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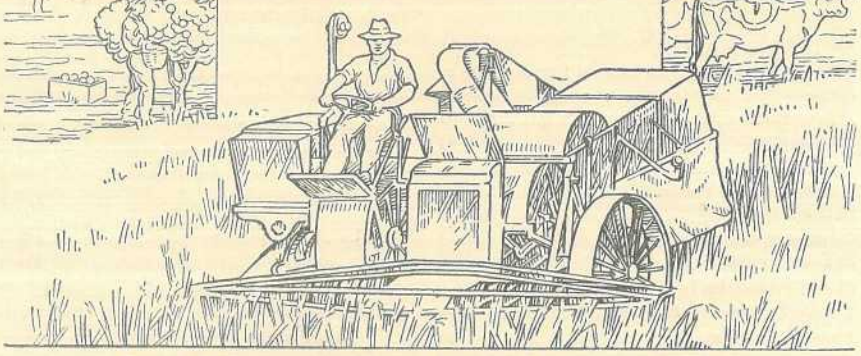
AND STOCK

Edited by
C. W. WINDERS, B.Sc.Agr.



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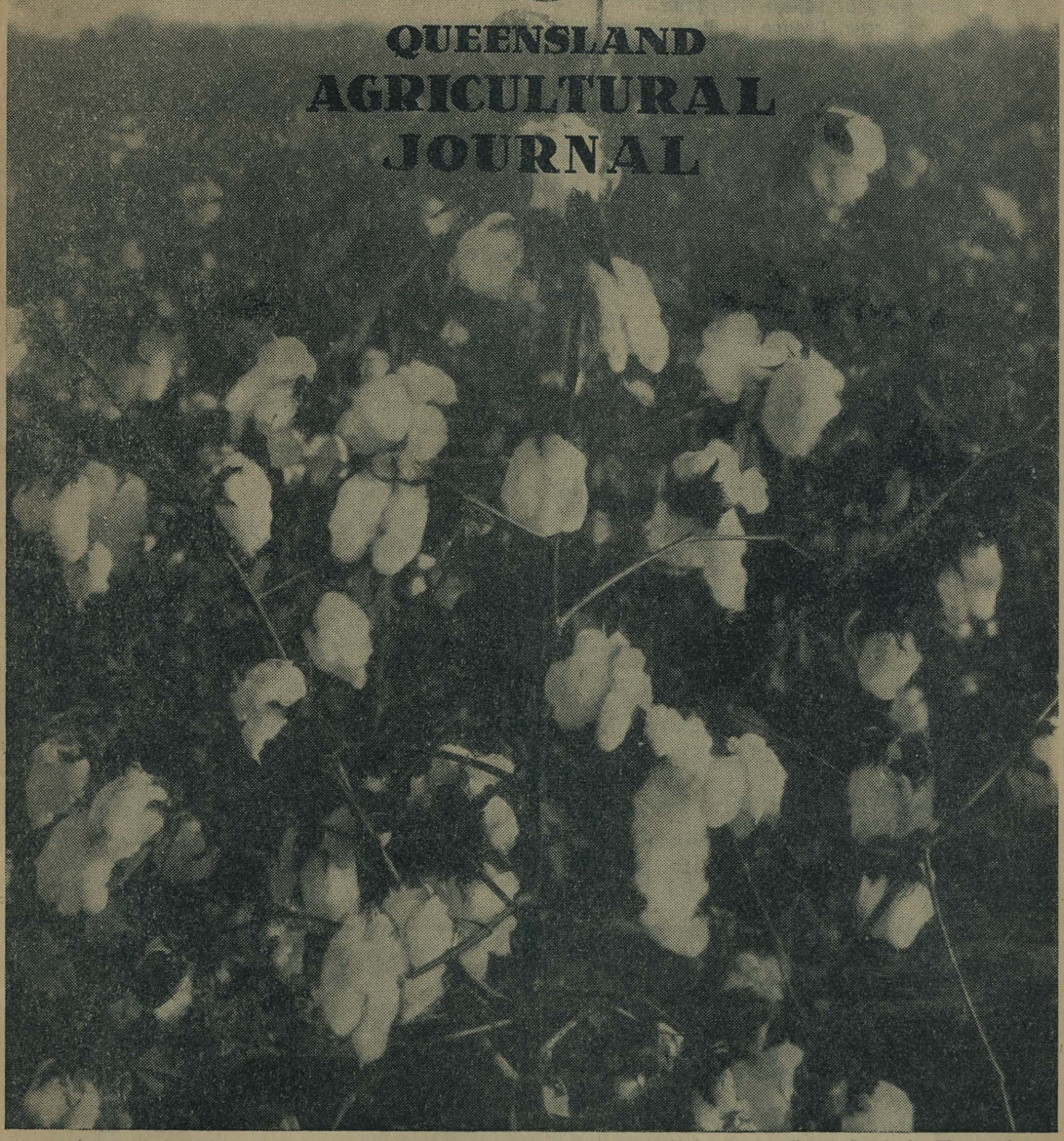

Cotton Ready for Harvesting.

LEADING FEATURES

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THE HONOURABLE H. H. COLLINS
MINISTER FOR AGRICULTURE AND STOCK

GOVERNMENT PRINTER, BRISBANE

Contents

Wheat Growing in Queensland.

C. S. CLYDESDALE (Senior Adviser in Agriculture) and L. G. MILES (Senior Plant Breeder).

(*Continued from page 337 of the June issue.*)

HARVESTING.

THE crop is ready for harvesting when the grain has become hard and dry; this can normally be ascertained by biting or by noting the effect of pressure with the thumb nail. Should the crop have ripened unevenly, the grain tested should be taken from the latest maturing section of the field. Ripe grain which has been dampened by rain must be allowed to harden again before it is harvested. Once the grain is in satisfactory condition for harvesting, no time should be lost in getting the crop off, as the risks of severe loss through hail and thunderstorms in Queensland districts are very real at this period of the year.

The advent of the modern header-harvester has greatly increased the safety factor at this critical period. This machine, which cuts, threshes and cleans the grain in one operation, has revolutionised wheat harvesting. Even its predecessor, the stripper, which itself provided a great advance upon previous harvesting methods, was much slower in operation and more limited in its effectiveness. Where soil was damp at harvest time the stripper was unable to remove the heads without pulling whole plants out of the ground, resulting in choking of the comb. Again, where crops were badly lodged by storms the stripper was powerless to deal with them. The modern header, on the other hand, has proved itself able to handle expeditiously, and with little loss of grain, crops which are weedy, badly lodged, or poorly anchored in moist soil.

Many makes of machines, all eminently suited for local conditions, are available on the Queensland market. The swathe cut by such machines ranges from 6 feet to 14 feet. Most machines of standard type may be hauled by either horse teams or tractors, but tractors are almost universally used now on account of the steadier power output, the greater possible speed and the longer hours that can be worked.

The operating machinery in most of the earlier harvesters was driven from the main cleated wheel of the harvester. Such machines sometimes fail in loose soil because of wheel slip. Another disadvantage is that when the "going" is heavy and tractor speed has to be reduced by the use of a lower gear, the threshing speed is correspondingly reduced, with the result that congestion may occur unless a narrow cut is taken. These disadvantages are largely overcome by replacing the

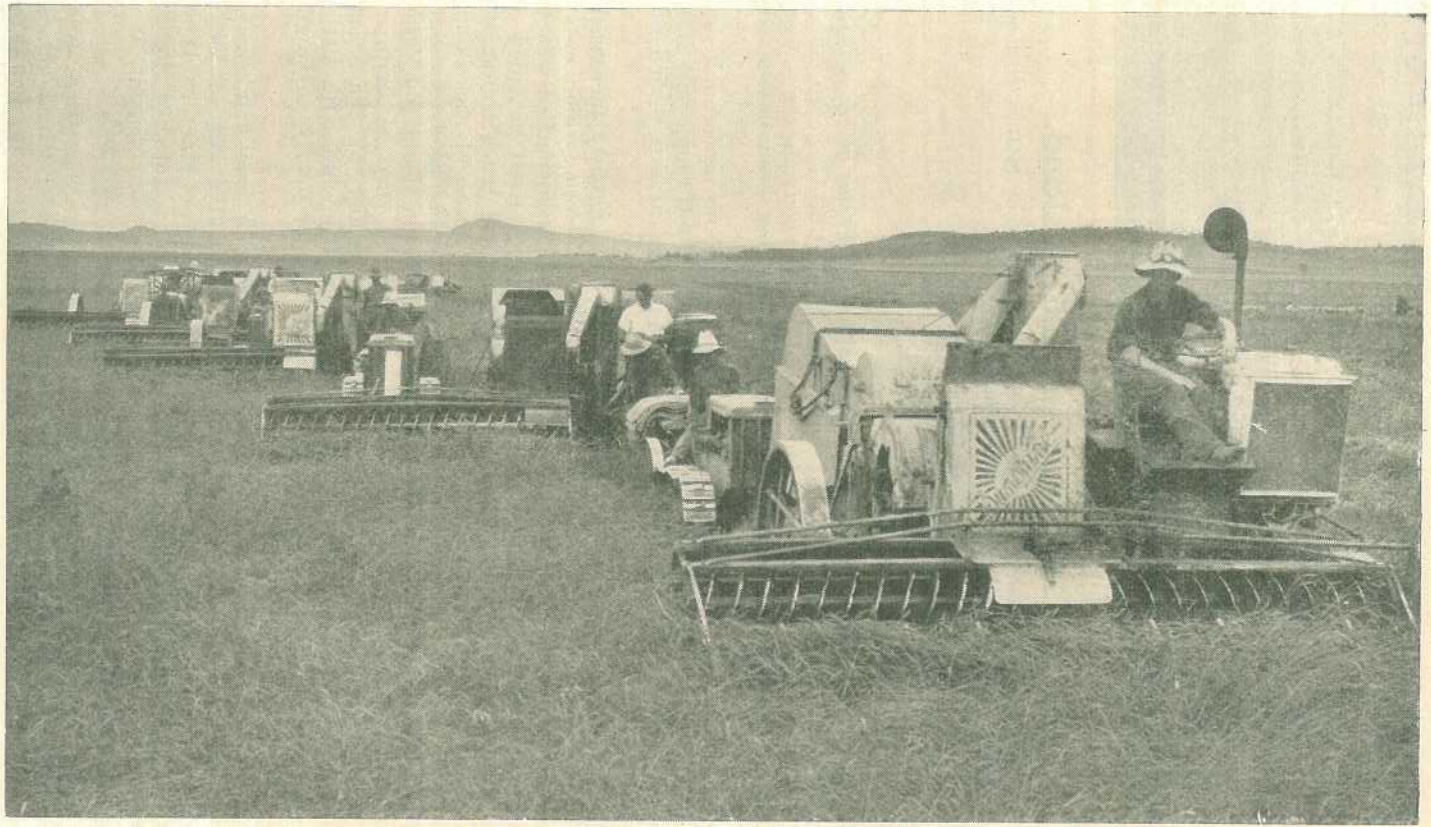


Plate 1.

Harvesting Wheat at Evanslea, Darling Downs.—An autoheader is followed by a number of tractor-drawn headers. This crop, though lodged and somewhat tangled, was satisfactorily harvested without the need for crop-lifters.

wheel-drive with a power take-off direct from the tractor. Harvesters equipped with power take-off normally operate far more efficiently than wheel-driven machines, particularly in heavy crops, in badly lodged or tangled crops, or on moist or loose soil. The necessity for power take-off is obviated if an engine-functioned header is available. This type carries its own engine, the purpose of which is to operate the functional parts of the header, but not to provide locomotion; either horse teams or light tractors may provide the motive power. Such machines, which are used for harvesting rice in southern irrigation areas, are not often encountered in Queensland wheat districts, but could be very useful on hillsides or on loose sandy land. The most expensive type of header, and that which is most efficient and labour-saving on large wheat farms, is the auto-header (Plate 1). These machines contain a built-in tractor which supplies all power requirements, including that of locomotion. The last three modifications of the general harvester type enable the machines to be used if required as stationary plants for threshing or re-cleaning of seed.

Crop-lifters, which can be readily attached to all standard machines, enable them to operate successfully in badly lodged and tangled crops. By this means, such crops, which were once written off as almost total failures, may now be harvested with little or no grain loss.

The one undesirable feature about the header-harvester in careless hands is its ability to harvest crops in which the grain is immature or otherwise carrying too high a moisture content. When an attempt was made in earlier days to harvest such crops with stripper-type machines, the choking of the comb indicated that the crop was not in condition to harvest, and compelled a cessation of operations. The harvesting of grain in an immature or moist condition does not save time, for the grain must be spread out, dried and rebagged, if total loss is to be avoided. Damp wheat will not be accepted by the Wheat Board's classifiers under any consideration. In addition, it should be remembered that wheat which is only slightly moist is far more susceptible to weevil attack than hard, dry, fully matured grain.

MARKETING.*

Progress in the industry has not been confined to production methods but has also extended to the marketing of the crop. The first step in this direction was taken in December, 1920, with the establishment of The State Wheat Board to handle the 1920-21 Queensland crop.

Once the Board was set up it became compulsory for all growers in the State to deliver their wheat to the Board, which undertook the storage and sale of the commodity and paid advances to growers from time to time on wheat delivered. The State Wheat Board is empowered under *The Wheat Pool Acts*, 1920 *to* 1930 to operate for limited periods, and provision is made for a poll of growers if required, at the expiration of such periods, to obtain approval for the continuance of the Board.

Such has been the confidence of growers in the Board that on each occasion on which such a poll has been conducted an overwhelming majority of growers has voted in favour of its continuance. The operation of the Acts at present extends to cover the 1949-50 season. The control of the Board is in the hands of growers, the present membership comprising four elected grower members, the Director of Marketing, and an independent Chairman.

* This section prepared by Division of Marketing.

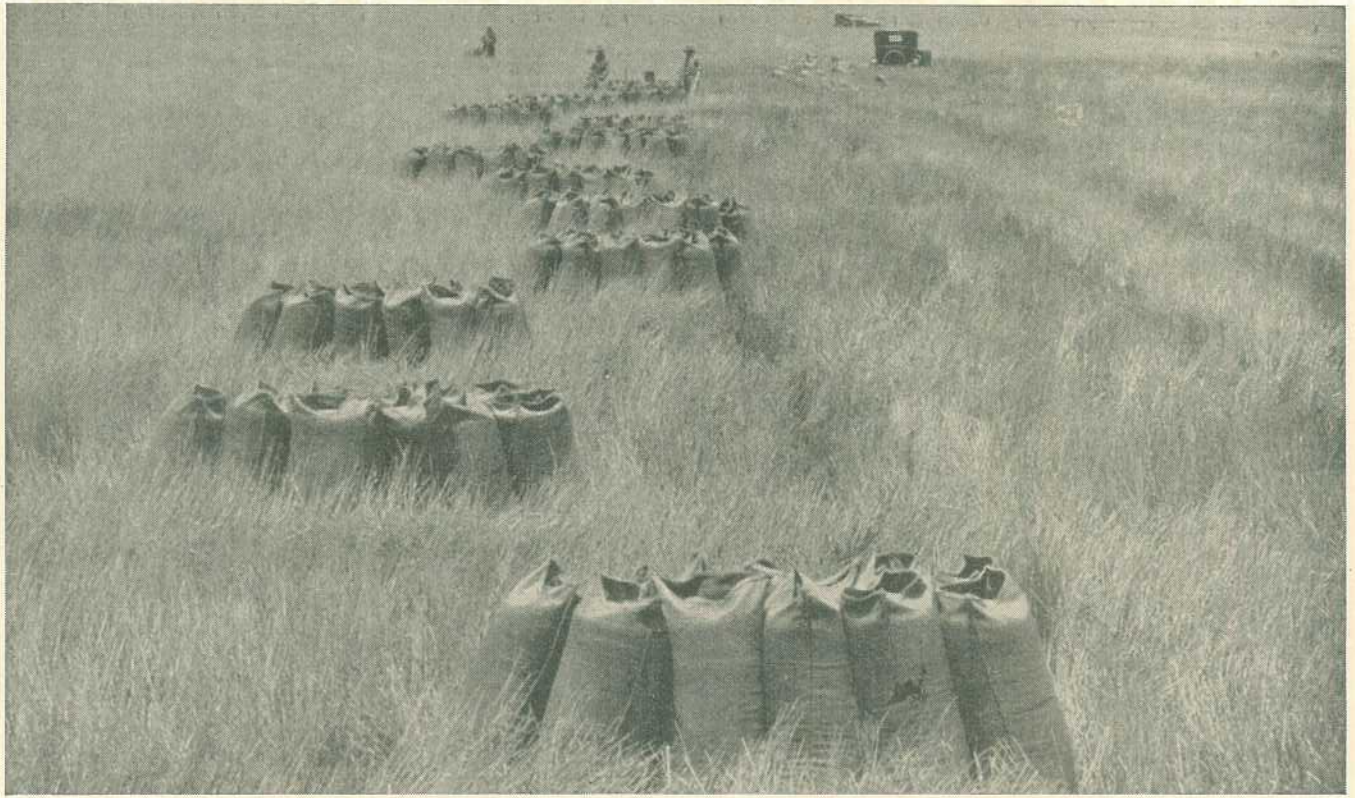


Plate 2.

Bagged Wheat Ready to be Sewn on a Bongeen Farm.

The activities of the Board are not confined entirely to the marketing of the crop. A compulsory co-operative hail insurance scheme is in operation which provides that all wheat grown in Queensland is, subject to completion of the required return, insured against hail damage on a scale provided in the hail insurance regulations. The scheme is financed by means of a levy on wheat harvested.

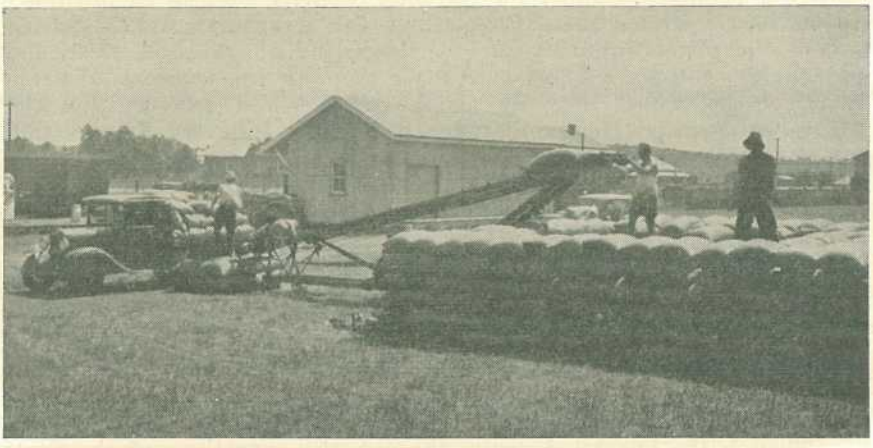


Plate 3.
Building a Wheat Dump at a Railway Siding.

Receiving, Classifying, and Grading.

The State Wheat Board operates a system of classifying the wheat grown in the State into Q1, Q2, and Q2A grades of milling wheat, and feed wheat. Queensland is the only State which has adopted such a classification system, all other States operating on the FAQ standard.

As wheat is delivered at the receiving depot (Plate 3) a Board classifier draws a fair sample of wheat from each bag and separates the load into the several grades. The wheat is then stacked and stored until required for outward delivery. A grower has the right to appeal for revision of classification if he is not satisfied with the original grading of his wheat.

The classification system is based on a visual examination of the wheat, the general requirements of the grades being as follows:—

Q1.—Wheat which is bright, dry and free from foreign substances, with good condition and colour, and of superior milling quality in every respect.

Q2.—Wheat which complies with the requirements for Q1 grade but which may contain foreign grains and substances which could be separated during milling; or wheat which is to some extent bleached, or pinched through dry conditions. This grade does not admit grain which has germinated.

Q2A.—Wheat of milling quality which cannot be admitted to Q1 or Q2 grades.

Feed Wheat.—Wheat which is not suitable for milling because of Hexham scent, or which is smutty, musty, excessively pinched or of generally low quality.

Queensland flour millers pay to The State Wheat Board premiums at the rates of 3d. and 1½d. per bushel for Q1 and Q2 wheat respectively,

which is supplied to them. The monies obtained from such premiums are used for the payment of premiums to growers who deliver such wheat.

Australian Wheat Board.

At the outbreak of war in 1939, all wheat grown in Australia was subject to acquisition under the National Security (Wheat Acquisition) Regulations. Under these Regulations the Australian Wheat Board became the prime authority for the marketing of wheat in Australia, and during, and for a short time after the war, the Queensland State Wheat Board acted only as agent and licensed receiver for the Australian Board. However, under the Wheat Industry Stabilisation Scheme which was introduced to commence with the 1947-48 season, the State Wheat Board is preserved as a separate entity and works in conjunction with the Australian Wheat Board, so that the industry is now organised on a national as well as a State basis. This scheme provides for guaranteed returns to growers until the 1952-53 season.

Further progress towards the stabilisation of the wheat industry has been accomplished with the operation of an international wheat agreement which now provides a measure of stability in the export market.

REDUCING FIRE RISKS.

Though the harvested grain, through the operations of the State Wheat Board, is automatically insured against loss by fire, this cover in respect of fire risks does not extend to the standing crop. The premiums required by insurance companies transacting this class of business are high, but the risk must be acknowledged to be a very real one with results that can be disastrous.

Ripening crops have been destroyed as a result of bush fires or grass fires getting out of control, through being struck by lightning during a dry storm, or through careless use of matches; furthermore, the risk has tended to increase with the universal use of tractors. It is an essential precaution, therefore, for growers to ensure that, if an outbreak of fire does occur, it will be localised as far as possible. Under most conditions, protection can be afforded by cutting a strip about half a chain in width all round the field, and ploughing or discing the stubble. Where large areas are cropped, the same procedure should be adopted, but in addition tracks of similar width should be cut through the crop in such a manner as to divide it into say 200-acre blocks. Cutting of these protective strips is best accomplished with a reaper-and-binder when the crop is at the hay stage. The sheaves obtained may be set aside for use by farm stock, or sold as hay or chaff if not locally required.

Should it be likely that a binder will not be available when required for this purpose, strips may be left unsown at the beginning of the season, or failing this, the young plants may be destroyed by cultivation to form the necessary breaks. For such breaks to be efficient, however, they must be kept cultivated and free of weed growth.

SHEEP AND WHEAT.

Sheep raising and wheatgrowing can be combined very economically on suitable land. The proposition becomes practicable only on the larger farms where ample uncultivated land is available for carrying the sheep when they cannot have access to the areas under immediate cultivation. Sheep have many uses on a large grain farm, and they are essentially easy to maintain. One of their main uses is in keeping

fallows clean. By this means they reduce the number of cultivations required, and the weeds which would otherwise be a serious liability are converted into a considerable asset.

Furthermore, in the event of a young wheat crop becoming too rank in growth or too forward as a result of seasonal or soil conditions, the sheep may be used to graze the crop, thereby reducing the probability of loss through lodging or frost injury. It is customary, where sheep are held, to plant slow-maturing varieties early in the season with the specific purpose of obtaining one or more grazings, and then, should the weather be favourable, allowing a grain crop to mature.

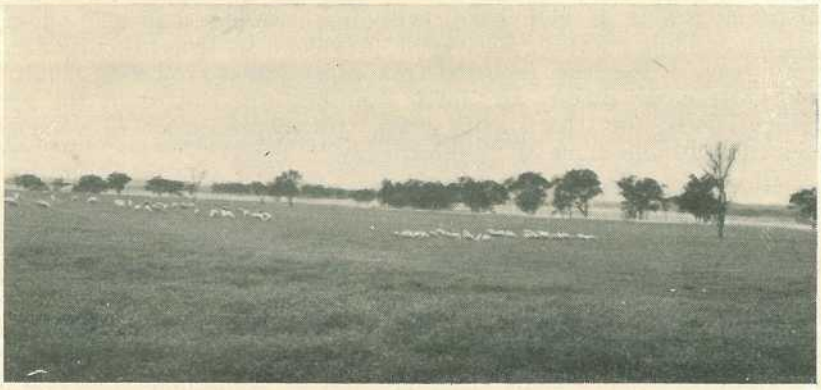


Plate 4

Sheep Grazing on Wheat on the Darling Downs.

No inflexible rule can be laid down regarding the number of sheep that can be profitably carried on a given acreage. Much depends upon the soil type, the rainfall, the size of the holding, the improvements, and the major object in view, whether stock or crop husbandry. There are instances, however, on the western Darling Downs of farms of about 1,200 acres, half of which is under crop, mainly wheat with a small area devoted to lucerne, carrying comfortably over a number of seasons up to 1,000 sheep.

Where a wheat crop has been fed off by sheep, it is advisable after the sheep have been removed to loosen the soil surface by running a set of heavy harrows over the field. By this means the soil mulch which has been destroyed by the grazing stock is restored. Stock should not of course be permitted to graze a crop, particularly on the heavier soils, when the ground is wet. If the crop is intended ultimately for grain, sufficient sheep should be used to graze it down as rapidly as possible. Where the number of sheep is small in comparison with the area to be grazed, there is a tendency for the stock to remain on the one spot, since they frequently prefer the regrowth to the ranker ungrazed material.

There is a stage in the growth of the wheat crop beyond which it is fatal to graze if a grain harvest is desired. This stage may be ascertained by taking a number of average stalks, dismembering them, and examining them closely for the undeveloped ear. If this miniature ear can be discerned, the crop is too far advanced to be further grazed as a dual purpose crop. On the Darling Downs feeding-off may usually be permitted with safety until the end of July, while in the Maranoa or more northerly districts grazing should be discontinued by the end of June. Crops have under exceptional circumstances been grazed until the end of August and still produced satisfactory grain yields, but such occurrences are not common.

Observations over a number of years support the view that feeding-off does not tend to increase the ultimate grain yield. Much depends upon the availability of moisture in the soil and the occurrence of rain subsequent to grazing, but in general, lower grain yields would be expected following the practice. In specific instances, however, this form of management does result in useful grain yields which might otherwise have been seriously reduced through excessive leafiness, lodging or frosting.

MOTTLING IN WHEAT.

Mottling in wheat is characterised by the occurrence together in individual grains of both hard (vitreous) sections and soft (floury) sections. While mottling has been prevalent in Queensland only in recent years, it has been reported from older wheat-producing countries from quite early times. In North America, where most of the grain produced is of the "hard red" class, this manifestation is commonly referred to by the name of "yellow-berry."

Mottling has been reliably reported by Queensland millers to cause a serious reduction in the bread-making quality of the milled flour. Its prevalence, therefore, in recent years has caused considerable concern, and the Department is engaged in a research programme seeking to find the causes of this trouble and practical methods for its correction.

While it is premature to try to anticipate the results of this investigation, the following points appear to have been fairly well established as a result of studies made elsewhere and of preliminary observations in Queensland.

(1) Mottling is not so much a cause as a symptom of reduced quality in wheat, the causes being definitely associated with soil fertility and crop management.

(2) Only grain types which are normally vitreous (or translucent) can mottle, and it is this group of wheats which includes all those of highest baking strength.

(3) Even normally vitreous varieties differ in their susceptibility to mottling. It should be remembered, however, that the conditions which cause mottling in one variety may cause a comparable loss in quality in a second variety, even though the latter is much less subject to mottling.

(4) The degree of mottling can be varied considerably by fertilizer and cultural treatments. Mottling is normally worse on eroded slopes and old cultivations than upon fertile soil which has been well fallowed.

(5) While other plant foods may be shown to have marked effects upon mottling, nitrogen is almost certainly the main determining factor. Upon the nitrogen taken up from the soil depends the quantity of gluten present in the mature grain. Where the nitrogen supply is insufficient in grains of normally translucent appearance, deterioration in texture occurs, giving the characteristic symptoms of mottling.

While these conclusions are probably valid for Queensland as for other countries, they do not offer any easy solution to the problem. The application of nitrogen as a fertilizer at planting time may not necessarily prove wholly effective or economic. It is clear that the problem is tied up with the whole system of wheat culture in the main grain-producing areas of the Darling Downs, and therefore considerable research may be necessary to provide remedial measures which will be both effective and acceptable to farmers.

WHEATS FOR GRAZING AND FOR HAY.

While in this State wheat is mainly grown for its grain yield, there are some 50,000 acres used annually for grazing and also nearly 10,000 acres grown for hay. Much of the area used for grazing is probably planted for grain production, and eventually fed off as a result of (i.) shortage of other green feed or grazing on the farm; or (ii.) a decision that the grain crop would probably fail on account of dry weather. As a winter grazing crop, wheat is second in importance to oats, and as a hay crop second to lucerne.

Where wheat is grown for hay or green feed, rust resistance is an important requirement in the variety chosen, particularly in the higher rainfall districts or districts which are close to the coast. Moreover, while quick-maturing wheats often offer the best prospects of grain yields in the more inland agricultural areas, slower-maturing varieties will normally provide higher hay yields or a more extended grazing season in the near-coastal dairying districts. For these reasons Florence x College suggests itself as a worthwhile variety for use for either grazing or hay in the more favoured dairying districts; its resistance to leaf-rust (in addition to stem-rust) gives it a big advantage over most other varieties, and it has proved under farm conditions to be very palatable to stock. Warput is a proven grazing wheat of some years' standing, but it suffers by comparison with Florence x College in its lower degree of rust resistance. In addition, its weaker straw would place it at a disadvantage as a hay wheat under conditions which are conducive to heavy growth. Other wheats which are worthy of trial for these purposes are Celebration, Charter, Kendee, and "Fedweb-5." Bearded wheats such as Three Seas or Seafoam should not be chosen for either grazing or hay-making.

Hay-making is discussed more fully in other Departmental publications. Best results with wheat are obtained by cutting during the early heading period, not later than a week after flowering. The presence of well formed grain in wheaten chaff generally indicates that the material has passed its most nutritious stage, and also invites destruction by mice and other vermin.

Crops may be cut with the reaper-and-binder, stooked in the field until satisfactorily cured, and finally stored in barns or stacked. Alternatively, they may be cut with a mower, allowed to cure in the swath, and converted into baled hay by use of a pick-up hay baler. The latter process, particularly where a one-man baler is available, is the most economical of human time and labour. As in making other types of hay, it is essential that the material should carry no free moisture when it is baled or stacked. The presence of excess moisture will cause overheating in a large stack of any type, and has frequently resulted in complete loss through spontaneous combustion. Only experience can provide a guide as to the correct stage at which to bale loose hay, or cart in sheaves for stacking. With wheat, however, the best criterion is the drying out and shrinkage of the upper nodes (or joints) of the straw. Where material is in the stook, handfuls of straw should be extracted from the middle of a number of inside sheaves for use in making this test.

MAJOR WEED PESTS.

Wild Oats.*

This weed, which is, as its name implies, a wild representative of the oat group, is one of the commonest pests of winter cereal crops the

* *Avena fatua.*

world over. The plant is very similar in its field appearance to cultivated oats, and is readily distinguished from them only by its mature seeds, which are enveloped by a tough, black, hairy chaff, and carry a strong, angled awn (or beard). The hard seed-covering enables the seed to lie in contact with moist soil for long periods of time without germinating. Even seeds favourably placed near the surface of the soil will not all germinate on the one rain, for which reason it is never possible to control the pest by a single cultivation. The wild oat also requires cooler soil conditions than most of the cultivated cereals for its germination.

Main disadvantage of the pest is that it occupies space in the wheatfield which would otherwise be producing wheat, and competes with neighbouring wheat plants for soil moisture and nutrients; the presence of a large population of wild oats in a wheat crop may represent a serious reduction in potential yield of the wheat. Secondly, although the wild oat has a shorter growing period than most wheats, its delayed germination may result in its producing a mass of green heads at the time the wheat is ready for harvest. Inclusion of the green oats in the bags of wheat would endanger the quality of the grain by overheating, while, if the crop is allowed to stand until the oats are ripe, serious losses or deterioration may occur through unfavourable weather. Thirdly, where the wild oat crop matures at approximately the same time as the wheat, its seed provides an important impurity which requires mechanical removal before the wheat can be milled for flour. Also, much of the seed will normally have shed before harvesting, providing a constant source of re-infestation of the land.

As with most weeds, the most effective control measure is prevention of its initial entry. Where new land or clean land is planted, care should be exercised in the selection of seed which is completely free of this pest. Grading machines of modern design can make a very effective separation of oats from wheat, and where planting seed cannot be obtained from perfectly clean land, it should be carefully graded in some such reliable machine. Care should also be taken to see that this pest is not introduced with wheat or other cereal grains used as stock food.

Where wheatfields are already infested with wild oats, control is not always easy, particularly where wheat is grown annually for grain, following the short fallow. Some measure of control has been claimed by the early sowing of mid-season or later-maturing wheat varieties. Since the wild oat requires a cooler temperature for its germination than the wheat, the early-planted crop may reach a stage at which it can suppress the wild oat before a heavy germination of the latter has occurred. Attempts at control have also been made by planting late, following several cultivations aimed at destroying successive weed crops. This method is seldom very successful because delayed germination enables portion of the seed to survive a large number of germination periods.

Where the long fallow is practised (either regularly or in rotation), wild oat control should be relatively simple. Cultural operations during the winter fallow period should be aimed at providing a seed-bed of fine tilth which will encourage germination of the oats when soil temperatures are favourable. Successive crops may then be destroyed by grazing or by further cultivation. Whichever method is adopted to destroy the seedling growth, it should be followed by harrowing in order to re-establish the desired tilth.

Another method open to the large-scale grain farmer is to change for some years to summer cropping, using the winter cultivation periods as a means of eradicating the pest. Suitable summer cash crops for mechanical handling are grain sorghum, Sudan grass, sunflowers, and millets. The smaller-scale mixed farmer has still better opportunities for crop rotation, since the use of winter grazing and hay crops and short-term pastures can also be made to assist directly in the eradication of the pest.

Wild Turnips.*

These distinctive, yellow-flowered weeds, which in favourable seasons cover whole roadsides and stock-routes as well as infesting wheatfields, belong to the well-known cabbage and turnip family. Apart from being a weed pest of winter crops they provide one of the commonest causes of taint in milk and cream.

Fortunately, this family of plants is particularly susceptible to even light applications of hormone weedicides. The selective nature of this agent makes the destruction of the pest in cereal crops a simple matter. Farmers have been quick to recognise the fact and over the past two seasons considerable areas of turnip-infested cereal crops have been successfully treated.

Experience has shown that wild turnips can be killed at all stages of growth, but generally the most effective treatment is that given when the plants are young and leafy. One pound acid equivalent mixed with 100 gallons of water is generally regarded as sufficient to treat approximately 6 acres.

Material applied at the above rate will cost only approximately 2s. 6d. per acre (April, 1950, costs). Treatment costs, such as labour, petrol and plant depreciation, are relatively light due to the fact that under normal working conditions it should be possible to cover up to 20 acres per hour with a spray of moderate size attached to a motor truck.

Hexham Scent.†

This weed belongs to the same group as the sweet clovers (or Bokhara clovers), and possesses the strong sweet smell which is characteristic of this group. It is an annual weed which is very prevalent in certain wheat cultivations, and is also widespread along railway enclosures and roadsides throughout the Downs. Its growing period is much the same as that of wheat, and the presence of harvested pods or seeds in the wheat bags imparts to the grain the characteristic scent of the weed. Grain so tainted is not acceptable for milling, as the taint is carried through to the flour and eventually to the bread or other end-product.

As with other winter weeds, control can be easily effected by the use of the long fallow or the introduction of summer cropping for a season or two. Where it is intended to continue with the growing of wheat in an infested area, control may be obtained by spraying the wheat crop with a selective hormone weedkiller while the Hexham scent plants are still young.

Climbing Buckwheat or Black Bindweed.‡

This climbing weed pest with a small black angular seed has recently become very widespread on the Darling Downs. As it is one of a group

* Mainly *Raphanus raphanistrum* and *Rapistrum rugosum.*

† *Melilotus indica.*

‡ *Polygonum convolvulus.*

of weeds which has proved to be resistant to the commercial hormone weedkillers, its wide spread is causing wheatgrowers much concern.

Climbing buckwheat is frequently carried in wheat seed from infested areas, but there is little excuse for its spread by this means, as the seed is very easily graded out of wheat. If only clean wheat is sown, there should be no danger of introducing the pest to clean paddocks. Control may, of course, be effected by the introduction of the long fallow or of summer crop rotations. There is also a possibility that the dinitro weedkillers may prove effective against this pest, but the practicability of field-scale control in wheat by this means has not yet been fully investigated.

Frost Occurrence in Agricultural Areas.

THE crop planting tables prepared by officers of the Agriculture Branch of the Department and published in recent issues of the Journal stress that certain crops are damaged by frosts and that time of planting must be considered in relation to the expectation of early and late frosts.

Information on frost occurrence in the agricultural and adjacent areas, compiled by Mr. J. C. Foley, of the Commonwealth Meteorological Bureau, and published originally in the Bureau's Bulletin No. 32 in 1945, is summarised here as a guide to Queensland producers.

In presenting the information in Bulletin No. 32, Mr. Foley wrote "..... It is considered that in view of the range of temperature which is critical for various crops susceptible to damage, and the variability of temperature differences between the ground and the thermometer screen under frosty conditions, a screen temperature of 36 deg. F. should provide a fair general basis for statistics of light to moderate frosts at or near ground level, while a screen temperature of 32 deg. may be adopted to give similar information for the level of foliage, blossom and setting fruit at a height of approximately 4 feet above the ground and heavy frosts on the ground."

The accompanying table shows, for both light and heavy frosts, the earliest and latest dates on which frost has occurred, the periods during which the first and the last frosts usually occur, and the average frost-free period. A number of centres (including Ayr, Bowen, Bundaberg, Charters Towers, Childers, Rockhampton, and Southport) which have recorded occasional frosts are excluded from the table, as they may be regarded as being virtually frost-free.

The original tables prepared by Mr. Foley were based on records from official recording stations, which in many centres are the post offices. The surrounding districts may or may not experience the same frosts.

FROST OCCURRENCE AT VARIOUS CENTRES.

Station.	Light Frost—Screen Temperature 36°.				Heavy Frost—Screen Temperature 32°.				Average Frost-free Period (Days).
	Earliest on Record.	Usual First.	Last on Record.	Usual Last.	Earliest on Record.	Usual First.	Last on Record.	Usual Last.	
Atherton	Apr. 29.	May 28—July 6	Oct. 2	July 10—Aug. 29	May 27.	June 6—July 18	Sept. 13	July 18—Aug. 23	316
Biloela	Apr. 22.	May 10—June 6	Oct. 5	Aug. 13—Sept. 10	May 18	June 6—July 6	Oct. 5	Aug. 13—Sept. 11	252
Bybera	Apr. 6	Apr. 13—Apr. 27	Oct. 23	Sept. 27—Oct. 11	Apr. 14.	Apr. 21—May 1	Oct. 23	Sept. 9—Oct 9	197
Cambooya	Mar. 29.	Apr. 18—Apr. 30	Nov. 17	Sept. 24—Oct. 12	Mar. 29.	Apr. 24—May 28	Oct. 10	Sept. 11—Sept. 29	202
Charleville	Apr. 22.	May 16—June 30	Oct. 2	Aug. 16—Sept. 11	May 26.	June 6—June 28	Sept. 13	July 26—Aug. 27	273
Clermont	Apr. 28.	June 11—July 1	Sept. 10	July 22—Aug. 19	May 15.	June 22—Aug. 5	Aug. 25.	July 10—Aug. 13	319
Dalby	Apr. 17.	May 3—June 2	Oct. 1	Sept. 4—Sept. 22	May 8	June 6—June 28	Sept. 16	Aug. 11—Sept. 4	246
Emerald	Apr. 28.	June 8—July 8	Sept. 11	Aug. 4—Aug. 26	May 26	June 15—July 25	Aug. 25	July 11—Aug. 6	311
Gatton College	Apr. 17.	May 29—July 6	Sept. 13	July 29—Aug. 30	June 7	June 19—July 23	Aug. 21.	July 5—July 25	306
Gayndah	Apr. 24.	May 31—June 18	Oct. 12	Aug. 19—Sept. 4	May 14.	June 10—June 28	Sept. 17	July 8—Aug. 9	285
Goondiwindi	Apr. 17.	May 19—June 12	Oct. 16	Aug. 19—Sept. 8	May 19.	June 10—July 20	Sept. 13	July 13—Aug. 24	274
Gympie	Apr. 24.	June 1—June 21	Sept. 19	Aug. 15—Sept. 8	May 15	June 16—July 14	Sept. 9	July 6—Aug. 13	287
Herberton	Apr. 29.	June 21—July 15	Sept. 30	July 8—Aug. 15	June 21	June 26—July 20	Sept. 12	July 7—July 25	340
Ipswich	May 21.	June 10—July 8	Sept. 3	July 31—Aug. 17	June 11	..	Aug. 24	..	319
Killarney	Mar. 29.	Apr. 19—May 11	Nov. 17	Sept. 14—Oct. 10	Apr. 17.	Apr. 27—June 2	Oct. 21	Aug. 31—Sept. 20	214
Maryborough	June 5	June 14—June 24	Aug. 31.	July 5—Aug. 6	June 25	..	July 16	..	332
Miles	Apr. 17.	Apr. 28—June 5	Oct. 21	Sept. 10—Oct. 4	Apr. 24.	June 3—June 17	Oct. 5	Aug. 21—Sept. 11	238
Mitchell	Apr. 11.	Apr. 21—May 21	Oct. 12	Sept. 9—Oct. 1	Apr. 24	May 20—June 17	Oct. 10	Aug. 16—Sept. 11	227
Mount Morgan	May 25.	June 12—July 22	Aug. 26	July 21—Aug. 10	June 25	..	Aug. 15	..	335
Nanango	Mar. 26.	Apr. 21—May 24	Nov. 6	Sept. 13—Oct. 7	Mar. 26.	May 29—June 18	Oct. 12	Sept. 2—Sept. 28	225
Pittsworth	Apr. 17.	May 6—June 17	Oct. 12	Aug. 16—Sept. 17	May 25.	June 11—July 5	Sept. 3	July 31—Aug. 20	267
Roma	Apr. 17.	May 7—June 4	Oct. 12	Sept. 6—Sept. 30	May 2.	May 27—June 20	Sept. 22	Aug. 9—Aug. 31	244
Stanthorpe	Mar. 15.	Mar. 31—Apr. 21	Nov. 17	Sept. 28—Oct. 24	Apr. 8	Apr. 16—May 16	Nov. 5	Sept. 19—Oct. 9	180
Tamborine Mountain	June 2	June 14—July 8	Sept. 29	July 12—Aug. 17	June 2	..	June 21	..	330
Toowoomba	Mar. 29.	May 6—June 9	Oct. 13	Aug. 28—Sept. 17	Apr. 17	May 29—July 3	Sept. 16	July 31—Sept. 4	257
Wallangarra	Mar. 29.	Apr. 14—May 8	Nov. 17	Sept. 21—Oct. 15	Mar. 29.	May 1—June 10	Nov. 8	Sept. 8—Oct. 14	204
Warwick	Apr. 10.	Apr. 24—May 30	Oct. 12	Sept. 10—Sept. 30	Apr. 17	May 23—June 16	Oct. 12	Aug. 20—Sept. 15	233

In most years temperatures do not fall to 32° at Ipswich, Maryborough, Mount Morgan or Tamborine Mountain.

Horticultural Districts of Queensland.

4. Metropolitan.

C. N. MORGAN, Senior Adviser in Horticulture.

THE metropolitan horticultural district embraces roughly all districts within a radius of 25 miles of Brisbane, together with Tamborine Mountain and the Moreton Bay Islands. It is bounded in the east by the waters of Moreton Bay, in the south by the Logan River, in the west by a line parallel to and approximately 25 miles from the coast, and in the north by the Caboolture River. The area includes a number of soil types and a wide range of altitudes varying from Tamborine Mountain, which is about 1,000 feet high, to Pinkenba and Nudgee, which are only a few feet above sea level.

The Brisbane River divides the district into two distinct sections, which are the north and south metropolitan advisory districts. In the former, the main production centres are Pinkenba, Nudgee, Redcliffe, Sandgate, Kallangur, Bald Hills, Aspley, Brookfield, Moggill, Mitchelton and Enoggera, whilst to the south are the Bay Islands, Redland Bay, Cleveland, Wellington Point, Manly, Rochedale, Sunnybank, Eight Mile Plains, Darra, Slacks Creek and Tamborine Mountain.

CLIMATE.

The climate (Table 1) is mainly sub-tropical. The annual rainfall is approximately 45 inches but is slightly higher immediately along the coast and at Tamborine Mountain, and a few inches lower along portions of the western boundary. Approximately half the annual rainfall is received during the summer months of December to March. The bulk of the vegetable production has ended when the wet season commences, and unless the rains extend into late March, they do not interfere to any great extent with land preparation for autumn crops. During the winter, the rainfall is spread out fairly evenly and is usually sufficient for crop growth in non-irrigated areas. A failure of the winter rains, however, does not affect production unduly, as vegetables are largely grown under irrigation and most orchard and plantation crops and trees make little growth at that time of the year.

The prevailing winds are mainly south-east to east in late summer and autumn. During July and August, cold westerly winds blow strongly and may interfere with fruit setting in some crops and often injure the plants. North-easterly to north-westerly winds blow between

October and December. When not accompanied by storms, they are often extremely dry. Windbreaks are a distinct advantage where natural protection is missing.

TABLE 1.

CLIMATIC DATA FOR METROPOLITAN AREA.

BRISBANE.

—	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
Mean Max. Temp. (°F.) ..	85·4	84·5	82·3	79	73·6	69·3	68·5
Mean Min. Temp. (°F.) ..	68·9	68·6	66·3	61·5	55·3	51	48·5
Average Rainfall (points)..	651	625	571	375	283	285	223

—	Aug.	Sept.	Oct.	Nov.	Dec.	Average.
Mean Max. Temp. (°F.) ..	71·3	75·7	79·7	82·8	85·1	78·1
Mean Min. Temp. (°F.) ..	49·9	54·8	60·0	64·2	67·4	59·7
Average Rainfall (points) ..	204	200	256	368	486	Total= 4,527

TAMBORINE MOUNTAIN.

Mean Max. Temp. (Annual)	70·6 degrees F.
Mean Min. Temp. (Annual)	55·8 degrees F.
Average Rainfall (Annual)	5,431 points

Most of the district enjoys an insular climate, the mean maximum temperature reaching its peak in January with 85·4 deg. F. and its minimum during July at 68·5 deg. F. The land is in production for the greater portion of the year and frosts occur but rarely on the cultivated coastal strip, with the exception of Lower Nudgee and Pinkenba.

SOILS.

Generally speaking, the soils of the metropolitan area are not particularly fertile, and many of them are unsuitable for cultivation. Characteristically, therefore, small groups of farms are often separated by large tracts of poor country.

The most important soils are the red to brown earths overlying a red subsoil containing ironstone (Plate 5). These deep, well drained soils are usually intensively farmed. Red to reddish brown basaltic soils with a loam to clay loam texture are found along the coast from Redland Bay in the south, through Cleveland and Wellington Point, to Redcliffe in the north, and also on some of the Bay islands. These soils are less fertile than they appear, even in their virgin state. They are well drained, easily prepared for cropping, and respond quickly to fertilizers. Many of the farms in these districts have been worked intensively for up to 70 years and, where skilfully managed, are still very productive. A deficiency of trace elements such as boron, zinc, and molybdenum has been noticed in many crops. The red loams readily "fix" phosphates and phosphatic fertilizers are therefore usually applied in bands in the crop row. The main crops on the red loams are bananas, custard apples, papaws, tomatoes, cabbage, lettuce, beans, strawberries, carrots, and beetroot.

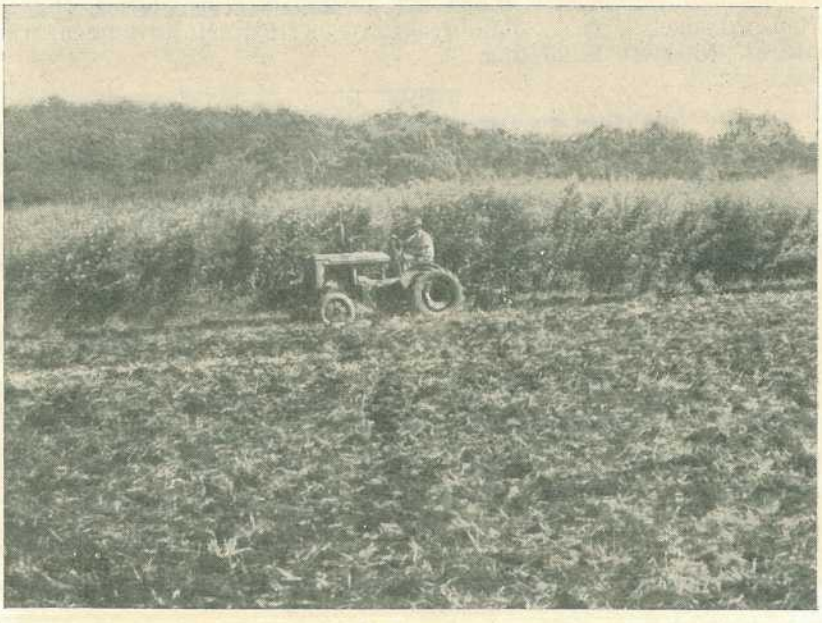


Plate 5.

Red Earth at Ormiston.—The cover crop being ploughed in is pigeon pea.

Plate 6.

Irrigated Strawberry Crop.—The variety is Phenomenal and the crop is 10 weeks old. Skinner spray system in operation at left.

Reddish brown loams and sandy loams in the higher parts of Rochedale, Sunnybank, Eight Mile Plains, Manly, Aspley, Nudgee, and Slacks Creek are mostly deep and well-drained with a red sandy-clay loam subsoil. They are easy to work but are not fertile and need heavy applications of fertilizer. The main crops are papaws, figs, custard apples, tomatoes, strawberries, cauliflowers, carrots, parsnips, lettuce, and beetroot.

Perhaps the largest group of soils are the podsolised, shallow, greyish-white, sandy loams with a heavy subsoil. In many cases, drainage is poor and the land is difficult to cultivate, particularly after heavy rain when the soil dries out slowly and weed growth is a major problem. As these soils often occur in areas where frosts are rare, they are used for vegetables and pineapples and the crops are usually planted on hills to improve the drainage. Soils of this type may be found in such localities as Kallangur, Capalaba, Kingston, and portions of Rochedale, Sunnybank, Oxley, and Park Ridge .

The soils in the hilly country west of the city are closely associated with the Brisbane schists and are usually grey to red-brown in colour, and of loam to clay-loam texture. The surface soils often contain gravel, are shallow but well drained, and overlie a gravelly subsoil. The terrain of the country is steep and erosion could be a problem. Some areas at Pullenvale and Brookfield are fairly fertile and grow very good papaws, pineapples, and bananas. Although water for irrigation is available, the steep and rocky country is not suitable for small crops.

The main alluvials are at Pinkenba, Myrtletown, Lower Nudgee, and along the Pine River, where the soil is a fertile, dark, silty-clay loam. The soil is shallow and overlies a few inches of clay below which is a great depth of fine sand. Excessive rains in the early part of the year affect the drainage and make cultivation difficult. The main crops are cauliflowers, grapes, peaches, tomatoes, melons and pumpkins. Practically no irrigation is practised, as the underground water is saline. Small pockets of alluvial soils along the banks of numerous small creeks through the districts are chiefly used for the production of such crops as rhubarb, radish, silver beet, and lettuce.

On Tamborine Mountain the soil is a basaltic red loam, easily worked but subject to erosion, and the main crops are cauliflowers, beans, and citrus. Avocadoes promise well, but only a small acreage is as yet under crop.

On soils other than those used for pineapples liming is a common practice, as practically all are normally acid with a pH below that preferred for the bulk of the crops grown.

Where water supplies are available, irrigation is practised during the comparatively dry winter and spring. Most of the easily accessible surface water flows through poor country and few of the better farms can use it. Consequently, irrigation is mainly dependent on bore or well supplies. The underground water is tapped at from 40 to 100 feet and the flow is variable. The minimum required from a well or bore is about 1,000 gallons per hour. Where the flow is inadequate for pumping direct through the spray lines, a reservoir or dam may be built. The reservoir is filled from the well or bore and the water is then fed to the spray lines, a single power unit operating the two pumps. Irrigation is comparatively new to the metropolitan districts; one of the first irrigation plants was installed in the Redlands area

TABLE 2.

ESTIMATED HORTICULTURAL PRODUCTION: METROPOLITAN DISTRICT AND TAMBORINE MOUNTAIN, 1948–49.

Crop.	Area.	Estimate of Production.
	Acres,	
Potatoes, English	291	579 tons
Potatoes, Sweet	42	163 tons
Turnips	32	112 tons
Carrots	190	759 tons
Parsnips	16	54 tons
Beetroot	175	673 tons
Tomatoes	1,548	340,392 ½-bushels
French Beans	692	85,367 bushels
Green Peas	177	10,623 bushels
Cabbages	501	140,314 dozens
Cauliflowers	471	115,156 dozens
Lettuce	209	135,891 bushels
Silver Beet and Spinach	6	3,292 dozen bunches
Melons, Water	192	927 tons
Melons, Rock	47	109 tons
Pumpkins	800	3,086 tons
Squashes and Marrows	105	624 tons
Cucumbers	309	38,988 bushels
Other Vegetables	66	..

	Number of Trees.		
	Not Bearing.	Bearing.	
Oranges	2,829	5,512	5,925 bushels
Lemons	2,266	2,160	2,513 bushels
Mandarins	830	482	626 bushels
Grapefruit	288	116	287 bushels
	Area—Acres.		
	Not Bearing.	Bearing.	
Grapes (Table)	66	158	379,074 lb.
lantation Fruits—			
Bananas	410	871	76,510 1¼ bushel cases
Pineapples (Factory)	441	1,111	763 tons
Pineapples (Other)	..	..	105,892 1½ bushel cases
Papaws	163	313	149,400 bushel cases
Passion Fruit	31	52	7,910 ½ bushel cases
Strawberries	31	82	447,862 lb.
	Number of Trees.		
	Not Bearing.	Bearing.	
Orchard Fruits—			
Custard Apples	3,127	10,721	28,195 bushels
Mangoes	537	692	790 bushels
Peaches	925	2,730	1,735 bushels
Nuts	9,476	2,059	13,360 lb.

approximately 30 years ago. Owing to the small amounts of water available, irrigation is mainly confined to the fixed overhead perforated pipeline system. Though expensive to install, the system is permanent and quite suitable for vegetable production on farms which would not normally exceed 10-12 acres.

VEGETATION.

The greater portion of the district could be described as savannah woodland, with the exception of such areas as Mount Cotton, Brookfield, and Tamborine Mountain, where the vegetation was mainly rain forest. The chief species of trees are a wide variety of gums, bloodwood, tallow-wood, stringybark, and ironbark. Various types of tea-tree thrive on the low-lying badly drained area, whilst many types of wattles are spread throughout the district, growing rapidly after bush fires.

HORTICULTURAL USES.

A perusal of the production data (Table 2) will give some idea of the important part that the metropolitan district plays in supplying the vegetable and fruit requirements of Queensland. The area under vegetables has increased over the last 20 years, but little expansion in fruit production can be expected. The proximity of the cropping areas to Brisbane allows the production of a wide variety of perishable crops.

Bananas.

The banana has been a major crop for many years. In the foothills the main varieties are Cavendish and Mons Mare, while the tall-growing Lady Finger is grown mainly on the coast, where plantations are rather exposed and sometimes cold. The banana acreage is declining, due, in the case of the Cavendish and Mons Mare, to the lack of new country suitable for their production, and in the Lady Finger, to the widespread incidence of Panama disease. Bananas respond to irrigation and regular fertilizing, and planting distances are closer under these conditions than in areas depending on normal rainfall: Consequently, the net yield over the crop cycle of the plantation is higher than might be expected from Panama disease affected areas. Bunchy top, a virus disease, is not serious in the Lady Finger variety unless the plantation is neglected, but it still remains the main hazard to production in the other varieties.

Pineapples.

The pineapple area remains fairly static. The main varieties are the smooth leaf Cayenne, the rough leaf Ripley and Common Rough. The first is grown fairly extensively in the Moggill, Brookfield, Dayboro' and Kallangur districts. Brackenridge is a district which grows the rough leaf varieties almost exclusively. Most of the smooth leaf fruit finds its way to the cannery but the smaller rough leaf is sold on the fresh fruit market. The Redland and Rochedale districts were formerly big producers of pineapples but the land is now more profitably employed producing vegetables and, to a lesser extent, papaws.

Strawberries.

Strawberries are grown in almost every part of the metropolitan area and the acreage is increasing yearly. An assured market has been a great stimulus to growers, as the crop is easily produced and a

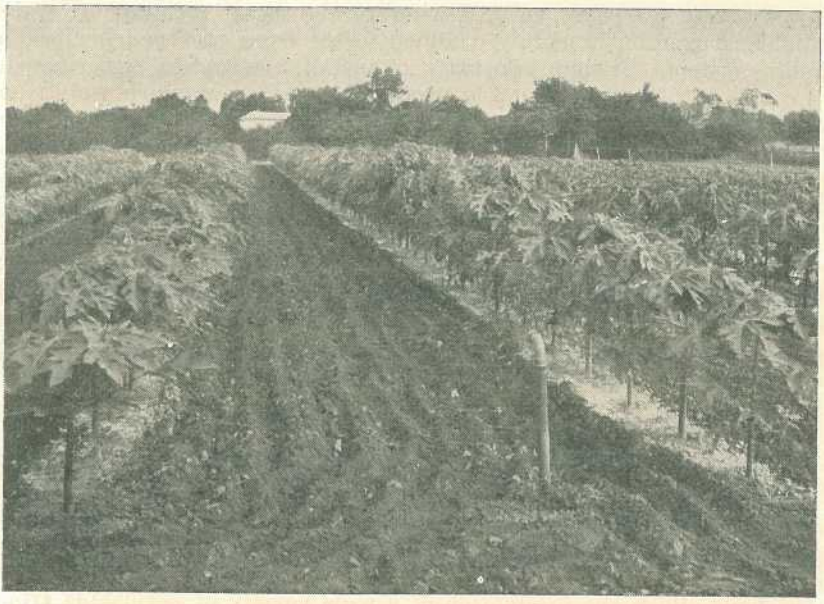


Plate 7.

Young Papaws at Sunnybank.—The stand will be thinned to the normal 8-feet spacing when 12 months old. Standpipe from underground irrigation main in foreground.

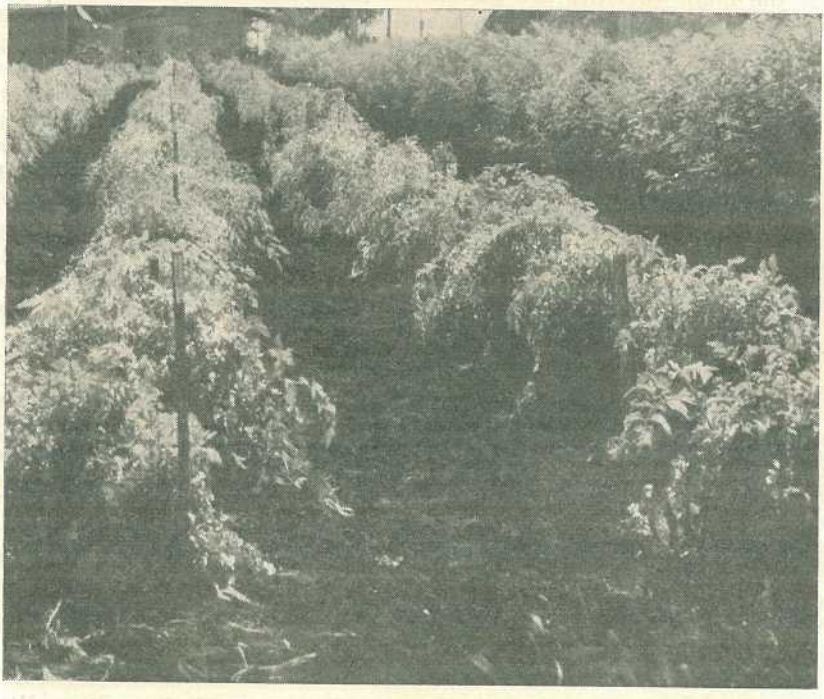


Plate 8.

Ground Crop of Tomatoes.—Note windbreak at right.

profitable return may be expected from it. Planting is done in March and production starts in June, terminating usually in November, Most of the fruit finds its way to the factory and the local fresh fruit market. However, a large interstate trade has been built up for the better class of berry and air transport is used to place the fruit on southern markets in first class condition. For nearly 50 years the main variety grown has been Phenomenal, a type developed in Queensland. It is a vigorous grower with good colour and carries well. Virus diseases are the main trouble, but growers are becoming adept at recognising the affected plants, which are removed and destroyed.

In an effort to produce virus-free stock, certain growers produce approved runners for sale under supervision of the Department of Agriculture and Stock. The main areas of production are Cleveland, Manly, Eight Mile Plains, Ormiston, and Slacks Creek (Plate 6).

Papaws.

Brookfield, Rochedale, and Sunnybank are the biggest papaw production centres and owing to the suitability of soils and climate for the crop are likely to remain so. This crop is troubled by various diseases; the worst, known as "die-back," may shorten the profitable life of the plantation by at least three years. Dioecious types are mainly grown and they vary considerably in shape and size. The eating quality of the fruit varies from good during the peak of the season to rather poor at the beginning and end (Plate 7).

Passion Fruit.

So serious are the diseases affecting passion fruit in the metropolitan district that the crop is now grown only on a limited scale. Some years ago Fusarium wilt wiped out completely the large production centre of Mount Cotton. This disease, together with woodiness and brown spot, has shortened the life of the average plantation to one or two crops. Cleveland is probably the main source of a limited supply.

Custard Apples.

The Redlands area, Sunnybank, and Rochedale have well established custard apple orchards, many of them over 40 years old. These very attractive trees have a most variable cropping habit. There appear to be differences within a variety and a rather rigorous selection of propagating material from regular cropping trees of good type may overcome this undesirable feature.

Little fault can be found with the quality of the fruit of the main variety, Pink's Mammoth, but some other varieties are inferior. Most of the fruit is sold locally on the fresh fruit market, and a lesser quantity is sent interstate. Approximately 16 years ago, many acres of custard apples were pulled out in the Redlands district to make way for bananas. Now that bananas are less profitable, much of the land is once more going back to custard apples. Trace element deficiencies, particularly of zinc, are apparent in most districts and control measures are normally applied by growers.

Figs.

Fig production is confined mainly to the Sunnybank area and the bulk of the crop is sold to factories for jam making. The deep, sandy soils suit the varieties in use, which are mainly self-fertile types such

as Brown Turkey, White Genoa, and White Adriatic. The crop is fairly safe if regular attention is given to the control of insect pests and fungus diseases. A large increase in the acreage is unlikely as the demand for figs is rather limited.

Grapes.

The Pinkenba and Nudgee districts, where grapes are mainly grown, have been in production for at least 60 years. Until recently, grape growing was confined almost entirely to these areas but now it is spreading fairly rapidly into Wellington Point and Darra. Phylloxera made its appearance in the Pinkenba-Nudgee areas approximately 25 years ago and destroyed a large acreage of the vinifera types of grapes, mainly Black Hamburg and Black Muscat, but did little apparent harm to the labrusca types such as Wilder and Iona. The district is quarantined. Phylloxera resistant stocks, mainly 1202 and A.R.G.1, were introduced, and the vineyards reconstructed. Crops from the grafted vines are satisfactory, but in some cases the berries on the young plants colour later than desired. As the vines become older, this trouble may disappear.

Snow's Black Muscat is the popular variety elsewhere, and is cropping well. With the exception of Darra, little grafting on to the resistant stocks is practised in the new areas.

Avocadoes.

The avocado shows great promise providing the market expands to absorb production. Redland Bay, Tamborine Mountain, and Sunnybank are the chief sources of supply and a number of young orchards are located in the Redlands districts. Propagation appears to be fairly difficult and nursery trees are expensive and supplies limited. There are a number of varieties, but the market shows a distinct preference for Fuerte, a pear shaped fruit commencing to harvest about April and picking for about three months. Nabal and Anaheim may be added, however, to spread the harvesting period. Irrigation is an advantage in spring, as dry weather at setting causes heavy fruit fall.

Citrus.

Citrus growing has declined in importance over the last 20 years and there are very few orchards of any size except in the Redlands area, where lemons are mainly grown, and Tamborine Mountain. The latter district still produces a fair quantity of late fruit but many orchards are on soils which dry out quickly and cannot be irrigated. The Meyer lemon, an early cropping and drought-resistant variety, has been planted in the Redlands area, and the results are promising.

Tomatoes.

A suitable climate, a wide choice of varieties, a ready local market, together with a large interstate outlet, make this crop one of the most important in the district. At one stage during the recent war tomatoes were worth more to Queensland than any other horticultural crop and the metropolitan areas produced 40 per cent. of the total production.

Tomatoes are grown in all parts of the district at certain times of the year, production commencing in April and continuing to December. The main producing centres are the Bay islands, Redland Bay to

Manly, Sunnybank and Rochedale. Owing to the difficulties experienced with setting, the winter crop planted from April to June is trellised or staked and a preference is shown for the small but prolific cluster types such as Salads Special and Potentate. The most popular varieties, grown mainly as bush types in autumn and spring, are Grosse Lisse, Sioux, Rutgers and Red Cloud. All bear large fruit on vigorous plants. Diseases are sometimes prevalent during the warm and usually wet months of early autumn, and of these target spot and bacterial spot are the most troublesome. The corn ear worm used to cause serious losses in the autumn and spring crops but the use of DDT has given satisfactory control.

Vegetables.

Vegetable growing under irrigation comprises the main horticultural activity of all but a few of the districts. Cabbages and cauliflowers are grown extensively, the former in the Redlands area and the latter mainly at Pinkenba, Nudgee, Kallangur and Tamborine Mountain. By using DDT for pest control and planting the right varieties, cabbages can be grown throughout practically the whole year. The drumhead cabbages such as Succession were popular until recently, but market preference is developing for the round head varieties, such as Midseason Market and Copenhagen Market. The latter are smaller than the Succession, a larger number of plants are cropped to the acre, and they mature more quickly. The cauliflower season is limited, the crop

Plate 9.

Irrigated Vegetable Crops.—French beans in left foreground, cauliflowers in centre and staked tomatoes in right background. Note Skinner system spray lines.

being harvested from April to October on the coast. Tamborine Mountain has a longer season and planting commences earlier than in the coastal areas. There is still some uncertainty as to the best varieties for early planting, but Snowball, Phenomenal Early and White Queen have done well. The later varieties have been mainly of the Phenomenal selections. "Whiptail" has been a serious trouble to cauliflower growers in all the main districts, and the use of ammonium molybdate to correct the disorder is now general (Plate 9).

Root crop production is a major activity in the Wellington Point, Birkdale, Sunnybank, and Sandgate areas and the city market gardens. Planting commences in early autumn and continues to June or July in the case of carrots and parsnips, and even later with beetroot. The early plantings are fairly risky but when successful are profitable. Formerly a rather costly crop to grow, carrots are now more easily handled since the introduction of power kerosene as a selective weedicide. The main variety is Red Cored Chantenay.

Beetroot are produced practically all the year round, with Early Wonder and Derwent Globe the most popular varieties. Lack of boron may cause serious losses with beetroot, but a soil application of borax prior to planting or at the first topdressing overcomes the trouble. Parsnips are a small crop with a limited market demand. Most of the root crops are marketed locally in bunches of a dozen, but they are bagged if sent to other markets.

The cucurbit crops, which include cucumbers, melons and pumpkins, are grown in reasonably large quantities. Wellington Point and the Bay islands specialise in early cucumbers, the crop being harvested during September and October. Pinkenba, Nudgee, Kallangur and Redcliffe supply most of the melon and pumpkin crop. The main varieties of cucumbers are Kirbys Stay Green and Early Fortune, while Hawkesbury Wilt Resistant, Sweetheart, Kleckley Sweet and Klondyke are popular melons.

Lettuce is a favourite crop at Eight Mile Plains, Oxley, Nudgee, Manly and in the city market gardens. Production is not difficult in winter, but although the summer crop suffers from heat and mildews, it is considered the more profitable. A reliable summer lettuce is needed, but until such time as better varieties are found, Imperial 847 and Great Lakes will continue to be used. Imperial 615 is widely grown in winter crops planted from March to August.

Beans are planted in the South Metropolitan area throughout the year, now that bean fly can be effectively controlled with DDT. Summer production is difficult and results may not be worth the effort and expense. Early autumn plantings are also a gamble, as heavy rains affect this crop. Brown Beauty and Hawkesbury Wonder varieties do well; the former is the more widely planted.

THE FUTURE.

The future of a district usually depends on its market outlets, its capacity to expand, or its ability to at least hold its own against the competition of a newer source of supply. The first of these does not present any great problem for the types of crop produced in the metropolitan district, as they find a ready outlet in Brisbane and other markets. The expected drop in the demand for vegetables in the post-war period did not materialise and prospects of any major slump are

not evident at present. To the competent and experienced farmer, the post-war years have been generous. However, there are many new growers working comparatively poor country in the district. As vegetable growing is a highly specialised business, many of them will suffer setbacks until they limit their cropping programme to those crops for which the country is suited and can install a reliable irrigation system.

Any expansion in plantation and orchard crops would involve big acreages before any appreciable difference in the volume of production could occur. However, suitable new land is not available, but an increase in the area under pineapples, papaws and custard apples may take place at the expense of bananas. There is still a fair amount of new land available for pineapple production, but it is not up to the standard of that already under this crop. Papaws require much better conditions than pines, and any extension of this crop is improbable until better control measures for diseases are available. Strawberries are definitely a crop with a future, for production at present is limited mainly by lack of labour.

Few properties specialising in vegetables are working the available ground to its capacity, and greater production should be fairly easy under irrigation. Although it is expensive, most growers are in a position to extend their equipment, and it would be safe to assume that vegetable production could be doubled on the present acreage if the available markets needed the produce.

Should the Brisbane water supply ever reach the rich alluvial country of Pinkenba, Myrtletown and Lower Nudgee in sufficient quantity to allow of irrigation, large quantities of vegetables and certain fruits could be grown. It is a pity that such a potentially valuable horticultural area close to Brisbane should be worked well below its capacity.

CERTIFIED TOMATO SEED—1950.

Under *The Seeds Acts,* 1937 *to* 1941, selected varieties of tomato were approved for certification during the 1949-1950 season. Certified crops were produced by the following growers, to whom enquiries for seed may be addressed:—

Grower.	Address.	Variety.
E. F. Wain	Bapaume	Q1
Harslett Bros.	Amiens	Q2
C. Couchman	Glen Aplin	Q3

Q1 is an early variety with Sioux characteristics.

Q2 is a mid-season variety with Grosse Lisse characteristics.

Q3 is a late variety with Valiant characteristics.

Chemical Control of Lantana.

B. EASTERBROOK, Assistant to Weeds Officer.

IN previous years, arsenic has been used with success to kill the roots of lantana by swabbing the cut-off butts or by spraying regrowth after brushing. However, hormone weedkillers have now been found to be effective and as they are non-poisonous to animals and humans, non-corrosive and do not kill grasses, they are to be preferred to arsenic in all circumstances.

Experience up to the present suggests that if Methoxone or the sodium salts of 2,4-D are used, consistently good kills can be obtained only if all old plants are brushed and sprayed some weeks later when there is an abundant and vigorous regrowth. If the regrowth is sprayed when very young, the roots may not be killed, as at this stage there is little downward movement of hormones within the plant. Therefore the best time to spray is when there is an abundant, leafy regrowth which is still actively growing. All the leaves and stems should be well covered with the spray. Small patches of regrowth are likely to occur, but these can be easily dealt with by later spot spraying.

If salts such as Hormex, Weedall, United and Weedar, or esters such as Weedone, are used, regrowth is likely to occur less frequently. 2,4,5-T formulations (either 2,4,5-T alone or in combination with 2,4-D) give better kills than 2,4-D alone, particularly on large bushes. Hence, if 2,4,5-T is used less brushing has to be done. However, it is usually not possible to spray effectively large areas of very dense, tall lantana because of the difficulty of getting through such country, so that brushing or burning of the lantana and spraying the regrowth will generally have to be done irrespective of whether Methoxone, 2,4-D or 2,4,5-T is used. In addition, 2,4,5-T is much dearer than Methoxone and the sodium and amine salts of 2,4-D, so that the use of the latter hormones, even with later re-spraying of small amounts of regrowth, is probably more economical than the use of 2,4,5-T.

The price of 2,4-D works out at roughly 22s. per pound of active constituent for all the brands except the ester Weedone, which costs about 32s. per pound. 2,4,5-T alone costs roughly double this, while 2,4,5-T in combination with 2,4-D costs about £1 12s. per pound of active constituent.

Hormones should be applied in fine, warm weather; rain falling within a few hours is likely to lessen greatly the effectiveness of the spray, although the oil-based esters are less likely to be affected in this way.

For small patches or in very hilly country where vehicles cannot go, knapsack sprays can be used. Their chief disadvantage is the fact that their capacity is about 3½ gallons, and therefore in high volume spraying, as is the case with lantana, much refilling is necessary. In suitable country, power sprays are very useful for spraying lantana. These sprays can usually be fitted with one or two hoses which are manipulated by men walking behind the vehicle on which the spray is mounted. Each hose should be fitted with one or two nozzles, preferably of the type which delivers a solid cone-shaped spray. The pump should be capable of developing pressures up to about 300 lb. per square inch. Outfits of this type at present cost in the neighbourhood of £80-£100.

Hormones must be thoroughly cleaned from equipment before it is used for any other purpose. All parts of the equipment should be washed about three times in warm, soapy water, then left to soak overnight in water to which household ammonia has been added at the rate of one quart to 25 gallons of water. Then rinse out thoroughly in cold water the following day. If esters are used, the equipment should be first rinsed in kerosene, then washed out as above.

Low volume spraying, applying 10 gallons or less per acre of a much more concentrated solution, has not been tested on lantana in Queensland, but it is not likely that this kind of treatment would be successful on a weed such as lantana.

No "Marker" for Weedicides.

Much time, labour and money is spent in the destruction or control of weeds by spraying with plant poisons or with hormones. It has been suggested that if the liquid used could be dyed with a suitable cheap "marker," then the path of spraying could be easily discerned, "overlapping" avoided, and a saving of both spray and labour effected, particularly on steep, rough or otherwise difficult country.

Following this suggestion, a number of dyes were tried in small tests in the Department's Chemical Laboratory. Blue, red and yellow household dyes, methylene blue, and potassium permanganate were all tried at various concentrations in an arsenical spray of normal strength.

The only one of these which left an easily discernible trail was methylene blue, but then only when used in such concentration that the cost would be high; indeed, greater than the cost of the arsenical spray itself.

The conclusion was reached that there is at present no readily available cheap dyestuff which could be used successfully as a "marker" for weedkillers. Suspended powders were not tested.

Report on Grade Herd Recording.

S. E. PEGG, Senior Adviser, Herd Recording.

THE Group Herd Production Recording Scheme for dairy cattle was introduced in Queensland in January, 1948, when the first unit was commenced at Beaudesert. This scheme appears to have filled a long-felt want, as applications for the formation of units have been received from many parts of the State.

Thirty-three units were operating during 1948-49, and this number could be greatly expanded if the necessary equipment were available.

This first report has taken into account all completed lactations since the inception of the units until September 30, 1949. Results have been compiled for 25 units, as the remaining 8 units have not been in operation long enough to have cows with completed lactation periods. In compiling the average production, only the first 270 days of any lactation is included.

TABLE 1.

NUMBER OF COWS AND THEIR AVERAGE PRODUCTION ACCORDING TO AGE GROUPS.

Age Group.	Number of Cows.	Milk.	Average Butterfat Test.	Butterfat.
(Years).		Lb.	Per cent.	Lb.
2	1,013	3,016	4·5	136
3	1,024	3,162	4·4	140
4	952	3,279	4·5	148
Mature	3,388	3,668	4·3	160
Unknown	10,839	3,208	4·3	139
Total	17,216	3,289	4·3	144

Table 1 gives the number of cows and their average production according to age groups. The average productions have been computed from 17,216 completed lactations from 507 herds. All completed lactations up to 270 days have been included, irrespective of the length of the lactation; in some cases cows dried off after 30 to 60 days in milk.

Table 2 shows the average production of cows in each herd recording unit. It will be seen that the highest average production per cow is to be found on the Darling Downs, where four units—Warwick, Allora, Oakey No. 1 and Oakey No. 2—showed averages of 190, 185, 184 and 185 lb. of butterfat respectively.

TABLE 2.

AVERAGE PRODUCTION FOR EACH UNIT.

Unit.	Number of Herds.	Number of Cows.	Milk.	Test.	Fat.
			Lb.	Per cent.	Lb.
Beaudesert	23	1,207	2,959	4·3	129
Maleny No. 1	20	944	3,110	5·0	155
Maleny No. 2	20	1,049	3,068	4·7	145
Oakey No. 1	24	725	4,185	4·4	184
Oakey No. 2	22	808	4,392	4·2	186
Oakey No. 3	16	121	3,536	4·2	149
Kingaroy No. 1	20	684	3,575	4·2	150
Kingaroy No. 2	19	506	3,042	3·9	120
Cooroy No. 1	22	772	2,757	4·4	121
Cooroy No. 2	22	596	2,299	4·4	102
Cedar Pocket	23	697	2,875	4·6	132
Pomona	18	634	2,685	4·4	118
Miva–Theebine	18	878	2,259	4·5	102
Goomeri	19	747	2,929	4·1	121
Allora	22	578	4,243	4·4	185
Warwick	19	670	4,774	4·0	190
Killarney	20	864	3,679	4·4	161
Monto	21	785	3,800	4·2	160
Toowoomba No. 1 ..	25	538	3,309	4·6	154
Toowoomba No. 2 ..	18	563	3,434	4·3	148
Toogoolawah	16	554	2,940	4·0	119
Kilcoy	19	587	2,583	4·4	113
Kenilworth	18	767	3,095	4·2	131
Malanda	22	606	3,829	4·3	163
Millaa Millaa	21	336	3,438	4·4	153

District Differences.

Much interesting information on the productive levels of herds in the different dairying districts of the State is provided by the results available to date. The average production of cows in herd recording groups in the districts was as shown in Table 3.

TABLE 3.

AVERAGE PRODUCTION PER COW.

District.	Average Milk.	Average Test.	Average Butterfat.
	Lb.	Per cent.	Lb.
Darling Downs	4,018	4·3	173
Southern Coastal Area (Gympie to N.S.W. Border)	2,822	4·5	128
Brisbane Valley	2,756	4·2	116
South Burnett	3,187	4·1	131
Upper Burnett	3,799	4·2	160
Atherton Tableland	3,690	4·3	160

Herd Differences.

The above figures show the effect of environment and farming practices in various districts on the productive standard of dairy herds. Within districts there were, however, appreciable differences in the average production levels of individual herds. The highest and lowest producing herds in each district were as shown in Table 4.

The desirability of raising the productive level of below-average herds is clearly evident from the above results. Comparing the average production of the lowest and highest herds in the southern coastal district, it will be seen that the monetary return per cow at the present

TABLE 4.

RANGE OF PRODUCTION.

District.	Highest Herd.			Lowest Herd.		
	Average Milk.	Test.	Average Fat.	Average Milk.	Test.	Average Fat.
	Lb.	Per cent.	Lb.	Lb.	Per cent.	Lb.
Darling Downs ..	7,690	4·1	320	2,295	4·2	95
Southern Coastal Area	5,471	5·0	273	1,512	4·3	65
Brisbane Valley ..	4,299	3·8	163	2,107	3·7	79
South Burnett ..	6,530	4·0	260	1,619	4·7	77
Upper Burnett ..	5,800	4·1	236	2,336	4·6	108
Atherton Tableland..	6,898	3·9	274	2,143	5·1	109

price of 2s. 4½d. per lb. commercial butter was £39 10s. in the highest producing herd and £9 7s. in the lowest producing herd. Thus each cow in the best herd returned £30 3s. for the year more to its owner than the cows in the lowest producing herd.

TABLE 5.

NUMBER AND PERCENTAGE OF COWS GROUPED ACCORDING TO BUTTERFAT RANGE.

Age Group.		Under 50 lb.	50 to 99 lb.	100 to 149 lb.	150 to 199 lb.	200 to 249 lb.
(Years).						
2	No.	56	208	362	256	98
	%	5·53	20·53	35·74	25·27	9·67
3	No.	35	215	396	218	104
	%	3·42	21·0	38·67	21·29	10·16
4	No.	28	177	329	257	94
	%	2·94	18·59	34·56	26·99	9·87
Mature ..	No.	84	513	1,028	954	486
	%	2·48	15·14	30·43	28·1	14·34
Unknown ..	No.	570	2,280	3,752	2,623	1,086
	%	5·3	21·03	34·61	24·20	10·02
Total ..	No.	773	3,393	5,867	4,308	1,868
	%	4·49	19·71	34·08	25·02	10·85

Age Group.		250 to 299 lb.	300 to 349 lb.	350 to 399 lb.	400 to 449 lb.	over 450 lb.
(Years).						
2	No.	25	6	2	..	..
	%	2·47	·59	·2	..	..
3	No.	47	9	..	..	..
	%	4·59	·88	..	..	..
4	No.	46	16	4	..	1
	%	4·83	1·68	·42	..	·1
Mature ..	No.	207	72	34	9	1
	%	6·11	2·09	1·0	·26	0·3
Unknown ..	No.	385	108	28	5	2
	%	3·55	1·0	·26	·05	·02
Total ..	No.	710	211	68	14	4
	%	4·12	1·23	·39	·08	0·02

Age Groups.

Table 5 gives the percentage of cows in age groups in various butterfat production ranges.

Need for Pasture Improvement.

It will be noted from Table 5 that 4.49 per cent. of all the cows produced less than 50 lb. butterfat and a further 19.71 per cent. between 50 and 99 lb. butterfat. Farmers in most cases have already culled many of these low producers and it is expected that the herd averages of most members of units will show an increase in the coming years. On overstocked farms where pastures are solely relied on for the feeding of the herd, a reduction in the number of cattle, by making more fodder available for the remaining cows, should result in increased production.

The fact that the average production in Queensland for the year was 144 lb. butterfat and that only 16.69 per cent. of the cows produced over 200 lb. of butterfat should cause considerable thought to those engaged in the dairying industry. As the dairy herds in this State are mostly pasture fed, the condition both quantitively and qualitatively of the pastures on dairy farms is the greatest single factor affecting the production of milk and butterfat. No cow can be expected to produce well unless she receives an adequate supply of suitable food. It seems obvious that the first approach to the raising of the average productivity of dairy cattle in Queensland must be by way of better pastures and better pasture management. This problem calls for concerted action by all associated with dairy farming. The advisory services of the Department are available to all farmers who desire to improve their pasture and farming methods.

Herd Averages.

When the recorded herds are grouped according to their average yield of butterfat (Table 6), it will be noted that 14 per cent. of the herds had an average production of under 100 lb. butterfat, whilst only 11 per cent. gave an average of 200 lb. or more butterfat.

TABLE 6.

NUMBER OF HERDS IN VARIOUS BUTTERFAT PRODUCTION RANGES.

—	Under 100 lb.	100–149 lb.	150–199 lb.	200–249 lb.	250–299 lb.	Over 300 lb.
No. of herds, 507 ..	71	228	152	38	17	1
Percentage ..	14·0	45·0	30·0	7·5	3·3	0·2

Value of Recording.

Apart from the value of production recording to the individual farmer in the general management of his own farm, a herd recording scheme enables information to be collated which is of great help to the economy of dairy farming generally, and in defining problems for investigation. Information which should be of fundamental importance to dairy farming economy in Queensland is now being prepared from data already available from the scheme. In this connection the following matters are being investigated and the information obtained will be published in future issues of this Journal:—

(*a*) The effect of the month of calving on the production of milk and butterfat.

(*b*) The effect of the month of calving on the length of lactation.

(*c*) The average length of lactation.

(*d*) The effect of the length of lactation on production.

(*e*) The effect of test on the production of milk and butterfat.

Many farmers have ceased recording after one year, not realising the value of continuous recording. Farmers who cease recording after 12 months lose valuable information. At that stage they are just beginning to reap the benefit of the work, as many cows will not have completed a full lactation period and reliable records will not even be available for all cows in the herd.

The first year of recording indicates to the farmer the productive level of his herd and his standard of husbandry.

The second year enables him to cull his herd to the best advantage and plan his breeding programme.

The third and fourth years enable him to build the herd and improve his methods and the fifth year enables him to prove the value of the sire and thus of his breeding programme.

Continuous recording is also necessary to ascertain which families have the desirable qualities sought for in dairy cattle—high production, a long working life, regular calvings and resistance to disease—and so allow the farmer to concentrate on such families in his herd improvement programme. It is also regrettable that many farmers have been unable to give the ages of their cows. It is to be hoped that with the formation of herd recording units farmers will be encouraged to keep better farm records. A calf identification scheme has been drafted and will be introduced shortly. This will assist in the better identification of animals and will also ensure accurate information regarding age.

The Cooling and Holding of Milk and Cream on the Farm.

F. G. FEW, Dairy Technologist.

(*Continued from page 359 of the June issue.*)

CHARCOAL COOLERS.

THIS unit is designed for the storage of filled cans during the daytime. Therefore, its use is necessary only in the case of cream-producing farms on which farm refrigerators are not installed. The cream, cooled initially to the existing wet-bulb temperature by the tower re-circulation water system, must be held at the lowest possible temperature whilst awaiting despatch to the factory. Again, the wet-bulb temperature is the lowest storage temperature attainable, using only natural means of cooling, and the charcoal unit enables this temperature to be maintained for the necessary storage period. It must be emphasised that the cream is not intended to be cooled in a charcoal cooler, tests having shown that such is entirely impracticable. The cream, already cooled to the existing wet-bulb temperature at the time of milking, can, however, be maintained at that temperature by storing the cans in the cabinet of these units.

Design and Construction.

The practical construction of charcoal coolers is obviously an item of the greatest importance from the farmer's viewpoint. When these units were first investigated some years ago, considerable attention was given to existing types of coolers with a view to standardising a design incorporating all desirable features. Quite a reasonable degree of flexibility does exist, however, especially in regard to the choice of suitable building materials, and this may considerably simplify the actual construction on the farm. The drawings included (Plates 10-14) have been made to facilitate the construction of a cooler unit, and they include features considered necessary as a result of the investigational work. Brief specifications of possible materials of construction are also included, all of which are equally suitable for the specific purpose mentioned.

Construction.

Foundation and floor of cabinet: concrete.

Sides of cabinet and cooler unit: chain wire or wire-netting.

Back of unit: concrete, fibro-cement, timber or galvanised iron.

Front of unit: hardwood, fibro-cement, or galvanised iron. Door, 1 inch hardwood, packed with charcoal.

Cabinet back and roof: galvanised iron soldered at joins or lightly reinforced concrete.

Uprights, 2 inch by 2 inch hardwood. Hinges, 2 inch by $\frac{1}{8}$ inch M.S. Vent, 4-inch diameter galvanised piping 3 feet high.

Essential features in the construction are the inclusion of charcoal-packed sides, with additional charcoal insulation on the top and at the back of the inner chamber. A thickness of 10 inches is ample for maximum efficiency, although the thickness on top can be greater, especially if the top of the unit is left open and the unit is in an outside exposed position. This outside location is quite allowable and permits

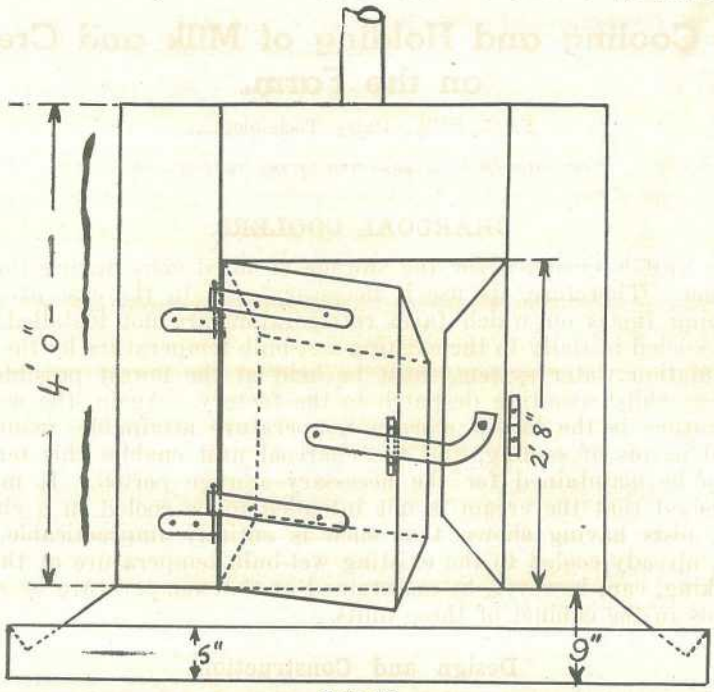


Plate 10.

Front Elevation of 4-gallon Can Size Charcoal Cooler.—The bevelled door is is 2 ft. 8 in. high by 2 ft. 4 in. wide outside.

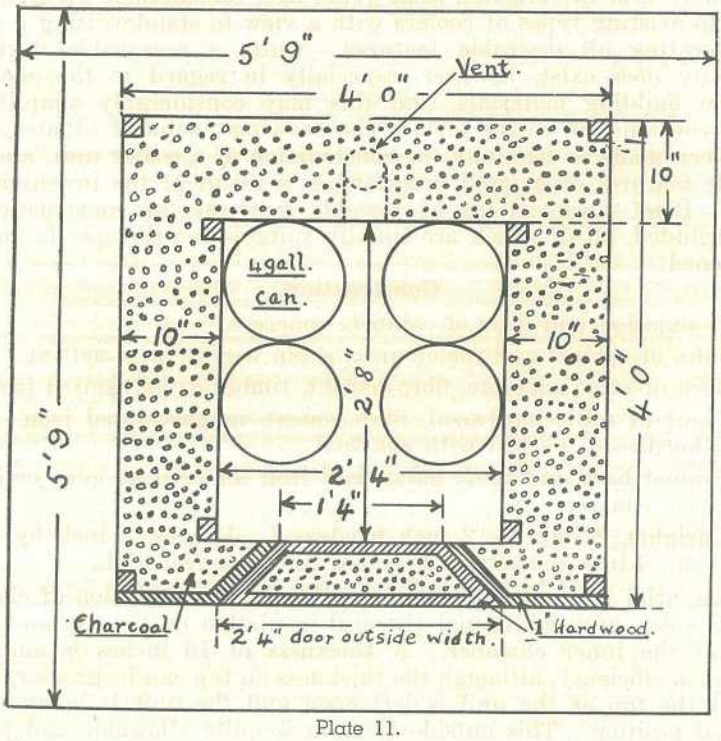


Plate 11.

Sectional Plan Through 4-gallon Can Size Charcoal Cooler.—The concrete base is shown. The bevelled door is 6 in. thick and has inside measurements of 1 ft. 6 in. high and 1 ft. 4 in. wide.

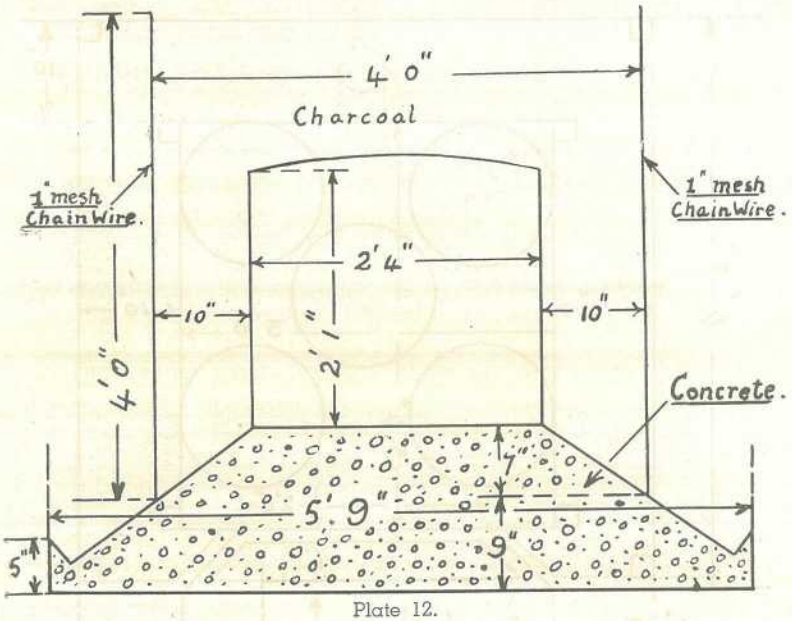


Plate 12.

Sectional Elevation Through 4-gallon Can Size Charcoal Cooler, Showing Open Top and Concrete Base.

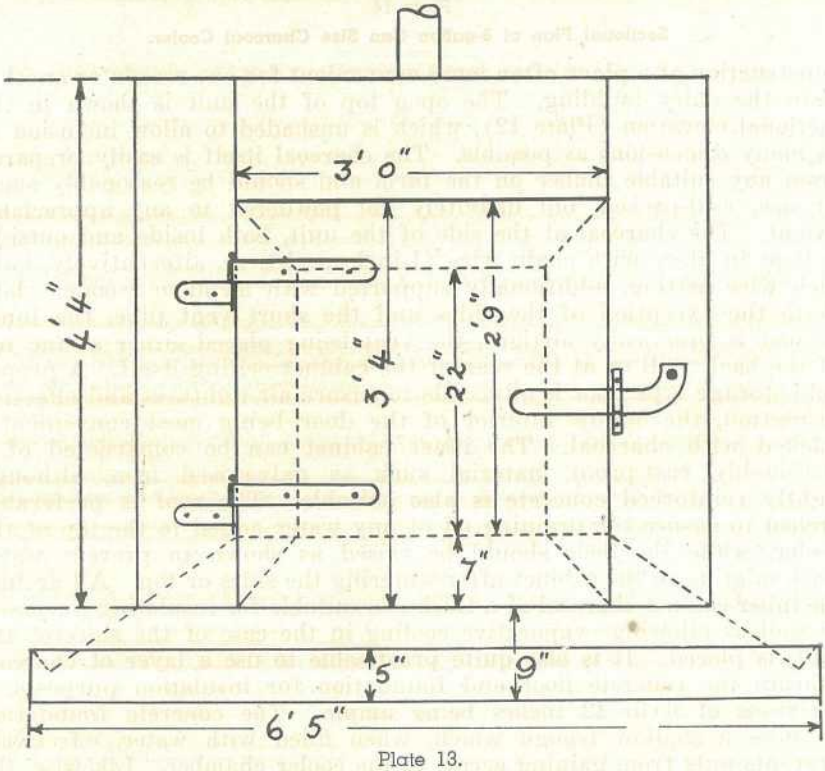


Plate 13.

Front Elevation of 8-gallon Can Size Charcoal Cooler.—The cabinet is 2 ft. 9 in. high. The door is 2 ft. 2 in. high and 2 ft. wide inside, and 3 ft. 4 in. high and 3 ft. wide outside.

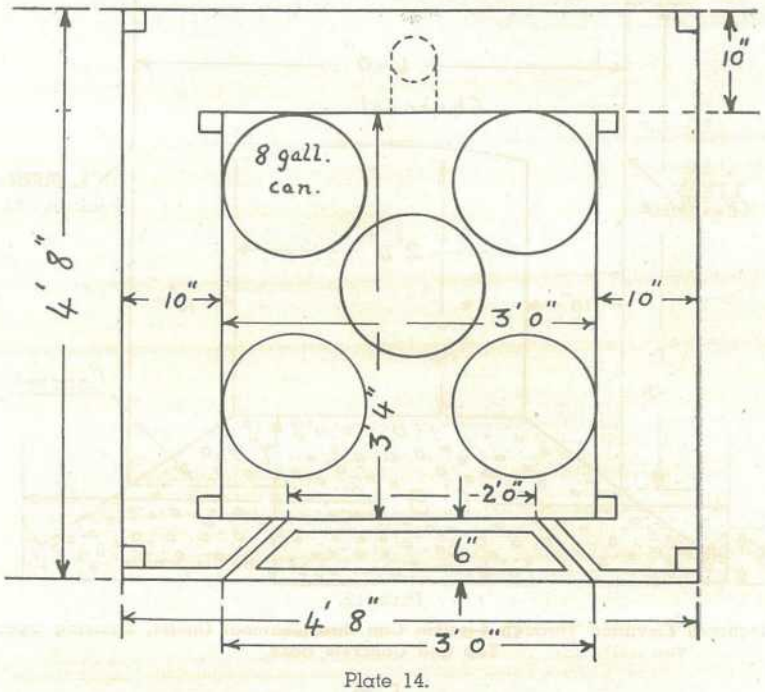


Plate 14.

Sectional Plan of 8-gallon Can Size Charcoal Cooler.

construction at a place often more convenient for one reason or another than the dairy building. The open top of the unit is shown in the sectional elevation (Plate 12), which is unshaded to allow inclusion of as many dimensions as possible. The charcoal itself is easily prepared from any suitable timber on the farm and should be reasonably small in size, well-packed, but definitely not powdered to any appreciable extent. The charcoal at the side of the unit, both inside and outside, is kept in place with chain wire (1-inch mesh), or, alternatively, half-inch wire netting, additionally supported with metal or wooden slats. With the exception of the sides and the short vent pipe, the inner cabinet is practically airtight, the vent being placed either at the top of the back wall or at the rear of the cabinet ceiling itself. A proper cold-storage type door is advisable to ensure air-tightness and effective insulation, the hollow interior of the door being most conveniently packed with charcoal. The inner cabinet can be constructed of a reasonably rust-proof material such as galvanised iron, although lightly reinforced concrete is also suitable. The roof is preferably arched to ensure the draining off of any water added to the top of the cooler, while the floor should be raised as shown to prevent water accumulating in the cabinet after watering the sides or top. All around the inner cabinet charcoal of a thickness suitable for insulating purposes, as well as allowing evaporative cooling in the case of the sides of the unit, is placed. It is also quite practicable to use a layer of charcoal beneath the concrete floor and foundation for insulation purposes, a thickness of 6 to 12 inches being ample. The concrete foundation includes a shallow trough which, when filled with water, effectively prevents ants from gaining access to the cooler chamber. Likewise, the vent pipe should be covered with coarse-mesh gauze at the end of the

uptake to avoid the entry of frogs, snakes, &c., while, in addition, a cowling can be fitted to prevent entry of water during periods of heavy rain.

The dimensions given are suitable for coolers of two sizes depending on the capacity of the cans to be stored. Two sizes, one suitable for 4 gallon cans and one for 8 gallon cans, are shown in the designs, and either should meet the requirements of average farms. Four of the smaller sized cans can be stored in the smaller cooler, while the larger unit is capable of holding five 8-gallon cans. It will be noted that the height of the inner cabinet in the case of the larger cooler has been made sufficient to allow inclusion of a shelf, the height of an 8 gallon can being only approximately 21½ inches. Quite a useful storage for certain household food articles can thus be provided, and there is no objection to this practice if proper care is taken with regard to the articles to be stored in the cooler.

Operation.

When investigations were made on charcoal coolers, attention was given to the most efficient method of operating the units. The following technique is recommended as a result of this work:—

One or more buckets of water are used to thoroughly wet the charcoal sides and top of the unit, this operation being preferably carried out as early as possible in the morning. After milking, the cans of cooled cream are placed in the cabinet and the door is securely closed. Generally speaking, no further addition of water should be necessary until the following morning, and, in any case, watering during the hot part of the day should be avoided. Under extremely dry conditions the application of water may be necessary more often, and, if so, an evening watering in addition to that usually practised in the morning can be given to the unit.

As a general rule it is inadvisable to open up the cabinet or remove the cans from the cooler overnight. The morning and evening, at which times the cabinet door will be opened to receive or remove cans of cream, should be used for thoroughly stirring all stored cream. Under average conditions, stirring the cream more frequently is not necessary if it has been shock-cooled initially to the existing wet-bulb temperature.

The interior of the cabinet should be kept in a clean condition; with the designs given, this is a matter of little difficulty. The cover suggested for the vent pipe and the raised floor of the cabinet assist materially in avoiding undue fouling of the storage section. Lids can also be safely left off cans during storage in properly constructed units.

Costs.

Apart from the fact that existing atmospheric conditions allow evaporative cooling to be quite practicable over a large part of the State, the relatively low cost involved in constructing and operating charcoal coolers is a big factor in their favour. All coolers seen on farms in the Wowan district—where many units are installed—during a visit in 1945 were made by the farmers themselves, and the complete cost varied from £8 to £15. Differences in size and materials of construction largely account for the variation in price, more particularly the latter.

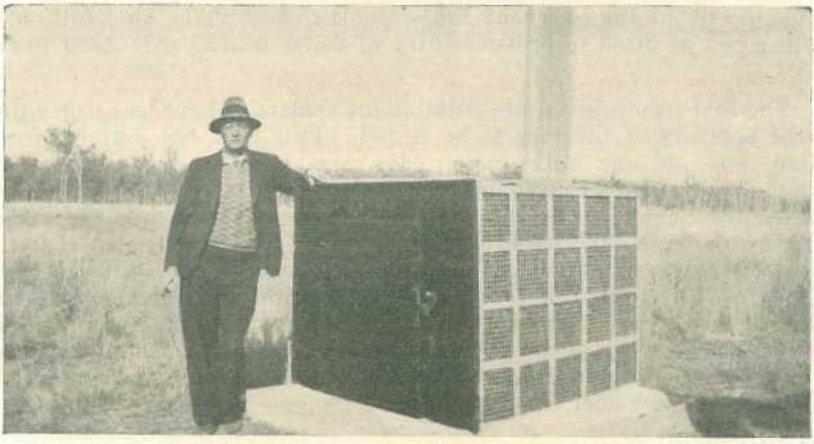


Plate 15.

Front and Side View of 4-gallon Can Size Charcoal Cooler.

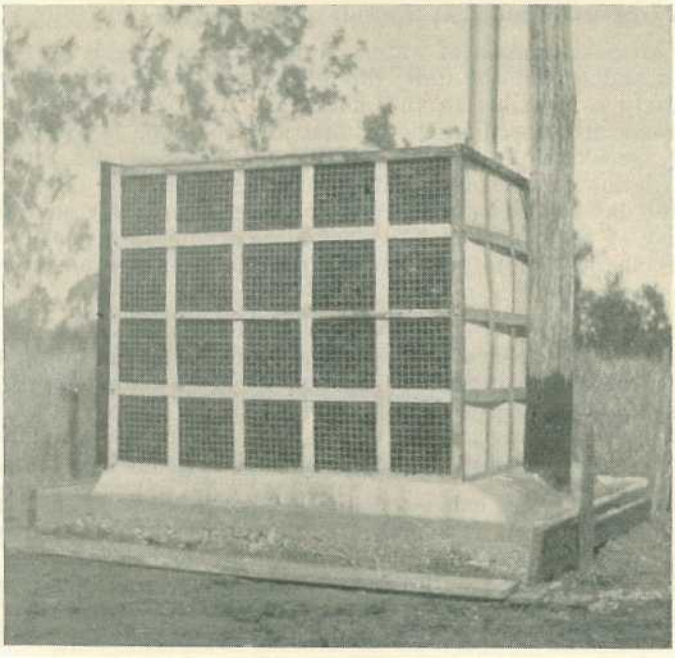


Plate 16.

Side and Back View of 4-gallon Can Size Charcoal Cooler.

Under present-day conditions it is not possible to give any accurate cost details; in any case these would be of little value owing to the wide variation in supply and cost of all building materials. It is, however, sufficient to state that for a relatively low cost any handyman can construct an efficient charcoal cooler quite effective for cream holding purposes in many dairying districts of the State. Plates 15 and 16 show the 4-gallon can size charcoal cooler used largely in the experimental

work carried out some years ago on these coolers. The one unnecessary feature is the long flue pipe (20 feet in this case) which can be reduced to one 2 or 3 feet length of piping.

COOLING STANDARDS.

As far as farm refrigerator units are concerned there is no necessity for checking cooling efficiency. Provided the units are functioning properly the degree of cooling listed in the text will be realised so long as the capacities stated are not exceeded. The necessity for fulfilling these requirements is the basis on which the units are designed.

The water-cooling tower system and the charcoal cooler are designed on the physical principles underlying natural evaporative cooling and will perform efficiently and satisfactorily if correctly operated. A provisional standard has, however, been made for testing these units in the field and it is of value in detecting any faults that may occur in either system. The technique recommended in the field is as follows:—

When the can is filled the milk or cream should be thoroughly stirred and the temperature taken, using a dairy thermometer. Readings of the existing wet-bulb temperature should be made at the beginning, middle interval and end of the milking period. More frequent readings can be taken if desired, but for a normal milking period between half an hour and 1½ hours the three stated will suffice. The temperature of each can of milk or cream should, however, be observed unless the number of cans is unusually high. Under average atmospheric conditions the wet-bulb readings will not vary by more than a few degrees and the same remarks apply generally to the milk and cream temperatures noted. As a result, the average wet-bulb temperature and the average reading for the milk or cream can be deduced by simple calculation. The cooling efficiency can be regarded as quite satisfactory if the milk or cream temperature does not exceed the wet-bulb temperature reading by more than 5° F. If a charcoal cooler is also to be tested the thermometer should be suspended inside the closed cabinet and left for some time. The door can then be opened and the temperature recorded as quickly as possible. The reading should not differ very much, if at all, from the wet-bulb temperature, and the 5° F. margin can be regarded as the maximum divergence allowable. A much closer agreement can be expected in all properly designed units.

Any farmer installing any of the equipment listed can have tests made to check efficiencies if so desired. The simplest way is to request such a test from the local visiting Dairy Officer, who will arrange accordingly. From results obtained it is generally possible to trace any faults that may have developed and their elimination will allow the farmer to receive the full benefit from the equipment he has been prepared to install.

SUMMARY.

The production of a good quality milk or cream depends materially on farm cooling facilities. The desired temperature is determined largely by the form of consumption intended for the product, but also to some extent by the holding time on the farm. The rate of cooling should, in general, be as great as possible but is influenced to some extent by the available time before despatch from the farm. Alternative

cooling systems are available when those considered most satisfactory are not favoured. The recommendations made in this article are summarised as follows:—

Market Milk.

(1) Farm refrigerator units used in conjunction with initial water cooling using the tower re-circulating system. The shock cooling system is employed in the case of the morning's milk whilst immersion cooling is used for the evening's milk to be kept overnight. The temperature after cooling should not be above 40° F. and must not be exceeded during any storage period.

(2) Water-cooling alone using recirculated water from a tower system. This system will generally ensure cooling to approximately 70° F. even under summer conditions. Market milk cannot, however, be safely stored at this temperature and this system is only applicable to milk despatched from the farm shortly after being produced.

Cheese Milk.

(1) It is obvious that farm refrigerator units can be used for the cooling of milk for cheese manufacture and, as far as the cooling problem is concerned, will prove equally as satisfactory as for market milk. The temperature, however, need not be so low and 50° F. is considered adequate both for cooling and for any subsequent storage. Tower recirculated water should be combined with refrigeration to effect running economy and ensure the maximum cooling capacity.

(2) Water-cooling alone using the tower system with overnight storage in a pit extension designed to accommodate the cans of evening milk. On the Downs—the State's chief cheese-producing area—very good cooling can be obtained because of suitable atmospheric conditions, and a temperature not exceeding 70° F., even under summer conditions, can almost invariably be reached for both the cooling and the storage of farm milk. Throughout most months of the year considerably lower temperatures can reasonably be expected.

Cream.

(1) Farm refrigerators alone with shock-cooling of the cream throughout the necessary cooling range in all cases. The desired temperature for both cooling and subsequent storage is 50° F.

(2) Without refrigeration the cream should be water cooled from a tower system using a surface tubular cooler. Subsequent storage, while awaiting despatch to the factory, should be provided by the use of a charcoal cooler.

Wool and Its Manufacture.

G. R. MOULE, Director of Sheep Husbandry.

THE diversity of woollen fabrics is sufficient evidence of the complexity of the woollen manufacturing industry. It is also indicative of the variation in the raw wool utilised in making different trade lines. These variations in staple length, fibre diameter, tensile strength, handle, colour and condition are apparent on examination of a number of lines offered for sale. The aim of classing is to sort the wool into uniform lines so that buyers can purchase the line of wool required for the manufacture of the type of fabric they wish to produce.

Differences in manufacturing methods dictate the classing, and an understanding of the processing of wool is the key to correct classing.

Woollen fabrics are classified as:—

(i.) Worsted, which is closely woven from tightly spun yarn and which has a smooth finish. Men's formal suitings are a good example.

(ii.) Woollen, which is less closely woven from more loosely spun yarn and which has a fluffy surface. Blankets, billiard table cloths, and Donegals are all woollens.

(iii.) Knit wear, which consists of threads knitted together and varies from half hose to wool jerseys.

(iv.) Felt, in which the woollen fibres are intertwined and matted. Fine felt is commonly used for the manufacture of hats and coarse felts for saddle blankets.

Scouring and Blending.

After the wool has been delivered to the manufacturer, it is scoured and blended. The scouring process (Plate 17) consists of washing the wool in warm soapy water to remove the dirt and yolk. It is carefully handled so that it will not "felt." Special treatments with dilute acids are sometimes required to remove grass seeds and burrs; this is referred to as carbonising, as the burrs are charred to carbon and removed with the liquid. Blending is the mixing of different wools to ensure the production of yarns of a particular type and the most economical usage of the available wool. Often these two processes are combined.

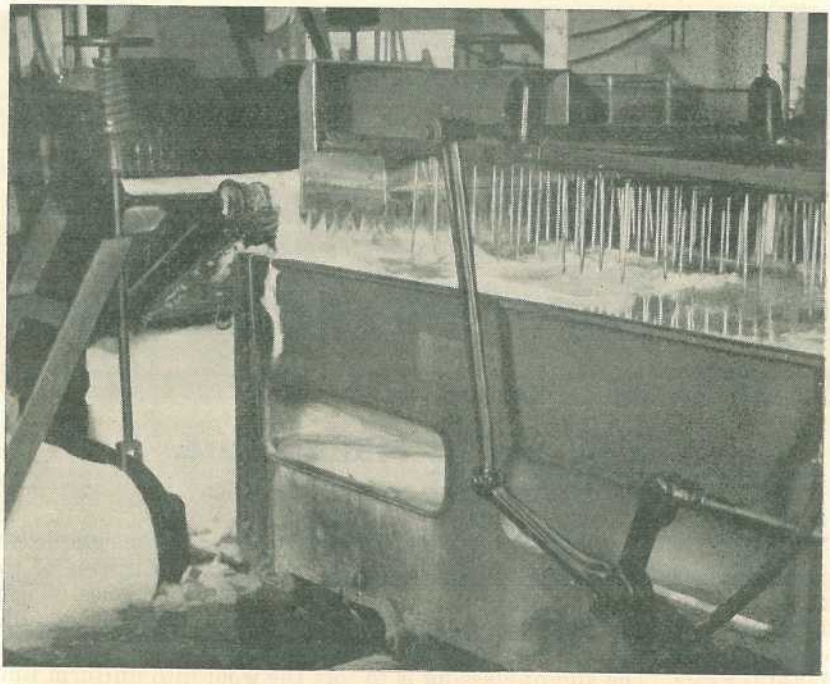


Plate 17.
Scouring Fleeces.

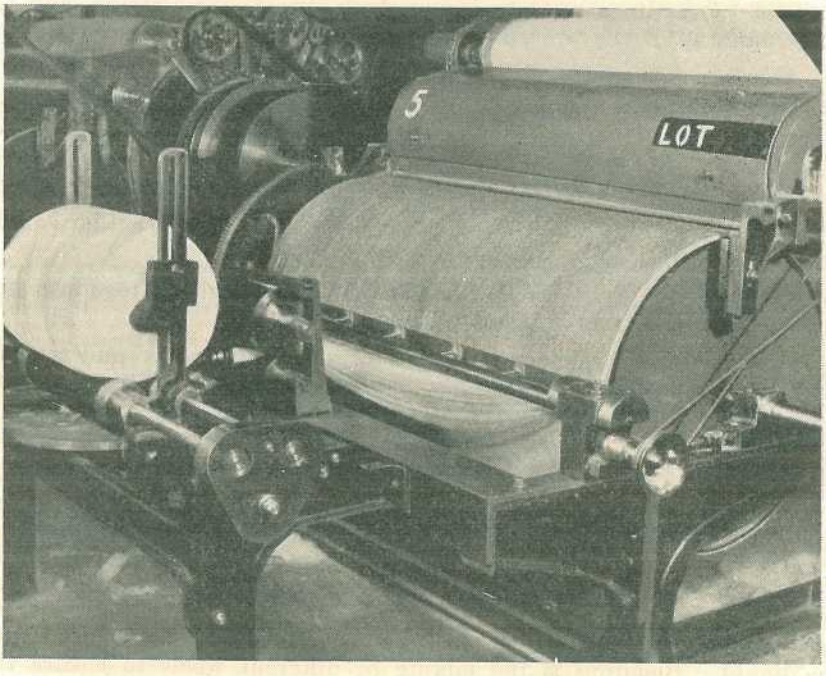


Plate 18.
Carding Machine.

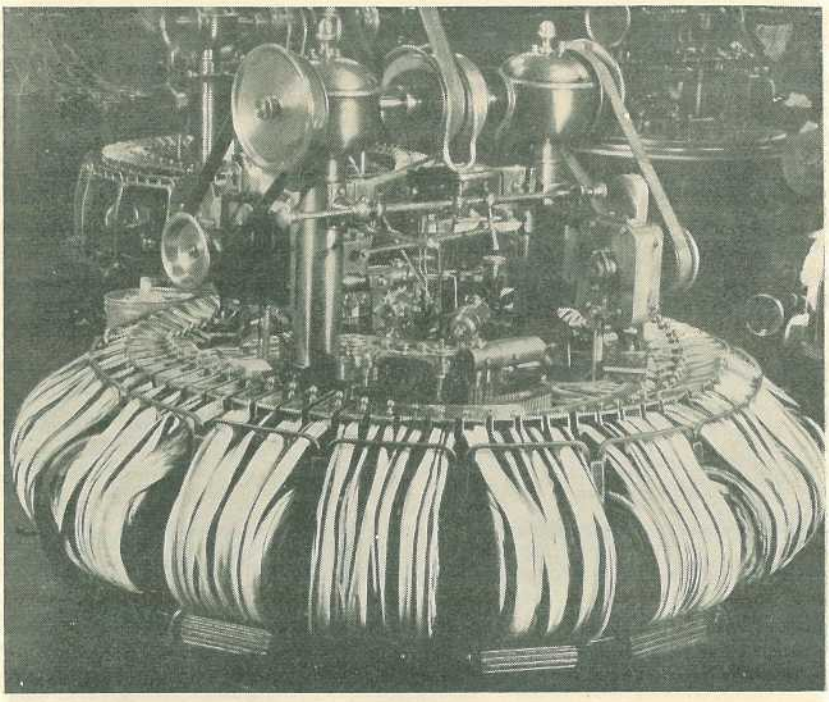


Plate 19.
English Combing Machine.

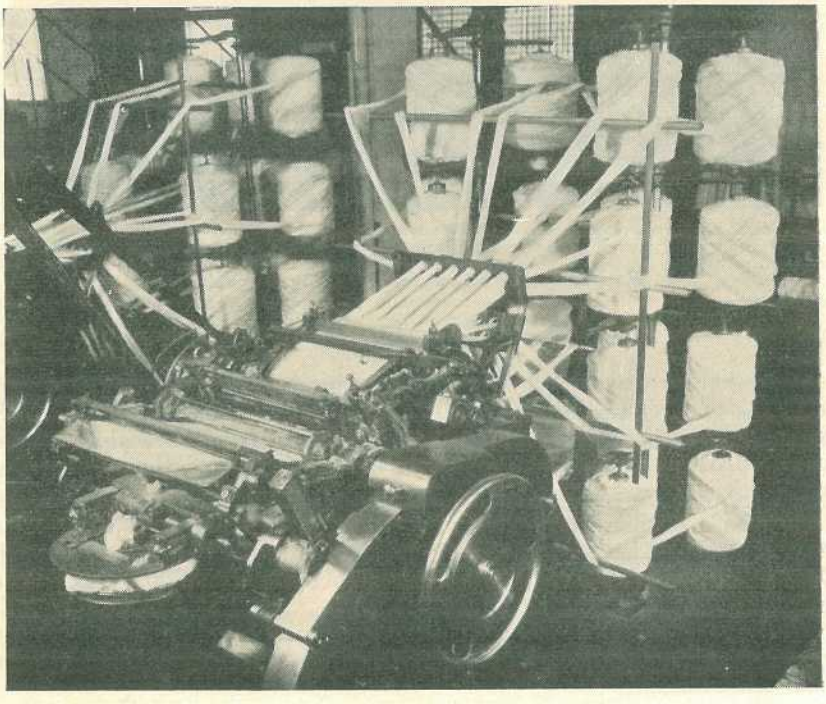


Plate 20.
French Combing Machine.

Carding.

The first important differentiation in the manufacturing process takes place after scouring. The shorter wools, used for the making of worsteds, woollens and knitwear, are sent to a carding machine (Plate 18). This consists of a number of drums which rotate at different speeds, and the fine wire teeth, with which they are covered, tear the wool apart and lay the longer fibres more or less parallel. The shorter fibres are left lying obliquely across the longer ones with which they interlock. The wool comes from the carding machine as a wide thin film and goes to a condensor which divides the film into a number of even strips. These strands are referred to as "slivers."

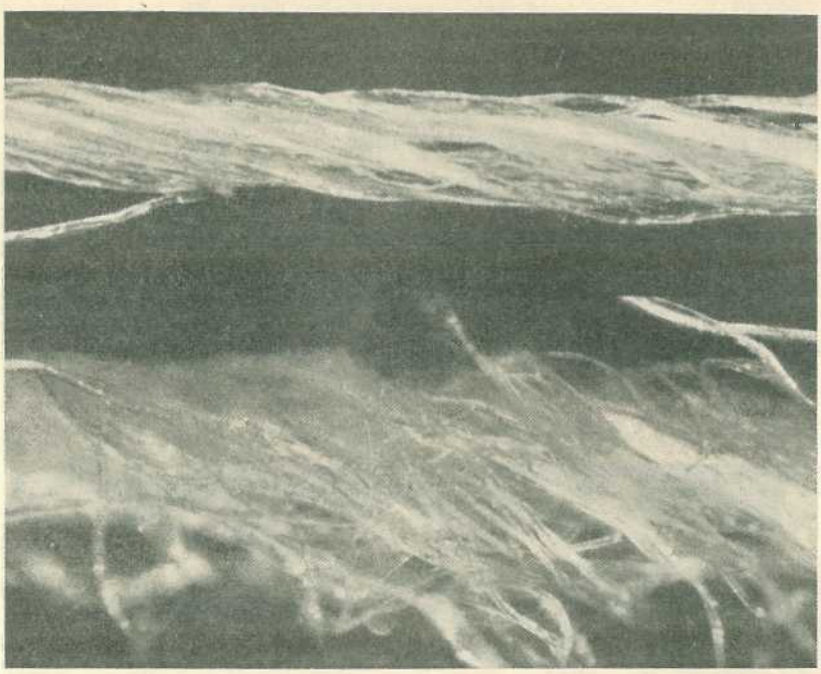


Plate 21.

Worsted and Woollen Yarns, Highly Magnified.

From The World Book of Wool.

Combing.

The longer wools used for worsted manufacture go through various processes of preparation for combing. Shorter wools, which are to be used for worsted making and which have been carded, are also combed. In this process the long fibres are all laid parallel and the shorter ones are removed.

These, together with any clusters of fibres and foreign matter, are termed noil. There are two main types of combing machines, the English comb (Plate 19) and the French comb (Plate 20). The latter can utilise shorter wools than the former. The wool as it leaves the combing machine is referred to as combed tops. These are then dyed, washed and reduced in size by drawing, prior to twisting or spinning them into threads.

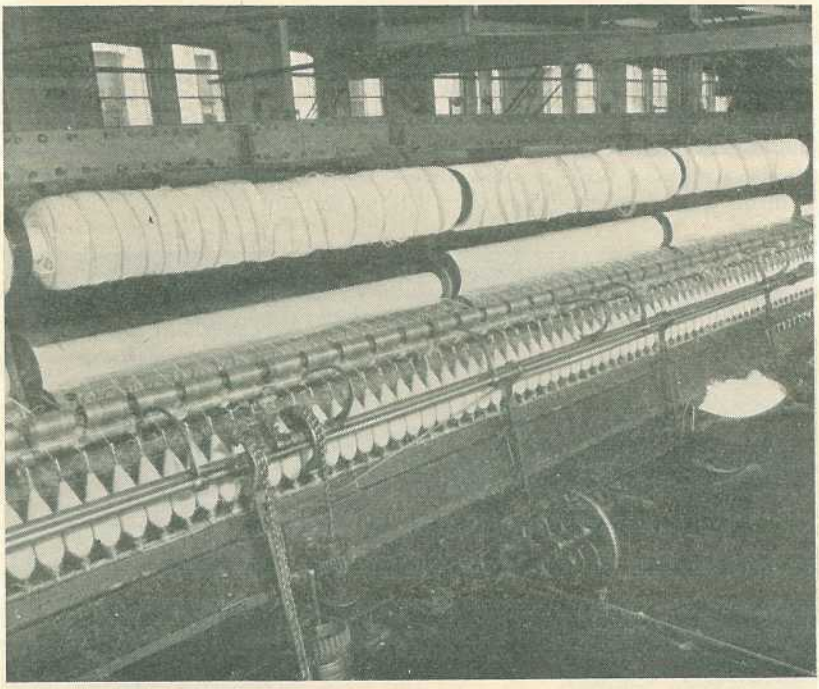


Plate 22.
Woollen Spinning.

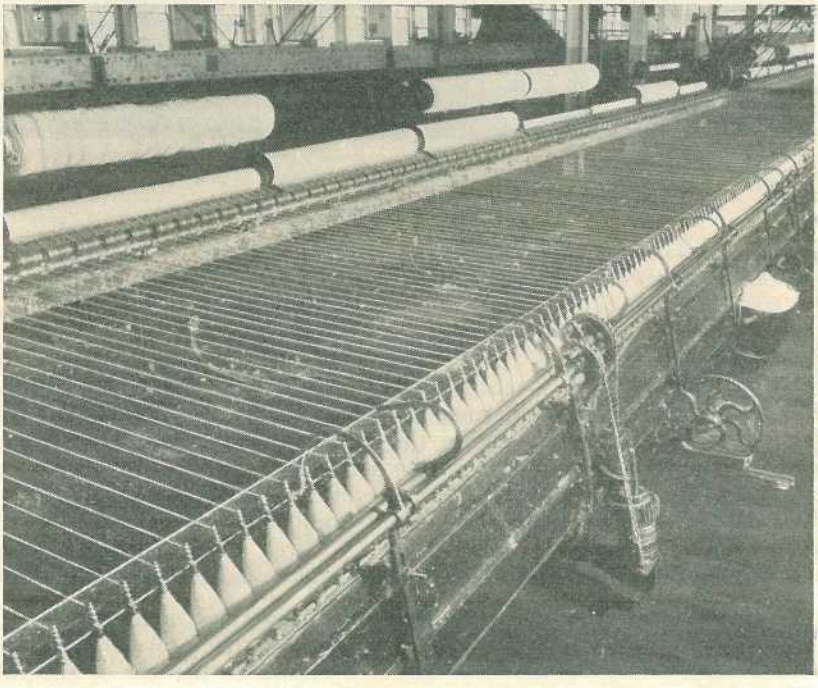


Plate 23.
Woollen (Mule) Spinning.

Spinning and Weaving.

Further differentiation in the manufacturing process occurs in the spinning. Worsted threads are tightly spun, and present a smooth appearance (Plate 21). They are round and even, strong and elastic. Woollen threads are loosely spun and because of the interlacing cross threads present a fluffy appearance. They are full and soft to handle. Spinning machines are shown in Plates 22 and 23.

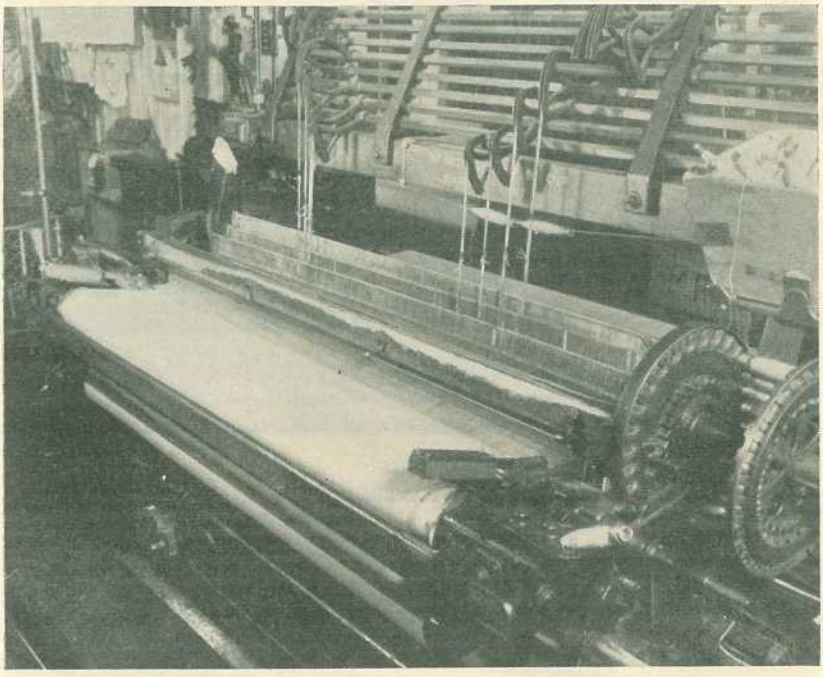


Plate 24.

Weaving Woollen Cloth.

The cloth is manufactured by weaving (Plate 24) or knitting. In the former process long threads known as "warp" (Plate 25) are selected to run lengthwise, while "weft" is the term applied to the threads which run across the fabric. The warp threads are moved up and down in the loom according to a prearranged plan and the weft threads are placed between them by the backward and forward movements of a shuttle. By varying the order in which the warp threads move up and down in relation to the movement of the shuttle a pattern can be woven into the fabric. Some cloths are dyed (Plate 26) after weaving, and worsteds pass over a roller and beneath a set of rotating blades (Plate 27) which "crop" any free fibres. Most cloths are examined for flaws and they are then pressed and rolled for sale (Plate 28).

The knitting industry can be divided into three main branches—hosiery, underwear, and outerwear manufacture. The processes in manufacture are similar, but there are wide variations in the size of the yarn used and the number of stitches per inch.

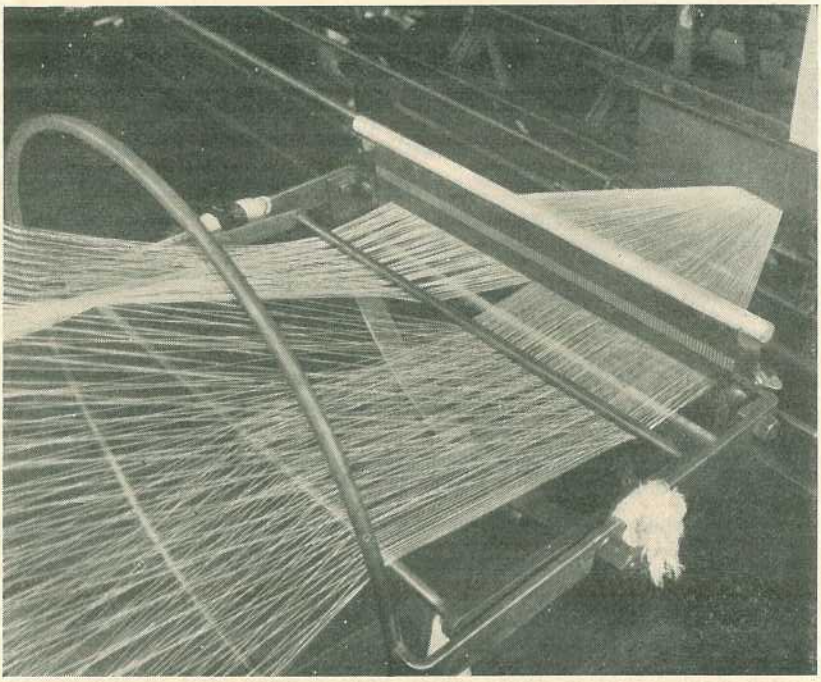


Plate 25.
Close View of Warp Threads.

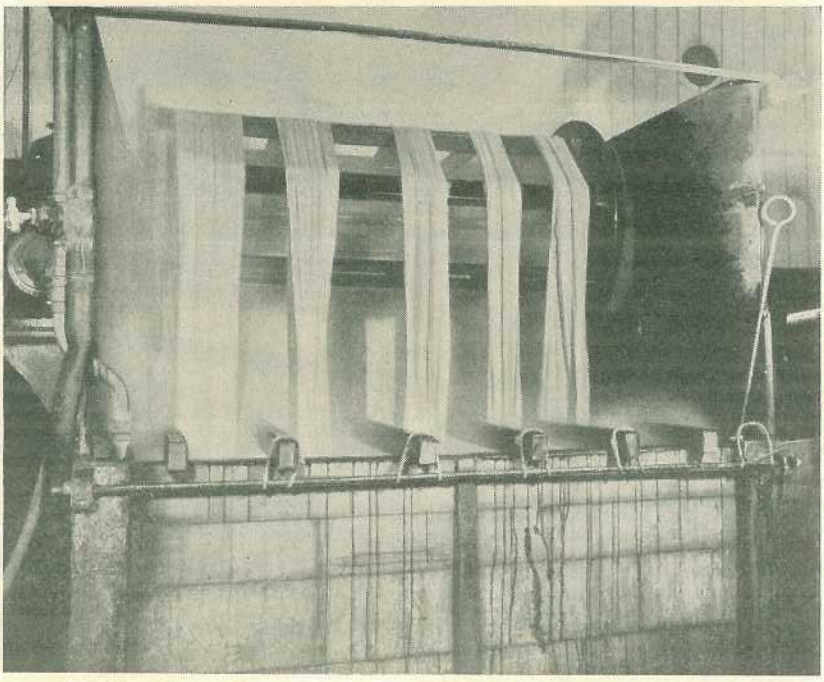


Plate 26.
Dyeing Cloth.

Felt making is probably the oldest form of woollen manufacture, but more recent developments in this branch of the industry have greatly increased the variety of materials produced. Fine light felts are used for hat making. A heavier grade is used for the uppers of felt slippers and in furnishing and upholstery felts. The felts used for floor coverings are heavier still, while those for numnah pads in saddle making or as beds for heavy machinery are thick and spongy.

These different types of felt require wools of special quality and lines from certain districts are sought by buyers for felt making. After blending, the wool is carded, but instead of being divided into a number of even strips by a condensor, it is taken off in the form of a wad, which is placed in a hardening machine. Here it is subjected to pressure, heat, and friction, and the fibres become entangled. This process is continued by milling, during which the felt is shrunk still further. During this process the material may be shrunk by as much as 50 per cent. in its length and width. The felt is then washed and dyed, and stretched to the required standards. All protruding fibres are "cropped" from its surface and it is pressed and rolled ready for sale.

During the whole of the manufacturing processes the wool is oiled, to make it slip easily, and there is some interchange of material. For instance, the noil, which consists of short fibres removed by the combing machine, is worked into the carded wools for woollen manufacture. In this way waste is reduced. A considerable amount of pull is exerted on individual fibres and upon yarns and fabrics during manufacture. Tender wools—that is, those which have a weak spot in the length of their staple, may break under this strain. Accordingly they are not sought by buyers.

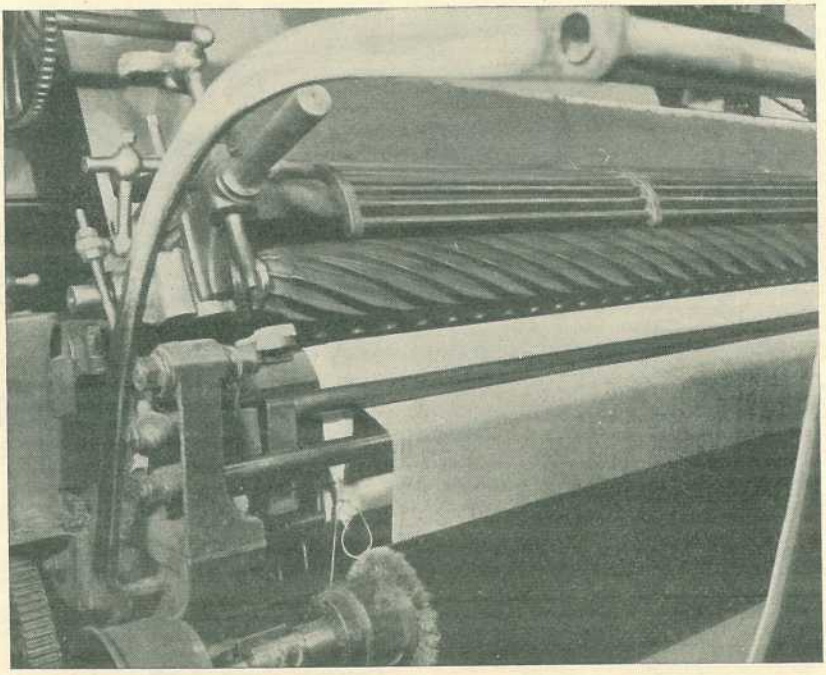


Plate 27.
Cropping Machine.

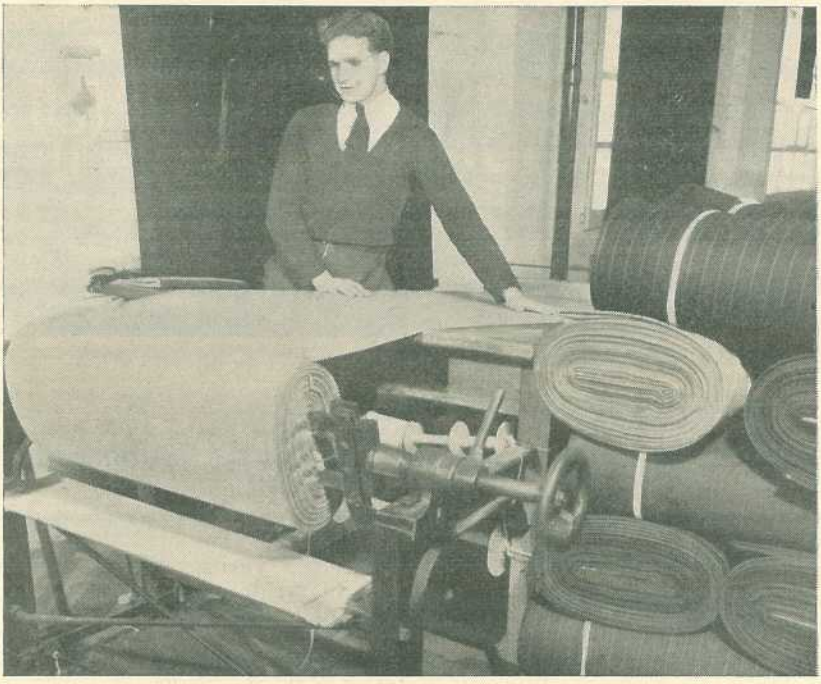


Plate 28.
Pressing and Rolling Cloth.

ACKNOWLEDGEMENT.

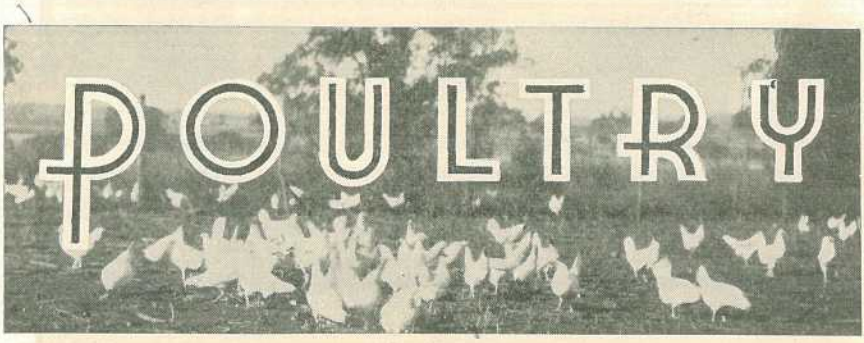
The illustrations in this article, except Plate 21, are from photographs of the Australian National Publicity Association, which has kindly permitted their reproduction.

JUNIOR FARMER NEWS.

Annual meetings of several Junior Farmer Clubs have resulted in some changes of secretaries, including Allora (Neville Gartner), Warwick (Colin C. Madsen) and Thangool (Ronald G. Reeve).

New clubs have been established recently at Eton North, Racecourse and Eungella in the Mackay district, and at Goovigen and Wowan in the Dawson Valley. The secretaries of these clubs are Messrs. J. Blackburn, Ken. Muller and S. M. Howie, and Misses T. Durken and P. Cue, respectively.

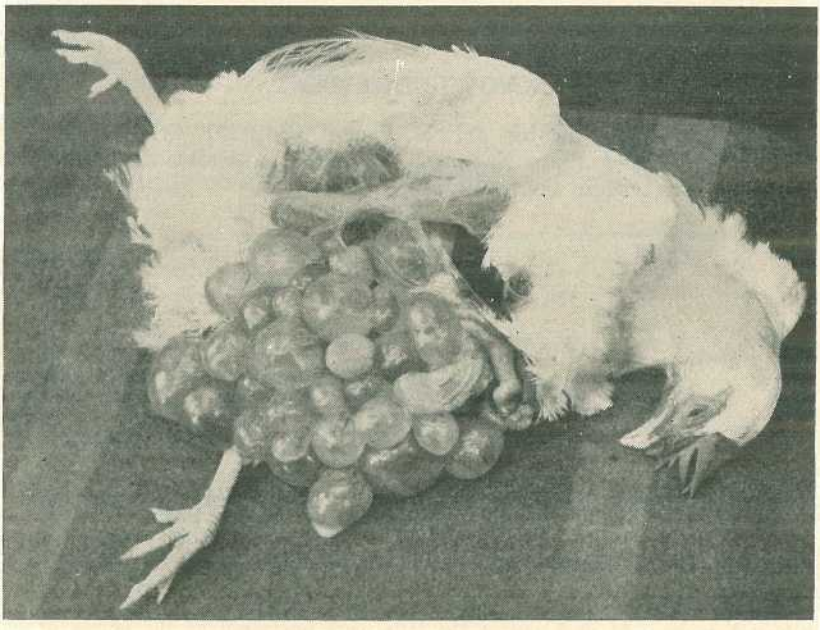
Three members of the British Junior Farmers' League recently spent a fortnight in Queensland visiting the Warwick, Murgon, Wondai, Gayndah, Biloela and Theodore districts. At each centre the lads were quartered at the homes of club members and were tendered civic receptions. They visited a number of well-known dairying, fruit-growing, pastoral and general farming properties during their stay and were also shown over butter, cheese and bacon factories.



A Rare Cystic Ovary.

Mr. J. J. McLachlan, Northern Poultry Adviser, has supplied the accompanying illustration of an enormous cystic ovary in a hen. A cystic condition of the ovary in hens is only occasionally seen, and as a general rule there is very little increase in size. The bird shown here found it necessary to rest after walking a few yards. When walking, the body was carried at an angle of about 60 degrees, the legs being forced very wide apart and the abdomen almost touching the ground.

The weight of the carcase after removal of the cystic ovary was 3 lb. 15 oz. and the cystic ovary weighed 2 lb. 3 oz. The hen was in well fleshed condition and between two and three years of age.



Cystic Ovary in White Leghorn Hen.

Photo.—C. and T. Pinder, Ingham.

ANIMAL HEALTH

Coccidiosis of Poultry.

P. J. O'SULLIVAN, Parasitologist, and A. K. SUTHERLAND, Senior Veterinary Pathologist, Animal Health Station, Yeerongpilly.

COCCIDIOSIS is the name given to infections of the intestine caused by microscopic parasites known as coccidia. Wherever chickens are kept under artificial conditions coccidiosis is the greatest hazard in their successful rearing. The disease causes enormous economic loss through deaths and decreased egg production due to the poor development of many which survive an outbreak.

In the last few years treatment with sulphonamides has greatly reduced losses from coccidiosis and poultry farmers have spent large sums on these drugs. It is considered wiser, however, to prevent coccidiosis by management based on knowledge of the parasite and the disease rather than to rely on drugs to control outbreaks after they occur.

Coccidia occur in most domestic animals but each species is remarkably host specific. Thus the coccidia of fowls are unable to survive in any other host. Similarly the coccidia of turkeys, ducks, geese, and other birds and animals cannot infect fowls.

Several different species of coccidia infect the intestines of fowls. Their effects range from a mild catarrh of the intestine to severe disease with extensive inflammation and haemorrhage resulting in death.

Two species of coccidia are important in fowls. They are *Eimeria tenella,* which causes caecal coccidiosis, and *Eimeria necatrix,* the principal cause of intestinal coccidiosis. Several other less harmful species infect fowls but they cause disease only on odd occasions.

LIFE CYCLE OF COCCIDIA.

Infection follows the ingestion of a mature (or sporulated) coccidia "egg," known as an oocyst, with the food or water, or from the litter. The digestive juices of the bird release from the oocyst motile forms known as sporozoites, which invade the cells lining the intestine (Plate 29). These sporozoites grow bigger at the expense of the host cells and then divide into numerous small merozoites, which in turn invade other intestinal cells. This type of asexual reproduction goes on for two generations, then some of the merozoites develop into male and female forms which mate to produce the oocyst or "egg." The oocyst has a thick shell and is passed out of the host in the droppings (Plate 30). In the presence of warmth, moisture and oxygen, further development takes place, so that in 48 hours or longer the oocyst has matured or sporulated, *i.e.,* contains sporozoites, and is then capable of infecting a chicken.

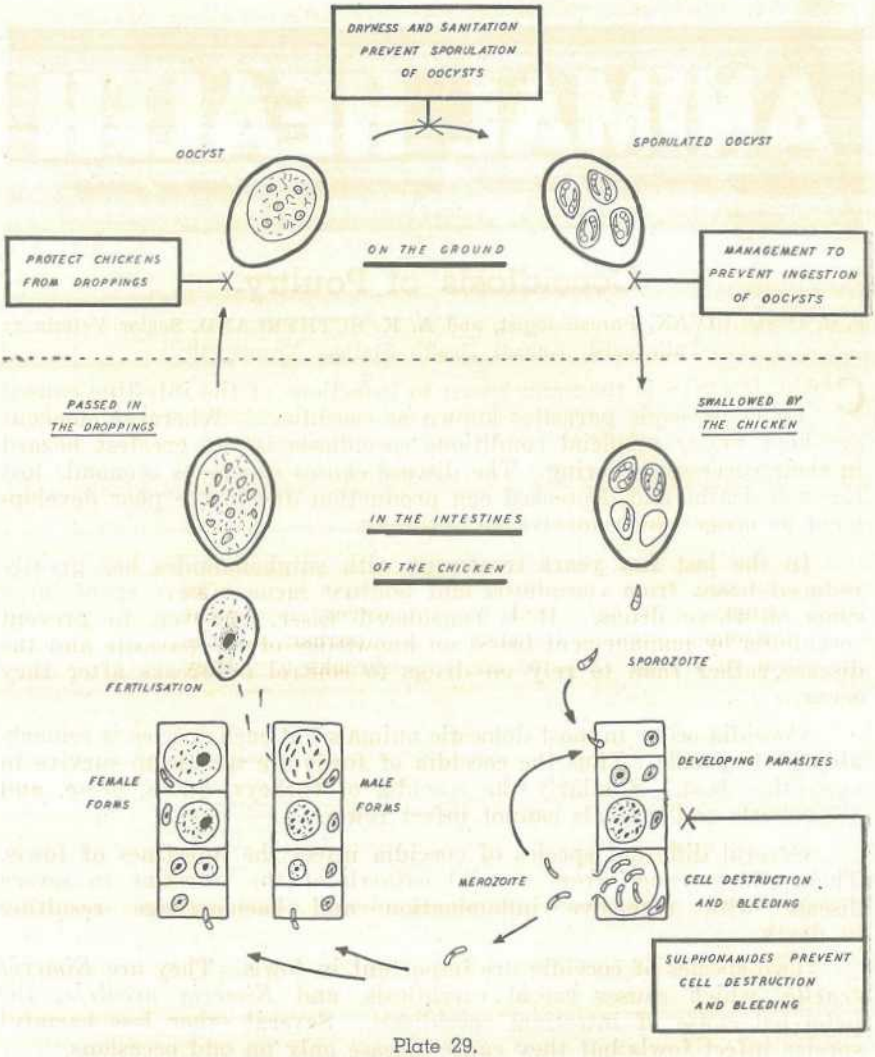


Plate 29.

Diagram of the Life Cycle of Poultry Coccidia.

The sporulated oocyst is very resistant and is capable of surviving in moist shady places for many months. Sunlight and dryness destroy the oocysts but they are very resistant to disinfectants.

The droppings of sick birds contain enormous numbers of oocysts. Chickens which appear healthy after recovery from coccidiosis may excrete smaller numbers of oocysts for many months. These oocysts are scattered in and about the litter and the feed and water troughs, from which they are picked up by susceptible fowls. Oocysts may be spread from pen to pen or from farm to farm on boots, buckets, crates, and other equipment.

CAECAL COCCIDIOSIS.

This is the commonest form of coccidiosis and is responsible for heavy losses. It occurs most often in chickens between 4 and 10 weeks of age but younger or older birds are occasionally affected.

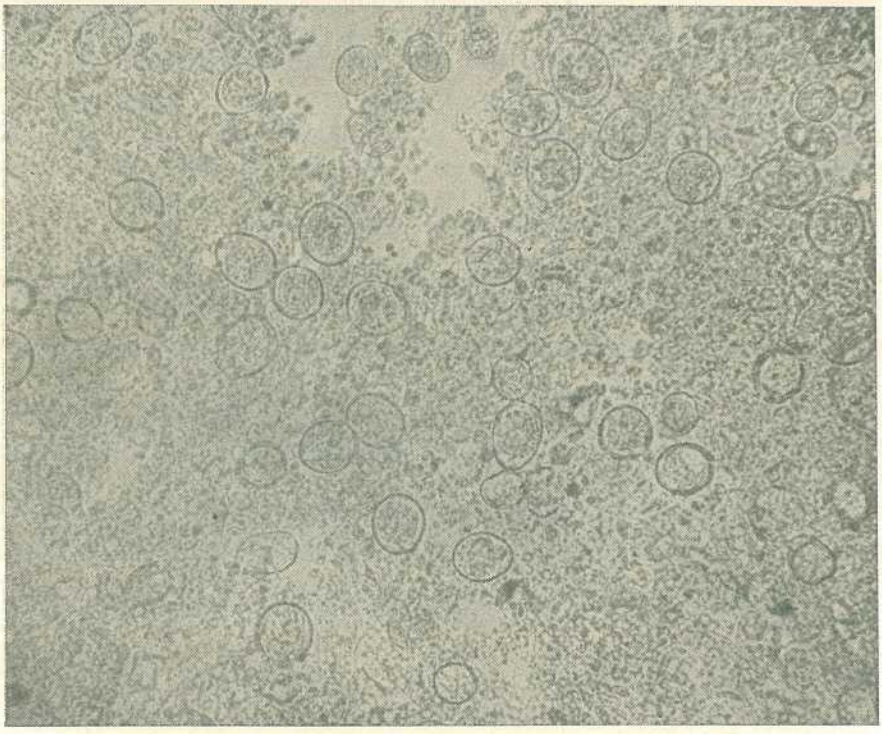


Plate 30.
Coccidia Oocysts in Intestine of a Chicken (magnified approximately 400 times).

Symptoms.

Severely affected birds appear depressed and huddle together with their feathers ruffled as though they were cold. The wings droop and the shanks and comb are pale. The thin watery droppings may contain blood, which often stains the tips of the wing and tail feathers. In some cases the droppings appear to be all blood. In less acute cases there is listlessness, paleness, and ruffled plumage, and the droppings may show a brownish tinge indicating the presence of blood. There is usually rapid loss of weight. The appetite is depressed. Water consumption is greatly increased in the early stages of the disease but is decreased during the acute stages and does not return to normal unless and until the birds start to recover.

Mortality as high as 60 per cent. occurs in severe natural outbreaks. The acute stage of the outbreak usually lasts one to two weeks but occasional deaths occur for several more weeks. In mild outbreaks deaths are spread over a longer period because only a few chickens pick up large doses of oocysts at any one time.

Chickens that have shown definite symptoms and have recovered from coccidiosis are generally stunted and more susceptible to other diseases and parasites. Often the effects are still noticed when the birds come into production.

Recovered chickens have a strong immunity to further attacks of caecal coccidiosis but they are still susceptible to the other forms of coccidiosis which affect the small intestine.

Post-mortem Findings.

In acute cases the lining of the caeca (blind guts) is extensively eroded (*i.e.*, ulcerated) and the caeca are filled with blood. In less acute cases the caecal wall is thickened and ulcerated and shows haemorrhagic patches (Plate 31). A cheesy core tinged with blood is often present, particularly in the later stages of the disease. In mild cases microscopic examination may be necessary to detect the disease. An accurate diagnosis should be made quickly so that treatment can be started before the whole batch is seriously affected.

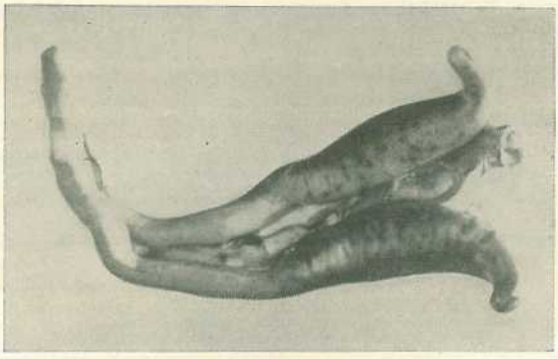


Plate 31.

Caecal Coccidiosis.—Caeca (blind guts) distended with blood and showing haemorrhages in walls.

The caeca of young chickens affected with pullorum disease or older chickens affected with blackhead (histomoniasis) may contain cheesy cores similar to those seen in coccidiosis. Thus laboratory tests may be necessary to differentiate these diseases.

Control Measures.

It is almost impossible to keep chickens entirely free from coccidia. When a chicken ingests a *small* dose of oocysts it usually suffers no appreciable harm, but if the environment favours the spread and survival of oocysts such a bird may initiate an outbreak of coccidiosis. The ingestion of *large* doses of oocysts produces disease.

A small number of oocysts may be brought into a pen by utensils or the boots of an attendant or they may be already present within the pen. A few chickens pick up these oocysts, the parasites multiply within their bodies and then large numbers of oocysts are passed in the droppings. Other chickens become infected and so the pen may soon be heavily contaminated.

Thus to prevent coccidiosis one should aim to—

(*a*) Develop a system of management which prevents the chickens from picking up large numbers of oocysts; and

(*b*) Make conditions as unfavourable as possible for the survival of oocysts.

A large accumulation of oocysts occurs where the droppings of chickens collect, namely under the roosts and around feed troughs and

water vessels. By preventing the birds from having contact with droppings in such places, losses from coccidiosis are reduced. Small mesh wire netting on or under the roosts prevents access to much of the droppings. The netting also prevents chickens from eating any bloody droppings and so enables one to detect a potential outbreak before many chickens are affected.

Feed troughs and water vessels should be constructed and placed so as to prevent the birds fouling the feed and water with droppings.

Dampness of the litter either from water vessels or from rain makes conditions favourable for oocyst survival and may lead to an outbreak of coccidiosis.

Overcrowding increases the contamination of the floor and so increases the chance of the birds picking up massive doses of oocysts.

For chickens reared in intensive pens, thorough cleaning of the pen every two or three days prevents coccidiosis because it removes the oocysts before they have reached the mature infective stage. However, with present labour costs this procedure is often impractical and other preventive measures are now preferred.

It is often difficult to control coccidiosis in flocks reared in semi-intensive yards. The earth floors cannot be cleaned so it is important that overcrowding be avoided and that the yards be absolutely dry in all parts.

Deep dry litter is an effective labour-saving method of controlling coccidiosis in chickens reared intensively. Any good dry litter such as wood shavings or sawdust may be used, but it must be about 6 inches deep. It is thoroughly stirred every day or so and care is taken to redistribute it about the feed and water troughs. Patches of damp or wet litter must be removed immediately. An inch or so of new litter may be added from time to time according to the degree of contamination of the litter already present. The litter may remain unchanged for eight to twelve weeks but a complete new litter should be provided for each fresh batch of chicks.

The effectiveness of deep litter in controlling coccidiosis apparently depends on two factors. Dilution of the droppings by stirring them into the litter prevents the chickens from swallowing big doses of coccidia oocysts. Secondly, the droppings are dried out so that most of the oocysts fail to reach the mature (sporulated) infective stage.

Deep litter may be improved if hydrated (*i.e.*, water slaked) lime is scattered over it at the rate of 10 to 15 lb. per 100 sq. feet every two to four weeks. The lime must be carefully mixed into the litter to avoid burning the feet of the birds.

Mild outbreaks of coccidiosis can usually be controlled by the methods of management described above, but in severe outbreaks it may be necessary to treat with sulphonamides.

Treatment of Coccidiosis.

Sulphaguanidine, sulphamezathine (= sulphamethazine), sulphamerazine, sulphapyrazine, and sulphaquinoxaline have proved effective for controlling caecal coccidiosis. Treatment is applied to minimise losses and yet permit relatively harmless infection so that the chickens

develop immunity. Improper use of these sulphonamides may be costly and disappointing to the owner and harmful to the chickens, so recommended treatments should be followed carefully.

Sulphaguanidine is almost insoluble in water so it is given only in the mash. Treatment with 1 lb. per 100 lb. of mash suppresses the early forms of the parasite but it has little effect after the intestine has started to bleed.

Sulphamezathine and sulphamerazine are very effective for controlling outbreaks because they have their greatest effect on the stage of the parasite that causes bleeding. They have little effect on the sporozoites or the first non-sexual generation, so the infection is not completely suppressed and the bird can acquire immunity to the disease. These two drugs may be administered in the mash or as soluble sodium salts in the drinking water. The soluble sodium salts are available commercially as 16 per cent. solutions, 2 oz. of which added to one gallon of drinking water gives a concentration of 0·2 per cent. of the drug. Treatment through the drinking water is preferred because it is more convenient and because sick chickens will drink although they may not eat.

To allow the birds to acquire an immunity, what is called the interrupted system of medication seems the most suitable. At the first signs of caecal coccidiosis sulphamezathine or sulphamerazine is administered for three days at the rate of 0·2 per cent. of the sodium salt in the drinking water. Normal untreated water is then given for four days and then medication is repeated at the same dose rate for one day. It is important to give the birds treatment for one day after the break of four days, even though they appear healthy. This method usually controls an outbreak but should any symptoms appear during the next week, treatment should be given again for one day.

The above treatment may control mild outbreaks so quickly that a portion of the flock is not exposed to coccidia and so does not develop immunity to the disease. In such cases the disease may re-appear later in the non-immune chickens. To overcome this, overseas workers have recommended that mild outbreaks be treated with 0·2 per cent. of sulphamezathine or sulphamerazine in drinking water on the first day and then half this dosage on the second, third, sixth, and seventh days.

To estimate the quantities of sulphonamides required to treat a group of chickens the following table is given as a rough guide. It should be noted, however, that there is great variation in feed and water consumption under different circumstances.

WATER AND FEED CONSUMPTION PER 100 CHICKENS (WHITE LEGHORNS) PER DAY.

Age. (Weeks).	Water Consumption. Gallons.	Feed Consumption. Lb.
1–2	1	..
2–4	1¼	3–5
4–8	1½	5–7
8–12	2	8–9
12–16	2½	10–15
16–20	3	15–20

At Brisbane prices in January, 1950, the cost of treating 100 chickens for one day with 0·2 per cent. of the sodium salts of sulphamezathine or

sulphamerazine was 4s. 3d. to 5s. for chickens 4-8 weeks old, and 5s. 8d. to 6s. 8d. for chickens 8-12 weeks old.

Chickens drink somewhat less when sulphamezathine is added to the drinking water but there is no evidence of ill effects from reduced water consumption during the period of treatment recommended. Continued treatment, however, is likely to be harmful.

Sulphapyrazine and sulphaquinoxaline have been shown by overseas workers to be effective against coccidiosis but they are not yet available commercially in Australia.

Flowers of sulphur fed continuously in the mash at the rate of 2 per cent. from 4 to 10 weeks of age has been used as a preventative but this is not recommended because of possible harmful effects on growth and development of chicks.

Borax given in the mash at the rate of 2 per cent. or in the drinking water at the rate of 0.3 per cent. (i.e. ½ ounce per gallon) has some preventive but no curative action against coccidiosis. Thus, if used early in an outbreak, borax may protect chickens not yet infected but it will not aid recovery of birds already infected. Borax is cheaper than the sulphonamides but it is much less effective and may retard growth and development, so it is not recommended.

INTESTINAL COCCIDIOSIS.

This type of coccidiosis is usually not as severe as caecal coccidiosis. The disease is seen most often between 8 and 12 weeks of age but birds of all ages may be affected.

The parasite responsible for intestinal coccidiosis is *Eimeria necatrix,* but several other less harmful species of coccidia also infect the small intestine.

Affected birds lose condition and become weak and anaemic with ruffled feathers and the shanks become pale and dry. The droppings are slimy and greyish but do not contain visible blood. In occasional severe outbreaks deaths occur suddenly but usually the birds are sick for many days and deaths are spread over a few weeks. Intestinal coccidiosis is sometimes the cause of pullets 3 to 4 months of age becoming unthrifty and "going light.".

The upper half of the small intestine is the site of the disease. The intestine is dilated and its wall is thickened and flabby. Haemorrhage occurs in severe cases, so free blood may be found within the intestine. However, the blood is usually digested lower down in the intestine and so is rarely recognisable in the droppings. A feature of coccidiosis due to *Eimeria necatrix* is the presence of greyish white spots, pin head to match head size like fig seeds, which are visible from the outside of the intestine. These spots are colonies of coccidia lying deep in the wall of the intestine.

Although most farmers quickly recognise caecal coccidiosis, they frequently overlook the intestinal form because of the absence of blood in the droppings or other striking symptoms. Intestinal coccidiosis is diagnosed by careful post-mortem inspection of the unopened intestine to detect the colonies of coccidia.

Symptoms similar to those of intestinal coccidiosis may be due to roundworm or tape worm infection, blackhead (histomoniasis), certain forms of the leucosis complex or incorrect feeding. Post-mortem examinations should be done to determine which disease is present.

Little experimental work has been done on the prevention and treatment of intestinal coccidiosis but the methods used for caecal coccidiosis have given good results in outbreaks on farms.

FEEDING IN RELATION TO COCCIDIOSIS.

Poorly nourished chickens have low resistance to coccidiosis, worms and other diseases. If the ration fed to chickens is deficient in protein or vitamin A or riboflavin, the flock is apt to suffer severely from coccidiosis. The best ration procurable is therefore always a wise investment. It should contain 18 to 20 per cent. of protein for birds up to 8 weeks of age and adequate amounts of other nutrients, especially vitamin A and riboflavin, as set out in the Departmental pamphlet "Poultry Nutrition: Principles and Practices."

Although outbreaks of coccidiosis can now be quickly controlled with sulphonamides, it is always wise, when outbreaks occur, to check the ration carefully to make sure that it supplies all the nutrients required for rapid growth of chickens.

COCCIDIOSIS OF ADULT FOWLS.

Occasionally adult fowls suffer from coccidiosis. The first half of the small intestine is affected. The species of coccidia responsible is usually one other than *E. tenella* and *E. necatrix*, the common species in chickens.

The affected birds become listless and thin and the comb is pale, dry and shrivelled. Diarrhoea is usually present. The wall of the intestine is flabby and its lining has a furry or velvety appearance.

Usually only a few cases occur at any one time in a flock of adults.

Coccidiosis in adult fowls is usually associated with a lowering of resistance by malnutrition, especially vitamin A deficiency, overcrowding, insanitary conditions or attacks of other diseases. Thus the first step in controlling coccidiosis among adults is to correct any of these predisposing factors. Affected birds may be either culled or removed to a quarantine pen and treated with sulphamerazine or sulphamezathine.

Agricultural Chemistry

Storage and Disposal of Poisons and Their Containers

C. W. R. McCRAY and G. A. WYATT, Analysts, Toxicological Section, Chemical Laboratory.

THE climatic factors in Queensland which are beneficial to the cultivation of food crops and the rearing of stock are, unfortunately, responsible for the prolific growth of animal and plant pests.

The growth of such pests must be kept in check. Their eradication requires very large quantities of poisonous substances, many of which do not discriminate between unwanted and desirable forms of life.

Thus land holders are forced to use substances poisonous to stock and the question of storage or disposal of dangerous residues is important. Careless storing, handling and disposal of such poisons have been causes of serious stock losses.

Arsenic, in one or other of its forms—dip concentrates, weed killers, Paris green or arsenate of lead—is the commonest and most persistent poison encountered and carelessness in its use accounts for most of the stock losses investigated in this State.

Careless Storage.

Tins and bags containing arsenic or other poisons are often stored in sheds or barns until corrosion or rotting causes their contents to spill or leak out. Many mortalities have been traced to contamination of food by these broken containers.

Because usually only the more valuable stock are hand fed, such losses are serious not only to the owner but also to the industry.

Other common storage places are the beams and shelves of outbuildings. These poisons, often unlabelled, are soon forgotten and in "tidying up" may be carelessly thrown aside, thereby contaminating pastures or making a hazard of a dump.

This danger is increased when properties are sold, for the new owners are less aware of the risk.

Correct Storage.

All poisons should be kept together in a recognised "poison place" and securely locked. They should be stored in strong containers to minimise breakage and loss. Containers should be labelled "POISON" and the name of the poison and its uses should also be indicated. If necessary both label and containers should be renewed as the markings fade or become indistinct.

Careless Disposal.

Even after use some poison containers are still a potential danger, and careless disposal has contributed to many mortalities. The most common form of disposal is the "rubbish dump," which is usually situated on a piece of waste land. Each year as favoured pastures are eaten out, the stock may range onto this waste ground, or new purchases, often valuable, are drawn by curiosity or strangeness or are attracted by the smell of linseed oil residues to places not usually frequented by the rest of the herd. In these circumstances the danger is real—drinking rain water from "empty" poison containers, licking broken bags or old lead paint tins have each been followed by deaths. In addition, deaths have resulted from stock licking poisoned timber.

The burning of poison containers before dumping does not in all cases reduce their potential danger.

Correct Disposal.

The safest method of disposal is by burial.

All poison residues, used containers and materials, unknown or suspected of being poisonous, should be buried as deeply as possible. The site of burial should be chosen carefully so that rain seepage will not cause these poisons to contaminate pastures or watercourses.

Conclusion.

Most of the stock poisonings investigated in this laboratory are due to carelessness during transport, storage, use or disposal of poisons.

In general, land owners respect the instructions and dose rates as directed but, "out of sight, out of mind" is too often a factor contributing to carelessness in storage and disposal both of these poisons and their containers.

TUBERCULOSIS-FREE CATTLE HERDS

(AS AT 15th JUNE, 1950.)

Breed.	Owner's Name and Address of Stud.
Aberdeen Angus	The Scottish Australian Company Ltd., Texas Station, Texas.
Jersey	W. E. O. Meier, "Kingsford" Stud, Rosevale, via Rosewood.
A.I.S.	F. B. Sullivan, "Fermagh," Pittsworth.
Ayrshire ..	L. Holmes, "Bencecula," Yarranlea.
A.I.S.	D. Sullivan, Rossvale, via Pittsworth.
A.I.S.	W. Henschell, Yarranlea.
A.I.S.	Con O'Sullivan, "Navillus Stud," Greenmount.
Jersey	J. S. McCarthy, "Glen Erin Jersey Stud," Greenmount.
Jersey	J. F. Lau, "Rosallen Jersey Stud," Goombungee.
A.I.S.	H. V. Littleton, "Wongalee" Stud, Hillview, Crow's Nest.
Jersey	G. Harley, Hopewell, Childers.

ASTRONOMICAL DATA FOR QUEENSLAND.

AUGUST.

By W. J. NEWELL, Hon. Secretary of The Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.30	5.18	Cairns	17	41	Longreach	29	40
6	6.27	5.21	Charleville ..	26	28	Quilpie	36	34
11	6.23	5.23	Cloncurry	41	58	Rockhampton ..	4	16
16	6.19	5.26	Cunnamulla ..	30	28	Roma	16	18
21	6.14	5.28	Dirranbandi ..	21	17	Townsville ..	15	35
26	6.10	5.31	Emerald	14	24	Winton	33	47
31	6.04	5.33	Hughenden ..	26	44	Warwick	5	3

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Day.	Rise.	Set.
	p.m.	a.m.
1	8.20	8.27
2	9.16	8.56
3	10.11	9.25
4	11.05	9.53
5	11.59	10.22
6	..	10.55
	a.m.	
7	12.54	11.31
		p.m.
8	1.51	12.12
9	2.47	12.59
10	3.42	1.51
11	4.34	2.49
12	5.21	3.50
13	6.04	4.53
14	6.41	5.55
15	7.16	6.57
16	7.49	7.58
17	8.21	9·00
18	8.54	10.04
19	9.29	11.10
20	10.09	..
		a.m.
21	10.56	12.18
22	11.49	1.27
	p.m.	
23	12.48	2.33
24	1.54	3.34
25	3.01	4,27
26	4.06	5.12
27	5.08	5.51
28	6.08	6.25
29	7.04	6·56
30	7.59	7.24
31	8.54	7.52

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville 27; Cunnamulla 29; Dirranbandi 19; Quilpie 35; Roma 17; Warwick 4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	21	16	37	31	12	7	43	35
6	13	25	28	41	3	16	31	47
11	9	30	25	45	0	21	26	53
16	18	19	33	35	9	10	38	41
21	29	11	45	25	20	0	52	28
26	27	12	43	26	18	1	50	29
31	23	17	39	32	14	8	45	37

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	34	22	53	45	38	30	28	19
3	23	32	46	53	30	38	20	28
5	13	42	39	59	24	44	12	36
7	9	51	37	64	21	50	8	43
9	2	55	33	67	17	52	3	45
11	2	55	33	67	17	52	3	45
13	9	47	37	62	21	47	8	39
15	20	36	43	55	28	40	17	31
17	31	24	51	46	35	31	25	21
19	43	11	59	38	44	23	36	11
21	53	6	67	34	50	20	44	7
23	57	0	69	31	53	16	47	2
25	52	4	66	33	50	19	43	5
27	42	13	58	39	43	24	35	13
29	31	24	51	46	35	32	25	21
31	20	34	43	54	28	39	17	29

Phases of the Moon.—Last Quarter, August 6th, 5.56 a.m.; New Moon, August 14th, 2.48 a.m.; First Quarter, August 21st, 1.35 a.m.; Full Moon, August 28th, 12.51 a.m.

On August 15th the Sun will rise and set about 17 degrees north of true east and true west respectively, and on the 2nd and 17th the Moon will rise and set almost at true east and true west respectively.

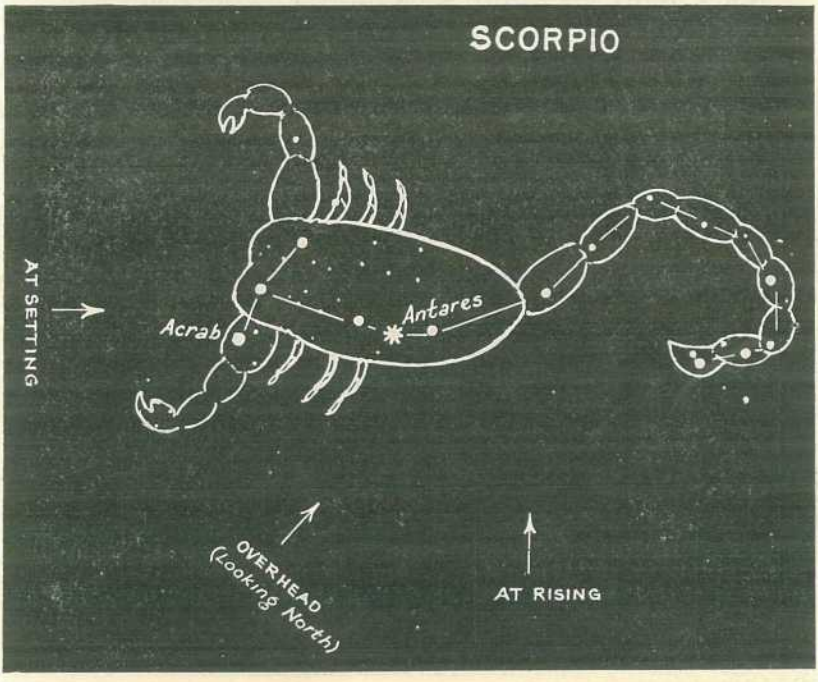
Mercury.—At the beginning of August, in the constellation of Leo, will pass 1 degree north of Regulus and will set about 1½ hour after the Sun, reaching greatest angle east of the Sun on the 21st, when it will set over 2 hours after the Sun. By the end of the month, in the constellation of Virgo, it will set 1 hour 51 minutes after the Sun.

Venus.—Now swiftly approaching the Sun; on the 1st in the constellation of Gemini rising 1½ hour before the Sun and on the 31st, in the constellation of Cancer, rising 26 minutes before sunrise.

Mars.—In the constellation of Virgo, now seen in the western evening sky; on the 1st of August setting between 11 p.m. and midnight and on the 31st between 10.30 p.m. and 11.30 p.m.

Jupiter.—Now a brilliant object in the eastern evening sky at the beginning of the month, rising a couple of hours after sunset, and at the end of the month rising an hour or more before sunset.

Saturn.—Too close to the Sun for observation.



The Constellations.—For some months star charts showing the positions of the more important stars and constellations have appeared in this journal and readers should now have a knowledge of their relation as well as the times and seasons they are above the horizon. From this issue star charts will be replaced by detailed descriptions of the constellations and that chosen for this month is the constellation of Scorpio (sometimes written Scorpius), which at this time of the year is about overhead at nightfall. It will be noticed that the constellations are slightly farther west at the same time after several night's observation, the amount being about 30 degrees every month, so that by December Scorpio will set about sunset, and it will reappear in the eastern morning sky in January. This constellation is perhaps the easiest to recognise in the sky and the only one which in any way (except the cross) resembles what it represents—a scorpion—the curved form shown by the fine line in the drawing being most striking. It covers 30 degrees of the sky and was believed by the Greeks to represent the horrible scorpion that frightened the horses and brought disaster to Phaeton when driving the Sun chariot of his father, Phoebus Apollo. Being situated in the Milky Way it has a background of thousands of small stars and some very interesting clusters and nebulae are found in it which even with small optical aids, such as binoculars, give many pleasant hours of interesting observation. Antares, the most brilliant star in this constellation, is one of the largest stars known, with a diameter of 370,000,000 miles (almost 500 times that of our Sun) which will cover the whole of the orbit of Mars. This star has a companion star which is only 3 seconds away and green in colour. It is easily seen in a telescope of 5 or 6 inch diameter. At certain periods the Moon's orbit passes so close to Antares that an eclipse of that brilliant star by the Moon—known as an occultation—is observed. On 11th February and 7th April of this year there was an occultation of Antares, and a further occultation occurs on the night of August 21st. The changing position of the curve of this constellation in relation to the horizon as it moves from east to west is most interesting. The arrows on the accompanying diagram show the direction perpendicular to the horizon at rising, at transit and at setting.