questions in Eastern waters can conveniently be divided into four aspects—ethical, medical, economic and social. It is an accepted principle of scientific enquiry that natural subdivisions of operative factors in a given problem, or independent factors themselves, should be separated and studied in isolated fashion; or, in other words, we should ask Nature (and presumably human conduct is included in this term) questions one at a time. This, however, represents only the "catabolic" aspect of scientific enquiry into affairs biological. Because this represents the main aspect of enquiry in non-biological sciences, however, one is apt to forget the essential importance in biological sciences of the reverse "anabolic" process. Having studied the variables one at a time, we are still not in a position to predict the results of their simultaneous action in nature. Just as due consideration in physiology has not been given to the organism as a whole reacting to a total environment, so there has been a very grave lack of consideration of the total problem of racial inter-relations.

Having outlined in abstract the complete plan of scientific attack upon biological problems, I propose to co-opt you in an enquiry as to what reliable data we possess upon each of the four aspects I mentioned above, and then to ask ourselves whether any broad principles can be established for the regulation of our conduct and orientation of an attitude towards the really broad aspect of social questions.

2. The Ethical Aspect.

No one can leave his own countrymen and journey amongst the peoples of other nations and speakers of other tongues without asking himself just what all this international fuss and bother is about. So much is good, but the answer he supplies to his own question is not necessarily the correct one. He is in grave danger of influence by unrecognised prejudices, inherent in his original up-bringing or, on the other hand, of over-compensation for such prejudices and consequent over-statement of the other man's case. For this reason I hesitate to display my own feelings. It is difficult, moreover, to make a purely ethical judgment, as centuries of conservatism, prejudice and lack of opportunity have so often suppressed the real evidences of relative worth. The conception of equality of individuals has had to yield place in the face of hard experience to that of equality of opportunity. It is highly probable that that of a strict equality of races would have to do likewise. The position is very much complicated by the possibility or even probabality that the suitability of a given race will vary from situation to situation and from time to time in world history. Even if we are agreed that the Caucasian race is the best suited to present conditions it does not follow that it will be in a thousand years time. We may accept it, therefore, as a purely ethical principle that all races should be given equality of opportunity. Some, no doubt, would like to add to this, "Unless it can be shown that to do so in a particular case would be detrimental to the interests of mankind as a whole." I am not sure how far such a proviso would take us from pure ethics and involve us in a system of philosophy.

3. The Medical Aspect.

The first pertinent question from the Australian viewpoint is "Can the Caucasian live efficiently in the tropics?" There is every reason to believe on the basis of considerable investigation and the results of our great Queensland experiment, that the Caucasian can live and reproduce healthily in such tropical areas as we possess, *provided that he is not subject to extensive and debilitating tropical diseases.* On the other hand it is highly probable that his mental and mechanical efficiency is lower than what it would be in temperate countries. With these provisos, therefore we may raise the further question "Are there any conditions under which a mixture of races on purely medical grounds, is permissible?" It would not be in keeping with the intellectual honesty with which we blithely commenced, to assert that there are *no* conditions under which a race admixture is, for medical reasons, permissible, but the restrictions to be imposed upon such an admixture would have to be most extensive and stringent, strict medical examination and surveillance of every single entrant, the closest safeguard against unlawful entrances, forced maintenance of the highest living conditions, strict decentralisation of immigrants and prevention of the slightest crowding, the maintenance of a very strict watch over the slightest outbreak of communicable disease, and so on. Provided that such limitations could be completely and permanently enforced, admixture on medical grounds might be admissible. The point might be made here, that the introduction of non-Caucasians might be feasible under such conditions in peace-time, but that all control would be cast to the four winds in the event of even a partially successful war-like invasion by such races. Should the question of admission ever become vital, on the basis of purely medical considerations it would be infinitely preferable to maintain

peace-time control than to suffer military imposition. That a healthy co-existence of races in tropical areas is not a mere phantasma is indicated by Malayan experience, that the only scourge to which the white man is subject in such a well administered and financially sound zone is malaria. In Australia, it should not be difficult to limit this to the narrow coastal zone.

The second pertinent question concerning Australian relationships is "What medical problems will be introduced by increased facilities for and reduction of time of communication between areas habitually occupied by Caucasian and those habitually occupied by non-Caucasian races?" This is a matter that has been foreseen by the Commonwealth Health Department, and steps have been taken to meet the problem which is rapidly becoming urgent. When Australia was connected only by sea travel with its neighbouring countries, by the time a boat reached a capital city from a port infected with a communicable disease, the incubation period was very near to conclusion, if it had not already expired. Now, however, one can reach Brisbane, Sydney or Perth three and a-half days after leaving Singapore, and we are not contented with that. If quarantine for the remainder of the incubation period (up to three weeks) were insisted upon, fast travel would be entirely useless. Fortunately, we have two safeguards, the first is innoculation against certain of these diseases, and the second, weekly disemmination by the Eastern Bureau of the League of Nations of the infectious disease position at all ports throughout the East. This permits formal surveillance alone if the port of origin is clean, but ensures close surveillance if it is infected.

4. The Economic Aspect.

Under the existing conditions within the various countries involved, there is no doubt that, in general, non-Caucasian races can market goods at a price which is very much below any that can be attained by Caucasians, even when the relative quality of the goods are taken into account. I have bought a beautifully and elaborately carved Chinese chest for eighteen dollars which in the matter of carving alone could not be produced by whites for less than seventy dollars. It is reported that Japanese have claimed that they could deliver a replica of the modern Ford car in American waters for £40. Why is this so, and can the discrepancy be adjusted? It is so because the different races live in separate tanks in which the level is arbitrarily determined by standards of living and methods of manufacture, and because communication between the tanks is permitted only through an elaborate system of locks, not by any means reciprocally adjusted. How close this artificial barrier is maintained is well illustrated in Singapore. The Chinese boy can buy an article in High Street for say 20 cents, a Hindu will be charged 30 cents, a European resident 40 cents, a ship's officer 45 cents, and a tourist anything he is foolish enough to pay. As to the possibility of adjusting such discrepancies, two revolutionary changes appear to be pre-requisites—equalisation of living standards and mutual racial conciliation. The former is gradually coming about, but it will be a very long time before the *mass* of native populations is on anything like a comparable footing with that of the Caucasian populace. The latter is completely beyond expectation as long as such intense national and class prejudices as are responsible for present European turmoil are possible. It would require the boundless hope of a Messiah to envisage the day when frank recognition of racial qualities is mutually possible.

5. The Social Aspect.

Everyone is aware of the general relationship between Caucasian and non-Caucasian races. We are perfectly familiar with the general relegation of natives to menial work and the reservation of administrative and professional positions to Europeans. The questions to be answered are—(i.) Is this arrangement in its present general form workable and permanent; or (ii.) should the system be abolished? There is no doubt whatever that the system in its present form is glaringly inconsistent, that it causes just irritation in the hearts of the subject races, that all sorts of subterfuges must be resorted to for its support, and that the European himself is often subject to demoralisation by its implication. True as all this criticism is, it does not follow that the system is not susceptible to improvement, and when improved would not be the least of a number of possible evils. To throw over all control of non-Caucasian affairs in these countries which we now govern would not only be a calamity to the races concerned but a new and terrible disruption in such unity as world progress now maintains. I am told that warning examples are not hard to find in British India, and even with my short experience of the native peoples of that country as they are at present makes me not surprised at this. Corruption and intrigue are, as yet, so prevalent in the community that demoralisation can be the only sequence to abandonment of control. If a more tolerant any sympathetic attitude were adopted towards the desires and necessities of non-European races, if more effort were made to understand their point of view, which, after all, is very different from ours; if authority over them were exhibited more as a therapeutic measure than as an immutable law of creation; and administration were designed and conducted in such a spirit, then I am convinced that a very great improvement in the position would be effected. At the same time, the bad effects upon Europeans of autocratic powers somewhat haphazardly conferred would be considerably mitigated.

In so far as this question affects Australians at home, any introduction of non-European peoples should be carried out under much more enlightened conditions and with considerably more effort to understand the foreigner than is at present generally characteristic of such relationship elsewhere. Australians abroad are in a somewhat different position in that they are cast into a system already well established, and it is usually very much better for all concerned for the lone individual to fall in with existing conditions than to attempt any forced imposition of his own convictions. If in Malaya you treat the "boys" according to shining humanitarian principles, you will at once be marked down by them as a raw newcomer and an "easy mark," work will be slummed, your pocket will be drained, and tempers will be lost, all to no purpose. If, on the other hand, you commence with domination, select your servants by trial and error, and then, having established good relations with reliable servants, attempt the gradual introduction of your principles, you will be much more likely to arrive at a working compromise. In short, in individual as in mass relationship, progress is much more sure along evolutionary than along revolutionary lines.

6. The Problem as a Whole.

Let me summarise the partial answers so far developed in so far as they affect Australian policy:—(i.) On purely ethical grounds, all races should be granted equality of opportunity; (ii.) on purely medical

grounds, a mixture of Caucasian and non-Caucasian races is feasible under certain stringent and well-defined controls; (iii.) on economic grounds there are considerable difficulties in the way of racial co-existence which require equalisation of living conditions and racial conciliation for their removal; (iv.) on social grounds, a system in which the Caucasian plays the enlightened and just controller of non-Caucasian affairs is probably the best for present world conditions, but this would have to show considerable improvement upon that usually operating at the present time.

Taking into account these answers to artificially isolated questions, are there any general principles to be developed for regulating Australian attitude to racial inter-relationships in general and the question of such relationships inside Australia? It is not an argument of convenience to divide the problem thus, as the starting point for discussion is very different in the two cases. In general, Australians should encourage the idea of as wide a co-existence and co-operation of existing races as is consistent with the real evolution of mankind, they should foster the collection of as much unequivocal data as possible of the worth and power, latent as well as apparent, of the different races, and should do all in their power to adjust the existing differences between them and harmonise smaller interests to the broader outlook. In countries in which other races co-exist with Caucasians, this is merely acceptance and improvement upon the "status quo." In Australia itself, we must also accept and improve upon the "status quo," which means that in general we preserve the essential Caucasian unity of this country and admit other races only in individual cases in which it can be clearly demonstrated that no medical, economic or social disturbance is entailed. When, if ever, the time comes that the mass of other races are on an equal footing with Australians in these respects, then such a policy would automatically admit such subjects, and to such a procedure no just opposition could be made.

RADIO SERVICE FOR FARMERS.

From National Station 4QG (or 4QR) (Relayed to 4RK Central Regional and 4QN North Regional).

Arrangements have been made with the Australian Broadcasting Commission (Queensland) for the regular delivery, in interesting dialogue form, of talks to farmers by officers of the Department of Agriculture and Stock during the

COUNTRYMAN'S SESSION 4QG (or 4QR) EVERY SUNDAY MORNING,

Beginning at 9.10 a.m.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

A Species of Rattlepod.

S.C. (Pittsworth)—

The specimen is *Crotalaria incana*, a species of rattlepod or rattlebox, a native plant sometimes called native lucerne, but this name is not very apt, as we have quite good fodders which could go under the name of "native lucerne" more appropriately. Species of rattlepod have been proved poisonous to stock both in Australia and abroad, but nothing is known particularly about the properties of the present species. It is moderately common in parts of Queensland, particularly on the coast, but, generally, does not manifest itself as a very aggressive weed. Ploughed or dug in, it makes a good green manure.

Plants from Mackay Named.

D.R.McG. (Mackay)—

1. With starlike seed head. This is coastal button grass, *Dactyloctenium ægyptium*. It is common in coastal localities in North Queensland, sometimes growing in sandy land almost down to the sea. It is quite good fodder during the summer months, but mostly dies off in the winter and early spring.
2. Bloomsbury (Rat's-tail or Parramatta) grass, *Sporobolus Berteranus*. A native of South America, it has been naturalised in Australia for a long time. It is generally regarded as inferior as a fodder, and has caused some concern in the southern dairy pasturess, because of its invasion of bare patches in paspalum paddocks.
3. Swamp paspalum (sour or yellow) grass, *Paspalum conjugatum*. It is spread very widely over the tropical regions of the world, and is generally regarded as inferior as a grass, particularly for dairying. It has invaded some of the wetter pastures of the Atherton Tableland and has caused considerable concern.
4. Devil's fig. This is a native of tropical America, now widely spread as a weed. It is very common in coastal Queensland from Gympie northwards, and devil's fig is the name usually applied to it. It is sometimes called Dirran curse, but this name belongs more correctly to another species.
5. Strychnine Bush, *Solanum Seaforthianum*, a vine naturalised recently as a garden plant, but now spread widely as a weed. The red berries have been accused of causing illness in children, and it belongs to a poisonous family. It is most frequently known as deadly nightshade. Many birds apparently eat the berries with impunity, as it seems to be spread mainly through their agency.
6. *Amarantus paniculatus*, a very common farm weed of the Amaranth family. It is not particularly aggressive, and not poisonous or harmful in any way. The leaves of several species of Amaranth are commonly used as a spinach.

"Monkey Vine."

G. (Talwood)—

The specimen submitted is *Lyonsia eucalyptifolia*, a plant very widely spread in Western Queensland and New South Wales, and commonly known as monkey vine. It is generally regarded as good fodder and is freely cut for stock. No chemical analysis is available. It has been suspected of causing trouble with stock at odd times, and it belongs to a dangerous family. Feeding this plant over a long period may be harmful, but we have no definite information. All we can say is that we know it has been often fed and found to be quite harmless. Like other fibres of a similar nature, it may cause impaction.

General Notes

Staff Changes and Appointments.

Mr. W. Dixon, Inspector of Stock, Goondiwindi, and Mr. P. P. Comiskey, Inspector of Stock, Boonah, have been appointed District Inspectors of Stock, Department of Agriculture and Stock.

Mr. W. A. R. Cowdry and Mr. W. G. Steele, Cotton Field Assistants, Cotton Research Station, Biloela, have been appointed Instructors in Cotton Culture, Department of Agriculture and Stock.

Constable W. J. Randle, Thallon, has been appointed also an inspector of brands.

Mr. K. M. Ward, M.Agr.Sc., Assistant Research Officer, has been appointed Research Officer, Horticultural Section, Division of Plant Industry (Research), Department of Agriculture and Stock. Mr. Ward is stationed at Stanthorpe.

An Order in Council has been approved under the Dairy Products Stabilisation Acts which appoints Mr. R. Wilson (Acting Director of Marketing) to be a member of the Dairy Products Stabilisation Board to fill the vacancy caused by the death of Mr. Graham.

Mr. William Kelly, Ayr, and Mr. J. B. McIlwraith, Bukali, Monto, have been appointed honorary protectors under the Fauna Protection Act.

Constable P. L. Drennan, Prairie, has been appointed also an inspector under the Slaughtering Act.

Mr. S. M. Seamer (Inspector of Stock, Brisbane), Mr. F. R. Dunn (District Inspector of Stock, Clonecurry) and Mr. D. Hardy (District Inspector of Stock, Emerald) have been appointed also inspectors under the Dairy Produce Acts.

The following police officers stationed at Roma have been appointed also inspectors under the Brands Acts:—Sergeant (1st Class) D. MacDonald, Constable L. P. Graf, Constable W. H. Fuller, and Constable G. Dickson.

The following transfers of dairy inspectors in the Department of Agriculture and Stock have been approved:—

Mr. G. F. E. Clarke, from Ipswich to Kingaroy;

Mr. E. R. Boyd, from Kingaroy to Ipswich;

Mr. M. D. O'Donnell, from Gympie to Lowood; and

Mr. W. B. Horneman, from Rosewood to Gympie.

Mr. W. S. Hartley has been appointed an inspector on probation under the Dairy Produce Acts.

The appointment of Mr. H. M. Groszmann as assistant to research officer, Horticultural Section, Division of Plant Industry (Research), has been confirmed as from 1st April, 1937.

Mr. H. G. Crofts, secretary of the Banana Industry Protection Board, has been appointed also an inspector under the Diseases in Plants Acts.

Mr. W. R. Burnett, Inspector of Stock, Toowoomba, has been appointed also an inspector of slaughterhouses.

Constable W. A. C. Zunker, of Leyburn, has been appointed also an Inspector of brands.

Messrs. J. L. Gynther (Margate) and R. K. McKee, (Murphy's Creek) have been appointed honorary protectors under the Fauna Protection Act.

Wild Life Preservation.

Ollera Creek Holding, Mutarnee, Ingham Line, has been declared a sanctuary for the protection of fauna under "*The Fauna Protection Act of* 1937."

Open Season for Duck and Quail.

On Order in Council under '*The Fauna Protection Act of* 1937" declares the periods of close season for duck and quail throughout the State. In effect, this will mean that the open season for duck and quail in the three divisions of Queensland will be:—

In Southern Queensland—From 1st May to 30th September.

In Central Queensland—From 1st July to 30th November.

In North Queensland—From 1st June to 31st October.

Rural Topics

New Methods of Soil Cultivation.

Farmers are finding out that the form and type of plough used is a matter of fundamental importance in cultivation. Ploughs vary greatly in form and in type as between one country and another, and also as between one district and another. Some very important improvements have recently been made in this respect, and the substitution of the plough by other implements and the use of new ploughing methods are under consideration. Among these implements are rototillers (which are already in use on several cane farms in Queensland), pulverator ploughs, subsoil ploughs (also in use in Queensland and in the cane country below the border of New South Wales), and cultivators with rigid prongs.

Teaching Co-operation.

Courses in co-operative production and marketing are now taught in forty-five out of the forty-eight agricultural colleges in the United States, and the number of students doing this course this year greatly exceeds all previous enrolments. This is said to be the most intensive organised effort on behalf of agricultural co-operation ever undertaken in any country. Out of this is expected to come a sounder, better informed and more prosperous farming population. When the budding farmer completes his agricultural college course he will have an infinitely greater knowledge of the problems confronting agriculture and their possible solution than his father before him. And he will realise that an important factor in agricultural progress is business-like producer co-operation.

The Most Useful Tree to Man.

Of all the trees useful to man the date palm comes first, according to a list of the most useful trees compiled by the American Nature Association. The date palm has been in cultivation for more than 4,000 years. Its fruit is the main item of diet for millions of people. In addition, it supplies oil, wood, and fibre. Dates grow well in Western Queensland, and several groves of palms have been established in the Barcaldine district, while some are growing near Charleville.

The coconut palm is given second place, followed in order by the almond tree, apple, fig, mulberry (food for silk worms), olive, quinine, and rubber.

Farmers' Co-operation.

The success of a co-operative organisation—more than any other business—depends on the men who are in it. The reason for this is that a co-operative undertaking requires a closer working together than is customary in most commercial enterprises. The entire theory of co-operative activity is that better returns are made possible by this close co-ordination of interests.

This close co-ordination of interests extends not only to the members but it applies to every individual and organisation connected with the business—from the employees to the concerns with which it has outside contacts.

—*The Australian Dairy Review.*

A Bit of Farm Philosophy.

A Fassifern farmer sends this:

"'Our doubts are traitors,
And makes us lose the good we oft might win,
By fearing to attempt.'

"'How can I get rid of an inferiority complex?' asked one of my cobbers the other day. He has been having a bit of a rough spin and is finding it hard to meet the world. The psychologists, it is relief to know, do not regard such cases as hopeless. Here is a slab of wisdom I read the other day, and which, I think, applies:—'Even after being down and out, individuals mount to the high ground of faith in themselves. How is such a change brought about? Certainly not by assuming a pose, which may impress but brings no lasting satisfaction. There are better ways. In most cases, cure is effected by submitting oneself to the rule of reason. And reason is a power of mind fostered by learning. Therefore a man needs to cultivate an intellectual interest—one that may further his work or enrich his leisure. His feeling of insecurity because of the inferiority complex will vanish when he comes to command some field of knowledge however small it be. Mastery of it gives self-respect. Efforts to gain knowledge and skill build wholesome habits of mind.'"

Orchard Notes

AUGUST.

THE COASTAL DISTRICTS.

IN many centres the bulk of the citrus fruits, with the exception of the late-ripening varieties, will have been harvested, and cultural operations should be receiving attention.

Trees which show indications of impaired vigour will require a somewhat heavy pruning, both in respect to thinning and shortening the branches. Where the trees are vigorous and healthy a light pruning only will be necessary, except in the case of the Glen Retreat mandarin. The densely-growing habit of this variety leads to a profusion of weak shoots, which, if allowed to develop, will cause overbearing with resultant small and inferior fruit at an early age.

Where trees show signs of failing, investigations for the presence of collar rot should be made at or near ground level. The roots should be examined for disease, and in the North Coast districts for the presence of the citrus root bark channeller. A light application of paradichlorobenzene buried a few inches deep in circular drills around the tree and with the surface stamped firmly has been recommended for controlling this pest. The distance between the circular drills should be not more than 18 inches, and care should be taken to prevent the crystals of paradichlorobenzene from coming into contact with the roots. It may be necessary to repeat the application after an interval of three or four weeks.

Where it is necessary to control black spot, melanose, and scab, the fungicide should be applied at the correct time. The control measures recommended are—

For Black Spot.

Bordeaux of 3-2-40 strength or Bordeaux of 3-2-40 strength + 1 per cent. of oil emulsion—

(1) As soon as the fruit has set;
(2) About a month to six weeks later;
(3) If black spot has been serious previously, another application just prior to the February rains.

For Melanose.

The use of a similar fungicide—

(1) Immediately the fruit has set;
(2) A month to six weeks later, or more often if the weather conditions are exceptionally wet.

For Scab.

(1) Bordeaux mixture 6-4-40 or Bordeaux 6-4-40 + 1 per cent. oil emulsion immediately before the new growth commences; this will help to clean up fungus on the old scabs;

(2) Bordeaux 3-2-40 or Bordeaux 3-2-40 + 1 per cent. oil emulsion at about the middle of the flowering period; this and subsequent applications are for the protection of young foliage and fruit;

(3) Bordeaux as soon as the fruit has set;

(4) If the season is exceptionally wet, it is advisable to give one or two further applications in order to keep the young fruit and foliage well covered.

Where for any reason healthy trees of vigorous constitution are unprofitable, they may be headed back—in fact, have the whole of the top removed—leaving a few selected arms. All other branches should be cut away at their source of origin. The three or four remaining arms, of which lengths will vary from 2 to 4 feet, will form the future framework of the tree. Care must be taken to cover the whole of the exposed bark with a suitable coating of whitewash to prevent sunburn. The numerous shoots which will grow from main arms should be suitably reduced, leaving from two to four on each arm. Under favourable conditions, these will be in a fit condition to receive selected buds from desirable trees by the following autumn.

It is desirable that when shoots intended for budding have attained a length of from 6 to 9 inches, their terminals should be nipped off in order to stiffen their growth and guard against the possibility of damage by strong winds.

Fertilizing should be completed as early as possible, the mixture for the spring application being high in readily available nitrogen. Ploughing should then be completed, the depth being regulated by local conditions and the nature of the original preparation of the land. Following the ploughing, the land should be worked down to a fine state of tilth. On hillside orchards, attention should be given to the care of possible storm waters. Cultivation should be so arranged as to form shallow drains or banks along the tree rows and across the heaviest slope, leading into suitable side drains which may be grassed to prevent erosion.

The planting of trees may be continued and, with the exception of custard apples, expedited. The attention of citrus growers should be confined to varieties suited to their local conditions.

The pruning of grape vines should be completed, and where cuttings for planting are required these should be selected, trimmed, and heeled-in in slightly dry soil. Canes intended for cuttings should not be allowed to lie about and dry out, but should be treated the day they are severed from the plant. Cuttings are frequently made of excessive length. From 10 to 12 inches is a suitable length which allows for insertion in the soil so as to permit of the top bud, with a short section of the internode, protruding above the surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL pruning other than that applied to peaches and varieties which are late in coming into growth should be completed this month, and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. When there are indications of the swelling of the buds, the time is opportune for working over unprofitable trees, where the stock is reasonably vigorous. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-working deciduous trees.

The pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation as they are subject to much variation.

The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted deep working is most detrimental. The matter of seedling stocks for apples and the inferior plants frequently received from Southern nurseries prompts a query as to how many seeds have been stratified for spring planting, and whether any effort is being made towards raising a local supply of nursery stock.

THE DIGNITY OF FARM LIFE.

In a book published recently—"The Land, Now and To-morrow"—Professor R. G. Stapledon, Director of the Welsh Plant-breeding Station, makes some very outspoken comments on education and the drift to the cities. "Our method of education," he says, "has undoubtedly accentuated the drift from the country to the town, because it tended to equip the more intelligent, even of country children, rather for the life in towns than for that of the country." The professor holds that the whole trend of education has been to glorify book learning and proficiency in the various subjects. "Subjects," he declares, "there are no subjects! It is only the true countryman who appreciates that life is life and learning is learning, and that all divisions into subjects are artificial and man-made." The professor condemns the "pigeon-holing of a boy's mind at school, which renders him unsuited for life in the country, which demands, above all things, an almost sublime naturalness, devoid of all artificial mental restrictions and barriers. Wisdom is the capacity for seeing life whole, and for bringing to bear on the problems of life all the knowledge of which man is possessed." He says, "I have more than a strong suspicion that wisdom is associated with simplicity and naturalness, and therefore that wisdom can be heightened by a closer contact with the country and the doings of the country, and perhaps by taking greater heed of the lessons of the country and of Nature." And then comes this interesting observation:— "I do not think I have ever met a real farmer who is a prig. Prigs there are in plenty behind the counter. You will meet them as chauffeurs, and in almost all walks of life, but they do not exist among agricultural labourers, whilst aristocrats —and not snobs—are to be found in every parish trudging behind their ploughs."

Farm Notes

AUGUST.

AUGUST is normally a dry month throughout the State, but where good soil moisture exists the advent of warmer weather will cause weed growth to increase, necessitating the use of cultivators in growing crops and land being prepared for maize, cotton, sorghums, &c.

Well-worked land having reserves of subsoil moisture is essential for satisfactory subsequent growth, as spring sown crops often have to withstand moderately dry conditions until the occurrance of early summer storms.

In coastal districts where frost is not liable to occur, early sowings can be commenced of maize, sorghums, millets, sudan grass, pumpkins, and melons, together with the planting of arrowroot, artichokes, sweet potatoes, &c., but unless ample soil moisture is present, there is little to be gained by very early sowings before the soil is sufficiently warm, as later-established areas will often make rapid growth, equalling or excelling that of earlier sowings.

Potato planting will be carried on in the Downs, South Burnett, and other areas away from the coast, where July plantings are likely to be affected by frost, the bulk of the spring crop being established during July and August.

Potatoes show a partiality to thoroughly prepared virgin soils, more especially deep, friable well-drained alluvial loams and scrub soils, which indicates that the maintenance of a supply of humus in the soil is essential for profitable yields.

Seed potatoes for this crop are usually procured from the Southern States, where certified seed true to varietal type is now available, but to prevent seed-bourne disease all seed should be treated either by the hot formalin or corrosive sublimate methods, full particulars of which are obtainable from the Department. Whole sets are preferable, but cut sets may be used for the spring planting, dusting the cut surfaces with wood ashes or slaked lime shortly after cutting.

Dairymen in many districts will now be utilising early sown winter fodder crops to maintain production, and where crops are grazed, temporary subdivision will prove valuable in conserving growth and providing fresh pastures at frequent intervals.

On the Downs the grazing of wheat areas, intended ultimately for grain, should cease by late July, otherwise probable yields are likely to be considerably reduced.

AGRICULTURAL POLICY IN BRITAIN.

Agricultural policy has been made a matter of greater urgency, if not of greater importance, by the recent events in Europe. Few in the Old Country seek to disguise the anxiety to which these events have given rise. The fundamental consideration is food supply should events reach a crisis. Agricultural policy is therefore directed to increase in home production—a fact not without significance to Queensland producers of exportable commodities. The policy of national defence is to make the land produce adequate food supplies for the nation. Two elements in the present situation in Britain which are causing worry are the decrease in the area of land under cultivation and the somewhat alarming decrease in the number of workers on the land. The development in farm mechanisation in the last dozen years cannot compensate for this loss, although the more extensive use of machinery does increase the amount of production per man employed in agriculture.

Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

CARE OF TWINS.

LAST month we talked about natural feeding and we said that there was no perfect substitute for mother's milk or for nursing by a healthy mother.

We are aiming to have all our babies fed naturally. We have talked to you about the care of the expectant mother who forms the environment and provides the food for the developing child before birth Childbearing is a natural process, but it makes extra demands upon the organs of the mother's body and everything should be done to keep her fit and prepare her to meet these demands with the least amount of strain. This is why we recommend the expectant mother to report to her doctor regularly or, if she has no doctor of her own, to attend an ante-natal clinic.

From time to time twins make their appearance. There is a fear in the minds of some expectant mothers regarding the possibility of their giving birth to twins, particularly where there is a history of such an event in either branch of the family. Interesting as the idea of twins may be to an outsider, they become a problem to the busy mother who already may have other young children to be cared for. The task of caring for them is made easier if the mother is able to secure suitable and especially trained assistance.

The healthy mother is able to nurse twins providing the babies are fully developed and that she has an adequate supply of milk. She is able to save a good deal of time if she feeds them simultaneously.

In order to carry this out satisfactorily it is important that she should be able to make herself comfortable The mother may sit on a bed and rest her back against pillows placed at the head of the bed, or she may prefer to sit on a couch with a high back and place her feet on a stool. When the infants are young they may be held in the natural position each being supported by an arm of the mother. As they become older and more active, it will be found more convenient to place each infant on a pillow stretching across the mother's lap on to the couch or bed on each side, the heads of the infants being near together and their legs away from the body of the mother.

When the supply of milk is adequate in both breasts the twins are put alternately to each breast:—

6 a.m.: A to right, B to left breast.
10 a.m.: A to left, B to right breast.
2 p.m.: A to right, B to left breast.
6 p.m.: A to left, B to right breast.
10 p.m.: A to right, B to left breast.

By adopting this method an approximately equal stimulus is applied to both breasts for the sucking power of each infant varies, and often one breast will yield its milk more easily than another. A number of mothers attending our Baby Clinics have followed this plan very successfully and with great economy of time.

When the supply of breast milk is inadequate for both babies the following method is found convenient and proves satisfactory:—

6 a.m.: A to both breasts, B artificially fed.
10 a.m.: B to both breasts, A artificially fed.
2 p.m.: A to both breasts, B artificially fed.
6 p.m.: B to both breasts, A artificially fed.
10 p.m.: A to both breasts, B artificially fed.

The following day B is breast-fed at 6 a.m., 2 p.m., and 10 p.m., and so on.

When one of the twins is much weaker than the other or shows an intolerance for the artificial food, it is advisable to give him the greater amount of breast milk, at least until he is thriving well. If he is too weak to suckle satisfactorily, give him expressed breast milk by means of a pipette or small, narrow-lipped spoon, until he becomes strong enough to take the breast, to which he is placed for short periods at first. The spoon is preferred to a bottle because some babies refuse the breast when they become accustomed to an artificial nipple or teat.

In practically every case the babies can be at least partly breast-fed. When complementary feeding has to be resorted to and one baby requires to be fed partly and the other wholly artificially at each feeding, it is necessary to hold the bottles so as to exercise a certain amount of resistance against the pull of the child in order that his power of suction will become developed. The practice of allowing a baby to lie in his cot sucking the teat of a feeding bottle supported by a pillow, so that the fluid runs into his mouth, is to be heartily condemned. The development of the jaws like the development of other parts of the body depends upon the amount of work they do, and by improving the power of suction the jaws become stronger. This favours the nutrition

of the teeth which are lying in the jaws as well as the proper spacing of the teeth when they erupt. When the babies are fortunate enough to have two people in attendance at feeding time their handling becomes relatively easy. When the mother is alone, feeding becomes a long and tedious task unless she can devise a method by which they can be fed simultaneously.

One method is provided by the mother sitting between two cots in which the infants are placed facing her. Resting an arm on a pillow placed on the edge of each cot the mother helds a bottle in each hand. As in the case of natural feeding, she may find it convenient to sit on a couch placing the infants facing one another on a low pillow on each side of her. Resting her arms on a pillow placed on her lap she holds a bottle in each hand.

IN THE FARM KITCHEN.

SIMPLE WAYS OF MAKING MERINGUES.

In making meringues the baking is of first importance. Here are a few simple recipes:—

Meringues.

Beat the whites of two eggs to a stiff froth; add very gradually three heaping tablespoonfuls of sugar. For one shell drop two tablespoonfuls on to a damp board covered with white paper and place in a very cool oven for fifteen or twenty minutes or until they are set enough to handle without breaking; then remove from the paper, and very carefully hollow out the soft inside, and place in the oven until the outside is crisp. Success lies in the baking; if the oven is too hot, they will scorch and have a bitter taste. Place two shells together, using whipped cream as a filling. The shells should be filled just before serving.

Meringue Glaces.

Take 1½ tablespoonfuls custard-powder, 1½ pints milk, 2 oz. sugar, 12 meringue cases, 2 oz. glace cherries, ½ pint cream, 2 oz. sugar.

Mix the custard-powder with one gill of the milk. Boil the rest of the milk and pour it on the mixed custard-powder, stirring all the time. Simmer for five minutes and leave till cold. Pack the freezer as tight as possible with ice and freezing salt. Strain the custard into the other end and freeze for one hour, stirring the ice cream well together every fifteen minutes. When ready to serve, whip the cream, and when it is stiff stir in about 2 oz. of sugar. To serve the meringues glaces, place a lump of firmly frozen ice cream between two meringue cases and decorate with a few dabs of cream and cherries.

Peach Meringues.

Take 1 small tin peaches, some shortbread biscuits (allow one for each peach), 1 egg-white, 1 tablespoonful castor sugar, jam.

Drain the peaches from the syrup and place one on each biscuit—cup side downwards. Whisk the egg-white to a stiff froth and then fold in the castor sugar. Turn the meringue into an icing bag with a rose tube fixed in the bottom of it, and force it out to form a border all round each peach. Put in a cool oven to set and lightly brown the meringue, and when cold serve with a little jam on top of each peach. Allow one for each person.

Meringue Trifle.

Take 6 pairs meringue cases, some sponge fingers, about 2 tablespoonfuls rum, milk, 1½ gills cream, glace cherries, angelica, sugar, and vanilla flavouring.

Arrange the meringue cases in a dish in pairs to form a border. Whisk the cream till it thickens, and sweeten and flavour it to taste. Split open the sponge fingers (or cakes) and then use them to fill up the centre of the ring, soaking each layer with a little milk and rum, and putting whipped cream between them. Heap the remainder of the cream on top and decorate with glace cherries and leaves of angelica.

Meringue Charlotte.

Take 1 packet pineapple jelly crystals, 6 oz. finger-shaped meringue biscuits, 2 eggs, 1 pint hot milk, 3 oz. sugar, ½ pint cream, 1 oz. gelatine, 2 oz. crystallised pineapple (chopped), ½ gill cold water.

Dissolve the jelly crystals in one pint of hot water, pour half into a tin, and let it set. Soak the gelatine in the cold water for five minutes, and dissolve it in the remainder of the liquid jelly. Beat the eggs and sugar; stir in the hot milk. Pour the custard into a double saucepan and stir until it is thick enough to coat the back of a spoon. When cold, strain in the gelatine. Whip the cream, and add it to the mixture with the pineapple, stirring it often as it begins to thicken. Place the biscuits round the tin. When the cream mixture is almost solid put it into the lined tin; it should come just above the top of the biscuits. To serve, shake gently out on to a dish.

Lemon Rice.

Take 8 oz. rice, 8 oz. sugar, 2 lemons, water.

Boil the rice and drain it. Pour cold water over it till the water is clear. Boil barely one gill of water with the sugar, lemon juice, and the grated rind of the lemons until this syrup is quite thick (letting the sugar dissolve before it comes to the boil). Mix this with the rice. Simmer them in a double saucepan for an hour. Remove it from the heat, let the rice cool, and use as directed.

Meringue Jelly.

Take 1 packet jelly crystals, hot water, 2 egg-whites.

Dissolve the jelly in the hot water, making it up to a pint with the jelly. Then turn it into a fairly large basin and leave it until it begins to set. You can use any flavoured jelly, and sometimes can utilise left-over fruit juice for this purpose instead of using so much water. It can also be flavoured with a little sherry if liked. When the jelly begins to thicken, add a pinch of salt to the egg-whites and whisk them to a stiff froth. Then add them to the jelly, and whisk them all together before turning the meringue jelly into a glass dish. Let the jelly set, and decorate it tastefully and serve it with cream. Meringue jelly looks just as attractive served in individual glasses.

Meringue Rice.

Take 4 egg-whites, 4 oz. icing sugar, 2 oz. almonds, 2 oz. chocolate, lemon rice, cream.

Heap the lemon rice in a fireproof dish. Beat the egg-whites and add the sugar gradually, also the chopped almonds. Cover the rice with this mixture. Put into a cool oven to brown the meringue slightly. Melt the chocolate and add a little water. Pour this over the rice, so that it runs down in streaks. Serve the meringue rice with the whipped cream. A thicker covering of meringue may be made if liked.

Chocolate Meringue.

Take 3 meringue cases, 1 oz. cocoa, 2 oz. sugar, 1 pint milk, 2 eggs, ½ gill water, ½ oz. gelatine, ½ pint cream (whipped), vanilla essence.

Soak the gelatine in the water. Mix the milk gradually with the cocoa and sugar. Stir till it boils, and add the gelatine. Cool slightly and add the beaten eggs. Stir in a double saucepan till it thickens. Add the vanilla and strain into three compote dishes. When set put sliced bananas round the edge and a meringue case decorated with cream in the centre of each.

Apricot Meringue.

Take 1 small tin apricots, 3 eggs, 1 breakfast-cupful white breadcrumbs, 2 oz. castor sugar, 1 oz. icing sugar, 1 teaspoonful orange flower water.

Boil the milk, pour it on to the breadcrumbs, return both to the saucepan, and bring to the boil. Beat the egg-yolks with the castor sugar, and stir them into the breadcrumbs and milk. Slice the apricots and lay them in the bottom of a fireproof dish. Mix a quarter of a pint of the syrup from the apricots with the milk mixture, also add a teaspoonful of orange flower water, and pour this over the apricots in the dish. Bake in a moderate oven until the mixture sets, then remove it from the oven. Whip the egg-whites to a stiff froth and put them into a forcing-bag with a large rose pipe. Ornament all the top of the pudding with this, then sprinkle with icing sugar. Bake in a moderate oven until it is a pale golden colour. When cooked, stand the dish on a lace paper. Put a pie-dish collar round it and serve either hot or cold.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY, IN THE AGRICULTURAL DISTRICTS TOGETHER WITH TOTAL RAINFALL DURING 1938 AND 1937, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of years' records.	May, 1938.	May, 1937.		May.	No. of years' records.	May, 1938.	May, 1937.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	2·26	37	1·38	1·42	Clermont ..	1·25	67	5·32	..
Cairns	4·53	56	3·19	2·61	Gindie	0·86	39	..	..
Cardwell	3·62	66	2·98	2·64	Springsure ..	1·21	69	3·07	0·30
Cooktown ..	2·81	62	1·40	0·62					
Herberton ..	1·74	52	0·44	1·27					
Ingham	3·63	46	7·91	2·27					
Innisfail	12·42	57	10·52	3·59					
Mossman Mill ..	3·85	25	4·11	1·53	*Darling Downs.*				
Townsville ..	1·27	67	0·39	0·13					
					Dalby	1·28	68	2·25	0·08
Central Coast.					Emu Vale ..	1·11	42	2·87	0·29
					Hermitage ..	1·10	32	..	0·26
Ayr	1·10	51	..	0·24	Jimbour ..	1·18	50	1·13	0·20
Bowen	1·28	67	0·11	0·17	Miles	1·43	53	6·24	..
Charters Towers ..	0·78	56	0·43	0·03	Stanthorpe ..	1·78	65	2·53	0·34
Mackay	3·78	67	4·17	0·92	Toowoomba ..	2·11	66	6·75	0·66
Proserpine ..	4·27	35	2·67	1·27	Warwick ..	1·48	73	3·59	0·29
St. Lawrence ..	1·75	67	1·95	0·06					
South Coast.									
					Maranoa.				
Biggenden ..	1·67	39	5·80	0·28					
Bundaberg ..	2·55	55	7·62	0·52					
Brisbane	2·72	86	11·81	0·25	Roma	1·34	64	8·31	..
Caboolture ..	2·77	51	14·20	1·24					
Childers	2·07	43	6·32	0·61					
Crohamhurst ..	4·70	45	..	0·54					
Esk	1·90	51	9·78	1·73					
Gayndah	1·54	67	4·03	0·06					
Gympie	2·76	68	8·77	0·51	*State Farms, &c.*				
Kilkivan	1·79	59	4·98	0·03					
Maryborough ..	2·95	67	6·58	0·26	Bungeworgorai ..	0·78	24	..	..
Nambour	4·59	42	26·71	0·94	Gatton College ..	1·48	39	..	0·32
Nanango	1·49	56	4·62	0·31	Kairi	..	..	..	..
Rockhampton ..	1·59	67	2·34	0·09	Mackay Sugar Experiment Station	3·30	41	4·11	0·59
Woodford ..	2·79	51	15·27	0·47					

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—MAY, 1938.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·89	83	74	85	1, 5, 27	67	18	140	18
Herberton	..	75	60	79	29, 30	54	21	44	5
Rockhampton	30·05	80	64	86	28	53	31	234	10
Brisbane	30·15	74	60	83	4	54	31	1,181	11
Darling Downs.									
Dalby	30·14	75	52	82	4	41	9	225	7
Stanthorpe	..	66	47	77	3	30	31	253	10
Toowoomba	..	69	52	79	3	39	31	675	10
Mid-Interior.									
Georgetown	29·93	90	65	93	26, 27	53	17	..	..
Longreach	30·03	84	57	90	3, 4	47	31	20	1
Mitchell	30·11	75	51	84	3	39	31	192	6
Western.									
Burketown	29·93	90	67	93	8, 9, 28	59	25	..	..
Boulia	30·04	80	56	90	3, 11	49	5, 6	..	..
Thargomindah	30·07	76	56	88	13	43	6	169	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	July. 1938.		August. 1938.		July. 1938.	Aug., 1938.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·46	5·6	6·35	5·21	9·7	9·42
2	6·46	5·6	6·34	5·22	9·50	10·20
3	6·46	5·7	6·33	5·23	10·22	11·0
4	6·46	5·7	6·33	5·24	11·7	11·42
						p.m.
5	6·45	5·8	6 32	5·25	11·43	12·26
					p.m.	
6	6·45	5·8	6·31	5·25	12·22	1·14
7	6·45	5·8	6·31	5·26	1·2	2·2
8	6·45	5·9	6·30	5·26	1·45	2·55
9	6·44	5·9	6·29	5·27	2·30	3·47
10	6·44	5 9	6·28	5·27	3·16	4·37
11	6·44	5·10	6·28	5·28	4·7	5·32
12	6·44	5·10	6·27	5·28	4·59	6·25
13	6·43	5·11	6·26	5·29	5·53	7·18
14	6·43	5·11	6·25	5·29	6·43	8·10
15	6·43	5·12	6·24	5·30	7·36	9·7
16	6·43	5·12	6·23	5·30	8·28	10·4
17	6·42	5·13	6·22	5·31	9·21	11·5
18	6·42	5·13	6·21	5·31	10·17	..
						a.m.
19	6·42	5·14	6·20	5·32	11·11	12·3
20	6·41	5·14	6·19	5·32	..	1·5
					a.m.	
21	6·41	5·15	6·18	5·33	12·12	2·5
22	6·41	5·15	6·18	5 33	1·11	3·4
23	6·40	5·16	6·17	5 33	2.14	3·55
24	6·40	5·17	6·16	5·34	3·10	4·45
25	6·39	5·17	6·15	5·34	4·19	5·32
26	6·39	5·18	6·14	5·35	5·17	6·15
27	6·38	5·18	6·13	5·35	6·10	6·53
28	6·37	5·19	6·12	5·36	6·59	7·35
29	6·37	5·20	6·11	5·36	7·42	8·15
30	6·36	5·20	6·10	5·37	8·23	8·57
31	6·35	5·21	6·9	5·37	9·1	9·39

Phases of the Moon, Occultations, &c.

4th July	☽ First Quarter	11	47 p.m.
13th ,,	○ Full Moon	1	5 a.m.
20th ,,	☾ Last Quarter	10	19 p.m.
27th ,,	● New Moon	1	54 p.m.

Apogee, 12th July, at 7.0 a.m.
Perigee, 26th July, at 9.0 p.m.

March, which from the beginning of the month has travelled from Gemini into Cancer, will set with the Sun on the 24th and disappear from the evening sky, having, in fact, been invisible to the naked eye for some time. On this day Mercury, in Leo, will pass Regulus on the path of the planets. They will be seen near the horizon in the north-west when darkness falls.

On the 29th at 7 p.m. Venus and the Moon, a very slender crescent, will be separated by 6 degrees, the length of the Southern Cross. On the next day the Moon, Venus, and Mercury will not be far apart as they are nearing the western horizon. On the 31st the invisible Neptune, very near Venus, will also be in the gathering of planets.

Mercury rises at 7.26 a.m., 40 minutes after the Sun, and sets at 5.50 p.m., 44 minutes after it, on the 1st; on the 15th it rises at 8.6 a.m., 1 hour 23 minutes after the Sun, and sets at 6.51 p.m., 1 hour 39 minutes after it.

Venus rises at 9.8 a.m., 2 hours 22 minutes after the Sun, and sets at 7.50 p.m., 2 hours 44 minutes after it, on the 1st; on the 15th it rises at 9.4 a.m., 2 hours 22 minutes after the Sun, and sets at 8.11 p.m., 2 hours 59 minutes after it.

Mars rises at 7.18 a.m. and sets at 5.38 p.m. on the 1st; on the 15th it rises at 6.57 a.m and sets at 5.25 p.m.

Jupiter rises at 9.11 p.m. and sets at 10.3 a.m. on the 1st; on the 15th it rises at 8.10 p.m. and sets at 9.7 a.m.

Saturn rises at 12.36 a.m and sets at 12.6 p.m. on the 1st; on the 15th it rises at 11.42 p.m. and sets at 11.25 a.m.

In the early evening, when the finest part of the Milky Way is coming into view, the Constellations partly in and near it will be from east to west; Sagittarius, the Archer, the Scorpion, the Pointers, the Southern Cross and Argo Navis On the ecliptic lie Regulus and Spica. Almost due north of Spica the brilliant Arcturus in Bootes, is most conspicuous among many small stars. North-east of Arcturus the Northern Crown will be seen on moonless nights: a circlet of small stars with one bright gem, Gemma, in the centre and just below Scorpio, suspended from nothing hangs a chain of very small stars: the Southern Crown.

3rd Aug.,	☽ First Quarter	12	0 p.m.
11th ,,	○ Full Moon	3	57 p.m.
99th ,,	☾ Last Quarter	6	30 a.m.
25th ,,	● New Moon	9	17 p.m.

Apogee, 8th August, at 1.0 p.m.
Perigee, 23rd August, at 3.0 a.m.

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 somewhat 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.

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