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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment

Planning for Post-War Stability.

AN important move is now under way in the Old Country for the formulation of basic principles from which will be developed a long-term agricultural policy. It is a highly significant move, not without interest to Australian producers, and probably the most important for a permanent peace-time policy that has yet been attempted. In fact, it actually involves changes in the higher directon of Government policy in which the Prime Minister himself, Mr. Churchill, is taking a hand. In addition to the appointment of an executive of three senior Cabinet Ministers to deal with man-power, production, and imports, a member of the War Cabinet has been allotted the duty of preparing plans for reconstruction in Great Britain after the war as the first step towards the establishment of a Ministry of Reconstruction. This new Ministry will cover the whole field of industry and social enterprise, and will include the preparation of an agricultural policy which can fit in with the present war-time policy of guaranteed prices and markets for the duration of the war and for the first year of peace. In this new policy the questions of the control of production, of prices, of markets, and of labour are involved.

Every representative section in Great Britain has already agreed that in the post-war years a sound and prosperous agriculture must be accepted as one of the fundamental factors in national policy. From

the Australian producer's point of view, there is one obvious point that crops up immediately, and that is that provision should be made in any new policy for the maintenance of a balance between British and Empire producers. It is apparent that economic planning after the war will be on a comparatively new basis, and it is essential that the relationship between producers in the Motherland and producers in the Dominions should be established beforehand, so that stability and continuity in policy may be ensured for the benefit of all concerned. One interesting suggestion has been made, and that is that "another Empire Producers' conference should be held in South Africa as the most central site, so that an Empire producing policy can be established and stabilised as one huge effort, instead of the conflict of interest and competition in markets which did so much damage in recent years."

In this new move, and in the deep thought which it has evoked, there is much to serve as a reminder of the necessity of our developing our own post-war plans for a better world. It seems certain that we shall have a great influx of population when the war is over. In addition to developing our powers of absorption of migrants, provision must also be made for a satisfactory post-war settlement of the men of the fighting forces now in the field. A complete survey of our whole resources, then, suggests itself as a matter of immediate urgency. There are so many vital factors involved that a start on such a nation-wide survey cannot be made too soon.

A Post-War Policy for Producers.

THE British Press is giving a lot of space to timely discussions on agriculture and its future. The London *Times,* in a leading article (18-1-41), stressed strongly the necessity of resisting any temptation to live merely in the immediate present and "to put off as premature consideration of future difficulties until it is too late for effective action." Continuing its comment, the *Times* said:—

> The country cannot afford to expose British farming or the agriculture of the Dominions and of the other great primary producing countries, to a repetition of their unhappy experience which followed the last war. Not only are the growers of foodstuffs and raw materials the great market for secondary industries, primary production is the basis of the whole complex social and economic structure, and in the long run the health of our civilisation depends upon its health. . . . There are few more vital or more fundamental necessities than that of maintaining a reasonable stability in the prices of primary products. War conditions should help to simplify the task. They bring home to everyone the necessity of some machinery for regulating the flow of supplies. . . . In any machinery which may be set up, the Empire Producers' Councils recommended by the Sydney conference are certain to play a very important part as representing the interests of the farmers. There are, of course, other interests which also need to be taken into account, especially

those of the ultimate consumer. It is quite true. . . . that in the long run no one, not even the consumer, benefits from depressed prices and demoralised markets. It is equally true that in the long run no one, not even the producer, benefits from inflated prices, which can be just as demoralising. The legitimate dealer stands to gain from the orderly regulation of markets as much as the consumer or the producer. The only person likely to suffer is the parasite on the industry whose operations are merely predatory and whose elimination would itself be a gain. At the same time there are many reasons why it would be dangerous to entrust this regulation exclusively to associations of producers. For one thing they can only handle the problem as one of over-production, while, as was made clear by the report of Lord Astor's Committee on Nutrition, there is not too much food grown in the world, but too little. The real trouble is that so many cannot afford to buy in sufficient quantities. Producers' organisations cannot themselves do everything to make this latent demand effective, and are forced therefore to rely on restricting supplies in order to maintain remunerative prices. This is necessary in present conditions, but it is a regrettable necessity. It can only be obviated by positive and concerted action of Governments to raise standards of nutrition where they are now too low for healthy growth and development. If for this reason alone Governments, who represent the interests of the whole community, including both consumers and producers, must take a predominant part in all questions affecting food supplies and prices, which must be regarded as constituting one of the major problems of reconstruction.

A New Handbook on Horticulture.

ORCHARDISTS in every part of the State will welcome the new handbook on horticulture issued by the Department of Agriculture and Stock as the second volume of an important series designed to serve as a practical guide for Queensland primary producers. The volume, which is now available at modest cost, deals with orchard practice in its many aspects, including the selection of a site, the propagation of fruit trees, and the cultivation of tropical, sub-tropical, and deciduous fruits, as well as vegetables grown in Queensland on a commercial scale. A very valuable section of the book covers the packing and marketing of both fruit and vegetables. As most orchardists in Queensland grow a diversity of fruits, the new handbook will be accepted as a useful guide to the established grower as well as to the beginner. It is a practical work conveying concisely and simply essential cultural information based on everyday experience, and to which advisory officers of the Department have contributed freely from their store of practical knowledge gained in the course of many years of service to the Queensland fruitgrowing industry. The Queensland Handbook of Horticulture should have a place in every Queensland farmer's library.

The Lantana Leaf Bug in Queensland.

ROBERT VEITCH, B.Sc.Agr., B.Sc.For., F.R.E.S., Director of Plant Industry (Research).

THE lantana seed fly* was introduced from Hawaii to Queensland by the Department of Agriculture and Stock nearly a quarter of a century ago, and it is considered that its establishment in this State was a useful step towards the control of lantana. The fly maggots, hatching from the eggs which are laid in the lantana berries, feed in the pulp and generally attack the seeds. As a result of this infestation, the percentage of seed germinating is reduced and the berries are rendered relatively unattractive to such birds as normally feed on them and thereby distribute the seed. Hence the effect of this introduction was to retard the spread of lantana.

It was felt eventually, however, that the position was still by no means satisfactory because, in spite of the establishment of the seed fly throughout the State virtually wherever lantana occurs, this plant was still spreading to new areas and flourishing in those in which it was already established, although doubtless to a lesser degree than would have been the case had the seed fly not been introduced to Queensland. Consideration was accordingly given to the introduction of other insect enemies of lantana, and in 1936 the lantana leaf bug† was introduced from Fiji by officers of the Council for Scientific and Industrial Research.

The insect was handled under quarantine conditions in Canberra and bred up for subsequent liberation at a few selected centres in Queensland and New South Wales. A colony was made available for liberation at the Kairi State Farm on the Atherton Tableland in November, 1936, this colony consisting of 600 adult bugs. Four colonies, totalling close on 4,000 adults and nymphs, were despatched also to Rockhampton for liberation at Fairy Bower, in the vicinity of that city, between the months of October, 1937, and October, 1938. These liberations were made by local officers of the Department of Agriculture and Stock, and a sufficient period has now elapsed to warrant an attempt at an assessment of the present position.

Position in North Queensland.

The single liberation at Atherton successfully established this insect in North Queensland, and in March, 1939, it had become sufficiently abundant to be responsible for extensive defoliation and flower destruction on the original liberation site. Its numbers there were such that steps were taken to distribute colonies to other portions of the Cairns Hinterland and to lantana infested coastal areas north of Townsville. This work was commenced by departmental officers in July, 1939, and was supplemented by distribution by private individuals. As a result of this distribution, assisted to some extent by natural spread, the lantana leaf bug is now present in large numbers in the great lantana belt which extends from the Herbert River to north of Cairns and, indeed, it has been found established as far north as Cooktown. It is also established at many lantana infested centres on the Cairns Hinterland.

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* *Agromyza lantanæ* Froggatt. † *Teleonemia scrupulosa* Stal.

The spread of the bug in the territory north of Townsville has thus been rather spectacular, and at many centres the effect on its host plant has been no less striking. Both the adult bug and its nymphal stages feed by sucking plant sap from the foliage and the bug also attacks the growing tips of the lantana plant. The upper surface of infested leaves rapidly assumes a speckled appearance and, when the bug is present in large numbers, these leaves become progressively more blemished and eventually the whole leaf surface presents a brown appearance, the colour change to brown working in from the leaf margin. Such severely attacked foliage appears as if it had been scorched by fire and the leaves fall to the ground. Feeding by the adult bugs is not confined, however, to the foliage and growing tips of infested plants, for they feed on the flower buds and opened flowers and, in cases of severe infestation, the attack on the various portions of the plant results in seed production being appreciably reduced. The nymphs also attack the flower buds and opened flowers. A further feature associated with infestation by this insect is the marked distortion of leaves after eggs have been laid in them. The eggs are inserted in the midrib or in the larger veins on the under surface of young leaves, and the plant cells in the immediate vicinity of these egg-laying sites die, thereby causing affected leaves to curl and become yellow in colour.

Mention may here be made of the fact that, in some cases where the bug population reached a very high level in North Queensland, certain garden plants and some other plants, which were growing wild, were attacked by the lantana leaf bug. No evidence, however, was obtained of the bug breeding on any plant other than lantana.

During the winter of 1940 large areas of lantana in North Queensland, but more particularly on the coast, presented the scorched and defoliated appearance just described The stems of the plants in such areas had died back close to ground level in many instances and, on the whole, the check administered to lantana was an extremely severe one. Occasional plants had apparently been killed by this attack, but, in most cases, regrowth from the base of these severely attacked plants took place in the spring months. Such regrowth, however, has been freely attacked by the lantana leaf bug and extensive defoliation has again taken place. It is too early to express an opinion as to the extent to which plants are likely to be killed by the lantana leaf bug in Queensland as a result of such repeated attacks and defoliation, but the experience of the next few seasons should supply a definite answer to that question. In the meantime, the results of this introduction can be regarded as gratifying and promising in so far as North Queensland is concerned.

Position in Central Queensland.

The first Fairy Bower colony, as already mentioned, was liberated in October, 1937, and the insect became established from that liberation. It was reinforced by three further colonies during the subsequent twelve months, but it has rarely shown signs of inflicting injury on the lantana at all comparable to that experienced in the Far North. Furthermore, the bug has never become really abundant at Fairy Bower at a season of the year when it would have been practicable to collect bugs there for liberation elsewhere. Several other colonies, obtained from North Queensland, were liberated in the Rockhampton district prior to the summer of 1940-41, but none of these appears to be any more promising than the Fairy Bower liberation. Between Townsville and Maryborough

liberations have been made at a number of appropriate centres during the present summer months, and perhaps some of these colonies will find local conditions more favourable to their multiplication and spread. Indeed, at several centres, the bugs of this season's liberations are at present known to be breeding actively although, of course, on a small scale.

Position in South Queensland.

A colony of the bug was liberated at Glenapp, near the Queensland-New South Wales border, in February, 1940, and when the liberation site was examined in the following December, evidence was obtained indicating that the bugs had survived the winter. Another colony was liberated in the Mount Perry district in the autumn of 1940, but it encountered heavy frosts during the subsequent winter months and may not have survived. Since December of last year, a number of colonies, again obtained from North Queensland, have been liberated, mainly for observational purposes, at selected centres between Maryborough and the southern border of the State. It is, of course, much too early to express an opinion as to the probable fate of these recent liberations. Further liberations in South Queensland are now undesirable until the advent of the 1940-41 summer months, because the cold dry conditions prevailing in the south during winter and spring are unfavourable to the establishment of the lantana leaf bug. These latter remarks might be regarded as being almost equally applicable to Central Queensland.

Summary.

The lantana leaf bug is well established in the lantana infested belt north of Townsville, and in that territory it has inflicted very severe damage on its host plant. It is now so widely distributed in the Far North that there no longer appears to be any necessity to continue the general distribution of colonies north of Townsville. Further liberations there may nevertheless be necessary to complete the distribution of the bug for there are doubtless some more or less isolated areas in which it has not yet obtained a foothold. In many portions of the lantana infested country north of Townsville the bug, of course, is still present in only relatively small numbers; it may not yet be represented on every holding in a district in which it is established, and so far it may not have inflicted severe damage on its host plant. If the experience of the last two years is repeated, however, the bug population should build up satisfactorily in those areas in which it is at present to be found only in limited numbers, and it should steadily spread from farm to farm, without the necessity for liberating colonies on individual holdings. The position south of Townsville is not so satisfactory, and there is as yet no evidence that the spectacular success achieved to date in the Far North will be duplicated in Central and South Queensland. A considerable number of colonies, however, have been liberated recently between Townsville and Maryborough, and it may be that some of these will find local conditions sufficiently congenial to enable them to inflict a severe check on the lantana. South of Maryborough a number of key centres have been selected and, at these, observational colonies have been liberated during the recent summer months. No general distribution of colonies has been undertaken in South Queensland, but it is hoped that the observational colonies recently liberated will give some indication of the possibilities of this insect in the more temperate portions of the State.

Pineapple Culture in Queensland.

H. K. LEWCOCK, M.Sc., B.Sc.Agr., Senior Research Officer.

(*Continued from page* 16, *July*, 1940.)

CHAPTER VII.—SELECTION OF LAND FOR PINEAPPLE CULTURE.

MISTAKES in land selection are always costly and may prove disastrous. Many of these result from failure to take into account all of the factors involved. For example, the suitability of land for pineapple production on a commercial scale is determined not by climate and soil alone, but also by economic and other considerations such as the availability of labour, the accessibility of markets, and the topography of the land. Though climate limits the geographical distribution of the pineapple as a field crop and the type of soil influences the yield, it is the economic considerations, which determine where and to what extent it can be profitably cultivated. In the selection of land for pineapple culture, therefore, the steps which should be followed are, firstly, the choice of a district which (*a*) is climatically suited to the crop (see Chapter VI.), (*b*) has an adequate supply of suitable labour, and (*c*) is favourably located with respect to markets or transport facilities; and, secondly, in that district, the choice of a location which is suitable both as regards topography and soil.

AVAILABILITY OF LABOUR.

Because modern methods of pineapple production entail the application of intensive cultivation practices, the first points to be considered in the selection of land for this crop are the availability of the labour required for working the plantation, and the cost of labour relative to that ruling in areas from which the product is likely to meet competition. No hard and fast rule can be laid down regarding labour requirements because so much depends on the rainfall, the topography, and the type of soil, as well as on the size of the plantation and the methods employed in its management. An excessively high rainfall, a heavy type of soil, or a steeply sloping or broken topography all add materially to the cost of the labour required to cultivate a given acreage. Labour can generally be used more efficiently on large plantations than on small ones because of the greater scope which large-scale methods of production afford for the employment of mechanical aids. However, pineapple production on a commercial scale can be undertaken successfully only where the supply of labour is adequate to meet all contingencies, including such seasonal operations as planting, weeding, and harvesting. In remote or sparsely settled districts the casual labour needed to carry out these operations on any but small holdings is not always obtainable when required.

MARKETING AND TRANSPORT FACILITIES.

Because of the perishable nature of the product, the location of a pineapple plantation in relation to markets or transport facilities is often decisive in determining whether the crop can be profitably cultivated or not. In fact, the economic advantages accruing from proximity to outlets such as large urban populations or canneries are frequently so great as to more than offset slight disabilities with respect

to climate or soil. It is to secure advantages such as these that the pineapple industry in Queensland has developed chiefly in the south-eastern portion of the State, despite the existence further north of large tracts of country which, climatically, topographically, and with respect to soil conditions, are better suited to the production of this crop than most of those now under cultivation. In other parts of the world, such as Malaya, Formosa, and the Hawaiian Islands, the establishment of canning facilities has made possible the development of pineapple-growing as an important industry in localities where only a very limited demand for the fruit previously existed.

In addition to the location of the plantation with respect to fresh fruit markets, canneries, and transport facilities, due consideration should also be given to the character of the roads leading to them. The advantages of a good connecting road are obvious.

TOPOGRAPHY.

Quite apart from the question of location, the prevailing topography or lay of the land is an important factor in determining its suitability for pineapple culture. The relation which exists between topography and climate, particularly as it influences the occurrence of frost, has been discussed in Chapter VI.; it remains now to consider the manner in which topography may affect the economic utilization of land.

Steeply sloping ground is not only difficult and expensive to cultivate, but when it is brought under cultivation it is so subject to erosion that rapid impoverishment of the soil occurs unless special protective measures are employed. These are expensive and inevitably add to the cost of production. For similar reasons, rough or badly broken land is poorly adapted to pineapple culture. Where the land is rough, cultivated areas must necessarily be small in extent and irregular in shape. Under such circumstances, cultural operations are invariably expensive to carry out, with the result that an economic level of production is difficult of achievement, irrespective of the nature of the climate, soil, or location. While moderately hilly country can be profitably utilized for pineapple culture, provided care is exercised in the selection and laying-out of the fields, where a choice is available preference should be given to land which has only a gentle gradient, not only because it is less costly to work, but also because it is less subject to both erosion and frost. However, an exception to this rule should be made in the case of soils which are retentive of moisture. When soils of this type are used for pineapple culture, a hillside plantation site is essential in all but exceptionally well-drained locations. For a similar reason, low-lying areas and depressions should always be avoided, irrespective of the type of soil, since few crop plants are as exacting as the pineapple in regard to drainage and soil aeration.

SOIL SELECTION.

Even where climate, location, and topography are favourable, it is on the character of the soil itself that the profitable utilization of land for pineapple culture depends. But while the suitability of the preceding factors may be readily assessed even from a cursory inspection of the proposed plantation site, considerably greater care is required to estimate the value of the soil. This is particularly the case in southern Queensland, where a variety of related soil types, differing in their suitability for pineapple culture, may occur over relatively small areas. In fact, it is

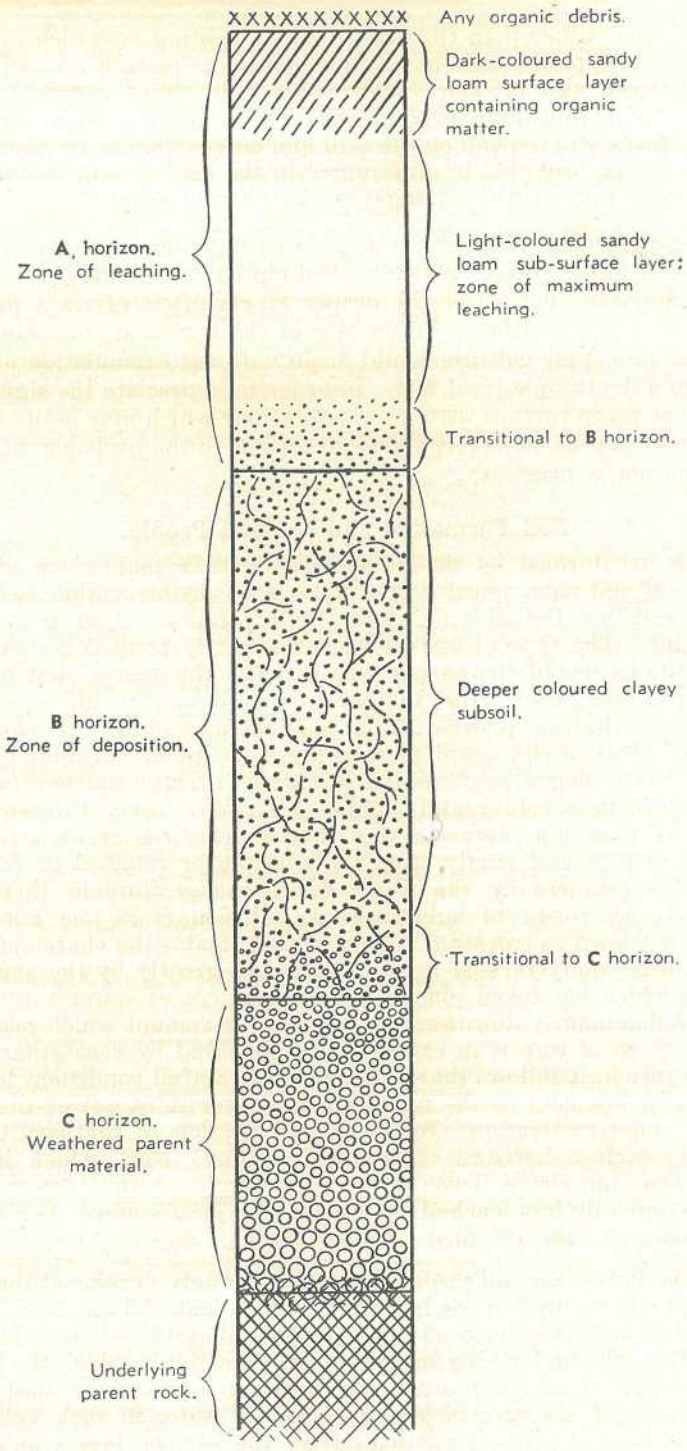


Plate 54.

Simplified Diagrammatic Representation of a Mature Forest Soil Profile.—Seldom does any soil show this complete profile, though much of it is found in many soils. In cultivated soils the dark-coloured surface layer of the A horizon may be entirely wanting, due to the combined effects of erosion and oxidation.

the exception rather than the rule to find a holding on which the soil is of a uniform type throughout. Consequently, a choice has usually to be made between two or more soils which may differ greatly in their suitability for pineapple production. The soundness with which this choice is made will depend on the skill and care employed in interpreting the indications provided by differences in the texture and colour of the various soil types and by changes in the natural vegetation.

In a preceding chapter it was pointed out that the suitability of a soil for pineapple culture is determined chiefly by its moisture relationships. Since the nature of the deeper layers often exerts a profound influence on the moisture relationships of the root zone, the selection of a soil for pineapple culture should begin with the examination of a face of soil to a depth of several feet. In order to appreciate the significance of the changes in texture, structure, and colour which may occur in a soil at different depths, however, a general idea as to the probable manner of its formation is necessary.

Soil Formation and the Soil Profile.

Soils are formed by the breaking-up and decomposition of rocks. In tropical and subtropical regions, this rock disintegration is brought about chiefly by the action of heat, water, and air, and is known as *weathering*. The type of soil which is ultimately formed is determined by (1) the nature of the parent rock and (2) the degree of weathering which has taken place. High temperatures and moist conditions accelerate the weathering process; low temperatures and dry conditions retard it. Ultimately, a soil reaches the stage when it exhibits a more or less well-developed *profile*—that is, a series of superimposed layers of varying thickness, colour, and texture (Plate 54). These different layers of soil are known as *horizons*, and they develop partly as a result of chemical change and partly from the addition or removal of solid and dissolved substances by the water which moves through them. The downward movement of substances in solution from one horizon to another is known as *leaching*, and in moist climates the character of the soil which is finally formed is influenced very greatly by the amount of leaching which has taken place. Since movement of water through the soil is predominantly downward only when the amount which penetrates it in the form of rain is in excess of that removed by vegetation or lost by evaporation, it follows that under similar rainfall conditions leaching increases in intensity as the natural plant cover thins out or the soil is brought under cultivation. In the coastal districts of southern Queensland, the surface horizons of so-called "scrub" soils, which in their virgin state support a dense growth of jungle or rain forest (Plate 55), are typically less leached than those carrying a more open type of vegetation—e.g., the so-called "forest" soils.

In the latter, the soil profiles are more strongly developed than they are in the scrub soils and the layer from which material has been leached (the surface or "A" horizon) is often well differentiated in colour and texture from the underlying subsoil or "B" horizon in which the leached materials have been redeposited. In addition to removing most of the soluble material, the unimpeded movement of water in such soils tends to wash out the finer soil particles from the surface layers and carry them downwards into the subsoil, so that the latter becomes heavier in texture than the surface soil and thus less permeable to water.

Eventually an impervious layer or "hardpan" may form in the subsoil as a result of the fine clay which fills the pore spaces cementing the larger particles together into a hard, stonelike mass. In the soil profile, such a deposition zone is clearly differentiated from the adjoining layers by its compactness, its fine though gritty texture, and its darker colour. A long period of time is required for the full development of a deposition zone such as that described, but even where cementation has not yet occurred any downward movement of clay particles which has taken place must have the effect of reducing the permeability of the subsoil.

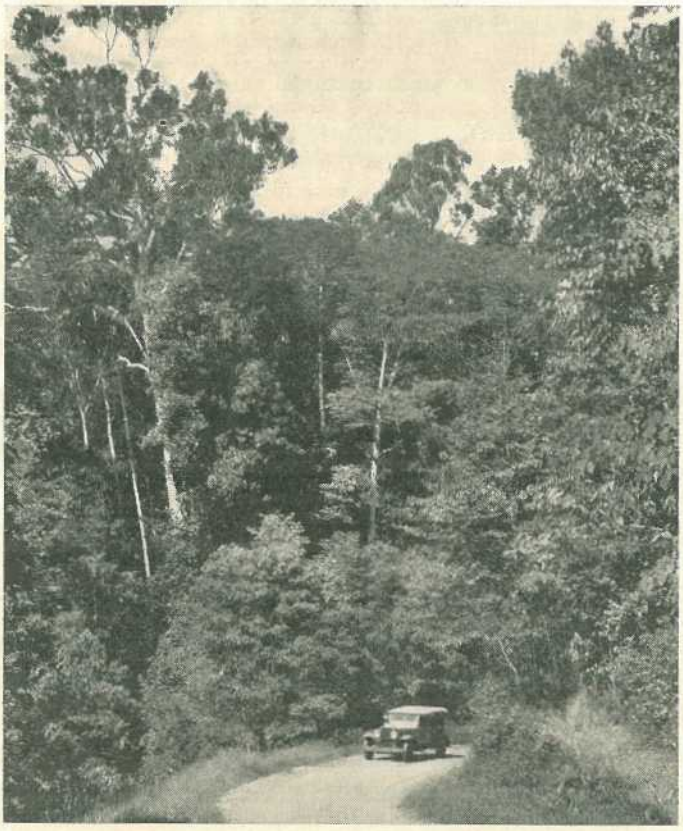


Plate 55.
Typical "Scrub" (Rain Forest) of the Queensland Coast.

Alluvial Soils and their Formation.—Transport of soil particles through the agency of water occurs not only in a downward direction, but also laterally. As everyone is aware, much eroded material is carried away from the place of its origin in the water that runs off the soil surface following heavy rain. The distance which this suspended material may be transported before it is deposited varies according to the velocity of the water and the size of the particles. Sooner or later, however, it all settles out, first the larger particles and then the smaller, to be again built up into deposits of soil which may differ greatly in texture, colour, and other properties from the substratum on which they rest. Soils which are formed gradually in this way from water-borne

material are termed *alluvial* soils, in contrast to those which are formed *in situ* from parent rock—i.e., *residual* soils. Alluvial soils occur chiefly as river flats or deltas. In southern Queensland, soils of this type are seldom suitable for pineapple culture, despite their relatively high fertility, because the low situations in which they are normally found render them subject to frost—e.g., the river flats of the Mary Valley. However, the extensive alluvial formations which occur as deltas at the mouths of several North Queensland rivers, notably the Burdekin and Don rivers, have been shown to be extremely well suited for pineapple culture, and, in fact, are possibly unexcelled for this purpose by any soils elsewhere in the State.

Because an alluvial soil is formed by the superimposition of successive layers of water-borne material, any variations in colour or texture which occur in its profile are due not so much to weathering and leaching as to changes in the velocity or course of the stream which built it up. For this reason, it is not uncommon for the subsoil, or B horizon, of an alluvial soil to be coarser in texture than the surface soil, though such is rarely the case in residual soils. Differences such as this are often useful in determining how a soil was formed.

The Examination and Interpretation of the Soil Profile

For the reasons which have been outlined, the selection of soils for pineapples should begin with an examination of the soil profile. To do this, pits at least 3 to 4 feet in depth should be dug wherever variations in the natural vegetation indicate that soil differences are likely to occur. If the sites for these pits are carefully chosen, a very small number will suffice to give a clear picture of the soil conditions obtaining generally over the area under consideration.

In the examination of a soil profile, the first points to observe are (*a*) the extent to which organic debris has accumulated at or near the surface, if at all; (*b*) the depth of the underlying A horizon—i.e., the layer of soil which extends from the surface down to the first well-marked change in texture or colour; (*c*) the size, character, and frequency of occurrence of any stony material which may be present in the A horizon; and (*d*) the height of the water table, if this is apparent at the depth to which the soil profile has been exposed.

An accumulation of decaying leaves and other ground litter in association with a deep brown colouration of the surface soil indicates a high organic matter content in this layer, and also that little or no erosion has taken place. With rare exceptions, the intensity of the brown colouration and the depth to which it extends is a reliable guide to the amount of humus present in the soil. Absence of a ground litter and little colour differentiation between the surface and subsurface layers—except in red or dark-coloured soils—is indicative of a deficiency in humus, due either to a sparse vegetation cover or to denudation of the surface layer by erosion. Soils which exhibit an acute lack of humus in their virgin state can seldom be made suitable for pineapple culture.

Since the zone of root penetration of the pineapple plant should lie wholly within the A horizon of a soil, the deeper this horizon is the better. A depth of anything less than 8 or 9 inches is likely to prove unsatisfactory, and at least 12 to 14 inches of top soil is desirable. Where serious erosion has occurred, as on cultivated slopes which have lacked protection against storm-water damage, the A horizon may be very

shallow (Plate 56) or even non-existent. Soils which have been depleted of their surface layers in this way are wholly unsuited for pineapple culture. (Plate 57).

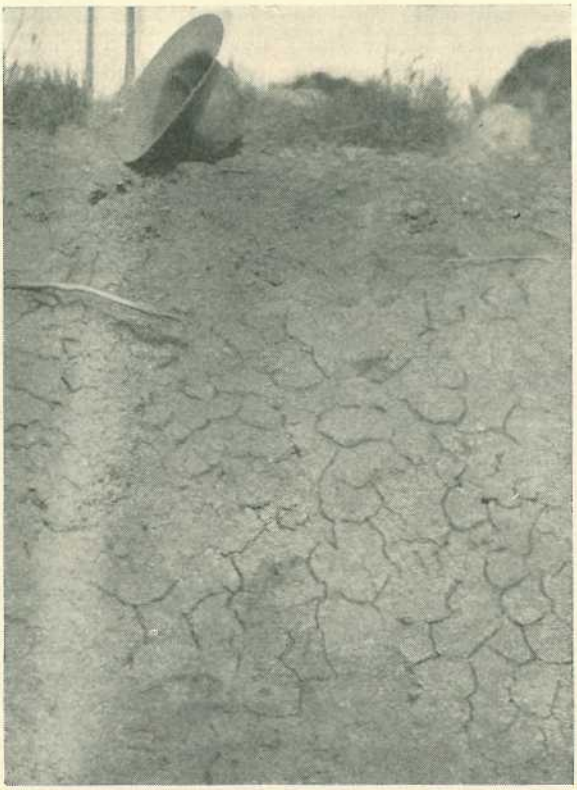


Plate 56.

PROFILE OF A SOIL FROM WHICH THE A HORIZON HAS BEEN ALMOST COMPLETELY ERODED SO THAT THE CLAY SUBSOIL NOW OCCURS WITHIN A FEW INCHES OF THE SURFACE.—The high clay content of the subsoil is indicated by the presence of cracks on the dried face of the cut.

Provided the surface layers are free from stones large enough to interfere with tillage operations, the presence in a soil of fragments of undecomposed rock is not objectionable. In the heavier types their presence may even prove beneficial, because such fragments tend to open up the deeper layers and thus promote drainage. On the other hand, a gravelly layer underlying a sandy A horizon is undesirable; the latter drains out so rapidly that even after a brief period of dry weather crop plants are unable to obtain sufficient water from it to fully meet their requirements. Immature or "young" soils—i.e., those in which the process of weathering is still incomplete—are frequently characterised by the presence of a considerable proportion of sharp-edged rock fragments of varying size. Older residual soils contain only rounded fragments of resistant material such as quartz or ironstone, and the state of division of the soil particles in the various layers is more uniform than it is in "young" soils. The agricultural significance of this distinction lies in

the fact that, in wet climates, a mature or weathered soil has undergone a high degree of leaching, with the result that most of the soluble materials which were present originally in the A horizon have been washed down into the subsoil. As these include nitrogen, potash, phosphoric acid, and other substances essential for plant growth, "old" soils are relatively less fertile than "new" ones. The red and chocolate coloured soils of the Mary Valley are good examples of the latter, while those of the Beerburrum area are typical "old" soils.

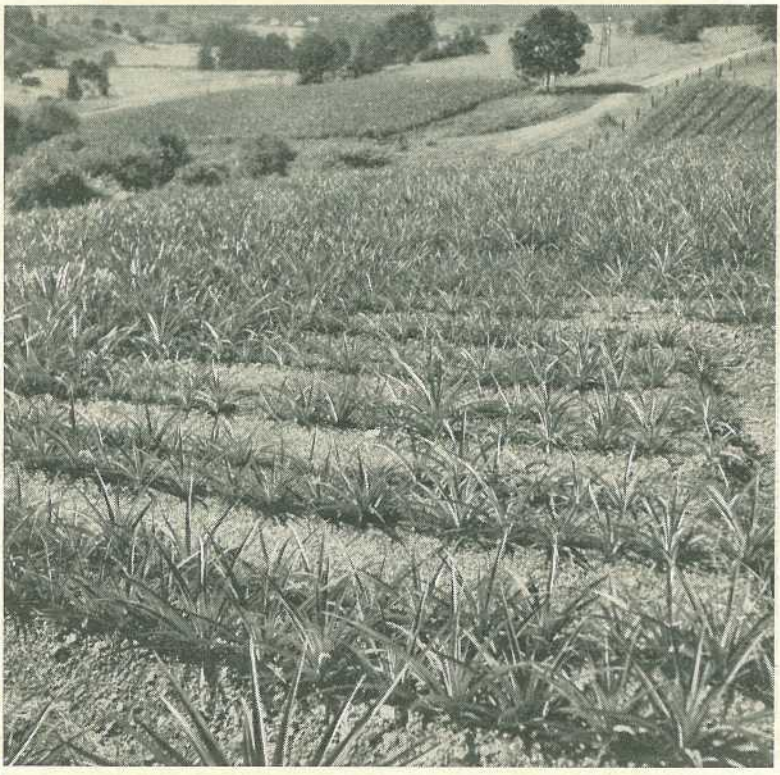


Plate 57.

FAILURE OF PINEAPPLES PLANTED ON AN AREA FROM WHICH THE A HORIZON HAS BEEN REMOVED BY EROSION.—Despite the fact that the plants in this field have been heavily fertilized, and also that the ground surface has been mulched with peanut shells, growth is stunted and weak wherever the subsoil is exposed.

As pointed out in an earlier chapter, the water table has little effect on the moisture relationships of the A horizon of a soil unless it lies within a few feet of the surface. In areas which are topographically suited for pineapple culture, a dangerously high water table is not likely to be encountered unless the total depth of soil which overlies the parent rock—i.e., the A, B, and C horizons together—is abnormally shallow. Even then it is improbable that the water table itself can be observed in the soil profile, except during the rainy season, so that due warning should be taken from such indications as are provided by a shallow C horizon or by rock masses protruding into the soil profile.

Significance of Soil Texture and Structure.—As explained in Chapter V., the movement of water in a soil—and, consequently, that of air also—is determined chiefly by its texture and structure. The changes which may occur in these two properties at various levels in the soil profile, particularly in the A and B horizons, provide an easily interpreted and reliable indication of the moisture relationships of a soil as they affect pineapple production.

Plate 58.
An Exposed Profile of a Highly-Leached Virgin Forest Soil in which a Shallow Sandy A Horizon Overlies an Impermeable Clay Subsoil.

The best soils for pineapple culture are those of medium texture—that is, loams and sandy loams—and it can be said with assurance that the deeper the loamy texture extends, the better adapted will a soil be for this purpose. Fine-textured soils—i.e., those of clayey consistency—are suitable only when they possess a particularly well-developed crumb structure, or when they overlie a sandy subsoil. On the other hand, coarse-textured, single-grained soils, such as the sands, are prone to dry out too rapidly unless they contain an abundance of organic matter—which is rarely the case—or grade into a considerably finer-textured subsoil. In selecting soils for pineapple culture very careful consideration should be given to the influence of the texture of the deeper layers on the moisture relationships of the root zone. Where the first marked change in the profile, proceeding from top to bottom, is in the direction of a coarser-textured or more sandy layer, the effect is to increase the drainage of the top soil. Conversely, if the B horizon is finer in texture than the A horizon, as is frequently the case in the coastal districts of southern Queensland, drainage of the root zone is impeded.

Except in moist locations or in the case of fine-textured clayey soils, a sandy subsoil is undesirable because it results in a too rapid drying-out of the A horizon in the same way as a layer of gravel. On the other hand, a subsoil which is sharply differentiated from the adjoining layers

by its higher clay content—particularly if a large proportion of this clay has been washed down from the A horizon—tends to be so closely compacted that percolation of water through it occurs only with difficulty. Where a definite hardpan is formed by the cementing together of the sand and clay particles the barrier to water movement is even more complete. Obviously, soils in which such a formation occurs are wholly unsuited for pineapple culture, since they tend to become waterlogged in wet seasons and drought-stricken in dry ones. It is not so generally recognised, however, that the cultivation of sandy soils overlying only moderately clayey subsoils is attended with risk if the latter approach too close to the surface (Plate 58). Many of the weak yellow patches which appear in pineapple plantations in the coastal districts of southern Queensland during the winter and spring months, even on virgin soils, are attributable to this cause alone. Great care should be exercised to ensure that no land is selected for pineapple culture in which a clayey subsoil occurs less than 10 inches from the surface.

From the foregoing discussion, it will be apparent that sharp breaks of any kind in the textural or structural properties of the profile of a residual soil are undesirable, since they indicate an extreme degree of weathering. The best type of profile is one in which the texture gradually increases in fineness from a loam or sandy loam at the surface to a clay loam in the subsoil (Plate 59). In addition to possessing better moisture relationships, such a soil is likely to be more fertile than one which exhibits clearly defined horizons in its profile.

Significance of Soil Colour.—Because the colour of a soil is determined by its organic matter content and permeability as well as by the nature of the rock material from which it was formed, there is often an intimate relationship between soil colour and productivity. Generally, though not invariably, dark-coloured soils are of greater value agriculturally than light coloured ones. As already pointed out, a brown colouration in a surface soil is largely due to its content of humus: the higher the humus content the darker the colour. Consequently, dark-coloured soils usually exhibit a well defined crumb structure and possess a relatively high level of fertility. If such soils suffer a loss of humus, either through faulty cultivation or as a result of erosion, they lose colour as well as productiveness. On the other hand, grey, yellow or other light-coloured soils are deficient in humus, possess little or no structure and are relatively low in fertility. Such soils normally support a much sparser type of plant cover than dark-coloured ones and this chiefly accounts for their lighter colour, due to the fact that the amount of organic matter which is returned to the soil from an open forest type of vegetation, for example, is much less than it is from luxuriant jungle or scrub. In heavy rainfall districts, however, a dark grey or black colouration of the surface soil is often indicative of faulty drainage, since it results more from changes which iron compounds undergo in the presence of accumulated organic debris under waterlogged conditions than from a high humus content of the soil itself. The existence of such conditions in low-lying areas and depressions accounts for the characteristically dark colour of swamp soils even when they are very coarse-textured.

For many years, the soils which were most sought after for pineapple culture in southern Queensland were those with a pronounced reddish or reddish-brown colouration. In general, this preference was well founded because a red colour, increasing in intensity from surface

soil to subsoil, is indicative of good aeration and good drainage. Soils of various types exhibiting this general characteristic occur in all districts between Redland Bay and Gympie: they are especially well developed on the Blackall Range where they have been formed by the weathering of iron-bearing basaltic rocks. The predominantly red colour of such soils is due to the fact that the iron which they contain is chiefly in the form of stable, insoluble ferric compounds which form only in the presence of air. In light sandy soils which contain only a relatively

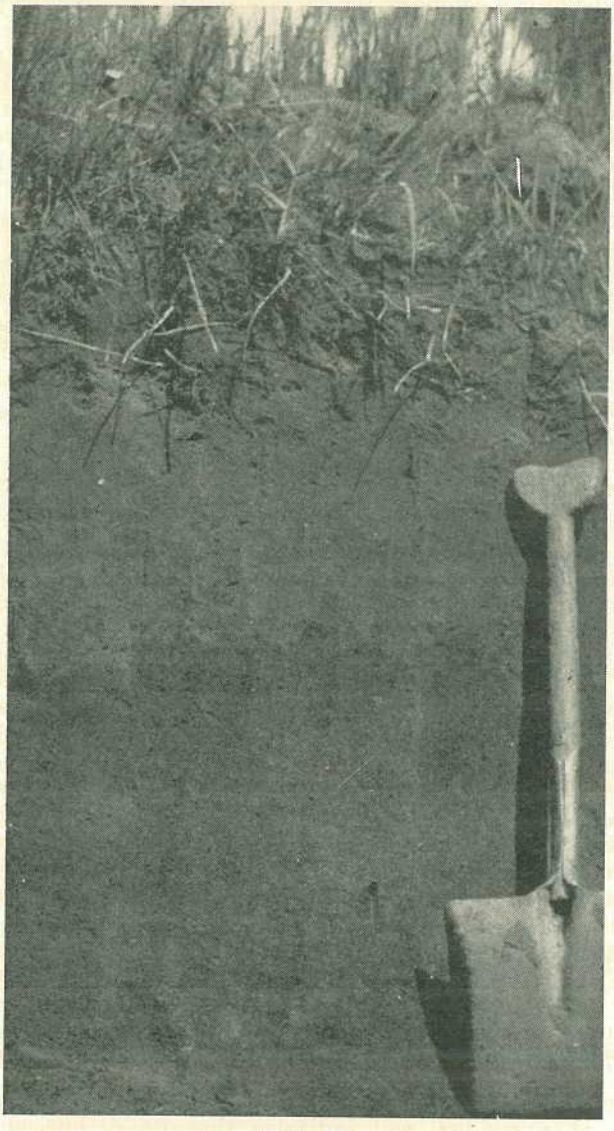


Plate 59.

Profile of a Virgin Scrub Soil in which the Texture Gradually Increases in Fineness from a Sandy Loam at the Surface to a Clay Loam in the Subsoil.—The relatively unleached character of such a soil is indicated by the absence of clearly defined horizons in its profile.

small proportion of iron, the red colour of these ferric compounds may be largely or even completely masked by the brown or brown-black colour imparted by organic matter.

The colour of a soil is rarely uniform throughout its depth; on the contrary, it usually exhibits considerable variation at different levels and it is from these variations that valuable deductions may be made regarding its aeration and drainage and the extent to which the surface layer has been eroded. In a general way, it can be safely assumed that the deeper the brown colour of the surface soil the greater the proportion of organic matter which it contains, and the smaller the degree of erosion which has taken place. In coarse-textured soils, the colour of the subsoil is commonly lighter than that of the surface soil on account of its lower organic matter content, except where iron has leached out of the surface layer and been redeposited at a lower level. Should this have occurred the colour of the subsoil will be red or yellowish-red if the drainage is good, or bluish-grey or yellowish-grey if it is defective. As previously pointed out, a reddish colouration indicates that the iron occurs as ferric compounds which form only under conditions of free aeration. However, when air is excluded or driven off from a soil, as it is in swampy or waterlogged areas, much of the iron which is present is not fully oxidised and occurs in the form of unstable ferrous compounds. These impart a bluish-grey or mottled appearance to the deeper layers of soils in which they occur and, because of the unfavourable moisture relationships which they denote, such soils should under no circumstances be planted to pineapples.

Assessing the Chemical Fertility of a Soil from a Field Examination.

No matter how favourable its moisture relationships, a soil cannot be cultivated profitably unless it is able to furnish the growing crop with all that it requires in the way of mineral nutrients. If these are not present when the soil is brought under cultivation they must be added subsequently in the form of fertilizer or manure. It is important to know, therefore, whether the soil under consideration contains a sufficiency of available mineral plant foods to meet the needs of the crop which it is proposed to plant and, if not, which of them must be added and to what extent. This aspect of pineapple production will be discussed in a subsequent chapter. In the present connection, however, it is necessary to point out that the notion that a soil analysis will provide all this information in a readily intelligible and wholly reliable form is far from being true. An analysis of a single soil sample considered apart from climate, the conformation of the soil profile, and the degree of soil variability which occurs in the area from which it was taken, may not merely have little value but may even be misleading. The only entirely reliable guide to productiveness of a soil when planted to a given crop is a properly conducted field trial, supplemented by intensive laboratory investigations. In the absence of such data, however, a very useful estimate of plant food resources of a soil can be gained from the soil profile, considered in conjunction with the vegetation cover.

As already pointed out, the presence of well-defined horizons in the profile of a residual soil indicates that its A horizon has been highly leached. This means, in the case of a shallow-rooting crop such as the pineapple, that most of the soluble compounds have been washed down below the zone of root penetration. Such soluble compounds include any nutrient material present in a form available to

plants. Soils which exhibit these features, i.e., "old" soils, are generally deficient in all of the mineral plant foods, so that when they are brought under cultivation for pineapples it can safely be assumed that the addition of "complete" fertilizer mixtures will be necessary from the outset. In the coastal districts of southern Queensland, soils which fall into this category include practically all of the forest types as well as some of the lighter scrub soils. On the other hand, alluvial soils and "new" residual soils, which show little evidence of leaching, may contain moderate or even large amounts of one or more of the elements required by plants. With the exception of nitrogen, the proportion in which the various minerals are present in such soils, and the extent to which they are available to plants, depends largely on the nature of the rock from which they were formed and the conditions under which its disintegration took place. While this can be readily ascertained in the case of residual soils, it is not easy to determine for alluvial soils except by microscopic examination and chemical analysis. Most volcanic soils of recent origin, and particularly those formed from basalt, are generally rich in potash and fairly well supplied with phosphoric acid. A good example of this class of soil is the red basaltic loam of the Blackall Range. Among alluvial soils, those of the Burdekin and Don deltas in North Queensland contain a relatively large amount of both phosphoric acid and potash in readily available form.

In contrast to phosphoric acid and potash, the nitrogen content of the A horizon of a soil is determined not by the nature of the rock from which it was formed but by the extent to which organic matter has accumulated in it. Thus a soil may be well supplied with the former nutrients but be deficient in nitrogen, or *vice versa*. It rarely happens, however, that a soil which lacks either phosphoric acid or potash is rich in nitrogen because a deficiency in one essential element limits the growth of the natural vegetation, the cyclic decay of which contributes to the soil most of the organic matter it contains. An equally important limiting factor in this connection is rainfall. Thus it is that in dry areas such as the Burdekin delta, where natural vegetation is very sparse except during the rainy season, the soils are deficient in nitrogen though well supplied with other nutrients. It will be apparent also, that under similar climatic conditions soils which support a dense growth of scrub will possess a much higher nitrogen content in their surface layers than those carrying open grass forest. Though it is true that much of this nitrogen is unavailable to plants until the material containing it has undergone bacterial decomposition, under tropical or subtropical conditions this takes place rapidly once the land has been brought under cultivation. In fact, in scrub soils it is often desirable to retard decomposition by shading the soil in order to prevent loss of soluble nitrogen due to leaching. The marked loss in fertility which many scrub soils exhibit after a relatively short period of cultivation is due chiefly to depletion of their humus and nitrogen content.

Native Vegetation as a Soil Indicator.

Though the character of the natural vegetation which a soil supports has long been regarded as one of the best indexes of its fertility, the indications provided by vegetation alone are not always wholly reliable, particularly in eucalyptus forest country. In the first place, removal of the natural plant cover for the purpose of land utilization often leads to profound changes in the soil conditions which made its development

possible. What are regarded as scrub soils or forest soils, described in terms of their natural vegetation, may cease to retain any distinguishing characteristic after a few years of cultivation. In the case of the medium and coarser-textured scrub soils particularly, three or four years of cropping will suffice to exhaust a capital of plant foods which took thousands of years to build up: under bad soil management, even a deep bed of organic refuse will vanish in a very short time in the moist tropics and sub-tropics, with consequent rapid loss of nitrogen.

The second reason why natural vegetation cannot always be relied upon as an indicator of soil fertility is because the conditions which favour the vigorous development of a plant cover consisting largely of deep-rooting trees are not necessarily adapted to the production of crops such as the pineapple. For this as well as other shallow-rooting field crops, the character and density of undergrowth, rather than the size and vigour of trees, is the safer guide to the agricultural value of a soil. Over limited areas, however, variations in the natural vegetation, including native trees, may provide valuable clues to some of the physical properties of the soils which support them, particularly as regards moisture relationships. In fact, the connection between physical properties and vegetation is generally fairly close for any locality over which the climatic factor is uniform. For this reason, a knowledge of natural vegetation as related to the main soil profiles occurring in any one locality is extremely useful in selecting land for cultivation, since areas in which drainage is likely to be defective can be recognised at the outset, and thus be eliminated from further consideration before the examination of soil profiles is begun. The latter should never be omitted, however, since, at best, the indications provided by vegetation tell only whether profile examinations are worth carrying out.

Within the limits defined, either individual plants or groups of different plants possessing similar growth requirements may serve as soil indicators. In southern Queensland, for example, a luxuriant growth of blady grass (*Imperata arundinacea*) in open forest country usually denotes a well-drained, medium-textured soil of good depth; under similar climatic conditions a sparse ground vegetation consisting chiefly of dwarf, prickly shrubs is indicative of a shallow, compacted, or badly eroded soil. Similarly, the occurrence of the paper-barked tree (*Melaleuca viridiflora*) is invariably associated with poorly-drained or swampy conditions. Many other plant-soil associations exist in the eucalyptus forests of the coastal pineapple districts, the commoner of which are as follows:—

Species which generally indicate medium-textured soils of good depth, permeability, and moisture-holding capacity—

Tallowwood (*E. microcorys*).—Generally occurs in localities not subject to frost.

Blackbutt (*E. pilularis*).—A somewhat cosmopolitan species, but occurs chiefly on the better types of soil.

Forest Oak (*Casuarina torulosa*).—This species frequently occurs in association with Blackbutt.

Scrub Box (*Tristania conferta*).—As its name implies, this tree is often encountered on the edges of scrub (rain forest) on reddish-coloured fine-textured loams.

Species which generally indicate deep, well-drained sandy ridges—

Bloodwood (*E. corymbosa*).—A cosmopolitan species, but attains its best development on deep, well-drained soils.

Grey Ironbark (*E. paniculata*).—This species occurs more frequently in poorly developed form as the dominant tree on hard, gravelly ridges.

Species which generally indicate hard, gravelly ridges—

White Stringybark (*E. eugenioides*).—This tree occurs only on the driest ridges.

Grey Ironbark (*E. paniculata*).—On this type of location, this species is often established as the dominant tree, but it may occur also in association with Spotted Gum.

Spotted Gum (*E. maculata*).

Species which generally indicate shallow, sandy soils with compact clay subsoils—

Scribbly Gum or White Gum (*E. micrantha*).—Wherever this species occurs it is an indication that the soil is so badly drained as to be of no value for agricultural purposes.

Honeysuckles (*Banksia* spp.).

Spear Grass (*Heteropogon* and *Aristida* spp.).

Soils of this type carry only a sparse ground cover, the undergrowth consisting mainly of prickly, narrow-leaved shrubs.

Species which generally indicate slow-draining clay loams and clays—

Grey Gum (*E. propinqua*).—Occurs on either ridges or flats.

Red Stringybark (*E. resinifera*).—This species prefers well-sheltered positions.

Turpentine (*Syncarpia laurifolia*).—The roots of this species frequently penetrate down to the water table.

Species which generally indicate fine-textured alluvial soils, usually in low-lying, moist situations—

Blue Gum (*E. tereticornis*).—This species favours river flats.

Apple-tree (*Angophera subvelutina*).—Often occurs in association with Blue Gum on river flats and in other locations where frosts are likely to occur.

Species which indicate swampy and waterlogged soils—

Paper-barked or Broad-leaved Tea-tree (*Melaleuca viridiflora*) and allied species.

Swamp Oak (*Casuarina glauca*).

Swamp Mahogany (*Tristania suaveolens*).—Also occurs occasionally on moist alluvial flats.

Bungwall Fern (*Blechnum serrulatum*).

Sedges and Allied Plants.—These invariably indicate swamp conditions.

[TO BE CONTINUED.]

ROSELLAS.

The selection of a sound, fertile seed is the most important point in rosella growing. Seeds grown in this State are generally of good quality, because of the long maturing season, due to absence of frost.

Any moderately good soil will grow rosellas well, but if the crop is to be grown on a large scale, a soil with a clay subsoil close to the surface should be avoided.

The seeds are usually planted out in a seed bed in spring, and the plants when 6 inches high set out in rows about 6 feet apart. If the grower is not disposed to start his seeds from beds, the seed may be planted where the bushes are to remain.

Thorough cultivation is essential and weeds should be kept in check, as they affect seriously the growth of the plants.

When the fruit is mature, it is advisable to lose no time in picking it, as the fruit stalk has a tendency to toughen, thereby making gathering a slower task than it should be.

Bean Fertilizer Investigations during 1940.

W. A. T. SUMMERVILLE, M.Sc., Senior Research Officer.

CONSIDERABLE progress was made during the 1940 coastal bean-growing season with departmental fertilizer experiments subsidised by the beangrowers. Although the work is still far from complete, it is felt that some of the information obtained will be of immediate interest and value. Accordingly, the chief results obtained to date and the lines along which it is proposed to continue the work during the present season are discussed in this article.

Experiment 1. Location: Nambour Field Station.

In this experiment the plots were laid down in the form of randomised blocks, with the plots, to which the lime was added, paired so as to make them continuous and thus facilitate the application of lime. All plots received a dressing of nitrogen in the form of sulphate of ammonia; half the plots received lime; and half received either phosphoric acid in the form of superphosphate or potash in the form of sulphate of potash. The yields from these plots demonstrated very clearly the value of phosphoric acid, the increase in yield due to the addition of phosphoric acid being highly significant. With respect to potash, the yield figures suggested that this element had no effect, whether the results were computed on weight of beans, number of beans, or quality. The outstanding observational point, which was also borne out by the yield figures, was the very poor results, both with respect to plant growth and yield, which followed the application of nitrogen in the absence of phosphoric acid. Without exception, in the absence of phosphoric acid, the plants were stunted, of poor quality, and commercially useless.

Experiment 2. Location: West Cooroy.

On this site the split block arrangement of plots was used, the treatments being all possible combinations of nitrogen, phosphoric acid, and potash. Yields in this experiment showed highly significant increases where nitrogen was supplied, but with respect to other elements there were no significant differences. At first sight this result would appear to be at variance with that obtained at Nambour in Experiment 1, but it is essential to examine the history of the land before arriving at any conclusions. In the Nambour work the plots were located on land of extremely low fertility and which had never previously received any fertilizer treatment. The Cooroy plots, on the other hand, were located on land which had been producing beans for a number of years and which had been regularly fertilized. Furthermore, at Cooroy the fertilizer which had been used regularly contained an abundance of phosphoric acid, which compound, in recent years, had been included partly in the form of bone, from which it would, no doubt, be but slowly available. It appears, then, that the results which were ostensibly brought about by an application of nitrogen were in reality due to nitrogen plus residual phosphoric acid, and these results then would be quite compatible with the results obtained in the Nambour experiment. The absence of significant differences between the nitrogen-phosphoric acid and nitrogen plots strongly suggests that phosphoric acid had been used in previous years in excess of requirements, and the results

open up the question of the most profitable way of applying phosphoric acid. The alternatives are (*a*) that small applications of phosphoric acid be given each year, and (*b*) that the phosphoric acid be given in larger amounts at, say, three-year intervals. This aspect will be referred to in connection with proposals for further work. On this plot, again, there was an entire absence of any response to potash.

Experiment 3. Location: Calico Creek.

The growth of plants on this plot was greatly reduced on account of the abnormally poor growing conditions which obtained over the greater portion of the season. Not only did this dry weather reduce the growth of plants in general with a consequential reduction in yield, but it also accentuated differences due to position, such as in slight hollows, which would otherwise not have occurred. In this experiment the one noteworthy feature was that there was evidence of a decrease in yield in the presence of potash in certain instances, notably when nitrogen was also used. It would, however, be rather dangerous to draw any very definite conclusions from this evidence. although the figures show statistical significance. However, coupled with the absence of any increases following the application of potash in all other experiments, the result here is certainly interesting.

Experiment 4. Location: Goomboorian.

In this experiment no significant differences were obtained with any material. The only suggestion which can be made from this experiment is that, in this instance, the residual effects were such as to have a masking effect on the applications made in this work. It is to be noted particularly that on this soil, which is red volcanic, a deficiency of potash was anticipated, and consequently a particularly heavy application of this element was given, without, however, the slightest effect either of increase or decrease in yield.

Experiment 5. Location: Nambour Field Station.

This work took the form of a pot experiment designed to show the effects of fertilizer placement on germination and was done as a preliminary to the field experiments described above. The outstanding result obtained was in connection with sulphate of ammonia. It was found that if this element were placed in close proximity to the seed, even in small concentrations, marked decreases in germination took place. Neither phosphoric acid nor potash appeared to have any detrimental effect on germination when placed close to the seed, and indeed phosphoric acid appeared to have a slight accelerating effect without any influence on the percentage of germination. In order to further examine the effect obtained from sulphate of ammonia, another experiment was conducted in which seed was soaked in solutions of ammonia, nitrate of soda, calcium nitrate, ammonium nitrate, potassium nitrate, potassium permanganate and pure water. It was found that in no case was the germination impaired following these treatments. This suggested that the interference with germination observed in the pot tests was not a direct chemical one, but that the soil in some way entered into the question. This would suggest either bacteriological influence or a chemical change which occurred when sulphate of ammonia was added to the soil. The work probably throws some light on poor germination which occurs from time to time and which growers usually

attribute to the seed itself. That this poor germination is only encountered irregularly even under the same fertilizer practices is in all probability due to soil moisture conditions, which in turn would influence both bacterial action and chemical interaction. The observations are of direct importance in the matter of fertilizer placement, and from these results and those which are reported in the literature from other parts, it is obvious that work on fertilizer placement is of great importance.

Observations suggest that the success of a bean plant is determined largely in the very early stages of its growth. It seems, therefore, that fertilizer placement must be such that there shall be no interference with the germination and therefore the fertilizer should be placed some little distance from the seed; at the same time it should be placed close enough to ensure availability to the plant in the early stages of its growth. This opens up a question of pressing moment.

Summary.

The results of the 1940 season's work may be summarised as follows:

1. Nitrogen and phosphoric acid must be added as artificial fertilizer for the successful growth of beans on all types of soil on which the work was done, namely schist, basaltic loam and trachyte alluvials.
2. The value of potash in bean fertilizer for the production of fresh beans is extremely doubtful. It is to be noted that no information has been obtained with respect to seed production, all results being based on yield of fresh beans.
3. In so far as the quality of beans is concerned, although in certain instances phosphoric acid alone gave yields as high as nitrogen-phosphoric acid, the quality of beans was improved when nitrogen and phosphoric acid were combined.
4. Counts of twisted and other malformed beans were made and there was no evidence that any of the elements, nitrogen, phosphoric acid, potash or calcium had any effect in this connection.
5. Sulphate of ammonia applied too close to the seed may, under certain conditions, definitely impair germination.
6. The investigation will be advanced a further stage during the present bean season when it is anticipated that experiments will be carried out with the object of obtaining information on the amount of each material that should be used, and on the time and method of its application. To this end a series of levels tests has been planned, whilst differential times and placements will also be the subject of investigation.

Suggestions for Conserving and Increasing the Production of Beeswax.

H. HACKER, Assistant Research Officer.

IN view of the present large and increasing demand for beeswax it is to the advantage of every beekeeper to increase wax production as far as possible, and for this purpose the following hints are offered to everyone keeping bees.

It is often noticed that actual wastage of wax occurs in the smaller apiaries. This is mainly due to one of two causes; either the beekeeper considers that the small quantity of wax obtained at each honey extraction does not justify the purchase of a wax press, or he considers that the quantity is not sufficient to be worth the trouble of saving. The cappings are often kept with the intention of melting down at some future time, but they are generally left lying about until destroyed by mice and wax moths. It is considered that it would be profitable for any beekeeper with six or more colonies to purchase a wax press, for the few pounds outlay would soon be regained by the much higher percentage of wax recovered by this method. To the owner of one or two colonies it is suggested that he melt down each lot of cappings at the time of honey extraction. The small cakes of wax will then be safe from wax moths and may be saved up in a tin or other mouse proof container until a quantity sufficient for sale has accumulated.

The production of wax can be increased if beekeepers practise deep cutting when uncapping for the extraction of honey. Instead of merely shaving off the cappings, the cut should be made well down the walls of the cells, indeed the comb may be almost entirely cut away, leaving only the midrib with the base of the cells on either side. The bees will readily draw out the combs again to the required depth and the amount of wax secured will be much greater than would be obtained by the usual uncapping method.

A stricter culling of combs is also recommended and at intervals every comb, both in the brood chambers and in the supers, should be closely examined for this purpose. When an apiary has been established for some years many of the brood combs will have become hard and black. These dark combs should be removed and melted down whenever an opportunity offers to withdraw them from the brood chamber, and they should be replaced with full sheets of foundation. A number of combs will also be found in which the top rows of cells are oval in shape; these stretched cells are usually caused by loose or improper wiring. All such combs should be removed as they waste a considerable amount of space in the brood chamber owing to the fact that the queen bee refuses to lay in cells which are not of normal shape and size. Combs containing an undue proportion of drone cells and also defective combs showing holes or combs of irregular shape should also be removed and melted down. In every case the substitution of new foundation for aged brood comb will improve the condition of the hive and in addition will release a quantity of wax for sale.

Planting Tomatoes.

H. BARNES, Director of Fruit Culture and R. L. PREST, Instructor in Fruit Culture.

THE advantages and disadvantages of cultural practices in the raising of plants of any kind from seed are always a fruitful source of discussion and argument.

So far as they concerned tomatoes, the Department decided last year—because tomatoes are an important source of livelihood to many growers—to make a series of small scale tests in the Redlands district, and the outcome will be most interesting to growers. The results should not be regarded as final. The experiments will be repeated again this season, but it is considered that as some growers may wish to try the various methods used for themselves, the information should be made available to them at this stage.

The first experiment was made during the winter using the variety, "Salads Special." In this instance, two methods were tried.

Plate 60.
TRELLISED TOMATO PLANTS IN THE REDLANDS DISTRICT.

(*a*) First, was the customary practice of growers of planting seed in a well prepared seedbed, and when the plants were large enough, planting them out without soil round the roots;

(*b*) Second, was a system of double rooting the plants by digging them out of the seedbed when about 1½ to 2 inches high and transplanting them to flat trays. The trays were made by splitting lengthwise old bushel dump cases and were thus about 18 inch x 14 inch. x 4 inch. deep. They were filled to a depth of three inches with good soil and compost, and the seedlings transplanted to them at a distance of about 2½ inches apart each way. Each tray thus held about 30

plants. The plants were transplanted in the field at the same time as the plants dug from the seedbed, i.e., when about 6 inches high. The system of planting from the trays was to cart the trays on to the field and knock out one side. The plants were then cut out with a block of soil measuring about 2½ inch x 2½ inch by 3 inch deep and planted with the soil adhering to the roots. The longer roots, of course, were cut but many of the smaller roots were undisturbed. One most noticeable feature was that after transplanting the plants showed no visible signs of drooping such as could be seen with the plants taken straight from the seedbed. The plants in both the (*a*) and (*b*) trials received exactly the same treatment, fertilizer, water, &c., and they were all trellised. During the first few weeks of growth, the plants from the trays showed stronger growth than those from the seedbed but later, because all were growing vigorously it was not easy to distinguish any difference.

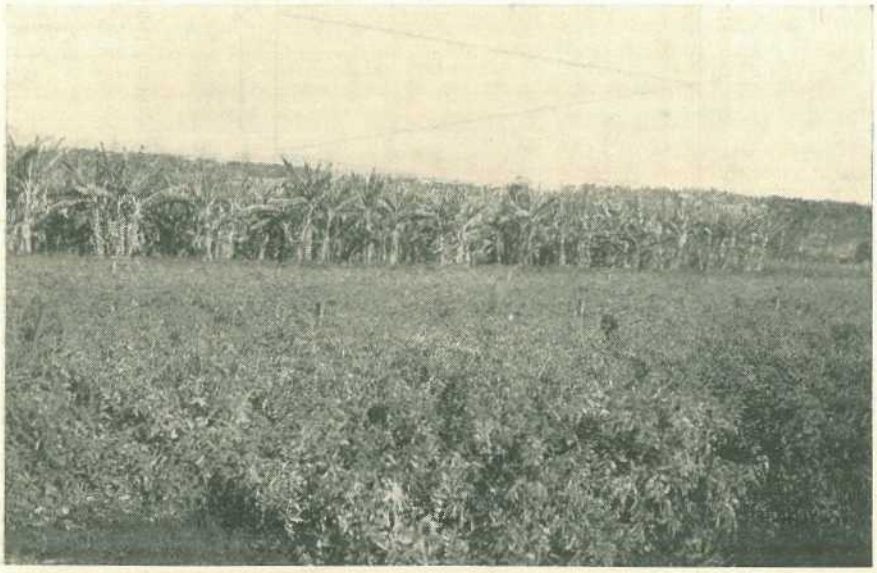


Plate 61.
Tomatoes Grown as a Ground Crop—Redlands District.

There was no apparent difference in earliness of maturity of the fruit but total yields at the finish of the harvest showed that the plants in the (*a*) plots which were planted straight from the seedbed produced an average of 7.2 lbs. per plant, whilst the plants in the (*b*) plots which were planted from the trays yielded an average of 8.2 lbs. per plant. Worked on an acreage basis, this would mean an estimated yield of 2,091 cases from the (*a*) plots and 2,381 cases from the (*b*) plots—a difference of 290 cases per acre, which on an estimated value of 5s. per case, means a difference of £72 per acre in favour of the tray method of planting.

The second experiment was made with the Spring crop, using the Break of Day variety. Three methods were used. Firstly, the trials (*a*) and (*b*) as set out above were repeated, and almost the same

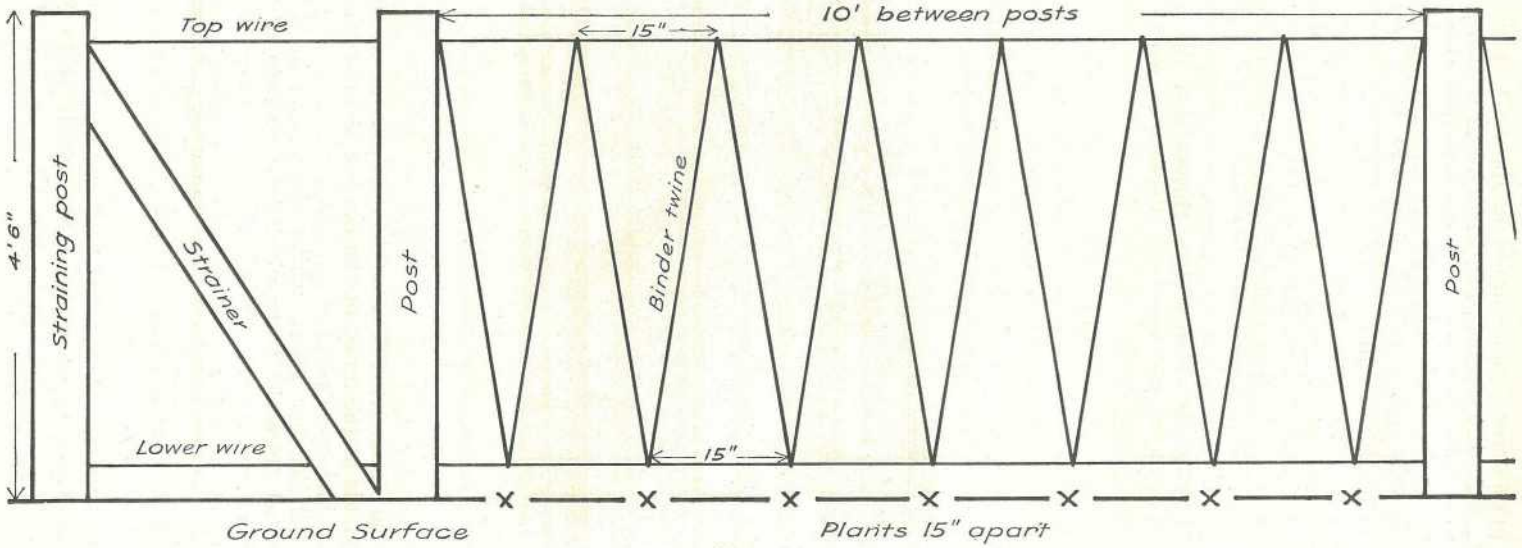


Plate 62.

DIAGRAM SHOWING MATERIAL REQUIRED AND HOW TO ERECT A TRELLIS FOR TOMATOES.

difference in cropping was obtained. The plants transplanted from the seedbed averaged 6·06 lbs. of fruit per plant, and those from the trays yielded 7.10 lbs. per plant, a difference of 1.04 lbs. per plant in favour of the trays.

Secondly, the usual method of planting was compared with a method known as "blocking," which is a variation of the tray method. In this instance, the plants were raised in the usual way in the seedbed and when 1½ to 2 inches high were thinned out to about 3 inches apart, those remaining being left to grow until large enough to plant out. The blade of a wide hoe was then pushed down into the bed between the rows of plants and the bed cut into 3 inch squares with a plant in the middle of each. The hoe was then inserted under the plants at a depth of about 3 inches and the plants removed with 3 inch cubes of soil adhering to the roots. They were placed in trays and carted to the field and planted out at the same time as those from the ordinary seedbed. In this instance, the latter plants averaged 6.45 lbs. of fruit per plant, whilst those which were blocked and planted with the cube of soil around the roots, yielded 8.45 lbs. per plant, a difference of 2 lbs. per plant in favour of the "blocked" system.

In the third trial, single plants were raised in tubes made of light cardboard and reinforced paper fabric. They measured 4 inches long and about 3 inches in diameter and were filled with soil. At the time of planting in the field the tubes were removed and the plants set out in the field with the soil adhering to the roots. They were planted at the same time as plants planted in the usual way by growers from a seedbed. In this instance, the plants taken from the seedbed yielded an average of 6.30 lbs. per plant, whilst those raised in the tubes produced 7·78 lbs. per plant, a difference of 1·48 lbs. per plant.

In summing up the observations from these trials, it is noted that in every instance where plants were transplanted with soil adhering to the roots, there was a substantial increase in the crops produced. Additionally, in the presence of wilt and target spot, the vigour of the plants set out in soil offered them an advantage over weaker plants. It seems, therefore, that growers would be wise to exercise greater care in transplanting and to endeavour to obtain their plants with soil adhering to the roots. As has been indicated, these are first trials and whilst for this reason neither traying, blocking, nor tubing is particularly advocated, it is likely that the method of thinning out in the seedbed and subsequently removing the plants with cubes of soil adhering to the roots will appeal most to growers because it entails somewhat less labour. There is, however, in practice, little difference in the labour required for "blocking" and the "tray" method. Tubes are not regarded so favourably because of the tendency of the soil in the top of the tube to dry out and hinder germination of the seed, and also because the cardboard and reinforced paper fabric tubes have a tendency to rot at the bottom where they are constantly damp.

Fig 1. Top Cross Arm 24" x 1½" x ½" made of sawn hardwood with hole bored for wire pin and sawn slots in each end.

Fig. 2. Lower Cross Arm 12" long and otherwise similar to the top arm.

Fig. 3. Dropper 3' 3" long x 2" x 2" bored about 2" from top and 15" further down. Pointed at the bottom end and driven about 12" into the ground.

Fig. 4. Wire pin about 6" long made from 10 or 12 gauge wire and used for pinning Cross Arms to Droppers.

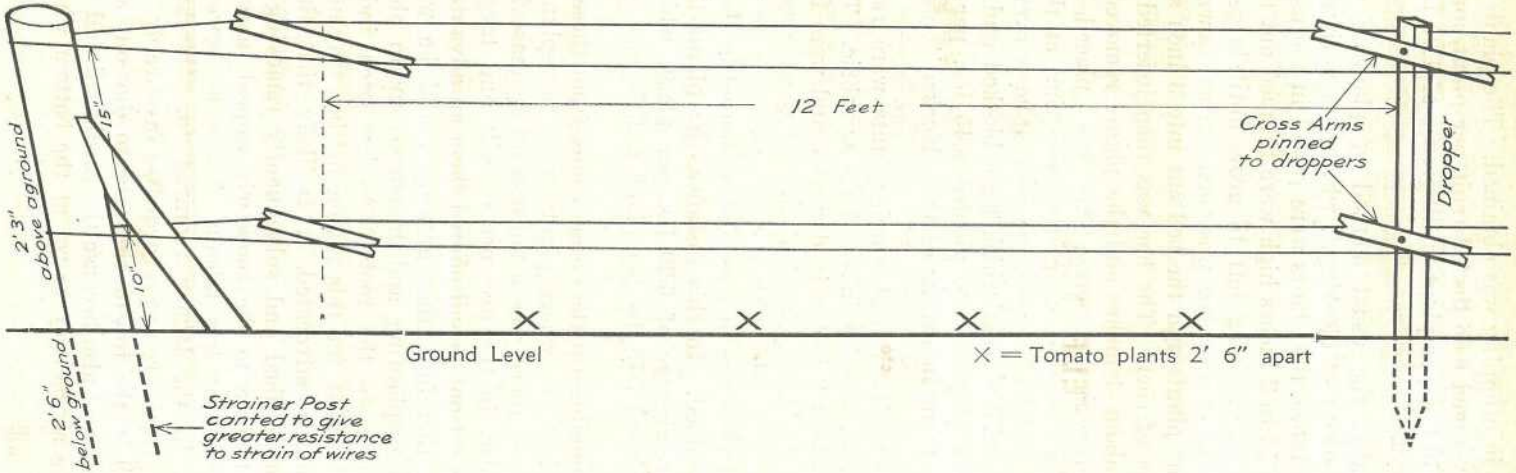


Plate 63.

LOW TRELLIS TO AVOID PRUNING.—The trellis is approximately 27 inches high. The plants are set out 30 inches apart, and as they develop are turned over the wires and allowed to grow towards the ground again. No pruning is required.

Red Flowered Lotus or Bird's Foot Trefoil *(Lotus Coccineus).*

A POSSIBLE DANGER TO STOCK.

E. H. GURNEY and C. T. WHITE.

(Contribution No. 12 from the Poison Plants Committee of the Department of Agriculture and Stock, Brisbane, established as a result of a grant from the Australian Wool Board.)

Description.

Lotus coccineus, illustrated in the accompanying photograph, is an anuual herb about a foot high, the leaves and young stems clothed with appressed hairs. The leaves are composed of three terminal leaflets like a trefoil or clover, and in addition have two leaflets at the base of the leaf-stalk, the whole leaf ½ to ¾ inch long. The flowers are red and 1-3 at the ends of short lateral branches, each group subtended by a leaf. Each flower is typically pea-shaped, dark red in colour, and about one-third of an inch long. The pod is narrow and about 1½ inches long; seeds numerous, dark brown, mottled with black, and one line in diameter.

Distribution.

A native of Western Australia, South Australia, New South Wales, and Queensland. It is not found outside Australia.

Botany.

The group of plants comprising the genus *Lotus* is widely spread over the temperate regions of the world. From the characteristic arrangement of the leaves into five leaflets, three at the end and two at the base of the leaf-stalk, the members are known at Bird's Foot Trefoils. Two species have been recognised as natives of Australia: *L.australis* and *L.corniculatus.* The latter is a yellow-flowered species, widely spread over the temperate world, including the southern States of Australia. The former is confined to Australia and is widely distributed throughout the continent. In New South Wales it is frequently known as Barwon River Lucerne, and is regarded as an excellent fodder, though dangerous under certain conditions, due to the presence of a cyanogenetic glucoside. The species dealt with in the present paper was originally described by the German Botanist Schlechtendal in 1848 as *L.coccineus,* but later was reduced by Bentham in the "Flora Australiensis" to a variety (var. *parviflorus*) of *L.australis.* It seems so constantly dissimilar to *L.australis* however, that we consider it should be retained as a distinct species.

Method of Analysis.

The method of analysis used by us was that of Finnemore (*Aust. Journal of Pharmacy,* 30th January, 1935, p. 41) with the slight modification that the distillate was collected in a saturated solution of sodium bicarbonate.

The analyses were made on the moist material as received, a moisture determination being made at 105 deg. C.) at the same time as the determination of HCN and then the HCN calculated in terms of moisture-free plant. Emulsin used in all determinations.

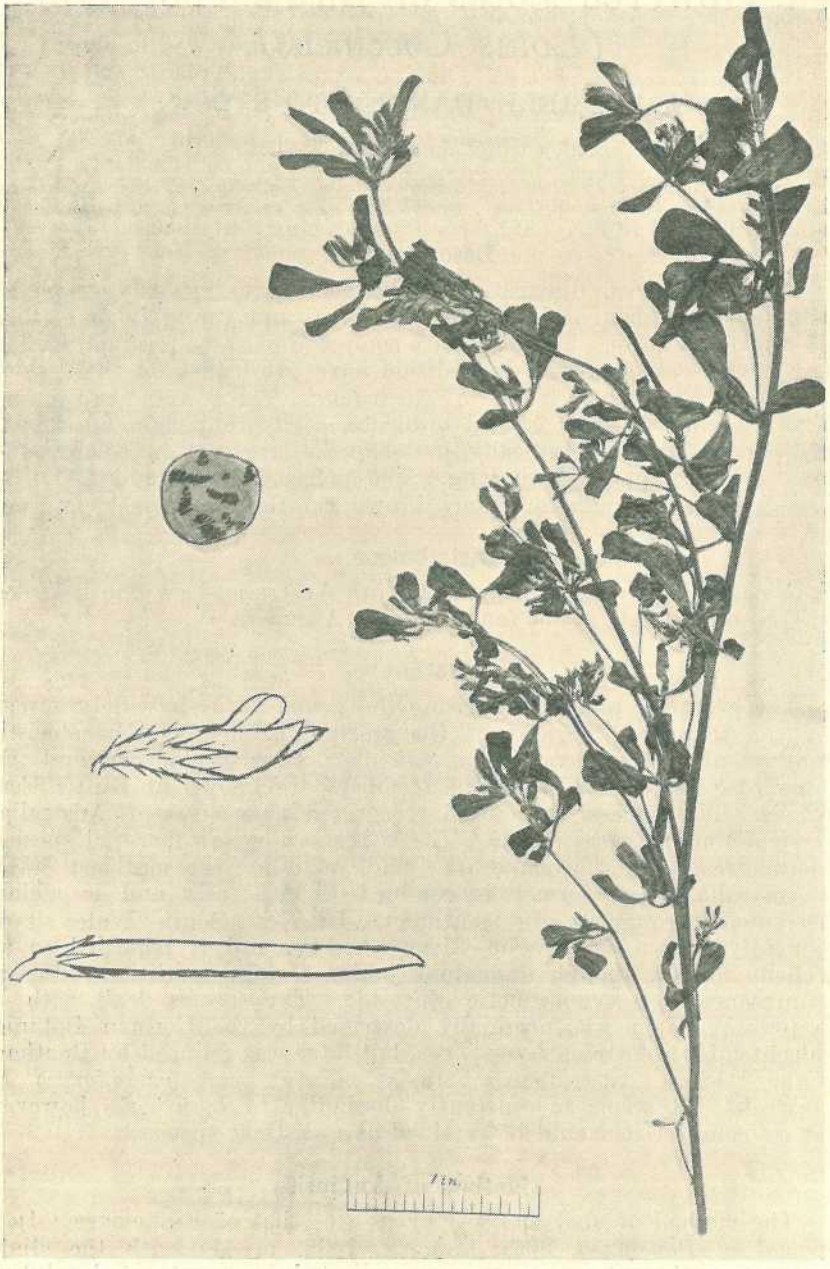


Plate 64.

RED-FLOWERED LOTUS OR BIRD'S FOOT TREFOIL.—Branch of plant (natural size), seed, flower and pod enlarged.

Two specimens of *Lotus coccineus* have been received for analysis. The first sample received July, 1938, was too small for quantitative determination of HCN, but gave very definite HCN qualitative tests.

The second sample received from Goondiwindi was in flower. It was analysed in two portions, viz.: A—the whole plant, and B—the young green tops about 6 inches long.

A—the whole plant contained 79.8 per cent. moisture, and 34 mgm. HCN per 100 grms. of green material, equivalent to 168.3 mgm. HCN per 100 grms. of moisture-free plant.

B—the young green tops about 6 inches long contained 80.3 per cent. moisture, and 51.2 mgm. HCN per 100 grms. of the green plant equivalent to 260 mgm. HCN per 100 grms. of the moisture free plant.

The figures above indicate that the plant must be regarded as dangerous to stock.

QUEENSLAND SHOW DATES FOR 1941.

April.

Dalby	1st and 2nd
Tara	4th and 5th
Chinchilla	8th and 9th
Boonah Patriotic Bushman's Carnival	14th
Miles	16th
Taroom Campdraft Show	28th, 29th, and 30th
Kingaroy	30th April, and 1st and 2nd May

May.

Monto	30th April and 1st May
Goondiwindi	2nd and 3rd
Longreach	5th to 7th
Mundubbera	7th and 8th
Nanango	8th and 9th
Wallumbilla	9th and 10th
Blackall	12th and 13th
Roma	14th and 15th
Gayndah	14th and 15th
Murgon	15th to 17th
Beaudesert Show	14th and 15th
Beaudesert Campdraft	16th and 17th
Warrill View	17th
Mitchell	21st and 22nd
Barcaldine	21st and 22nd
Biggenden	22nd and 23rd
Blackbutt	23rd and 24th
St. George	23rd and 24th
Charleville	27th to 29th
Ipswich	27th to 30th
Kalbar	31st

June.

Wowan Bushman's Carnival	6th
Maryborough	Postponed
Lowood	6th and 7th
Childers Patriotic Carnival	9th and 10th
Boonah	11th and 12th
Bundaberg	12th to 14th
Gin Gin Horse Show and Carnival	16th and 17th
Gladstone	18th and 19th
Rockhampton	24th to 28th
Toogoolawah	27th and 28th

July.

Mackay	1st to 3rd
Proserpine	4th and 5th
Bowen	9th and 10th
Charters Towers	10th to 12th
Nambour	10th to 12th
Ayr	11th and 12th
Townsville	15th to 17th
Laidley	16th and 17th
Rosewood	18th and 19th
Ingham	18th and 19th
Cleveland	18th and 19th
Cairns	22nd to 24th
Gatton	23rd and 24th
Innisfail	25th and 26th
Atherton	29th and 30th
Crow's Nest	30th and 31st

August.

Pine Rivers	1st and 2nd
Home Hill	1st and 2nd
Royal National, Brisbane	11th to 16th

September.

Imbil	5th and 6th
Canungra	6th
Pomona	12th and 13th
Rocklea	13th
Beenleigh	19th and 20th

Shade and Ornamental Trees and Shrubs for the Pig Farm.

C. T. WHITE, Government Botanist and E. J. SHELTON, H.D.A. Pig Section.

RECENTLY numerous references have been made in publicity work to the use of Carob Beans as a stock food and of the value of this tree in the agricultural world generally.

Carob Beans should be quite suitable for pig food if used in combination with other foodstuffs; the tree is suitable for growing in the cooler portions of the State and seed can be obtained without great difficulty. The Carob Bean tree has also been referred to as St. John's Bread. It is both attractive and provides abundant shade.

Henry and Morrison in their popular "Feeds and Feeding" say of Carob Beans that the seeds are imbedded in a thick fleshy pod, rich in sugars, which forms about 89 per cent. of the fruit. The ground pods and seeds form Carob-bean meal which in America is used chiefly in certain mixed feeds especially calf meals. It contains only 5.5 per cent. protein thus differing from most legume seeds.

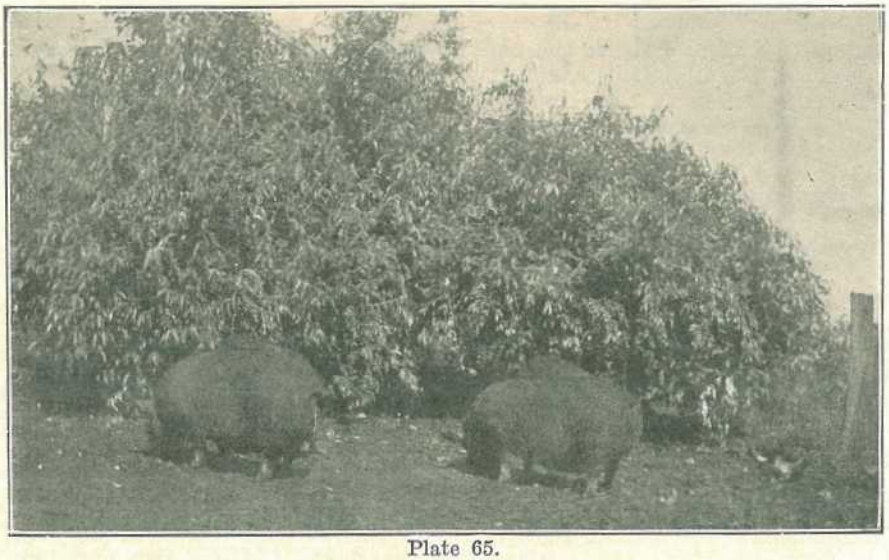


Plate 65.

BUDELIA SCRUB-PROVIDING SHADE FOR PIGS AT THE FARM HOME FOR BOYS AT WESTBROOK.

Honey Locust.

Another shady attractive tree best used as a well trimmed tall hedge is the ornamental Honey Locust (Gladitschia triacanthos) a native of North America. In good years and if the tree is suitably pruned it bears an abundance of pods relished by stock. These pods contain a honey-like substance very sweet and nutty in flavour and the fibrous portion appears to be readily digestible. Seeds of this tree are available at seed stores and while young, the upright growing shoots should be protected by a strong tree guard, in fact, it is useless attempting to grow any trees in or around a piggery unless the trunk is well protected by a tree guard through which the pig cannot poke his mouth and nose.

A Popular Shrub.

An attractive easily grown and popular shrub, both ornamental and useful and particularly suitable for Queensland conditions, but not bearing edible pods, is that known as Budelia or Chinese Lantern, a beautiful bushy attractive shrub with silvery leaves and yellow blossoms.

Of all the shrubs suitable for shade for pigs, this is probably the best as it is free growing, carries abundant foliage and is practically evergreen. Pigs like to rest under the shade of its branching arms and no matter how they worry the soil so long as the trunk and bark is protected, the shrub will flourish and is readily grown from cuttings.

A notable instance of the success of this shrub is at the Farm Home for Boys, Westbrook, where it is regularly grown and is well liked (see plate).

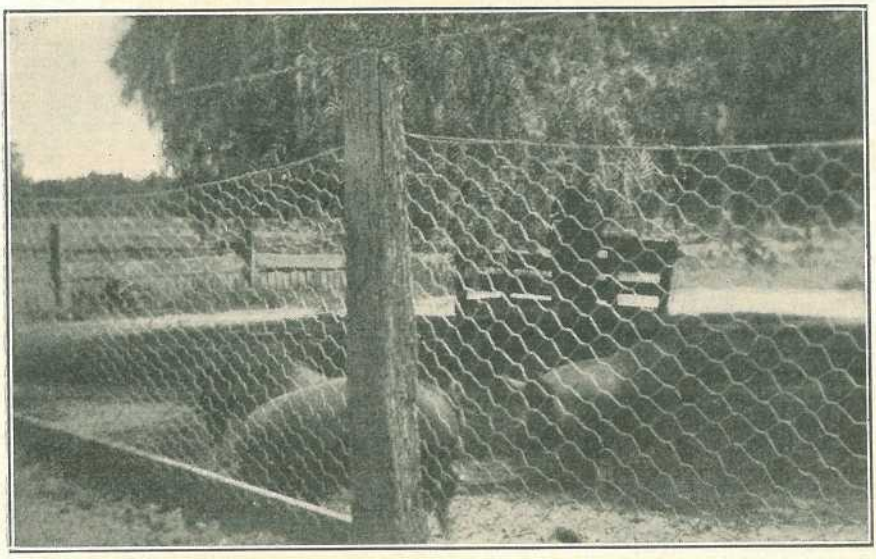


Plate 66.
Abundant Shade is an Essential in the Well-run Piggery.

Persons ordering from a nursery firm are advised to specify the variety "Madagascariersis" the one with yellow flowers, the varieties with the purple flowers, though more popular with gardeners, are barely robust enough to be of value as shade for piggeries and poultry runs.

As shade and attractive trees other than these one could mention Phytolacca or Bella Sombra as one of the best.

Trees bearing poisonous seeds (like White Cedar) should not be grown near piggeries for the white and brown berries of this tree are definitely poisonous to pigs. Weeping Figs are useful especially in the coastal belt and the fruit is non-poisonous, but somewhat laxative if eaten in any quantity.

Other figs which can be used are the Moreton Bay Fig (both the large and small leaved varieties) and the Port Jackson Fig.

The Portuguese Elm is another useful tree, which does well over a wide climatic range. The best variety is *Celtis Sinensis.* This is quite naturalised in parts, and has run out along the Burnett River at Gayndah.

If contemplating planting a few trees for shade around pig yards, and you are doubtful about the variety to plant, readers are advised to get in touch with the Department, when advice as to the best species for the locality will be given.

PASTURES FOR PIGS.

Although young pigs will not grow rapidly if given only bulky foods—such as pasture—because of the limited capacity of their digestive tract, approximately one-third of their diet may consist of good pasture. In the case of dry sows, four-fifths of the diet may be provided as pasture.

Pasture, being relatively cheap fodder, should be used to the greatest economic capacity in pig feeding. Not only does grazing provide pigs with cheap food, but it provides a measure of insurance against deficiencies of minerals and vitamins which are likely to occur when pigs are intensively housed and hand-fed.

Pigs require a relatively high proportion of protein in their food, and they are unable to cope with large amounts of fibre; it is therefore desirable to graze pigs on pasture or forage crops when they are young and succulent.

Annual forage crops have the advantage of yielding large quantities of green feed in a short time; also, the practice of ploughing and planting pig paddocks twice a year is a satisfactory method of providing sanitation and control of parasites in the piggery. However, some permanent pasture is usually desirable in the piggery, but it should be stocked lightly and given frequent rests to preserve the stand and to prevent fouling of the paddock.

Wherever it can be grown, lucerne provides the best permanent pasture for pigs, but to prevent the pigs from rooting and spoiling the lucerne plants their snouts should either be cut or ringed. When lucerne cannot be used, Kikuyu grass is a very good substitute. Kikuyu has the advantage of being able to withstand severe grazing and rooting, and will quickly recover from drastic treatment by the pigs. It is a palatable and nutritious grass, and will thrive under a wide range of climatic and soil conditions.

Root crops, with the exception of carrots, are very low in vitamins A, B, and D, so that when they form a large part of the pigs' diet care should be taken to have good pasture available or to feed an allowance of yellow maize.

The Indian Jujube—A Useful Fruit, but a Possible Pest.

WRITING to the Department from Woodstock, near Townsville, recently, Mr. J. J. Neville stated:—

"When I was at the R.N.A. show, I noticed two plates of Chini Apples on display. I would like to point out that this pest is spreading extremely rapidly this last few years on account of stock cultivating a taste for them. Many seeds are swallowed by the stock, and when passed in the manure, about 90 per cent. germinates and in this way they soon become established. Many years ago, settlers here paid 2s. 6d. each for Chini Apple trees and there is no need for me to tell you the result. At the present time many passing motorists call here for a spade to dig up small Chini Apple trees to take up North. Perhaps it would be a good plan to place an article in the *Queensland Agricultural Journal* from time to time, pointing out the menace of this pest."

The Government Botanist (Mr. C. T. White) states that the tree commonly known in North Queensland as Chini Apple, or more frequently as Chinee Apple), and which has become a minor pest around some coastal towns from Rockhampton northwards, is the Indian Jujube (*Zizyphus mauritiana*). Two species of Zizyphus are known as Jujubes; the temperate China Jujube (*Zizyphus jujuba*) and the more tropical Indian Jujube (*Zizyphus mauritiana*). The former is much cultivated in China, and to a limited extent in the United States. The fruits are mostly eaten after being boiled in syrup and dried, the processed fruits being sold as Chinese Dates.

The Indian Jujube is a native of Mauritius, India and South-west China, and is regarded as a valuable fruit.

Mr. D. G. Hancock, Inspector, Diseases in Plant Acts, at Townsville, has reported on this plant as follows:—

"It is abundant on the flat land surrounding Townsville, and the undulating country around Charters Towers and Ravenswood. In general it seems to prefer the drier and more arid situations, and is a tough hardy plant, flourishing where few other plants do well. As a rule it forms a rather ragged and untidy bush or small tree up to about 12 feet high, but occasionally it may grow to about 20 feet. It is profusely armed on the younger branches with sharp hooked spines. The bushes are normally many-stemmed, but around Charters Towers it is often seen in the form of a small standard tree with a single trunk and shapely dense head. This is due to goats having eaten off all side shoots within reach. It will plainly stand drastic cutting back, and can be trained to form a dense impenetrable hedge. Early in the season, the foliage is bright green, but later a black fungus develops on the under sides of the leaves.

"It has been seen to blossom shortly after the close of the summer rains and continues until about May, the fruits maturing during the winter months and until about September. Fruits of individual trees vary considerably in size, shape and palatability. These outwardly resemble small crab apples or large cherries. The

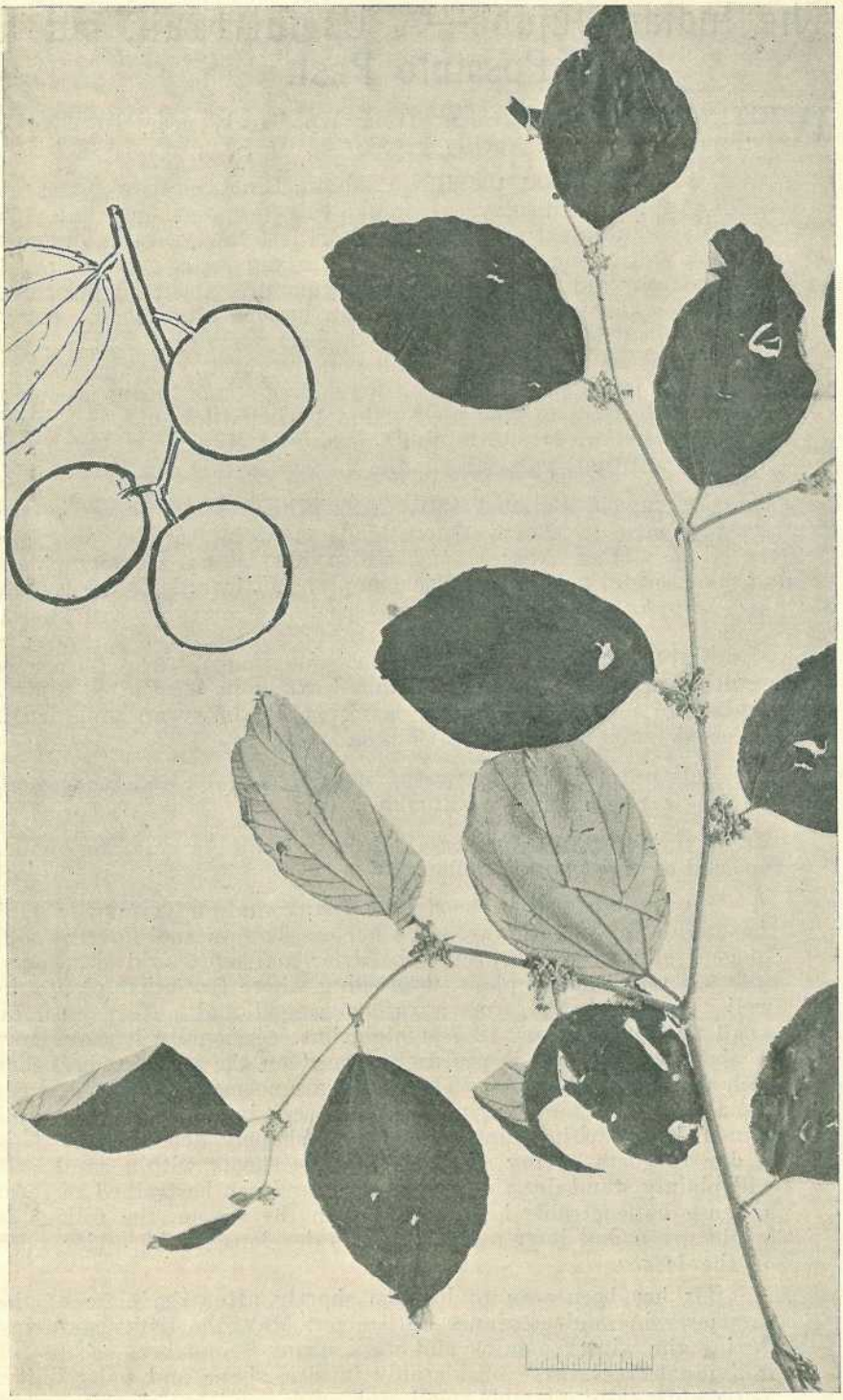


Plate 67.
INDIAN JUJUBE OR CHINI (*Zizyphus mauritiana*).

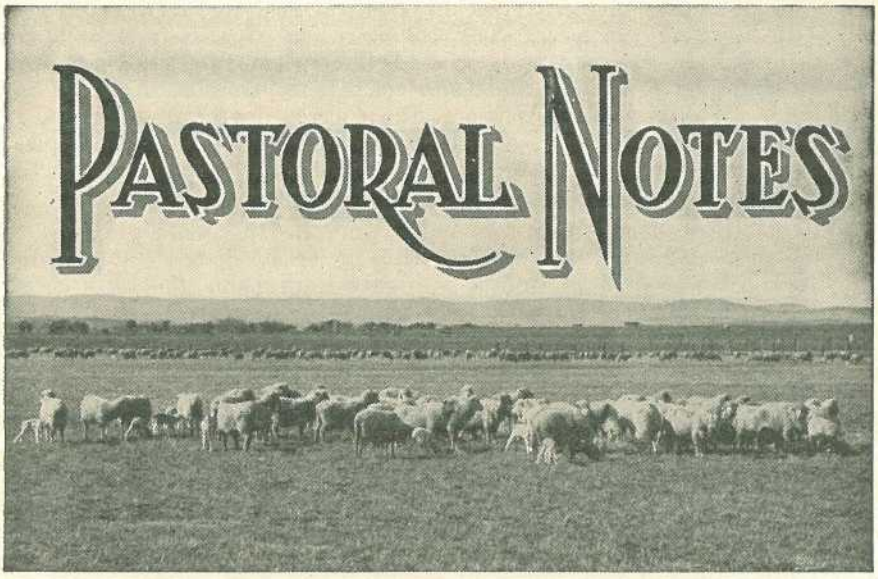
fruit is usually globular, or it may be oval, and varies from between ¼-1½ inch in diameter. The colour when ripe is yellowish or reddish. In the centre is a seed like a cherry stone, and the surrounding flesh is in taste and consistency similar to one of the drier sorts of apple. When at the correct degree of ripeness, it is quite palatable raw, and is good stewed, as jam, or in pies. However, due no doubt to the contempt usually accorded to a wild plant, it is not much eaten except by children.

"It does not seem to really warrant the description of a menace. Firstly, it has been growing in certain districts admittedly for very many years, and it is highly improbable that any effort has ever been made to eradicate chance plants; even so, although common, it has not spread to an alarming extent. It does not form a dense thicket like the Lantana, for instance; and is no more difficult to eradicate, except for the spines, than the average small tree or bush. In the case of occupied lands, it should not give any trouble; along water courses it may even serve a useful purpose in holding up the banks. It does not appear to be connected with fruit fly propagation; scores of examinations of fruit have been made for presence of fruit fly larvæ, but in not one case has any been found; while no flies have ever emerged from ripe fruits collected from different localities and held in glass jars."

It would seem from Mr. Hancock's report that people who are growing the Indian Jujube should make special efforts to see the tree does not get out of bounds. Many thorny trees of this type can become pests if a careful check is not kept on them.

Plate 68.

From the Road to the Furrow.—A North Coast farmer, becoming "tractor-minded," converted an old car to this effective power unit, which now straddles the furrow instead of straddling the rut, and does its job well.



Calving Troubles.

CASES of difficult calving are fairly common, and before the usual calving time arrives, a few hints may be useful.

When about to calve, the cow leaves the herd and seeks a quiet spot. There she will become restless—getting up and lying down—and show evident signs of pain.

As labour advances the back is arched, the hindquarters are drooped, and straining becomes violent and continuous. Meanwhile blood may appear on the vulva and tail, and the waterbags protrude between the lips of the vulva. They increase rapidly and the feet of the calf may be seen within them.

The waterbags furnish a soft, uniform pressure for the preliminary distention of the womb and passages, and prepare the way for the delivery of the calf. In normal presentations, it is wrong to break these bags prematurely.

When the cow calves standing up, the navel string breaks when the calf falls to the ground; but, when she calves lying down, the string is broken when she rises. A few hours after calving normally, afterpains commence and the placenta or afterbirth is expelled. If this is not expelled within twenty-four hours, it should be removed by careful traction. A good method is to take two sticks about 2 feet long, between which the end of the afterbirth is grasped, and rotated around them until close to the vulva, when gentle traction is applied, from side to side, and backwards and downwards, care being taken not to break it. A vaginal douche of boiled water at blood heat, to which has been added a mild antiseptic, should be given. A cheap and efficient outfit for this purpose consists of about 4 feet of ½-inch rubber hose and an ordinary funnel. The end of the hose should have its edge pared off with a sharp knife, and, after having been smeared with carbolic vaseline, it is introduced into the vagina, and gently pressed forward as far as the womb. The funnel is then placed in the other end of the hose and held above the cow's back, the douche being poured into it.

It is well, at all times, to allow nature to do its work without interference; but, when calving is protracted, and progress is not being made, a careful examination is necessary.

The operator should wear a clean sleeveless shirt, and his arm should be smeared with carbolised vaseline, or an antiseptic oil. This protects the arm from poisoning and the cow from the introduction of infective material into the passage.

The hand should now be introduced into the vagina and a careful examination made. It may be found that (1) the waterbags have burst, and that neither the

feet nor head of the calf are presented, or that there is a presentation of (2) one fore foot and head; (3) both fore feet, and head back; (4) head with both fore feet back; (5) one hind foot without the other; or (6) other abnormal presentation.

Whatever part is presented should first be secured by a rope with running noose, so that it will not be lost during subsequent manipulation, and may be readily brought into position when the missing parts are found. If the cow is standing, her head should be turned downhill so that the fœtus and abdominal organs lie forward to give more room to bring up the missing head or limb. If lying down, she should be turned over on to the side opposite to that on which the limb is missing. When the missing part is located, no attempt should be made to bring it up during a labour pain, but after the pain has ceased, an effort should be made to secure it before the next pain comes on.

If the pains are continuous and violent, they may be checked by putting a tight surcingle round the body in front of the udder. If it is found that the passages are dry, pure olive oil may be run into the womb through a rubber tube. If the head is back, the limbs which are presented should be first secured with a rope having a running noose, then the fœtus should be pushed as far back as possible and an attempt made to secure the head with a noose or hook, and to bring it up into the passage. Having brought the limbs and head into suitable position, traction should now be applied in a downward and backward direction, but only when the cow is straining.

Pulling when the cow is not straining should not be attempted. Patience and care are necessary. The extraordinary practice of attaching a draught horse or motor-car to the fœtus and pulling it out by sheer force is not only cruel, but usually results in the death of both the cow and the calf. After a protracted calving the cow will be exhausted, and she should be provided with a warm rug and bed, also a few bottles of warm gruel.

Points to remember are:—

Do not interfere too soon.

When interference is necessary, exercise patience and take time.

Do not use force until the fore feet and head or the hind feet are secured in position.

Remember to pull only when the cow is straining.

GETTING READY FOR SHEARING.

Long before the shearing season starts graziers would be well advised to give that necessary attention to the shed, plant, and yards.

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

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

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

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

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

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

MERINO STUDS IN QUEENSLAND.

From time to time it has been argued that Queensland cannot produce merino stud sheep comparable with those of other States. Fortunately, there are men in the State who, with foresight, ability, and capital, have, in a practical way, proved the opposite.

No branch of the sheep and wool industry in Queensland has shown more rapid progress than stud breeding. To Victoria Downs must go the credit for the initial effort. From the inception of that stud, the sheep produced have more than held their own with Southern importations.

Lansdowne imported into this State the highest-priced ram sold at the Sydney sales a year or so ago. There, excellent work also is being done.

Dunstan provides for those who believe in the policy of strength for the Western country, and at Charleville took the championship of Queensland with a ram of this type.

For some years past the Strathdarr stud has progressed remarkably, and at Central-Western shows the list of awards gained by sheep from this stud must give much satisfaction to the breeders.

Coreena in the same district breeds wool of splendid quality, and more than maintains a general excellency.

Malvern Hills continues to improve, and a fair proportion of the awards go to this stud wherever sheep are shown.

Terrick produces quality sheep eminently suited to the climate and conditions for which they are bred, and the general improvement in this stud is remarkable.

At The Womals are produced probably the strongest merinos in Queensland—fine, big, upstanding sheep with plenty of constitution and fitted to withstand droughty conditions in the Far West.

Craigielea sheep, too, are of great size, with a very nice handling wool, medium to strong.

Weribone stud also has done, and continues to do, great service to the Queensland pastoral industry.

The object of this brief note is not to mention all the merino studs in Queensland, and those named are selected because of the fact that they show regularly, and their sheep are therefore constantly before the public. Smaller studs are starting, and with the wise selection of sires and constant, thorough culling of the ewes will, no doubt, in course of time, achieve the success for which they are working. The successful establishment of these studs in Queensland has an effect on the industry which it is difficult to estimate in money figures.

BONE-CHEWING.

No animal can thrive unless its food contains a sufficiency of certain elements, including the minerals phosphorus and calcium. The requirements of the different farm animals are, however, not the same. Normally, enough phosphorus to maintain the health of cattle is contained in the pasturage, but for various reasons—e.g., phosphorus-deficient soils, and a succession of years in which the rainfall is scanty—a deficiency in this element arises in the natural feed.

An early symptom of phosphorus deficiency is a marked desire shown by affected animals to eat bones and offal. This condition is fairly common in parts of Queensland. Animals develop dropsical swellings, stiffness in gait, and symptoms similar to those of rickets in children. Young cows about the time of first and second calf, milking cows, and cows heavy in calf make heavy demands on the available phosphorus and are therefore very susceptible. Dry cows and older stock are less liable to suffer. Stock suffering from a shortage of phosphorus will chew bones, pieces of wood, bark, earth, and other substances.

Treatment, except in extreme cases, is followed by good results. On the smaller holdings where animals are watered at troughs, the addition of six drams of phosphoric acid to each 10 gallons water, supplemented by a ration of bran and chaff, gives very satisfactory results. Under station conditions, a lick containing sterilised bone meal two parts and coarse salt one part—a proportion of 2 to 1—with the addition of molasses to increase palatability, should be made available to the animals.

SEASONAL CONDITIONS AND SHEEP PARASITES.

Seasonal conditions should be considered when attempting to protect sheep against likely losses from blowfly strike.

If spring rains occur, resultant warm, moist conditions may be conducive to a big increase in flies. Fresh green vegetation, springing up after rain, is likely to cause scouring in flocks in localities in which those conditions prevail. Graziers who benefit by spring rains may, therefore, expect trouble amongst their sheep with wool sufficiently long and probably dirty.

To treat the old sheep in a flock is only putting off the evil day, and much greater benefit will follow the effective treatment of the whole mob. Shearing is a great protection, but as this is only an annual job, the long interval between shearings must be considered. In places where dipping for lice and ticks is necessary, it has —if a good arsenical mixture is used—a most protective effect on the sheep, besides killing many of the flies. Dipping, from this point of view, is most satisfactory when the sheep are carrying at least six weeks' growth of wool. Crutching is a sanitary and useful method likely to give some protection against fly strike, but, as it does not kill the pest, the protection will be of short duration in a bad fly season.

Jetting with a regulation .8 per cent. arsenical mixture will not only protect the sheep from maggots, but also will destroy large numbers of flies which suck the poisonous moisture from the wool. Because of the strength of the mixture, the wool surrounding the usual places of attack will carry arsenic in sufficient quantity for some weeks to kill any maggots which may be deposited after jetting. Jetting does not prevent strike, but will destroy the maggots before they do harm to the sheep. The important point is for the flock owner, where early storms are experienced, to apply his favoured method of protection to all his sheep as soon as convenient.

The same seasonal conditions are also conducive to an increase in internal parasites. The worms which usually cause trouble in a flock become numerous while the sheep are still doing well on fresh green feed. Consequently, the risk of pasture contamination is serious. When the grass becomes dry and less nutritious as the season advances, the wormy sheep will suffer severely, while heavy lamb losses may be expected. Early drenching for the control of stomach worms will do much to protect the sheep. Where necessary, drenching should be continued at monthly intervals.

VEALER CALVES.

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

A CATTLE CRUSH ON EVERY FARM.

A crush for holding cattle or horses should be built on every farm. It costs little and occupies a small area; yet it saves much time and labour when full-grown stock are to be dehorned, branded, castrated, speyed, drenched, or otherwise treated. For these operations, the animal should be held in a position which allows of no movement.

The ordinary crush can be arranged to accommodate large or small animals. A series of auger holes ($\frac{1}{2}$ in. diameter) are bored about 6 inches apart along two rails of convenient height on each side of the crush. The holes should be deep enough to seat a bolt or iron pin firmly. The bolt or pin should stand 4 to 6 inches above the rail. These pins—one on each side—serve as chocks against which a cross rail may be placed. By working the animal right to the front of the crush, the pins and rails may be arranged to prevent any "backing." In a similar way the width of the crush may be adjusted to prevent lateral movement.

To secure the head of the animal, the "A" shaped bail-type of structure may be made from a double cross rail between which slide vertical poles attached to the base of the crush posts by stout hinges. With such a crush, many farm operations usually requiring four men can be done quickly and efficiently by a man and boy.

GRAIN SORGHUM FOR SHEEP.

Sheep are thorough masticators, so whole sorghum grain may be fed to them without fear of serious waste. Provided the sheep are able to get enough roughage—so that rumination is not impaired—whole grain is returned to the mouth, and so becomes well ground in the process of mastication.

The smallness of the grain enables it to be intimately mixed with most feeds, so there is little danger of selective feeding. This is of importance in the drought feeding of the merino.

The harder grains may present some difficulty to lambs. In such cases, grinding of the grain is recommended. Where grinding is impracticable, the grain may be soaked. If soaking is decided upon, it should be done while the grain is still in the bag. Half bags are most convenient to handle. A routine by which one lot is draining and the next lot is soaking should be arranged. Each time a drained lot is removed for feeding it may be replaced by the next lot in soak, which, in turn, is replaced with a fresh lot for soaking. This process ensures clean, soft grain for feeding to the animals.

MERINO TYPES FOR DIFFERENT DISTRICTS.

The old argument as to the best type of merino wool to breed is frequently heard amongst sheepmen. Advocates of the fine wools are usually most emphatic, likewise those who hold a brief for the strong and medium. As a matter of fact, there is a useful place for all three types, but it is a fatal error to try and breed a type on country unsuited to it. Thus in the far west, north-west and central areas, where sheep have certain hardships to withstand, and there are periodical droughts, the fine-woolled merino is not considered suitable. Remembering that to a very large extent constitution goes with strength of fibre, a strong-woolled merino does best in those regions.

Nearer in, in the south-west and Maranoa districts particularly, a strict medium may be found most profitable, but it should be recollected that to maintain this medium, rams slightly stronger than the desired type should be used. On the Darling Downs, Stanthorpe, and Border areas a fine wool may be grown with profit. Thus fine, medium, and strong all have their uses and habitats.

POLLED CATTLE.

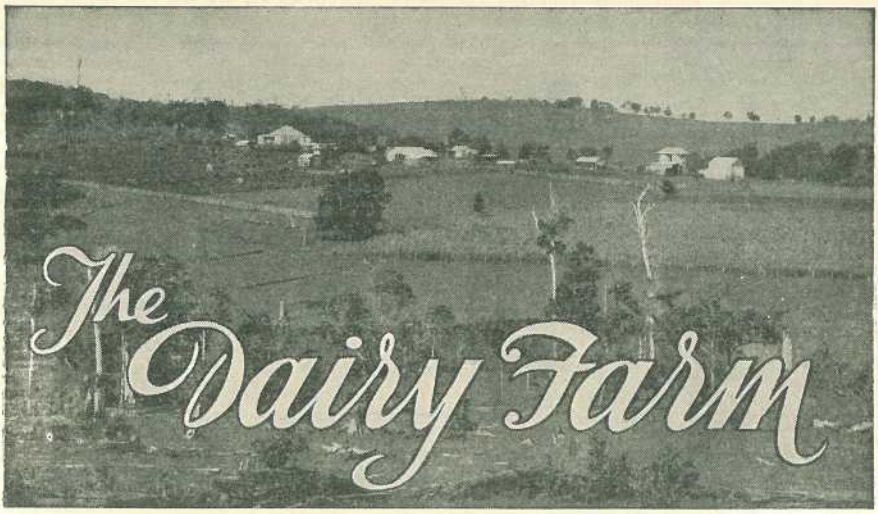
In any programme of breeding or of grading up existing herds, the introduction of polled stock should be regarded as a necessity. Shorthorns and Herefords represent the bulk of the beef cattle in Queensland. The polled Shorthorns and Herefords are a comparatively recent development and the percentage of polled stock which will result from crossing with horned breeds is uncertain.

With the so-called "natural polls," the power to transmit this characteristic is marked. It is most noticeable in the Galloway breed, but this type is not largely represented in Australia.

Red polled bulls crossed with horned breeds or their crosses may produce a large percentage of hornless stock, but the prepotency of Aberdeen Angus bulls with respect to colour, conformation, and hornlessness is superior. From 80 to 90 per cent. of the calves obtained when Aberdeen Angus bulls are mated with horned stock of mixed breeding are black in colour and most of them are hornless.

FEEDING FARM HORSES.

It is not unusual to see a farm-hand pitchfork hay into a yard over which manure is thickly scattered. This is a source of loss and risk. Much of the hay is trampled into the dust or mud and rendered unusable. Even ensilage may be wasted in this way. A far greater, although more indirect loss to the stockowner, is caused by the contaminated feed. Many farm horses are infested with worms of various kinds, and dirty yards may teem with the parasites in their initial stages. These get into hay, or other feed tossed on to the ground, and are swallowed by stock, often with disastrous results. Deaths among farm horses have been traced to worm infestation, and owners will find it worth while to take great care in feeding their working animals. A rack or a trough ensures greater cleanliness and saves waste of good feed.



Care of Milking Machines.

MILKING machines, although they have revolutionised dairying methods, may, if mishandled or neglected, constitute a real menace to milk and cream quality. Some people hold the opinion that clean milk of good keeping quality and choice grade cream cannot be produced with a machine, but this has been investigated fully and both research work and practical experience have proved that it is wrong. As good a quality of milk can be produced by machine as by hand, provided the correct procedure is followed in care and cleaning.

Another objection often brought forward is that the machine tends to increase udder trouble. This is, of course, true if the farmer fails to notice cases of infection as soon as they occur and allows diseased cows to be milked by the machine. The great importance of inspecting the foremilk for any abnormal appearance should be realised, and any cow showing signs of mastitis in the first-drawn streams should be milked out by hand and the milk isolated from that used for human consumption. Cows with sore teats should also be milked by hand, although the machine may safely be used if they are left until last. A machine is very unlikely to cause teat sores—in fact, one Queensland dairy farmer with a large herd has experienced complete freedom from them over six months since he started machine milking—but it is liable to transfer the infection if used subsequently, without sterilization, on other cows.

The solution of most milking machine troubles lies in proper cleaning and sterilizing after each milking. It is essential that cleaning should be done promptly after milking is completed before the milk solids have time to dry on the rubber parts, for once dry they are far more difficult to remove completely. The first machines were crude inventions made with ordinary rubber parts, which were easily cracked and pitted by the action of fat and hot water, making them excellent breeding places for contaminating bacteria. Nowadays, the modern machines are solidly built and the rubbers are of the very best quality resistant to high temperatures, so that they can safely be boiled and even sterilized regularly by steam, without injury.

The method of dealing with milking machines using a weak solution of caustic soda in boiling water is well adapted to Australian conditions, and has proved economical, rapid, and successful. This method is as follows:—

(1) One gallon of clean *cold* water is drawn through each set of teat cups by suction, lifting the unit up and down in a bucket of water to allow air to mix with it.

(2) The outsides of teat cups and rubber tubing are then washed and brushed in *warm* water and caustic soda.

(3) At least one gallon of *boiling* caustic soda solution is drawn through each separate set of teat cups, holding them so that all receive equal treatment.

(4) The solution is removed completely by drawing at least 2 gallons of *boiling* water through each set of cups.

(5) If steam is available this is applied for five minutes to complete the sterilization.

Strength of Solution.—One full teaspoonful of caustic soda added to every 4 gallons of boiling water is the correct amount and, provided this strength is not exceeded, no damage will be done to the machine and satisfactory results will be obtained. Used carelessly, however, caustic soda is dangerous in its action, and care is needed in handling it and in making up the solution. The water used must be really boiling to achieve proper cleansing and sterilization, and by this treatment the resistance of the rubber parts to cracking is actually increased.

The vacuum line is often a source of trouble and should receive a complete flushing once each day with boiling water, care being taken not to flood the pump. All taps should be left open when the machine is not in use and the teat cups should be hung up in a cool, dust-free place. The use of chemicals, other than in the washing process, has been found to be unsatisfactory, and there is great danger of traces of them finding their way into the milk and cream and causing taints.

A COMMON CREAM TAINT.

One of the more common defects in cream is that which is referred to as "disinfectant flavour."

The cause of this taint, in most cases, is carelessness in the handling of disinfectants before and during milking. The use of dilute solutions of some disinfectants—other than Condy's fluid—for bathing cows' udders and teats before milking also can give a taint to the milk. The cleansing of milking machines and utensils with disinfectants, possessing strong odours, is another cause of this taint, which is imparted to the cream, either by absorption of the vapours or direct contact. No amount of aeration or stirring will remove the taint from the milk or cream. For this reason, disinfectant-tainted cream cannot be used with safety, even in the manufacture of pastry butter. Consequently, it is rejected at the butter factory as being unfit for human consumption.

To avoid the risk of taint the following suggestions are offered:—

1. Don't use disinfectants with marked odours.
2. Sore teats should be treated with petroleum jelly, or some odourless ointment.
3. Use a solution of washing soda—from 3 to 5 per cent., say—for cleansing dairy utensils. It removes grease readily and corrects acidity.

MILK FROM THE NEWLY-CALVED COW.

The milk of the newly-calved cow is abnormal and is called colostrum or beastings. It is yellow in colour, has a rather strong pungent taste, an unpleasant odour, a sickly albuminous flavour, a high specific gravity, a high total of solids, high albumin, and low figures for fat and sugar. The fat of colostrum has different properties from that of normal milk, and the sugar is largely glucose and not lactose—it also shows a larger proportion of phosphate.

Colostrum milk serves only as food for the new-born calf, and not as a means of increasing the supply to the factory. Besides serving as food for the calf, it increases the resistance of the calf to disease during the first few days of its existence. The milk approaches normal day by day until, in seven days after calving, it is practically normal, although it may take up to a fortnight to attain perfect normal composition.

It is advisable to isolate the newly-calved cows, and for the first seven days at least this colostrum milk should not be mixed with normal milk, either for butter or cheese making. Cream from such milk blended with good cream results either in the whole delivery being graded down to second grade, or in its being completely rejected. For that reason, this milk should not be separated at all. Colostrum milk is quite unfit for cheese-making, since it is easily coagulated by heat, curdles very slowly with acids and rennet, and results in very poor quality cheese.

It should be remembered, therefore, that—(1) colostrum milk is food for young calves only; (2) it should on no account be sent to cheese factories or, as cream, to butter factories.

MILK FEVER AND HOW TO TREAT IT.

Since the discovery of udder inflation for the treatment of milk fever, this disease has had few worries for the dairy farmer, but it is considered that a few notes on it, describing the precautions to be observed in udder inflation, some of the undesirable consequences that may follow, and recent advances in treatment may be useful.

Usually the condition has been present some time before treatment is applied, and the affected beast will be down and more or less unconscious.

The udder should be wiped well with a clean, damp rag, and then a clean towel should be placed under the udder to prevent contamination from the soil. The beast should then be propped up on its breast bone in as natural a position as possible, taking care that the hind legs are in a normal position and not causing undue pressure on the udder. In very advanced cases this may not always be possible, but it should be attempted.

Strip the udder of any milk present and then commence inflation with a teat syphon. Each quarter is inflated firmly and the teats are tied off at the bottom with clean tapes to prevent the escape of air. The udder should then be massaged gently to distribute the air throughout the organ. The tapes should be untied about an hour after they were put on. If no improvement is noted after three hours, inflation should be repeated. The most undesirable after-effect that may follow treatment by udder inflation is mammatis. To avoid this the following precautions should be observed:—

1. The teat syphon used should be sterilised thoroughly before use by boiling.
2. Take every precaution during inflation that the teat syphon does not come in contact with any contamination; should that happen, immerse the syphon in boiling water before continuing its use.

   These precautions are against the possibility of introducing any infection into the healthy udder.
3. If a quarter of the udder of a cow being treated with milk fever is affected with mammitis, or has been so affected at any time, that quarter should be the last inflated; and, following use on that quarter, the teat syphon must be sterilised thoroughly by boiling before being used again.

   The necessity for such a precaution is obvious.

Despite the fact that most cows treated for milk fever by udder inflation record an uneventful recovery, it has been found that better results are obtained by the subcutaneous (under the skin) injections of a substance known as calcium boro gluconate. It is well known that in milk fever the calcium content of the blood drops considerably, and the injection of calcium boro gluconate aims at restoring the lost calcium balance. In addition to being a more convenient treatment, other advantages it possesses over udder inflation are that there is no risk of introducing or spreading mammitis, recovery is more rapid, relapses are less likely to occur, and also the method may be used as a preventive. The drug is put up in convenient form commercially, and the local chemist will be able to advise where to get it.

The drug is usually issued in cartons containing 2½ oz., the contents are dissolved in 10 oz. of hot water recently boiled and then allowed to cool to body temperature before use.

The dose given is sufficient for one treatment, and should be injected under the skin at various parts of the body—do not inject all the solution in one place. The usual precautions are taken regarding sterilisation of the syringe and needles and antiseptic precautions at injection.

It has been found that repetition of the dose is rarely necessary.

Some cows are known to be more subject to milk fever than others, and in such cases it has been found advisable to give an injection immediately after calving, followed by a second injection about twenty hours later. For these injections the dose should be half that used for curative treatment.

Whatever the method of treatment adopted, it is advisable to cover the animal with a rug, and in no circumstances should the beast be drenched, as because of the paralysis extending to the throat the cow is unable to swallow, and any liquid forcibly given many enter the lungs and set up pneumonia, which almost invariably proves fatal.

When the treated cow gets to her feet, it is advisable that some form of after treatment should be adopted. The udder should not be touched for at least twelve hours after the cow has risen, and milking "dry" must be avoided. Small quantities of milk should be drawn off at frequent intervals on the following day, and the diet should be restricted.

QUALITY IN MILK AND CREAM.

During summer it is necessary for dairy farmers to take greater care in milk and cream production if defects in milk or cream are to be avoided.

Milk is an ideal food for bacteria—microbes or germs as they are popularly called—which thrive on milk and soon spoil it, with the result that not only the milk but its derivatives are de-graded in quality. Spring and summer temperatures in Queensland are conducive to the rapid multiplication of most bacteria, and the summer heat especially favours organisms which impart objectionable taints to milk and cream.

The prevention of faults in milk and cream is almost entirely dependent on the methods of production. It may be claimed that clean milk production calls for much greater effort and correspondingly increased costs for which there are no compensating returns. This is not so. Milk of a very low bacteria count may be produced with little, if any, additional work or time in ordinary hygienic surroundings, and with inexpensive equipment. On the other hand—although not usually—dirty milk may be produced in elaborate buildings and with faultless equipment. Success in clean milk production, like most other activities, depends largely on the will of the persons engaged in it. If those responsible exercise cleanliness and care in every operation from the moment the milk leaves the udder until the delivery of cream at the factory, undesirable fermentation caused by the entry and multiplication of harmful bacteria will be largely prevented, because the normal lactic acid-producing bacteria are more likely to gain control and suppress the growth of the objectionble types. With milk for cheese-making an attempt should be made to check the development of too much acid by keeping the evening's milk as cool as possible while it is being held overnight on the farm. Passing the milk over a tubular metal cooler through which water is circulating is the method for rapidly cooling milk easily adapted to ordinary farm conditions.

The chief factors governing the production of choice quality milk and cream are set out briefly below:—

1. Clean flanks and udders with a cloth moistened in water in which there is a weak solution of Condy's fluid.
2. Wash the hands before and as often as necessary during milking.
3. Thoroughly clean and sterilise utensils after use in the following manner:—
   (*a*) Rinse with cold or luke-warm water.
   (*b*) Wash in hot water in which washing soda is dissolved, using a scrubbing brush for the purpose.
   (*c*) Immerse in, or scald with, boiling water.
4. Allow utensils to drain and dry in an inverted position on a dust-free rack. Do not use a cloth to dry them.
5. Cool milk and cream immediately after milking, and maintain as cool as possible until delivery.
6. Exercise care in sterilising utensils at all times, and more than usual care in summer, when temperatures are more favourable for bacterial multiplication.

DAIRY FARM FACTORS.

There are certain essential factors in dairy farm management that make all the difference between success and failure. Although milking may be regarded as the main job on a modern dairying property, it is really the culmination of herd management, breeding, feeding, and attention to detail.

Why is it that on two identical farms, with only a boundary fence between them, production will show a vast variation? The answer is found in the fact that on one property, constant attention is given to all the operations—from calf rearing to the final disposal of the milk or cream—while on the other farm, careless or bad management in one or two operations mars the whole effort.

It is useless to lay down good pastures and provide food, shade, shelter, and water for stock, and then keep on breeding from low type producers.

Another important matter which should not be overlooked is the fact that modern intensive methods of dairy farming place a very high strain on the constitution of the dairy cow, and much of this constitution may be ruined by faulty methods in calf-rearing. From a practical viewpoint it is better to feed the breed than to feed the weed.

PROFITABLE DAIRYING.

Some farmers consider that the more cows they milk, the more efficient and profitable their dairying practice becomes. But when success in dairying is mentioned, many other factors must come into the reckoning.

Pasture management, milk and cream quality, and stock diseases can all be controlled by the farmer. Good pasture management requires the introduction of the best grasses, rotational grazing, the conservation of fodder, pasture renovation, and the use of any necessary fertilizers.

The quality of milk and cream is controlled largely by the attention given to milking, separating, storage on the farm, freedom of the pastures from milk-tainting weeds, and the health of the herd. The incidence of disease in the dairy herd, of course, depends largely on the care and attention given to the animals.

The milking capacity of the herd depends obviously on the milking capacity of the individual cows. The question as to which are the best producers can be determined by systematic herd testing. Unprofitable cows should be culled as soon as practicable. Only the best cows should be kept as breeders. Boiled down, the yield of butter-fat to the acre determines the soundness of dairy farm management.

Good farm management and a poor herd are just as bad as a good herd and poor management. Good management and a good herd together must result in a high yield per acre.

CREAM COOLING.

If properly used under conditions of scrupulous cleanliness, a cream cooler will give excellent results. Besides lowering the temperature of the cream and thus checking bacterial development, a cooler aerates the cream, releases gases and food flavours, and improves its consistency. Freshly separated cream, after it has been cooled sufficiently, should be mixed with the cream already held in the dairy. Fresh and over-ripe cream should not be mixed, as is often done when lots are held in separate vessels until delivery day. Cream should be stirred frequently while it is held on the farm. Proper stirring controls the ripening.

STERILITY IN DAIRY COWS.

In each year, with careful management, the proportion of calves dropped should approach 100 per cent; but on many dairy farms, perhaps, the number of calves dropped ordinarily would not approximate 80 per cent. Hence, about one-fifth of the progeny is lost.

Apart from disease, the most common causes of sterility are protracted periods of semi-starvation, and the other extreme of over-feeding. The latter cause usually occurs among cattle prepared for the show ring. But with show cattle the trouble may be overcome by making the animals work hard for their living by turning them into a paddock where feed is short, and where they have to walk long distances to grass and water.

When starvation is the cause, the remedy is obvious. Failure to make provision for the hard times which always come along leads to loss through cows not breeding regularly, involving the loss of the calf, the production of the cow, and often the cow herself.

The provision of stacks of hay or silage in favourable seasons, and keeping them in reserve until required, may make all the difference between profit and loss.

The breeding animal should be of adult age, neither under nor over-fed, and should have moderate exercise.

The common practice of allowing the bull to run with the cows is not commendable. With the bull kept under control he is able to serve many more cows, and the time of cows coming in may be so arranged that they will calve when feed should be available in normal seasons, and when butter-fat is not usually at its lower price.

Size of Breeding Sows.

SIZE is an important feature in breeding pigs, yet some breeders do not give it sufficient consideration.

One of the chief objectives in pig raising is to get pigs to marketable weights in the shortest possible time. To obtain the desired rapid development and still have a finished pig with a light covering of fat, it is necessary to breed from pigs which are big within their class. That is to say, pork type breeding stock—such as Middle Whites—should be big animals of their category if their progeny are to grow quickly to porker weights. Bacon type breeding stock—such as Large Whites—also should be big of their type if their progeny are to develop similarly to baconer weights. The extreme bacon type of breeding stock could, of course, be used to produce fast-growing porkers, but such porkers, under normal feeding conditions, would not be sufficiently mature to give good carcases at porker weights. Breeding pigs should be big within their type.

Size is inherited in pigs as it is in horses, and trying to grow a small type pig into an extreme bacon type is like trying to make a pony into a draught horse.

Observations lead to the belief that size within a breed is frequently lost through mating stock before they are sufficiently grown.

A large breeding sow, provided she is not too fat and clumsy, is more likely to produce a litter of large pigs and to be able to suckle them better than a smaller sow under similar conditions.

Records of a large number of breeding sows show that sows which are mated when between nine and twelve months old are more productive throughout their breeding career than sows mated earlier or later.

Under Queensland conditions, it is common to see sows mated at five to six months old when they are barely bacon weight, but this practice does not give the sows a chance to develop and become productive mothers.

The best recommendation is to mate sows when they are about nine months old, or when they have reached a live weight of approximately 250 lb. In cases where sows are mated when very young, either by accident or design, they might be given a chance to develop by withholding them from service for some weeks after their first litter has been weaned.

HOW TO KEEP PIGS HEALTHY.

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

Roomy, well-ventilated, but draught-proof sties are necessary.

The floors should be swept clean every morning, all refuse being taken away, and the yards raked over. Correct drainage of sties and yards will avoid the accumulation of water and help to keep down insanitary conditions.

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

Unhygienic and insanitary conditions are predisposing causes of rheumatism, catarrh, and some of the more serious bacterial infections—such as suppurative otitis and pneumonia. Piggeries should therefore be constructed on high ground, floors should be made of concrete, and the run should be well sheltered from inclement weather.

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

PIG BRANDING.

Under the Queensland Pig Industry Act the identification of all pigs sold, offered for sale, barter, or exchange is compulsory. This is essential to satisfactory marketing of this class of stock, and where marking is done as a regular routine job it presents little difficulty. Identification facilitates investigation into disease, whether epidemic or otherwise.

The Act provides particularly for the marking of all pigs consigned to factories, and there has been widespread appreciation of its value. There may be differences of opinion in regard to the advantages of various systems of identification; but, from a factory point of view, it is a very great advantage to have the carcases plainly identified.

Exporters prefer the body tattoo as a means of identification, and bacon-curers almost without exception are more than satisfied if the carcases are tattooed efficiently. The use of the firebrand is being superseded generally by the more efficient method of tattooing, in which a body-tattooing instrument and marking paste or ink are used.

The marking of sucker, weaner, and store pigs presents greater difficulty, because neither the body tattoo nor the firebrand are sufficiently permanent where the pigs are to be retained on the farm for periods varying from two to five months. In the case of these young pigs two systems are especially adaptable—viz., earmarking and ear-tattooing—the latter being suitable only in the case of white or red coloured pigs.

The departmental pamphlet, "Identification of Pigs," is available free on application to the Department of Agriculture and Stock, Brisbane.

PIG RINGING.

To save unnecessary exertion and to avoid the risk of being bitten when ringing a pig, a twitch like that used when drenching a horse is useful.

Small pigs may be held while the twitch is fitted, but larger pigs should be forced into a crate or race where they cannot turn or back. The rope loop of the twitch is slipped into the pig's mouth and pulled round the upper jaw just past the end of the snout. Twist the handle quickly until the loop is tight, and the pig should stand quietly. The handle should be held firmly while the operator puts the ring in place, then untwist the rope and allow it to fall clear of the pig's mouth, retaining a hold on the handle.

Pigs of all sizes may be held firmly by this method, and apart from the convenience of handling the job may be performed quicker.

The use of a twitch is also advisable when tusks are being removed from boars.

CARCASE YIELD.

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

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

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

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

POINTS FOR THE PIG BUYER.

It is not every day that we buy a pig, so it is worth while remembering a few points when considering the purchase of stores. Having decided the class and type of animals required, the next thing to do is to inspect the pigs on offer. Move them around and inspect each one individually, observing defects like rupture, rough, coarse skin and hair, and estimating what is the real and not the apparent average weight.

A point that cannot be overstressed is that if a pig sale is attended for the purpose of purchasing stores, and there is nothing really suitable on offer, or the prices are too high, it would be wise from a financial point of view to forget all about them.

Far too many people just buy because that was their original intention, forgetting the point as to whether the pigs put up for auction are worth a higher bid.

It is important to know the highest figure that should be bid, and the one which will turn out to be economically sound when the pigs are fattened up to pork or bacon weights. The class and age of the animals, of course, must be considered, but it is just as well to make sure that there is a reasonable margin of profit in prospect when the pigs go eventually to the butcher or the bacon curer. Only a simple calculation is needed, and the error, if any, should be on the low side, for optimism may turn out to be monetarily disastrous.

It is impossible to get away from the fact that some people are born salesmen or born buyers, but the qualities of both can be cultivated. It is a good thing to know just when to "get in" or "get out," but that knowledge must go hand in hand with sound practical farm management. A note of warning: Cheap pigs in low condition are no good to any man, and must eventually cause a heavy instead of a light expenditure.

ON THE SCALES—PIG WEIGHTS.

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

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

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

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

Name and Address.	Name of Hatchery.	Breeds Kept.
F. J. Akers, Eight Mile Plains ..	Elmsdale ..	Australorps
W. Brown, Waterworks road, The Gap, Ashgrove	Strathleven ..	White Leghorns
J. Cameron, Oxley Central ..	Cameron's ..	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca.. ..	White Leghorns and Australorps
J. L. Carrick and Son, Manly road, Tingalpa	Craigard ..	White Leghorns and Australorps
J. E. Caspaney, Kalamia Estate, Ayr	Evlinton ..	White Leghorns
W. Chataway, Cleveland ..	Wilona ..	White Leghorns and Australorps
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
Mrs. M. M. Cousner, The Gap, Ashgrove	Progressive Poultry Farm	Australorps and White Leghorns
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme ..	White Leghorns, Australorps, Rhode Island Reds and Whites
O. M. Dart, Brookfield	Woodville ..	White Leghorns, Australorps, Langshans, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros. ..	White Leghorns
T. Duval, Home Hill	Athalie ..	White Leghorns and Rhode Island Reds
E. Eckert, Head street, Laidley	Laidley ..	Australorps, Langshans, and White Leghorns
Elks and Sudlow, Beerwah ..	Woodlands ..	White Leghorns and Australorps
F. G. Ellis, Old Stanthorpe road, Warwick	Sunny Corner ..	Australorps
B. E. W. Frederich, Oxley road, Corinda	Glenalbyn ..	Australorps
W. H. Gibson, Manly road, Tingalpa	Gibson's ..	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros. ..	White Leghorns
G. Grice, Loch Lomond, via Warwick	Kiama	White Leghorns and Australorps
J. W. Grice, Loch Lomond, via Warwick	Quarrington ..	White Leghorns
Mrs. M. Grillmeier, Milman ..	Mountain View	Australorps and Minorcas
C. and C. E. Gustafson, Tannymorel	Bellevue ..	White Leghorns, Australorps, and Rhode Island Reds
C. Hodges, Kuraby	Kuraby ..	White Leghorns and Anconas
H. Hufschmid, Ellison road, Geebung	Meadowbank ..	White Leghorns, Brown Leghorns, Minorcas, Australorps, and Rhode Island Reds

Name and Address.	Name of Hatchery.	Breeds Kept.
S. W. Kay, Cemetery road, Mackay	Kay's Poultry Stud	White Wyandottes, Light Sussex, Rhode Island Reds, Australorps, White and Brown Leghorns
W. A. Lehfeldt, Kalapa ..	Lehfeldt's ..	Australorps
F. W. R. Longwill, Birkdale ..	Nuventure ..	Australorps, White Leghorns, and Light Sussex
J. McCulloch, Whites road, Manly	Hinde's Stud Poultry Farm	White and Brown Leghorns and Australorps
W. S. McDonald, Babinda ..	Redbird ..	Rhode Island Reds and Anconas
F. W. McNamara, Vogel road, Brassall, Ipswich	Franmara ..	White Leghorns and Australorps
A. Malvine, Junr., Waterworks road, The Gap, Ashgrove	Alva	Australorps and White Leghorns
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White and Black Leghorns
C. Mengel, New Lindum road, Wynnum West	Mengel's ..	Australorps
J. A. Miller, Charters Towers ..	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	White and Brown Leghorns and Australorps
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric	White Leghorns
J. W. Moule, Kureen	Kureen ..	Australorps and White Leghorns
D. J. Murphy, Marmor	Ferndale ..	White and Brown Leghorns, Australorps, Silver Campines, and Light Sussex
A. C. Pearce, Marlborough ..	Marlborough ..	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, and Langshans
E. K. Pennefather, Douglas street, Oxley Central	Pennefather's ..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farms	White Wyandottes, White Leghorns, Brown Leghorns, Australorps, Rhode Island Reds, Langshans, and Light Sussex
G. R. Rawson, Upper Mount Gravatt	Rawson's ..	Australorps
J. Richards, P.O., Atherton ..	Mountain View	Leghorns and Australorps
W. G. Robertson, Bilsen road, Nundah	Ellerslie ..	Australorps, Light Sussex, and Plymouth Rocks
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
S. E. Searle, New Cleveland road, Tingalpa	Tingalpa Stud Poultry Farm	White Leghorns and Australorps
W. B. Slawson, Camp Mountain	Kupidabin ..	White Leghorns, Australorps, and Light Sussex
Mrs. A. Smith, Beerwah.. ..	Endcliffe ..	Australorps and White Leghorns
A. T. Smith, Waterworks road, Ashgrove	Smith's ..	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview ..	White Leghorns and Australorps
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
A. G. Teitzel, West street, Aitkenvale, Townsville	Teitzel's ..	White Leghorns and Australorps
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's ..	White Leghorns, Australorps, and Rhode Island Reds
P. and K. Walsh, Pinklands, via Cleveland	Pinklands ..	White Leghorns
W. A. Watson, Box 365 P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Herberton road, Atherton	Weaver's ..	Australorps, White and Brown Leghorns, Anconas, Minorcas, Rhode Island Reds, Indian Game, and Bantams
H. M. Whitty, Boundary road, Kuraby	Witty's ..	White Leghorns and Anconas
P. A. Wright, Laidley	Chillowdeane ..	White Leghorns, Brown Leghorns, and Australorps

CARE OF GROWING PULLETS.

Any special attention or care given to pullets during their growing stage will be well repaid by greater production when they come into profit.

The main points in management which ensure profitable pullets are:—Perching early, separation of sexes, small units, feeding, and sanitation. Pullets should be taught to perch as soon as possible after they have been removed from the brooder. The earlier they become accustomed to perching, the more they spread at night. This prevents crowding and ensures a good air supply for all.

The separation of sexes as soon as the males can be distinguished gives them a much better chance of making good development. Small units also assist in their development and decreases the percentage of stunted pullets, which is the usual result when large numbers are housed together. It is advisable not to house more than 100 pullets in any one unit.

Feeding also is important. The ration should be correctly balanced and the birds given as much food as they will eat. The birds should be given as much mash as they will consume in about twenty minutes; if they require more, it should be supplied. It is advisable to give two meals of wet mash, one early in the morning and the other at mid-day.

In no circumstances should wet mash be left lying about, as it sours rapidly and puts the birds off their food. Dry mash hoppers should be kept well filled and always open. The feeding troughs of both systems should be long enough to provide ample feeding space. Lack of sufficient feeding space is a very common error in dry mash feeding. At least 1 foot of space should be allowed for each ten birds.

Green feed may be supplied with the mid-day meal, unless the birds have access to a well-grassed run. Wet mash should form the bulk of the mid-day meal, unless the dry mash method is used. In dry mash feeding, a small quantity of mash mixed with the greens will tend to increase the consumption of greenstuff. As an evening meal, the pullets should be given as much grain as they will consume.

Clean, cool, fresh water should always be supplied daily, and the drinking vessels should be kept in a shaded position.

Coarse sand, shell grit, and charcoal should always be available, and kept in suitable containers. Each of these materials has an important influence as an aid to digestion and assimilation of food, and is, therefore, invaluable in maintaining health in the flock.

Sanitation also is important and covers the regular cleaning of pullet pens. Wet patches should not be allowed to surround the drinking vessels, and the treatment of perches with creosote to prevent an invasion of blood-sucking parasites should not be overlooked.

INCUBATOR HYGIENE.

It has been proved conclusively that some poultry diseases are transmitted within incubators. Having this knowledge, it is recommended that every incubator operator should do all in his power to minimise the possibility of the spread of disease.

There is little or no difference in the hatching results of dirty and clean eggs, but the filth on eggs may act as a vehicle in carrying disease, whereas clean eggs minimise such possibilities. Therefore, the first thing to do in incubator hygiene is to clean all eggs before placing them in the incubator.

After the chickens have been taken from the incubator the trays should be scrubbed, using disinfectant in the water, and the interior of the machine washed out with a similar disinfectant solution.

The fumigation of the incubator after washing is another precautionary measure which will considerably minimise the possibility of disease being transmitted within the machine.

Fumigation is a very simple process, and the method recommended is both cheap and efficient. Formalin (40 per cent.) and permanganate of potash are used, the quantities varying in accordance with the cubic capacity of the incubator. The following quantities are recommended: Formalin two teaspoonfuls, permanganate of potash one teaspoonful (scraped level with the edge of a knife), to each 20 cubic feet. Put the container in which the permanganate of potash has been placed in the incubator and pour on the formalin, closing the doors immediately. The doors should be kept closed for at least ten minutes.

POULTRY FEEDING.

Poultry raisers are familiar with the general principles of poultry feeding, but there is the possibility that the necessity for vitamins may be overlooked. Many of our commercial poultry farmers and small poultry raisers have been in the habit of using prepared mashes. These mashes invariably contained cod liver oil—an oil particularly rich in vitamins A and D. It is becoming increasingly difficult to secure supplies of cod liver oil, and it is quite possible that many of our mashes are being prepared to-day in which cod liver oil is not used, and in which it is difficult to make provision for the vitamin deficiency that results.

Vitamin A is essential to the health of the fowl, as in the absence of this vitamin a disorder similar to roup, which is commonly termed nutritional roup, occurs. In these circumstances the poultry raiser has to do something to help himself.

Green feed and yellow maize are two common sources of this vitamin. With the smaller poultry raiser, where birds are running on free range, sufficient supplies of this vitamin are obtained, but with the larger poultry raiser the position is somewhat different. Natural herbage is not available, and during the winter months green feed is not plentiful. Where such is the case it is suggested that lucerne dust or soaked lucerne chaff should be fed as extensively as possible. Let the birds be the judge—if they will eat more, give it to them. This is particularly important where wheat and grain sorghum are being used as the sole grain portion of the ration. Where maize is available and can be economically used in addition to feeding greed feed or green feed substitutes, it should form at least one-third of the grain portion of the ration. This will not only protect your birds against nutritional roup, but will improve the yolk colour of the egg, thereby enhancing its value from the consumer's point of view.

GRAIN SORGHUM FOR FOWLS.

Poultry farmers in Queensland generally have to feed either wheat or maize, or a mixture of both, although on odd occasions other grains, such as grain sorghum, barley, and oats are available in limited quantities.

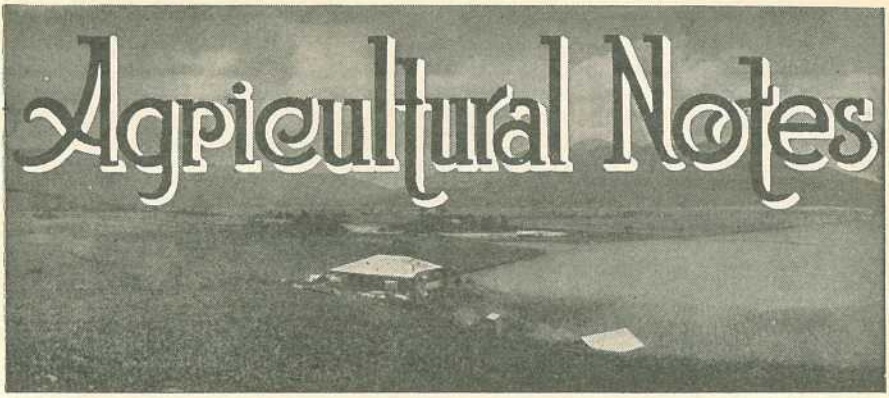
As a result of the activities of the Department of Agriculture and Stock, this season farmers have harvested large areas of grain sorghum. This grain is now available.

Poultry farmers should immediately start feeding grain sorghums to their flocks. As the birds will not be accustomed to this grain, the change should be gradual until such time as the full quantity intended to be fed is supplied each day. As far as is possible, grain sorghum should be used to the extent of one-third of the grain ration at least. Poultrymen who grind grains for the preparation of mashes could replace portion of the other grains with grain sorghum without, in any way, interfering with the food value or the palatability of the ration.

Grain sorghums on chemical analysis compare well with wheat and maize. Experiments conducted in poultry feeding, using grain sorghum, gave favourable results when compared with bran and pollard rations.

In the past, the poultry industry has had to rely on wheat and maize, and frequently these foodstuffs are very scarce and costly, resulting in the margin between food costs and profits being very narrow. In such circumstances, the poultry farmer should encourage the agriculturist to extend the area under grain sorghum by feeding this cereal to his flock. By doing so, this will permit of three foodstuffs being available, and it is well known that a variety of foods increases the palatability of the ration.

The fact that sorghum grains are smaller than wheat should be a decided advantage, more particularly with fowls kept on the intensive system, because when the grain is fed in litter the birds are continuously working and are thus occupied. The feeding of this smaller grain into litter will greatly minimise the vices of feather-plucking and cannibalism.



Legume Inoculation.

THE practice of including a legume crop in a rotation is a common one, and the general belief that the productivity of a soil is noticeably better after a legume than after a non-legume is true, but with the important qualification that this is the case only when an association exists between the roots of the host plant and a certain type of bacteria. Without this association a legume draws on the soil for its supply of nitrogen, as is the case with other plants.

When this association obtains, however, characteristic swellings or nodules are formed on the root system of the host and it is inside these nodules that nitrogen-assimilating bacteria obtain nitrogen from the air and manufacture compounds containing this element which are then passed on to and utilised by the plant for growth. Two beneficial results are obtained from this association. Firstly, the legume itself is furnished with an additional nitrogen supply which enables it to make enhanced growth. This is particularly the case with lucerne when efficient inoculation with the appropriate bacteria greatly aids the rapid establishment of a good stand. Secondly, when the legume is turned in at an appropriate time an increase in soil nitrogen is obtained due to the addition of the nitrogen gained from the air.

Unfortunately, it would appear that these beneficial bacteria are absent from many of our agricultural soils, and under these conditions seed inoculation with a pure culture of the organism—isolated from nodules by bacteriological methods—is essential. These cultures represent a carefully selected strain which has been tested and found to fix nitrogen to the greatest extent, for just as varieties of plants vary in their ability to produce a desired character, so strains of the nodule organism vary in their nitrogen assimilatory capacity. While some strains may be very efficient in benefiting the host plant, others may be of relatively little value, and still others would appear to give no benefit at all. In addition to this, it is important to note that while all nodule bacteria have the same general function of fixing atmospheric nitrogen different cultures are required for different legumes, e.g., a culture of the bacteria suitable for lucerne would be ineffective with cowpeas, and vice versa. Similarly, the strain of bacteria which beneficially associates with garden peas and field peas would be ineffective with white or red clover.

Three points, therefore, immediately suggest themselves—that it is incorrect to presuppose the presence of the appropriate strain of bacteria for one legume just because another legume well equipped with nodules has grown before on the same land; secondly, that if moderate or even good stands of a particular legume are obtained there is no reason to assume that a marked benefit would not accompany inoculation of seed with a selected strain for subsequent sowings; and thirdly, that it is highly desirable that only inoculated seed be sown on new land.

The actual operation of seed inoculation is simple, and consists firstly in obtaining a suspension of the bacteria by mixing the contents of the culture bottle with an appropriate quantity of skim milk. To this is added a small quantity of tricalcium phosphate which stimulates the bacteria to a more active stage, and the seed is then inoculated by pouring the suspension over the seed and mixing thoroughly by hand. In this way each seed is covered with a thin film of milk containing large numbers of bacteria.

Complete directions for carrying out the inoculation, together with the quantity of tricalcium phosphate necessary, accompany any inoculum supplied by the Department of Agriculture and Stock. Farmers intending to sow inoculated seed should write, indicating the amount of seed to be sown, at least ten (10) days before sowing is planned, as this time is necessary for the preparation and despatch of cultures.

COWPEA CULTURE.

The cowpea should undoubtedly be grown much more extensively—as a cash crop for seed, a grazing crop for stock, and for green manure—by Central Queensland farmers than it is at present.

It is a summer annual related more closely to the bean than the pea, and while it thrives best under warm, moist conditions, it grows satisfactorily in the inland agricultural districts and during dry weather, provided that it is warm enough. In addition, this accommodating plant does well on poor soils and is thus useful for enriching them, as it is a supplier of nitrogen.

Cowpeas should be sown from mid-November to mid-December to get the best results. The rates of sowing are very elastic, depending on the nature of the soil, the rainfall, and the purpose for which the crop is required. The sowing may vary from 10 to 20 lb. of seed to the acre, according to variety.

If grown for seed, it is recommended that it be planted in rows 2 feet 3 inches apart at a rate of 8 to 12 lb. to the acre, and from 2 to 2½ inches deep. Seed yields of from 15 to 20 bushels an acre may be obtained under moderately good conditions. The seed can be either harvested and sold—it usually commands a good price (15s. to 20s. per bushel)—or fed in the fields to pigs in conjunction with other foods. A variety grown for seed should be one of the kinds which have been especially developed for seed production as against vine production. The black cowpea is a good type, but others—such as Poona, Groit and Brabham—are now gaining favour.

The cowpea is an excellent crop for grazing, especially for soils and districts where lucerne does not flourish. Having a high protein content, it supplies the necessary balance to the crops of low protein content—such as Sudan grass and other fodders of that type—and thus enables the farmer to provide feed with a proper nutrient ratio for his stock.

As a grazing crop, the best results—unless rainfall is abundant—are obtained by planting in rows 2 feet 3 inches apart and cultivating once or twice. The crop will be ready for grazing in 50 days or so, and yields of from 6 to 8 tons an acre of green fodder may be produced in 70 days under good growing conditions. Many varieties suitable for grazing are available, but Victor cowpea has yielded the heaviest growths in the shortest time at the Biloela Cotton Research Station, producing over 15 tons green weight to the acre in 70 days.

As a green manure crop cowpeas are valuable for orchards or general farm rotations—their deep rooting and nitrogen-fixing habits making them especially suitable for this purpose. Such a planting may be broadcast or sown through a grain drill, and will require 15 to 20 lb. of seed to the acre.

In rotations, the cowpea is an excellent predecessor to a cereal, and is recommended to the notice of dairymen who grow winter wheat or oats for their cows. It should not precede cotton, however, as the nitrate stimulus which follows induces a rank growth of the cotton plant which usually results in a reduced yield.

SUDAN GRASS SEED.

Buyers of Sudan grass seed should make certain that their purchases comply with the prescribed germination standard of 70 per cent.

An examination of seed offered for sale has revealed many undersized and mouldy samples of poor germination, containing an abnormal quantity of unformed or sterile seeds.

Any farmer in doubt as to the quality of seed may forward a 4-oz. sample to the seed-testing station, Department of Agriculture and Stock, Brisbane, for a free test. In doing so, care should be taken to mark the sender's name and address clearly in block letters on the sample, which should be accompanied by a letter of advice of the despatch.

LUCERNE AS A GRAZING CROP.

The success of lucerne as a grazing crop depends so much on the way in which it is treated during growth that every consideration should be given to methods which will prolong the life of the stand and ensure maximum production from it.

If possible, grazing by heavy stock should be avoided for the first twelve months, the best method being to run sheep on the new stand of lucerne and feed only half the growth. This promotes maximum root development at an early period, and establishes greater resistance against summer heat and dry weather.

A common cause of failure with lucerne is overstocking. In a dry spell, when native grasses are going off, there is every temptation to crowd stock on to lucerne paddocks, and the crop is thus over-grazed. Even if plantings have to be made progressively year by year, every effort should be made to bring the area of lucerne up to a level consistent with the maximum number of stock it will be expected to carry. After some experience this can be done without much difficulty, taking into consideration such factors as soil type, carrying capacity of the property, other crops grown, and the conserved fodder available.

Rotational grazing is very desirable with lucerne. Feeding off has to be controlled in order to prevent grazing too close to the ground, which injures the crown of the plant, and may thin the stand out considerably. Grazing in one large paddock is very wasteful.

One of the most important factors in lucerne management is renovation. The beneficial results following this practice have been amply demonstrated on the Western Downs, and it can be stated quite definitely that renovation at least once or twice a year is essential. Tines are preferable to discs for this work because of the danger of cutting the crowns with disc implements. The stirring of the soil around plants helps in the distribution of manure over the paddock, aerates the soil, allows rain quicker access and easier penetration to roots, and forms a soil mulch which decreases the evaporation of moisture. Renovated paddocks, therefore, retain vitality for a longer period, recover more rapidly after grazing and after rain, and are less likely to thin out during droughts.

COTTONSEED MEAL.

Different animals require rations of different compositions, and a study of the distinction between maintenance and productive requirements should be made before deciding on a suitable ration. For example, dairy cows in milk require plenty of protein in the ration if they are to produce to their fullest capacity. Breeding sows require much more protein than fattening pigs. Young growing stock of all descriptions require more protein than adult stock. There is a tendency among some farmers to buy the cheapest feed, irrespective of its analysis; such a practice is often false economy. At this time of the year protein is usually of prime importance, so that, for most classes of livestock, the protein content of the feeds to be used or purchased demands first consideration. If the natural feed is low in protein and thus unbalanced, it is obvious that the feeding of, say, wheatmeal (or barley meal) just because it happens to be cheapest, is not going to give good results, as both are relatively low in protein and high in carbohydrates. In such cases, cottonseed meal (of the grade containing 30 per cent. protein, which can be had for £8 per short ton) is usually much better, especially for dairy cattle. Not only is the protein of good quality, but it is readily digested and palatable, so, under the conditions mentioned, cottonseed meal is worth more than meals of low protein content.

It should always be borne in mind, too, that a ration containing several different ingredients will invariably give better results than a single meal, the reason being that the animal body demands proteins of many different kinds from which to build up the complex proteins in wool, meat, milk, &c. Cottonseed meal combines excellently with pollard, wheat, maize, barley, and other meals of lower protein content, and also with meat and milk proteins used for pig feeding. Although it was once thought that cottonseed meal could not be fed to pigs, research in recent years has proved that a ration consisting of a low protein meal combined with cottonseed meal and meat meal is best, resulting in rapid and economical weight gains and a first-grade carcase for either pork or bacon.

Many sheepowners have obtained excellent results from feeding cottonseed meal as a supplement to pastures of poor protein content, and undoubtedly the feeding of such supplements will become more general in the near future. Graziers would do well to give serious thought to supplementary feeding of cottonseed meal at certain times of the year when pastures begin to fail. A planned experiment on a small scale will very often prove a real eye-opener.

FARM GATES.

On every farm there is always a lot of maintenance work to be done, such as fencing repairs, the making and hanging of gates, the painting of buildings, and the overhauling of machinery, implements, and harness. Some of these jobs can be done during dry weather, and others are better reserved for rainy days.

It is advisable to give attention to the outside jobs first, and, of these, the erection and repair of gates is important. It is surprising to find so many make-shift gates on the farm when strong light gates can be made or bought at very reasonable prices.

Of the different types on the market, the wooden gates are the best, as those having a steel pipe frame, if once bent out of shape, are difficult to straighten, whereas a broken rail or two can readily be replaced. The self-opening types are favoured by some farmers, but these are more expensive and more liable to get out of order than the simpler kind.

Gates should always be swung on good heavy posts placed 4 feet in the ground, with a sill log in between. The hinges, which should be strong, are generally placed in a vertical line. Occasionally, it is desirable that the foot of a gate should lift when opened, and this can be arranged by placing the lower hinge half an inch off the plumb in the opening direction.

The materials required to make a double five-barred bolted gate for a 12-foot opening without any morticing are—

112 running feet of 3-inch by 1-inch or 4-inch by 1-inch timber;

3 lb. of 3½-inch by ⅜-inch bolts and washers;

2 pairs hook and eye hinges 2 feet by 2 inch by 5/16 inch.

Butts and heads should be cut 4 feet long, and should be double—that is, placed on each side of the bars. The bottom of the first rail should be 3 inches from the bottom of the upright. The distance between the first and second rails should be 6 inches; between second and third, 6 inches; between third and fourth, 7 inches; and between fourth and fifth, 8 inches. There should be two double stays on either side of rails on each gate, running from the bottom of the butt to the top of the head.

When hinges are being placed in position, small pieces of 3-inch by 1-inch timber should be inserted against the rails for packing purposes. A sliding piece of 3-inch by 1-inch timber along the third rail between the stay and the head makes an excellent fastener.

Gates are not finished until they have been painted, and if the first two coats are given before the gates are put together, the job will be easier and considerable time will be saved.

CARE OF IMPLEMENTS KEEPS DOWN COSTS.

Care of farm machinery keeps down costs in running a farm by saving expense in repairs and replacements.

Regular and thorough lubrication always pays. A few minutes occasionally spent in checking over adjustments, overhauling canvases, tightening up loose nuts, and so on may often prevent a breakdown and save both worry and expense at a busy time, apart from the fact that a timely overhaul, particularly of harvesting or seeding machinery, will ensure that any duplicates which may be necessary are available when required.

A shed should be the only home for the plough, combine and header, and, in fact, all machinery when not in use. Machinery depreciates quite heavily enough, even when used and looked after with care; continuous exposure to the elements probably doubles depreciation.

Another point well worth consideration is to know when to scrap. New and better machinery is being evolved almost every year, and with which faster and more efficient work can be done, so there is every temptation to scrap or sell what one has and buy the newer model. Sometimes it does pay to scrap existing plant and buy the more efficient implement—the header has replaced the stripper, the combine the drill, and so on—but every additional purchase should be considered on its merits. The question should be: Will it pay? Can the old machine be adapted to approximate the work of the new one? Prematurely placing a half-worn machine on the scrap-heap or market just to save a few days with a new implement may not be profitable. It is a matter which calls for careful thought, with an eye always on practical farm economy.

THE CONTROL OF MEAT ANTS.

The meat ant is a common and widely distributed insect which nests in mounds. These mounds may be several feet in diameter and are raised slightly above ground level. A number of entrance holes lead to an extensive series of subterranean galleries, where eggs are laid by the queen and the immature stages are tended by the workers. Distinctive foraging tracks lead from the nests, often for a distance of some chains.

Though they seldom attack plants, meat ants have a considerable nuisance value if the nests are close to buildings, stock yards, &c., for the workers invade food stores, find their way on to animals, and, though not capable of stinging, frequently bite both man and beast. Quite apart from these characteristics, the nests themselves often disfigure paths, gardens, and tennis courts, and there they must be destroyed.

Control should be carried out at the nest itself; palliatives which aim at merely protecting buildings from invasion have no permanent value and are seldom really effective. Fortunately, the nests can be easily located and their destruction by fumigation is a comparatively simple matter. Two fumigants can be used; these are carbon bisulphide and calcium cyanide.

When using carbon bisulphide, a small quantity of the liquid is poured into each entrance hole and the mound is then covered with wet bags. Three or four minutes later the bags are removed and a light, held at the end of a pole not less than 5 feet in length, is placed at several points on the surface of the mound. A series of muffled explosions follows, and these shatter many of the subterranean galleries penetrated by the gas. Five minutes later the bags are replaced over the mound. Nests up to 4 feet in diameter require about half a pint of carbon bisulphide, but a greater quantity must be used in larger nests.

Calcium cyanide releases prussic acid gas on exposure to the air. It is introduced to the nest by a blower or simply by pouring it into the entrance holes. All these must be treated and then plugged to prevent the escape of the fumes. From 1 to 4 oz. of calcium cyanide are required, the amount depending on the size of the mound.

Frequently mounds are linked by underground tunnels, and unless all those linked in this way are treated, repopulation of any one which may be fumigated is rapid. All mounds in an area should be fumigated and not merely the one which is the apparent nuisance. Treatment should also be carried out when the greater part of the colony is within the mound and when the soil is comparatively dry. Both fumigants are poisons and must be used with the requisite care.

THE PASTURE SEED-BED.

Seed-beds of various types, ranging from uncultivated forest land to the onion-bed type, are used for sown pastures. The seed-bed provided by partly cleared forest land, even though some form of harrowing has been done, is very unsuitable for pasture establishment, the competition of native grasses and undergrowth usually proving too vigorous for the seedlings of sown pastures. Likewise, established pastures of native or other grasses are not receptive of additional pasture plants unless a disturbed seed-bed is provided, and a temporary check given to the growth of the established plants by drastic harrowing. The ashes from scrub burns provide quite a good seed-bed for pasture plants.

By far the best seed-bed is that resulting from the thorough tillage of fertile soil. Most of the common pasture plants have small seeds and require a seed-bed of fine tilth, and by compacting the soil close to the surface a seed-bed is provided which is favourable to the fine, early root systems of the pasture plants. The seed-bed should contain ample moisture, and in dry districts particularly, cultural operations throughout the seed-bed preparation period should be done with due regard to the conservation of moisture. Ploughing well in advance of sowing is desirable, and the land should be allowed to lie in the rough state for a few weeks before further cultivation is undertaken. Heavy tine harrows, or a spring-tooth cultivator, will be required to break down the clods. Subsequent working should be designed for the destruction of weeds and the compaction of the sub-surface soil, and shallow harrowings will help. If the land becomes weedy and the surface sets hard, a disc harrow may have to be used to destroy the weeds. Rolling before sowing may be desirable in cases where the ordinary cultivation has not sufficed to form a fine seed-bed.

Colouring Citrus Fruits.

AS citrus fruits are only sold to best advantage when they are mature, full flavoured and showing an unblemished skin with its normal ripe colour, aid in colouring fruit lacking in normal colouring, but which possess the other required qualities, will enhance their market value.

All who have had experience in citrus-growing in various districts agree that certain varieties of oranges and mandarins growing in the cooler regions have ample colour long before they attain sufficient sugar to make them desirable for eating purposes, while fruits produced in warmer climates are sweet and luscious for some time prior to their attaining a normal ripe colour. It is these latter fruits, and also lemons, which are, as a rule, picked when they come within a standard range of sizes, and not left to colour on the tree, that colouring may sometimes be advantageous.

The colouring or forced curing, a practice known in California as "sweating," was formerly done by gas generated from kerosene stoves. In 1924, Denny* found that ethylene gas in small quantities—1 part in 10,000—was capable of producing the same results. He also found, however, that a very high percentage of gas (for example, 80 per cent.) delayed colouring. Colouring also was delayed by temperatures as high as 92 degrees F. and as low as 45 degrees F. A temperature of between 60 and 70 degrees F. with a humidity of from 70 to 75 per cent. was found satisfactory.

Ethylene gas can be obtained in metal cylinders under high pressure, with regulator valves attached to the cylinders. When released from the regulator valve, the gas is conveyed by tubing into the colouring chamber. The quantity of gas passing into the room is recorded by the valve on the cylinder, so the correct charge according to the size of the chamber can be readily determined.

It also has been found that a very small quantity of acetylene gas (1 part in 5,000) colours satisfactorily mature citrus fruits. To determine the dosage required, the air space remaining after the chamber has been loaded should be known. One ounce of carbide generates sufficient gas for every 75 cubic feet of air space. For practical purposes, it is sufficient to allow 1¼ cubic feet displacement for each bushel case of fruit placed in the chamber. For example, the following table illustrates the dosages required for a chamber of 200 cubic feet capacity with a varying number of cases:—

No. of Bushel Cases.	Air Space.	Dosage.
40 ..	150 cubic feet ..	2 oz. carbide
20 ..	175 cubic feet ..	2⅛ oz. carbide
10 ..	187½ cubic feet ..	2¼ oz. carbide

* F. E. Denny, Jour. Ag. Res. (1924).

The colouring of citrus fruits is accompanied by greatly increased respiration. The life processes are stimulated, and usually an abscession layer is formed that results in the loss of "buttons." It has been found that certain forms of physiological breakdowns are greatly aggravated, more especially red blotch and, to some degree, membranous stain. If the gas is too strong, it may weaken the tissue and open the way for moulds, stem-end rots, and other forms of decay resulting from weakened tissue; this, however, can be greatly reduced by keeping the gas sufficiently dilute.

Too much stress cannot be given to the fact that the utmost care should be taken if the successful colouring of mature citrus fruits is to be accomplished.

Some of the factors operating while the fruit is on the tree are moisture, temperature, wind, insect, and other injuries, cultural conditions and time and rate of growth of the fruit. Moisture, as well as temperature in both air and soil, is important in determining whether weak or strong fruit will be produced. Wind, in affecting moisture and in producing injuries from which decay may be accelerated during colouring also are important factors. Cold or extreme heat, both conditions of temperature, also are contributing factors towards decay. These extremes may impair the resistance of the fruit, even when the tissue is not visibly affected. The time and rate of growth of fruit also are important factors.

To colour oranges, mandarins, and grape fruits satisfactorily, they should have reached maturity, for if too green or immature they will not develop a normal ripe colour, but will shrivel and become dull and dirty in appearance. Lemons are picked, as a rule, when they come within a standard range of sizes. Lemon trees bloom and bear fruit during all seasons, and must, therefore, be picked at frequent intervals. The best lemon for market is one picked when green and left for several weeks in the packing shed to colour. As lemons colour on the trees at different sizes, depending on the season and physiological condition of the tree, the picked fruit as it comes from the orchard is usually made up of what is known as "dark green," "light green," "silver," and "yellow" or "tree ripe."

All fruits to be coloured require to be treated with special care in handling. Due regard also should be given to factors operating while the fruit is on the tree—such as irrigation, rains, winds, and extreme temperatures immediately prior to or at picking—as these are important factors governing the resistance of the fruit against physical breakdowns and decays.

Bruises show up as greenish areas; oil liberated from the rind may cause spotting; while if the residue of oil or Bordeaux sprays remains on the fruit, it will be found to come from the colouring room spotted and unsightly.

Colouring chambers may be built of timber, or other suitable materials insulated and lined. Ventilators should be placed opposite to the door. A convenient and economical size is one to hold from 40 to 50 bushel cases. Allowing 5 cubic feet air space for each case, the chamber would require to be 200 to 250 cubic feet in capacity. Even where large numbers of cases are to be treated, it will be found more satisfactory to build two medium-sized chambers than one large one.

For oranges, mandarins, grapefruit, and lemons, an average temperature in the chamber of between 65 and 75 degrees F. will prove satisfactory. If the temperature falls below 65 degrees F. the colouring process is retarded. On the other hand, high normal temperatures are not likely to affect the fruit, no ill effects having been shown by temperatures up to 89 degrees. However, the humidity will require to be adjusted; in the case of a very dry atmosphere an open container of water may be introduced to moisten the air and prevent withering of the fruit; while when the humidity is high and likely to cause softening of the fruit, it may be reduced by placing sand, caustic soda, or quick lime on the floor of the chamber.

All fruits should be sweated for twenty-four hours before being placed in the colouring chamber, graded for colour and placed loosely in trays or open cases having plenty of ventilation. Dunnage or "packing" should be used in stacking so that free circulation around each case is permitted.

The required amount of ethylene and acetylene gas is introduced slowly into the chamber—in the case of ethylene by opening the regular valve; and of acetylene gas by placing the required quantity of carbide in a suitable container, arranging a second vessel containing water in such a way as to permit the water to slowly drip on to the carbide, thus generating the gas which is led into the chamber by means of suitable piping.

After closing the chamber and making sure that it is airtight, it should be charged and allowed to remain closed for four hours. It should then be opened and aired thoroughly for at least two hours, after which it may be charged again, and the performance repeated as often as necessary. Between nine and fifteen charges should be sufficient to give mature citrus fruits their normal ripe colour.

TOMATO SEED-BED DISEASES.

The following diseases may occur in tomato seed-beds in Queensland:—Irish blight, target spot, Septoria leaf spot, bacterial wilt, Fusarium wilt, bacterial canker, damping-off, and possibly the virus troubles. Growers planting seed-beds at the present time—e.g., those in the Stanthorpe area—are not likely to be troubled with Irish blight, but target spot and collar rot (both of which are caused by the same fungus) may be serious.

The utmost care in managing seedbeds is always justified, for here the whole crop is concentrated into one single patch. As a result of this proximity of the plants to each other the spread of a disease is often very rapid and the effect disastrous, resulting in the loss of several weeks in planting up and the failure to catch the advantages of an early market.

There are three points during the production of tomato seedlings at which some control of diseases may be exercised—

(i.) Before planting seed, by—
  (*a*) Sterilising the seed-bed;
  (*b*) Disinfecting the seed;

(ii.) At the time of planting, by arranging the seed in rows instead of broadcasting it;

(iii.) After emergence of the seedlings, by dusting and spraying with a fungicide.

Seed-bed.—The placing of a seed-bed on virgin soil is usually sufficient protection against soil-borne troubles other than nematodes, but if there is any doubt about this point then sterilisation should be practised. The two most suitable methods are by fire and by formalin.

Firing.—Brushwood and branches should be laid evenly over the bed and the surrounding margin. The quantity of wood required can be reckoned as the equivalent of a solid layer of about 3 inches thick. The soil should be moist and neither dry nor excessively wet when firing takes place. Where wood is readily available the fire is the cheapest method.

Formalin.—When using formalin in the seed-bed, allowance should be made for the fact that the seed cannot be planted until some twelve to fourteen days after application of the liquid. The beds are prepared ready for planting, and preferably should be moist but not wet. If the soil is dry use a 1 per cent. solution of formalin (1 gallon of commercial formalin in 100 gallons of water), and apply with a watering can at the rate of 10 gallons to the square yard. If the soil is moist, use a 2 per cent. solution of formalin watered on at the rate of not less than 5 gallons to the square yard. The beds, as soon as treated, are covered with sacking for two or three days to keep in the fumes. They are then aired for a further ten days or until the odour of formalin can no longer be detected, after which they are ready for use.

The target spot organism, which causes a black spot on the stem and may result in the seedlings suffering a collar rot just at soil level, appears to carry over in the soil. Other damping-off organisms may also be present.

Seed.—Seed treatment has always been a general recommendation, though only a few growers have made a routine practice of it. In the light of recent observations, however, it is strongly recommended that all growers should treat their tomato seed with corrosive sublimate before planting. If it is known that the seed has come from a sound, healthy crop, then treatment is not necessary. In most cases, however, the seed source is not known.

Tomato diseases shown to be carried by the seed include Irish blight, target spot, Fusarium wilt, bacterial wilt, bacterial canker, and mosaic.

It must be understood clearly that the action of this corrosive sublimate treatment is to destroy any disease-producing organism which may be adhering to the outside of the seed, and so prevent the introduction of a disease into the seed-bed. It does not in any way protect the seedling against a disease which may attack it after it has emerged. A small percentage of the disease organism may be present inside the seed, and so be unaffected by the treatment, but this is usually of no practical importance. In the case of bacterial wilt and bacterial canker, seed treatment is the most important method of control.

The seed treatment is summarised as follows:—

The tomato seed is placed in a piece of mosquito netting and suspended in a solution of corrosive sublimate (mercuric chloride), one part to 3,000 parts of water,

for five minutes. The seed mass is stirred occasionally with a wooden stick during this period to remove air bubbles. After that it is thoroughly washed in four or five changes of water and dried. It is recommended that the seed be sown immediately after treatment. Corrosive sublimate tablets, with directions for the preparation of the solution, should be obtainable at any chemist.

Planting.—Growing conditions include many factors, of which the more obvious —such as soil tilth and sufficiency of plant foods—are well known to growers. The point for consideration here is whether the seed should be broadcast or planted in rows. In order to control disease better, the latter method is preferable. Distances of about 6 inches between rows allow easy penetration of the dust or spray to the stems, and also prevent the formation of a still, humid atmosphere beneath the leaf canopy, as is found when plants are broadcast.

Spraying.—Regular spraying or dusting with a copper compound is necessary. If using a wet spray, Bordeaux mixture of 2-3-40 strength is recommended. Care should be taken not to spray the seedlings too heavily, as an accumulation of spray liquid in the centre of the plants may result in a burning of the young foliage. In the case of dusts, any of the proprietary copper dusts may be used. Heavy applications of these dusts should not be made on seedlings if much free moisture is present on the young plants, especially if warm weather is likely to follow. Under such conditions burning may result with either copper carbonate or copper sulphate dusts.

At various times the grower will have to include in his spray or dust arsenate of lead and nicotine or nicotine sulphate for insects such as caterpillars and aphids. For tomato mites a separate dusting with sulphur is the most suitable. Dust mixtures are available which contain the various insecticides in addition to copper compounds.

JERUSALEM ARTICHOKE.

Like the sweet potato, the Jerusalem artichoke should attract much more attention as a crop than it does at present, more particularly by pig raisers in the drier farming districts, for not only is it drought-resistant, but its tubers are highly nutritious as well. The yield may range from 6 to 8 tons or more per acre, and although the plant does best on good friable loams, it will thrive on sandy, gravelly, or clayey soils, which enables the poorer patches of soil on the farm to be put to a profitable use.

The area intended for Jerusalem artichokes should be prepared in much the same way as for potatoes. The crop may be planted in early spring in furrows 3 feet apart, with the sets 2 feet apart. This spacing with medium-sized tubers will entail the use of between 4 and 5 cwt. per acre.

As with maize and potatoes, until the crop is 4 inches high, all cultivation can be done with tined harrows working across the drills. Afterwards, the cultivator should be used as the condition of the soil and weed growth necessitates.

PASSION FRUIT.

Passion fruit vines are prone to several diseases which, with proper attention, can be controlled, but which, when the vines are allowed to grow uncared for, quickly destroy them. Because of these diseases and the old haphazard method of cultivation, the idea has become current among orchardists that vines can be grown only for about two or at most three years. That this is erroneous has been demonstrated by growers who have made passion fruit culture their main occupation, and who have vines bearing well at seven years of age. These growers, however, prune correctly and spray at the right times, as advised by officers of the Department of Agriculture and Stock. They also grade and pack their product carefully for market.

It is stated by some that passion fruit growing entails too much work pruning and spraying, and that the results are not worth it. That is not necessarily so. Pruning the vine certainly is a tedious and lengthy operation. Spraying also is objectionable, but it should be remembered that citrus growers, grape growers, and practically all other fruit growers must also prune and spray.

Good passion vines produce up to half a bushel of fruit a year. They are usually planted 15 feet by 8 feet apart, or 363 vines to the acre. On a conservative average of 3s. 6d. per half-bushel clear of marketing expenses the return would be £63 per acre per annum. Are there many other fruit crops netting orchardists this sum per acre?

The passion vine thrives in warm, moist situations, preferably in the coastal districts. It grows well on the coastal highlands, like the Blackall Range and Tamborine Mountains, and also on the lowlands between these and the sea. The vine will resist light frost, but heavy frosts will cause damage.

Reasonably fertile scrub and forest loams, provided they are well drained, are suitable soils, and if a hillside site is chosen it should be well sheltered from heavy winds, and preferably have an easterly or north-easterly aspect. It is important that the trellises be strongly made, and that they be at least 6 feet in height.

Two crops are borne each year, a summer and a winter crop, while occasionally intermediate crops are borne.

Spring is the best time to plant, although autumn planting is sometimes practised. Spring-planted vines sometimes return a small crop the following winter, but the first main crop can be looked for twelve to fifteen months after planting. With autumn-planted vines the first main crop often is not obtained until eighteen to twenty-one months after planting.

A pamphlet giving full cultural details is available free on application to the Department of Agriculture and Stock.

THE WATER MELON.

Three essential requirements for successful water melon production are a warm climate, a reasonably fertile soil, and abundant water. Because of the latter necessity, commercial production is practically limited to coastal districts, although inland good crops can be grown where irrigation is available. The most suitable soils are those of a sandy loamy nature, to which has been added a fair amount of organic matter, preferably animal manures where these are available.

An application of artificial fertilizer worked into the soil a week or so before planting also is desirable, and the following is recommended per acre:—

1½ to 2 cwt. sulphate of ammonia.
3 to 4 cwt. superphosphate.
1½ cwt. sulphate of potash.

The land should be deeply ploughed during the winter, and properly broken down ready for planting in the spring. In the southern part of the State, August and September are the best months to plant, though seed sowing may be carried on until December. Further north, planting may commence in July.

Seed may be planted singly about 1 inch deep and 2 feet apart in rows about 4 feet 6 inches apart, or three or four seeds may be planted together in "hills" made about 6 feet apart each way. Two pounds of seed are required to plant an acre.

Rotation of crops should be practised with melons, which should not occupy the same ground for more than two years in succession.

When the main runners are 4 to 6 feet in length, or when the first flower drops and the fruit starts to set, the tips may be cut off to induce the vines to branch. In no case, however, should the pruning be done closer than two or three joints from the nearest flower or setting fruit. Whilst the vines and fruit are growing, they must be kept well watered, and if the weather is excessively hot it is advisable to cover each melon with a handful of straw. When the fruit begins to ripen the water supply may be cut off.

Water melons take three to four months from seed sowing to maturity.

Difficulty is often experienced by new growers in determining when a melon is ripe and ready to pick. Some experts can tell by giving the fruit a slight crushing, when the creaking of the breaking flesh inside will indicate ripeness. Apart from

this, there are two sure ways of testing for ripeness. When the little tendril on the vine near where the fruit breaks away begins to wither, it indicates that the fruit is ripening; but when the tendril at the next joint of the vine also dies, the melon is ripe.

Another test is to turn the melon over and examine the skin which has been in contact with the ground. At first that part is white, but as the melon ripens it turns a darker colour.

Some good varieties are:—

Early Yates.—Extra early maturing, medium size, good cropper, light mottled green colour.

Kleckley Sweet.—Long dark green, medium to large size, excellent flavour.

Tom Watson.—Large dark green, good carrier.

Cuban Queen.—Very large long melon, good carrier.

HOW TO PLANT A DECIDUOUS FRUIT TREE.

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

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

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

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

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

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

When planting the tree allowance must be made for the looseness of the ground in deciduous fruit areas in the Stanthorpe district. If the tree is set only as deep as the collar, it will be well out of the ground twelve months later when the land has settled down. Hence, to ensure the best results, the collar of the young tree should be from 4 to 6 inches below the surface of the ground. In twelve months' time the collar will be at the proper depth—namely, level with or just under ground level.

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

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

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

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

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

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

SOIL EROSION NATURE'S "FIFTH COLUMN."

If a certain amount of control work is done every year in the way of conserving both soil and fertility on holdings that are subject to erosion, almost any farm can be put in a safe position in ten years.

That opinion was expressed by Mr. H. A. Fraser, project manager of the Cowra Soil Conservation Research Station (N.S.W.) at a recent field day. To carry out conservation effectively, he said, it was necessary to go into the question of altering the land use practice. Land too steep for cultivation should be put down to pasture and the flatter and low slopes should be devoted to cultivation on a wide rotation basis. Every effort should be made to reduce the incidence of bare fallow from the customary once in two years to once in four, five, or even six years.

Cultivation land subject to erosion should be contour farmed with the necessary contour banks correctly located and constructed properly to detail. Consideration was necessary, first of all, to the disposal of the water, and in many cases a waterway should be established before the banks were built. The best form of outlet protection was vegetative cover.

Landholders were warned against the indiscriminate diversion and haphazard placement of contour banks, and advised them, before embarking on major works, to consult competent authorities and start out with a general farm plan.

The adoption of a sound rotation system, in which pasture improvement was given its correct place, was the most important basis on which to found conservation activities.

"The practice of burning stubble should be immediately dispensed with," said Mr. Fraser. "This valuable material should be left to rot and cover the ground in the late summer or autumn, when the much-needed protection will prevent an excessive amount of damage being done by seasonal storms. The feeding of stock to relieve the strain on pastures and vegetative cover would do much to reduce the menace of erosion."

The use of increased amounts of superphosphates on crop or grassland would increase the amount of grass cover and grazing available, and would, when managed correctly, provide permanent cover for the greater part of the year.

THE FRUIT MARKET.

JAS. H. GREGORY, Instructor in Fruit Packing.

MARCH is always a month of transition from temperate to tropical fruits. Now is the time for special attention to every requirement of the interstate markets, for Queensland has practically a monopoly of the tropical fruit supply. To establish and maintain a reputation for quality should be the aim of every grower, and popular demand depends on a regular supply of good quality fruit at reasonable retail prices. Carelessness in marketing methods increases the quantity of unsaleable fruit to such an extent that even though retailers buy cheaply, the quantity of first-grade saleable fruit is so small that high prices have to be obtained to cover waste. While the effect of careless methods is bad on the Brisbane market it is very much worse on the Southern markets. During a recent duty tour of the Sydney markets, one was staggered (there is no other words for it) by the amount of avoidable waste and other depreciating factors which characterised some Queensland consignments. This avoidable waste costs the Queensland industry hundreds of pounds weekly—that is money directly out of the pockets of growers, because of sheer neglect of the observance of sound principles in fruit marketing.

Here is a summary of some of the faults observed in different consignments from this State:—*Pineapples*—Some consignments were affected by water blister to the extent of 100 per cent. Old factory packing cases contained the worst lines under offer. Faulty handling of fruit was too frequently in evidence. Growers should know that pineapples should not be cut or trimmed in any part, whether tops, bottoms, or abnormal growths. *Bananas*—Much fruit was arriving on the markets which had obviously been packed when "plantation ripe." *Custard Apples*—Most lines were in good condition, but some were affected with mealy bug. Fruit should be mature and free from pest attack. *Grape Fruit*—Some poor seedy lines were observed. Present prices are high, but if growers, as in past seasons, send immature fruit, values will soon topple over. *Papaws*—The mixing of coloured fruit with fruit showing no colouring in the one case reduced the value of consignments. During the December-March period, all care should be taken with our tropical fruits to exclude damaged units, or units advanced too far towards full ripeness, from market consignments, because of the humidity usual during that period causing skin damaged or ripe fruit to "break down" quickly. Practices which a grower may "get away with" during cooler weather will greatly reduce his returns from his summer consignments. On the other hand, ripe fruit may be placed on the Brisbane market with less risk of the loss that is the usual experience with faulty fruit, or fruit too near complete ripeness, in the interstate trade.

Prices during the last week of March were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Smalls, 7s. to 13s.; Sixes, 9s. to 16s.; Sevens, 7s. to 17s.; Eights, 9s. to 18s.; Nines, 8s. to 17s. Bunches, 3d. to 10½d. dozen. Lady Fingers, 3d. to 7½d. per dozen. Sugars, 3d. to 6d. per dozen.

Sydney.—Cavendish: Sixes, 11s. to 14s.; Sevens, 13s. to 15s.; Eights and Nines, 16s. to 19s.

Melbourne.—Cavendish: Sixes, 11s. to 14s.; Sevens, 14s. to 16s.; Eights and Nines, 16s. to 18s.

Pineapples.

Brisbane.—Smooths, 2s. to 5s. per case; 1s. to 4s. per dozen. Roughs: 5s. to 9s. per case; 1s. 6d. to 5s. per dozen.

Sydney.—Smooths: 5s. to 10s. per case. Small sizes slow of sale.

Melbourne.—Smooths: 6s. to 11s. per case. Small sizes slow of sale.

Papaws.

Brisbane.—Yarwun, 10s. to 24s. tropical case.

Sydney.—10s. to 15s. tropical case.

Custard Apples.

Brisbane.—4s. to 5s. half bushel.

Sydney.—5s. to 8s. half bushel.

Melbourne.—6s. to 8s. half bushel.

Monstera Deliciosa.

Brisbane.—3s. per dozen.

Sydney.—3s. to 4s. half bushel.

CITRUS FRUITS.

Oranges.

Brisbane.—Navels: 7s. to 9s. bushel. Valencias: 6s. to 8s.

Sydney.—Navels: Queensland hard of sale, immature, and poorly coloured. Valencies: 5s. to 9s.

Grapefruit.

Brisbane.—6s. to 8s. bushel.

Sydney.—Gayndah, 16s. to 20s.; others 8s. to 14s.

Melbourne.—14s. to 17s. Only choice varieties wanted.

Lemons.

Brisbane.—6s. to 14s. bushel.

Sydney.—Gayndah, 13s. to 18s.; others 6s. to 12s.

Rosellas.

Brisbane.—2s. to 3s. bag.

Sydney.—3s. half bushel.

Passion Fruit.

Brisbane.—Firsts, 8s. to 12s. half bushel; Seconds, 4s. to 6s. half bushel.

Figs.

Brisbane.—7s. to 9s. dozen boxes; trays, 2s. to 3s.

Grapes.

Brisbane.—Coleman, 4s. to 5s.; Waltham Cross, 3s. 6d. to 8s.; Black Muscat, 2s. to 7s.; Purple Cornishman, 6s. to 9s.

Sydney.—Queensland Colemans, 2s. to 6s.; Walthams, 4s. to 7s. Many lines of Colemans over-ripe during third week of March.

Apples.

Brisbane.—Stanthorpe Granny Smith, 6s. to 7s. 6d. Imported dessert apples, 7s. 6d. to 9s.

Tomatoes.

Brisbane.—Ripe, 3s. to 6s 6d.; coloured, 4s. to 9s.; Stanthorpe, green, 2s. to 4s.; local, green, 3s. to 6s.

Sydney.—Victorian Portland, 12s. to 14s. bushel; New South Wales, Orange and Barlow, 4s. to 8s. half bushel; Stanthorpe, 3s. to 5s.

VEGETABLES, ETC.

Beans.—Stanthorpe, 10s. to 13s. bag; others, 7s. to 9s.; Sydney, 5s. to 10s. case.

Peas.—Stanthorpe, 8s. to 11s. bag.

Cabbages.—Stanthorpe, 6s. to 10s. bag. Local, 1s. to 6s. dozen.

Carrots.—6d. to 1s. 6d. bundle.

Lettuce.—2s. to 4s. dozen.

Beetroot.—4d. to 1s. bundle.

Marrows.—7s. to 9s. bag.

Pumpkins.—3s. to 4s. bag.

Chokos.—3d. to 6d. dozen.

Cucumbers.—1s. to 2s. dozen; 8s. to 10s. bushel case.

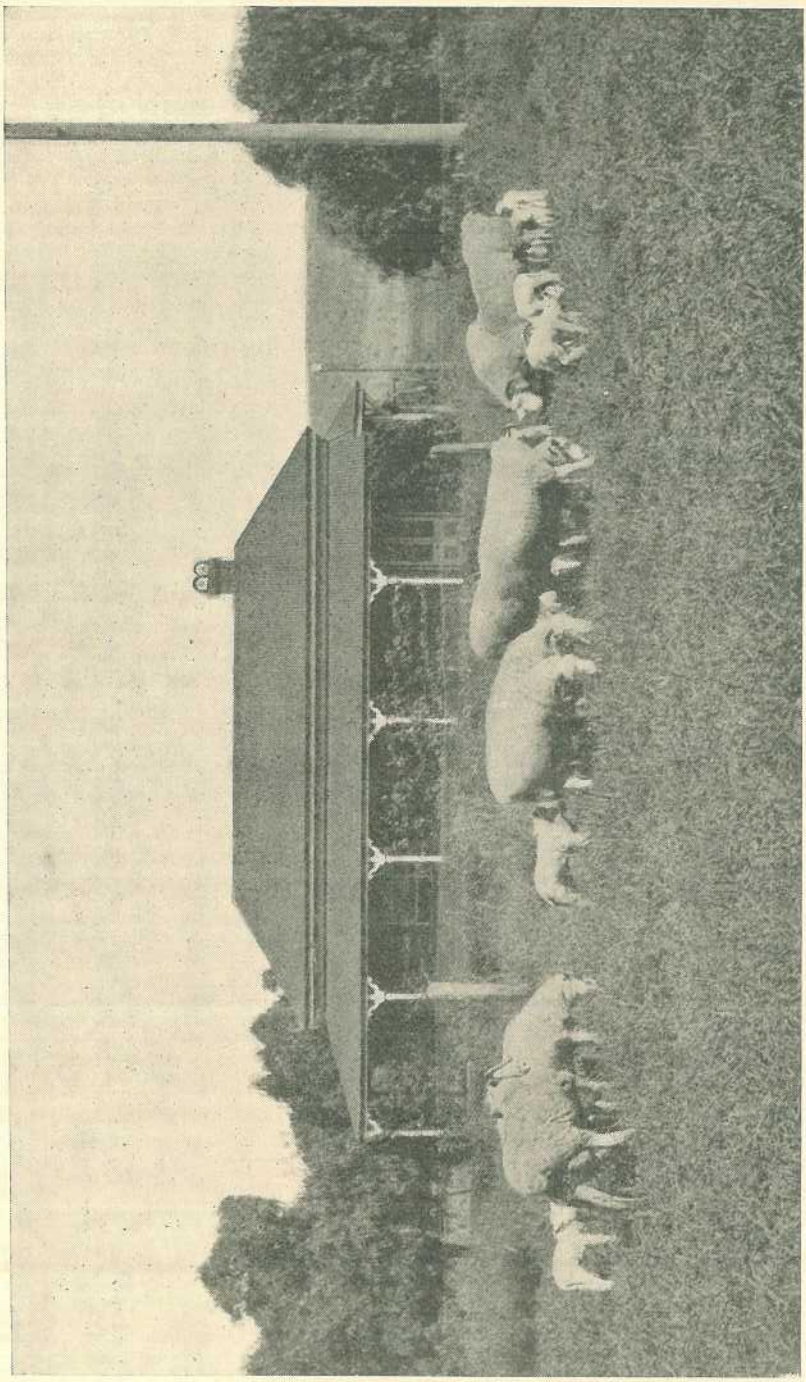


Plate 69.
Dorset Horn Ewes and Lambs, Cambooya, Darling Downs, Q.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society and the Ayrshire Cattle Society, production charts for which were compiled during the month of February, 1941 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
Mature Cow (Standard, 350 lb.).				
Alfa Vale Model 4th	W. H. Thompson, Alfa Vale, Nanango	15,717·5	678·526	Reward of Fairfield
Alfa Vale Gentle 2nd	W. H. Thompson, Alfa Vale, Nanango	15,518·65	640·529	Reward of Fairfield
Alfa Vale Midge	W. H. Thompson, Alfa Vale, Nanango	15,635·2	576·568	Reward of Fairfield
Merravale Bonnie 3rd	W. Soley, Malanda	9,940·55	379·644	Greyleigh Honorarium
Senior, 4 Years (Standard, 330 lb.).				
Kyabram Mab	Clarence W. Black, Kumbia, *via* Kingaroy	16,962·63	732·906	Ledger of Greyleigh
Junior, 4 Years (Standard, 310 lb.).				
Trevor Hill Picture	W. Henschell, Yarranvale, Pittsworth	16,057·83	643·935	North Glen Emblem
Alfa Vale Model 11th	W. H. Thompson, Alfa Vale, Nanango	14,896·6	635·207	Reward of Fairfield
Fairlie Beauty 29th	C. B. Michell, Fairlie, Rosenthal	9,584	412·582	Rosenthal Peggy's Admiration
Burradale Rosetta 31st	J. F. Evans, Malanda	10,546·2	368·519	Dulcamah Irish Peer
Mabreen's Nancy 2nd	F. Haldane, Wolvi	8,732·6	328·681	Dnalwon Boston
Junior, 3 Years (Standard, 270 lb.).				
Ardilea Sadie	W. Hinricksen, Ardilea, Clifton	7,146	294·929	Midget Shiek of Westbrook
Senior, 2 Years (Standard, 250 lb.).				
Trevor Hill Una	Sullivan Bros., Valera, Pittsworth	8,826·47	377·95	Corunna Supreme
Fairvale Dulcie	J. H. Anderson, Fairvale, Southbrook	7,591·94	297·221	Fairvale Optimist
Junior, 2 Years (Standard, 230 lb.).				
Fairvale Dainty	J. H. Anderson, Fairvale, Southbrook	9,343·7	382·681	Fairvale Czar
JERSEY.				
Senior, 3 Years (Standard, 290 lb.).				
Glenview Mischief	F. P. Fowler and Sons, Glenview, Coalstoun Lakes	9,914·55	466·162	Trinity Governor's Hope
Bellgarth Pretty Lady 2nd	P. Kerlin, Glenrandle, Killarney	6,140	321·883	Bellgarth Bellboy 2nd
Junior, 3 Years (Standard, 270 lb.).				
Inverlaw Fairy Fly	R. J. Crawford, Inverlaw, Kingaroy	8,642·7	471·055	Oxford Royal Lad
Banyule Silvermine 11th	Farm Home for Boys, Westbrook	8,242·95	425·276	Banyule, Oxford Don
Keystone Lavender	E. J. Keys, Proston	7,408·15	394·011	Gunawah Gamboge Prince

SENIOR, 2 YEARS (STANDARD, 250 LB.).				
Inverlaw Doreen	R. J. Crawford, Inverlaw, Kingaroy	7,006·2	363·673	Oxford Royal Lad
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Inverlaw Mountain Daisy	R. J. Crawford, Inverlaw, Kingaroy	7,359·65	374·406	Oxford Royal Lad
Fauvic White Bait	H. Cochrane, Fauvic, Kin Kin	6,326·1	279·36	Austral Park Sheik
Oxford Mamie	E. J. Keys, Proston	5,341·75	233·642	Oxford Jovial Lad
AYRSHIRE.				
JUNIOR, 3 YEARS (STANDARD, 270 LB.).				
Myola Vinnie	R. M. Anderson, Southbrook	7,790·16	303·365	Benbecula Bonnie Willie

General Notes

Staff Changes and Appointments.

Mr. W. E. Hamley, Inspector, *Diseases in Plants Acts*, at present stationed at Wallangarra, has been appointed also an inspector under *The Apiaries Act* and *The Diseases in Stock Acts*.

Mr. K. King, Inspector, *Diseases in Plants Acts*, Coolangatta, has been appointed also an inspector under *The Diseases in Stock Acts*.

Mr. C. F. Parry-Okeden, of Auburn Station, via Chinchilla, has been appointed an honorary inspector of stock.

Mr. W. Head, Septimus, Mirani, has been appointed canegrowers' representative on the North Eton Local Sugar Cane Prices Board in place of Mr. A. Smoothy, who has resigned.

Mr. J. R. Loveless, loader for the Committee of Direction of Fruit Marketing at Burrum, has been appointed an inspector under *The Diseases in Plants Acts* in succession to Mr. I. L. Andersson.

Constable J. J. Garmester, Mt. Surprise, has been appointed also an inspector under *The Slaughtering Act*.

Transfers approved: Mr. R. D. Chester, Government Veterinary Surgeon, from Murgon to Toowoomba; Mr. O. H. Brooks, Assistant to Veterinary Surgeons, from Brisbane to Murgon.

Messrs. G. R. Moule, B.V.Sc., and L. G. Newton, B.V.Sc., Government Veterinary Surgeons, and O. H. Brooks, B.V.Sc., Assistant to Veterinary Surgeons, have been appointed also inspectors under *The Diseases in Stock Acts*, *The Dairy Produce Acts*, *The Slaughtering Act*, and *The Pig Industry Act*.

The Officer in Charge of Police, Torrens Creek, has been appointed also an acting inspector of stock.

Messrs. E. E. Prenzler and G. C. Kenny (Wynnum and Holland Park, respectively) have been appointed inspectors under *The Diseases in Stock Acts*, *The Slaughtering Act*, and *The Dairy Produce Acts*, Department of Agriculture and Stock.

Mr. R. Letters, inspector under *The Diseases in Plants Acts* has been appointed also an agent under *The Banana Industry Protection Acts* and transferred from Brisbane to Pomona.

Mr. J. H. Mitchell, agent under *The Banana Industry Protection Acts*, has been transferred from Yandina to Nambour.

Messrs. C. M. Calder, H. A. Lowe, and J. J. Shepherd, of the Queensland Main Roads Commission, have been appointed honorary rangers under *The Native Plants Protection Act*.

Sugar Experiment Stations Advisory Board.

The following have been appointed members of the Sugar Experiment Stations Advisory Board constituted under "*The Sugar Experiment Stations Acts*, 1900 to 1938," for the period from 1st April, 1941, to 31st March, 1944:—

Hon. F. W. Bulcock, M.L.A. (Chairman).

Dr. H. W. Kerr (Director of Sugar Experiment Stations).

Messrs. N. H. Wellard (Miallo, Mossman) and B. Foley (Childers) (Representatives of growers of sugar-cane).

J. Smith (Mackay) and A. V. Thorp (Nambour) (Representatives of manufacturers of cane sugar).

Veterinary Surgeons Board.

Messrs. E. F. E. Sunners (Chairman of the Queensland Meat Industry Board) and R. P. M. Short (Under Secretary, Department of Agriculture and Stock) have been appointed representatives of the Government on the Queensland Veterinary Surgeons Board. Dr. J. Legg (Senior Veterinary Surgeon, Animal Health Station, Yeerongpilly) and Mr. K. M. Lucas (Ascot) have been elected members of the Board, of which Professor H. R. Seddon (Director of Veterinary Services) is President.

Citrus Levy.

The Citrus Levy Regulation, which has been in force for a number of years, has been again extended for twelve months from 1st March, 1941. The levy is imposed by the Committee of Direction of Fruit Marketing under *The Fruit Marketing Organisation Acts*, and the sums raised thereby are expended in the interests of the citrus industry. The levy is made as follows:—

On all citrus sent to factories, at the rate of 5s. per ton;

On all citrus sent by rail to agents or persons other than to factories, at the rate of 1s. 7d. per ton, with a minimum of one penny; and

On all citrus sent otherwise than by rail to agents or persons, except factories, at the rate of one-halfpenny per case, with a minimum of one penny.

In Memoriam.

JOSEPH KILMARTIN.

THE death on 21st March of Mr. Joseph Kilmartin, Interviewing Officer of the Department of Agriculture and Stock, is recorded with very deep regret. The late Mr. Kilmartin was one of the best known and most popular officers of the Department by reason of his daily personal contact with every caller. He was a native of Brisbane and had attained his forty-seventh year. He entered the Public Service in 1908 as a junior officer of the Department of Home Affairs and was afterwards transferred to the Department of Agriculture and Stock. Apart from his ordinary duties, which were discharged with unfailing courtesy, innate kindliness and tact, he was greatly interested in the boy employment problem. As selection officer for the St. Lucia Boys' Farm School, he gave noticeable service during the depression and post-depression years, and many a youth owes his start in successful agriculture to Mr. Kilmartin's encouragement, and to whom he acted as guide, philosopher, and friend. He was an unobtrusive and assiduous worker for charitable and patriotic causes, and is greatly missed by all who have business with the Department he served so well. Surfing, cricket, and gardening were his chief outside interests, and as a rose-grower he excelled.

Plate 70.

A graceful tribute was paid to his memory by the Premier, Hon. W. Forgan Smith, LL.D., under whom he had served when the Premier was Minister for Agriculture and Stock. "I heard with very keen regret of the death of Mr. Kilmartin," he said. "He was a courteous, capable, intelligent, and industrious man. I offer my sincere sympathy to his relatives in their bereavement."

The late Mr. Kilmartin was laid to rest in the South Brisbane Cemetery in the presence of a large gathering of fellow officers and of representatives of the commercial life of the city, and of sporting bodies with which he had long been associated, and within sight of what was St. Lucia Farm Boys' School across the river, which he had helped to success. The Premier was represented by Mr. G. D. Lee, of the Chief Secretary's Department, and the Minister for Agriculture and Stock, Hon. F. W. Bulcock, by his Under Secretary, Mr. R. P. M. Short. Mr. J. D. O'Hagan, Under Secretary, represented the Justice Department. Mr. Kilmartin, who was unmarried, is survived by seven brothers (including Mr. Jim Kilmartin, of the Premier's Department) and three sisters, to whom deep sympathy is extended.

Answers to Correspondents

VETERINARY ADVICE.

(Selections from the outgoing mail from the office of the Director of Veterinary Services.)

Corns in Horses.

S.A. (Jimbour)—

A corn may be caused by the heel of the shoe pressing on the seat of a corn, which is at the angle formed between the wall of the hoof at the heel and the bar of the foot. This condition may arise from faulty shoeing, or by allowing the shoes to remain on too long. Another cause is a stone or piece of metal becoming wedged at the seat of corn.

Treatment—

1. The shoe should be removed and the hard dry outer horn pared away. All the diseased horn should be removed from the surface of the bruised or suppurating (festering) area, and the latter should be cleansed.
2. If the corn is suppurating (festering) adequate drainage should be provided. If this is not attended to, the pus may underrun the sole and the condition become hopeless. As this is a painful condition, it may not be possible for you to restrain the mare to do the job properly without a local anæsthetic.

If this is necessary, and the corn is suppurating, it would be advisable to obtain the services of a qualified veterinarian.

Warts.

A.J.C. (Roma)—

Regarding your two thoroughbred colts affected with warts, it is advised that you apply raw castor oil to the affected parts. Those that are pedunculated (stalk-like) could be tied off with a fine piece of thread. Arrest of the blood supply will cause them to dry off.

In some instances you may find that the warts disappear in course of time.

Poll Evil.

B.B.C. (Murphy's Creek)—

Poll evil is a swelling of a bursa over the poll—that is, the region immediately behind the ear at the uppermost part.

A bursa is a cavity filled with an oily fluid, which normally acts as a lubricating mechanism. Poll evil is usually caused by some form of irritation or to an internal infection.

In the early stages it may be treated by applying cold water continuously for two to three hours daily with a hose, and also by preventing further irritation. If a hose is not available, camphorated liniment may be used as a medium for massage. If the condition is chronic—that is, long standing—it may be advisable to apply a blister and turn the animal out until the condition passes.

A blister consists of biniodide of mercury one (1) part, lard eight (8) parts. The area is clipped free of hair, and the blister rubbed in for about twenty minutes. It is allowed to remain on for about twelve hours, then the part is washed with soap and water. It is advisable to have the animal tied up during this period. At the end of the twelve hours the part will be considerably inflamed, and by this it will be seen that the blister has had the desired effect. When the inflammation subsides the poll evil will probably subside also.

It is advisable to apply vaseline around the edge of the area blistered so that the effects of the blister will be limited to that area.

A more satisfactory treatment would be carried out by a qualified veterinarian, who would apply surgical measures.

Scours in Calves.

W.S. (Woogoompah Island, Moreton Bay)—

In the treatment of scours it is advised to proceed as follows:—

1. Administer up to 2 oz. of castor oil to each calf.
2. Administer one teaspoonful of formalin in each one pint of whole milk fed. When scours appear, whole milk should be used instead of skim milk.
3. Affected calves should be isolated and the yards which have been used left open to the sun for a month or so to clean up the infection.
4. Affected calves should also be fed half a breakfastcupful of lime water at each feed. This is made by placing slaked lime in a cask and adding water. Occasionally it should be stirred and allowed to settle, and the clear fluid—lime water—is taken off and fed. As long as a slight scum forms on top of the water more water may be added to the lime, as only a certain amount of lime goes into solution.

Milk Fever.

B. J. H. (Kulgun, West Moreton)—

The history and symptoms described are typical of milk fever. This condition results from a sudden lowering of the stores of the metal calcium in the blood, which results from the cow suddenly coming into milk (comparatively large quantities of calcium being present in milk.)

When once developed, the treatment for the condition is—

1. Obtain 2 oz. of calcium borogluconate from your local chemist and dissolve it in 10 oz. (half a pint) of water.
2. The above solution should be warmed to about blood heat and injected under the skin with an ordinary pound syringe.
3. It will be readily realised that half a pint of solution is a considerable volume of fluid to inject into the skin in one place, and therefore the injection should be made in several places.

The old treatment for this condition was to pump the udder up with a bicycle pump. This treatment is quite effective, and is carried out by passing a clean teat tube up the teat duct and connecting the tube on to the pump and inflating the udder to a comfortable degree of tension. The teat tube is then removed, and after the four quarters have been pumped up the animal usually gets up within twenty to thirty minutes. This method of treatment obviously does not get to the primary cause of the disease.

By way of prevention it is necessary to—

(*a*) Feed the dry cattle a mineral supplement containing sterilized bone meal two parts, and coarse salt one part, during the time when they are turned out prior to calving. This is particularly important when the cows are experiencing drought conditions.

(*b*) Do not milk newly-calved cows immediately they have calved. It is better both for the cow and the calf to allow the calf to suck for twenty-four to forty-eight hours after it is born.

BOTANY.

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

Abnormality in Climber (Tecoma Mackenii).

A.S. (Bundaberg)—

Thanks for the specimen of fasciated growth in *Pandorea ricasoliana*. This beautiful climber, which is a native of South Africa, is more commonly known to nurserymen and gardeners as *Tecoma Mackenii*. The peculiar abnormality you send is the result of what is known as *fasciation*, and is due to the fact that in place of one terminal bud arising a great number arise and grow thickly together, forming these strap-shaped stems. You sometimes see remarkable examples of this in the ordinary *Asparagus plumosus*. The Cockscomb (*Celosia cristata*) is a form of fasciated inflorescence which has been gradually increased by breeding. It is not known what conditions bring about this fasciation. Fasciations are most abundant in hot wet weather following a dry spell.

Rural Topics

Ensilage as Stock Feed.

Recent experiments in England have given a sharp rebuff to the belief in some quarters that ensilage is not a first-class feed for stock. Experiments in the use of grass silage at the Rowett Research Institute's Experimental Stock Farm, show that a cow can eat up to 152 lb. a day of high-quality silage and maintain an average yield of five gallons for at least two months. The silage was made from three year old pasture cut in June and made in July. A pit was dug 8 yards long by 2 feet deep and sloping to one end. The pit was filled and was covered with earth within three days. Commenting on the experiments, the farm authorities state that it has been generally considered that grass silage could not be fed to a cow at a greater rate than 80 lb. a day, whereas they have had no difficulty in getting stock to eat 150 lb. No taint in the milk has been observed.

A Poultry-Plucking Machine.

Among the novel machines on the market to-day is the chicken plucker. This unit automatically plucks the feathers of 250 to 300 birds an hour, while expert hand pickers in the poultry business can pluck about 35 to 40 chickens in this length of time. The tail and wing feathers, however, require manual attention after the machine operation. The plucker consists of one or more metal drums, each about 2½ feet in diameter. Rubber tube fingers line each drum, making a cylindrical brush. As the drum revolves rapidly it brushes off the feathers.—"*New Zealand Farmer's Weekly.*"

A Rubber-Producing Shrub.

After nine years of research and experimentation it is reported that success has been achieved in the cultivation in California (U.S.A.) of the guayule, a rubber producing shrub. This plant is native to Mexico and Texas and yields a return four years after planting. The entire plant is ploughed up at harvest and crushed under water, when the rubber content is washed free and floats to the surface, where it is skimmed off. A plantation of one acre, it is calculated, will yield a sufficiency of plants to produce 1,800 lb. of rubber. The plant is said to thrive in relatively desert and dry regions and calls for only a minimum of supervision.

Success of Tuberculin Tests.

The United States Department of Agriculture has announced that the whole of that country is now practically free of bovine tuberculosis, the degree of infection having been reduced to less than one half per cent. This is the culmination of the vision of many prominent veterinarians who, in 1917, believed the task of tuberculin testing of millions of cattle to be feasible, in spite of many doubts and much opposition. Actually, the huge enterprise in the course of the 23 years involved more than 232,000,000 tuberculin tests and retests. About 4,000,000 tuberculous cattle were detected and removed for slaughter.

Sheep Fed from the Air.

Marooned on a 400-acre island in one of the channels of the Bulloo River, near Cunnamulla, during the recent floods, 5,200 sheep were fed with 5 tons of maize landed by three aeroplanes. The sheep were owned by the Elsinora Pastoral Co., and it was found impossible to remove them to higher land or get feed to them by land. At the suggestion of Mr. Colin Young, three privately-owned passenger aeroplanes were converted to carry freight and they landed successfully on an improvised landing ground 60 feet wide and 225 yards long. The fodder was carried by air from Cunnamulla and the machines covered 174 miles.

For Grain and Grass.

A palatable and nourishing perennial plant that is both grain and grass is said to have been successfully evolved at the University of Idaho, U.S.A. This was achieved by crossing common wild rye grass and red winter wheat. The plant is said to have the drought-resisting qualities of the rye grass, together with the palatability and high seed production of the wheat plant.

A Rubber "Persuader" in the Trucking Yard.

To avoid injuring or bruising cattle in trucking yards, one beef buyer does all his urging when trucking stock with a whip made of an old motor tyre tube. The tube is cut in sections lengthwise and mounted on a wooden handle. When the rubber whip is slapped on a beast it makes a loud report which startles the animal and produces the same effect as a painful blow. Investigation of slaughtered cattle has shown no bruise or injury to the carcase through the use of this effective yet gentle rubber "persuader."

It seems a sound idea, for the use of a rubber slapper like that would do away with a lot of unnecessary bruising which depreciates the value of a carcase. In fact, bruising of beef on the hoof means a substantial reduction of the value of beef on the hook. There is apparently no reason why such a harmless rubber slapper should not come into general use.

"Sweet-Buck" Syrup.

Two American science workers have succeeded in producing a marketable sweet syrup from sweet potatoes. Sweet potatoes are rated as the second most important vegetable crop growing in the United States; yet only about 70 per cent. of the production is marketed. The remainder are potatoes which have the same composition and quality as the marketable ones, but are larger than buyers will accept. Very little or no use is made of these oversized "sweet bucks," and they represent a considerable loss to the grower.

If the new discovery can be applied in practice by the formation of a sweet potato by-products industry, growers would benefit considerably who would then have a market for the portion of the crop which is now wasted.

A Novel Stock Feeding Scheme.

An interesting method of fodder conservation and stock feeding is practised by a North Dorrigo (N.S.W.) farmer. Hay, containing red clover, rye, and lucerne, is cut in the usual way and stacked in the paddocks in which it is grown, each stack holding about 5 tons. While the stack is being built, 8 to 10 lb. of salt to the ton is scattered over the hay to keep it soft and palatable. The retention of moisture, too, keeps it fairly free from dust. The mown hay is gathered with a horse-drawn sweep and pulled to the stack, the horse, as the stack gets higher, passing over it, tipping the sweep at the top as it does so and consolidating the hay by trampling it down. In building the stack, a batter is provided on both sides for the going up and the going down of the horse, but both batters are removed when the stack is topped, and so leaving the stack with a good finish.

The hay is protected from stock until it is required in the autumn, when the cattle are grazed in the paddocks and given free access to the stacks. There is practically no waste. Large stacks have proved unsuitable, because, when high, the lower portion is eaten out leaving the top overhanging.

Although seventy head of cattle have free access to the hay they never over-eat, no case of sickness from this cause ever having occurred on the farm.

Ploughing Matches Replace Shows.

In some farming districts in England the annual shows have been abandoned in favour of ploughing matches while the war is on. It is held that ploughing contests would have greater war time value, while still remaining a means of maintaining interest in local show societies.

The Democratic Cow.

Talk about constitutional rights! Cows in England, at least, can do just about what they like. No worrying about stop lights or parking tickets, or being strafed by traffic cops. The High Court of Appeal in England held recently that a cow had the constitutional right to stand in the middle of the road and chew her cud and let traffic go hang—or roundabout. At least, the Court said that cows do not move in straight lines (they certainly don't, especially on the road home from shire council meetings!), and no driver could be expected to make them go in straight lines or stay out of the road.

The decision was made in a case where a motorist had collided with a cow and claimed damages to his car. In announcing his decision, the judge said that cows have "strayed about the road for time immemorial" and will probably continue to do so.

To those of us who have to travel country roads where local farmers turn their cows into the "long paddock" at night, that's what might be called a "cow" of a decision!

Farm Notes

MAY.

WHEN seasonal conditions permit, May sowing of wheat is recommended in the Maranoa and Central districts, where early-sown crops invariably outyield those established later in the season.

For the main Downs sowing, June is preferred (unless sheep are available to check the early growth), as the principal varieties now grown, Flora, Florence, Pusa, Three Seas, Seafoam, and Gluyas, are all sufficiently quick maturing for early sowings to risk damage by frost. All seed wheat should be graded and treated with copper carbonate or a reliable mercury dust as a preventive of ball smut, utilising 1 to 2 oz. per bushel. Seed barley and oats are preferably treated with formalin, or with either of the mercury dusts agrosan and ceresan.

Succession sowings of oats, barley, or wheat required for grazing may be made during the month, with a mixture of field pea seed or tares, as described in previous issues of this Journal

Winter grasses should now be well established. Land now in good condition may still be sown with suitable types, preferably *Phalaris tuberosa*, Wimmera rye, or prairie grass, all of which will withstand fairly dry conditions. Sowings later than May are not recommended.

Lucerne sowings may be continued, drilling the seed to a shallow depth only, on soil containing enough moisture for satisfactory germination. Rolling is beneficial if the surface is somewhat loose and rough, but should be followed by a light harrowing.

Potatoes will have received their final cultivation and hilling, so that cultivators may now be diverted to root crops, such as mangolds and swede turnips grown for pig feed.

The sowing of onion seed may be continued on suitable soils, drilling in their permanent position, in rows spaced from 12 to 15 inches apart, and with a covering of not more than ½ inch of soil. Hand seeders are useful for this work, if the areas are not large.

Mature sweet potatoes may be dug, allowed to dry in the sun for a few hours, and if desired for home use placed in dry sand until required. Sweet potatoes are mature when the cut surface dries white and does not turn greenish black round the edge.

Attention should be given to the importarnt work of seed selection for future sowings before finalising the harvesting of maize, sorghum, sudan grass, cowpea, pumpkins, &c., as it is wise to be sure of varietal purity rather than depend on the seedsman from year to year.

THE USEFUL CORRIEDALE.

That the useful Corriedale breed of sheep can go on doing the job of providing good heavy fleeces and keeping its price up, even when times are bad and drought conditions prevail is shown by the experience of a New South Wales sheepman. Here is what he says:—

"During the last five years, which include two droughty years (1937 and 1938), the Corriedales, without any wethers, have averaged 12¼ lb. of wool a head, the studs averaging nearly 14 lb. Last year's shearing: 5,000 flock Corriedale ewes and ewe hoggetts, no wethers, cut 44 bales a thousand sheep, averaging 13¾ lb. a sheep. Approximately 1,200 sheep, including cull ewe hoggetts, and breeding ewes up to 12 years old—the breeders carrying 95 per cent. of lambs—averaged more than 14¼ lb. During the height of the dry time the cast for age flock ewes—5 years old—sold at public auction at 29s., the whole drop of wether lambs sold at the same auction for 27s. These lambs were 5 months old and shorn in the previous November."

Orchard Notes

MAY.

SUCCESS in fruitgrowing depends not only on the proper working and management of the orchard, but also on the way in which fruit is handled and marketed. With citrus fruit particularly, none pay better for extra care in packing and presentation.

Some growers do not realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions.

To prevent injury to the skin when gathering, all fruit should be cut and not pulled. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to a distant market. If, however, the injury is only slight it may be sent to a local market for quick sale.

For interstate markets, only choice fruit should be selected. It should be graded for size, colour, and quality and properly packed, only one grade of fruit being packed in a case.

All orchards, vineyards, and plantations not completely clean should receive immediate attention.

Banana and pineapple plantations should be put into good order and kept free from weed growth.

Land to be planted with fruit trees should be got ready, for it is always advisable, if possible, to allow newly-cleared land to "sweeten" before planting.

APPLES AS STOCK FEED.

In New Zealand apples which, although good eating, are marred by some outside blemish which makes them unfit for marketing are usually delivered to dairy farms for cow and pig feeding. It is said that where fed to pigs apples should be in combination with meal or ground barley, and it is a good plan to balance them with bran (if obtainable) for cow-feeding.

When apple feeding for pigs was first tried out, some farmers put their pigs on to a straight diet of skim milk and apples, and found that they scoured on it. To give the best results, apples should be combined with a concentrate of some kind.

Plate 71.

NOT A "GUSHER," BUT NEARLY AS GOOD.—New well on a cotton farm in the Callide Valley.

Maternal and Child Welfare.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

BABY'S HEALTH—NATION'S WEALTH.

This month we have a birthday! It is exactly twenty-three years ago since our Maternal and Child Welfare Centres (Baby Clinics) were established in Queensland, and we think it appropriate that the occasion should be marked by a birthday present—not to ourselves, but to our country mothers. That is why we have established a new branch of our service which has been designed especially to meet the needs of mothers who live in the country and cannot attend the centres—namely a Correspondence Section. Let us explain to you how it can help.

CORRESPONDENCE SECTION—ITS AIMS.

Firstly, we want to get into contact not only with mothers living in districts in which welfare centres have been established, but with *every mother in the State.* In this, as in all the other branches of our service, our object is to keep mothers and babies fit and well.

After the district registrar has notified the birth of a child whose mother lives outside the district in which a welfare centre is established, the sister in charge of the correspondence section will be informed. A letter from the Medical Director will then be sent out to the mother, and she will be told that she can obtain advice about the feeding, care and management of her baby just by writing a letter addressed simply, "Baby Clinic, Brisbane." The letter need not even be stamped, because arrangements have been made with the Post Office by which the Department of Health and Home Affairs will undertake the cost of the postage. In the same way, mothers may obtain copies of either of our books, "The Expectant Mother" or "Care of Mother and Child." The books are free of charge, and all that country mothers have to do is to address letters "Baby Clinic, Brisbane," as explained before, and the book requested will be forwarded. Once having written to us, we feel sure that mothers will wish to make it a regular practice, because this is to be a really personal service, and we shall want to have reports as to when baby sits up and cuts his first tooth, and so on, and, of course, we wish to continue

helping with advice about diet and other matters, until baby is five years of age and not a baby any more, but a school boy or girl who will then come under the care of the school medical service. The kind of food baby gets during the first five years is so tremendously important because his body is built up and nourished by the food he eats, and it is impossible to build up strong bones and muscles and good, well-spaced teeth with the wrong kinds of food, just as one cannot build anything that is beautiful and lasting with poor materials.

We look after the children who attend our centres until they are five, and we want to do exactly the same with our "correspondence babies." We wish to point out that, although you may have our book to refer to, no two babies are alike, and so every baby needs individual care and attention. This our Correspondence Sister can give you, because she has had experience of all kinds of babies in the different centres, and if country mothers will explain to her carefully just how this particular baby is behaving, Sister will know how to advise. The service is under the personal direction of the Medical Director. Remember that the Correspondence Service has been established in order to help mothers who are living in districts where a welfare centre (baby clinic) has not so far been opened. It is not for those mothers who are able to attend the centres, because advice obtained in a personal interview is naturally of greater value than that obtained in a letter. In our Correspondence Section, however, we shall aim at obtaining as intimate a knowledge as possible of each mother and her child. Country mothers are invited to ask for any kind of information, and if we cannot supply it ourselves, we will put them in touch with the person or department best qualified to help. Please tell all your country friends about this new service, and help us to make it a great success. If you do, we will feel that our twenty-third birthday anniversary has been a very important one indeed. For the benefit of those mothers who do not know about our maternal and child welfare work, we shall go back to the time when our work began.

Development of the Maternal and Child Welfare Service.

In March, 1918, four child welfare centres were opened in Brisbane. To-day, there are 145 centres spread over the State—along the coast from Coolangatta in the South to Mossman in the North, in the interior from Cunnamulla in the South-west to Mt. Isa in the North-west, and along all the railway lines running inland from the coast.

Reduction of Infant Mortality.

During the years from 1918 until now, deaths of infants aged one month and under one year, the age at which the child welfare service exerts its greatest influence, have been reduced to one-third. *This represents the saving of the lives of about* 400 *babies every year.*

Ante-natal Care.

Another important aspect of our work is that of advising expectant mothers regarding their health. The nurse cannot take the place of the doctor, but in regard to diet and other matters relating to antenatal care, she is well qualified to advise mothers. In short, the aim of the service is to render motherhood safe, and to give the children the best possible start in life, namely, good health. Country mothers may also obtain patterns of baby clothing through our Correspondence Service.

Babies are Individuals.

In criticism of child welfare work, it has been stated that welfare nurses attempt to treat every baby alike, in other words to make all babies conform to a certain fixed standard of feeding and management. This is very far from the case. No one knows better than a child welfare nurse who is dealing with thousands of babies a year that no baby is quite like any other baby, and the aim of our service is always to consider each child as an individual. A mother who lives in a district where a maternal and child welfare centre is established is indeed a privileged person, and it would be surprising if she did not avail herself of a valuable health service which is freely offered. In order to receive the full benefit of the service, she must be regular in her attendance.

Co-operation of Fathers.

In connection with our Correspondence Service, as also in the ordinary work of our centres, we would appreciate the active co-operation of our fathers. Too often the problems associated with the care and general management of children are left entirely to our mothers. We want the fathers to realise that we cannot do our best work without this interest and support. Not only would we like them

to read our books and write to us and ask their own questions and present their own points of view and their own difficulties, but we would like them to talk to others about the work of the Maternal and Child Welfare Service, and particularly about its Correspondence Service. In districts in which child welfare centres have been established, fathers might form clubs and invite the sister in charge to tell them about the work. Next month we shall discuss a most important subject—the care of baby's feet.

IN THE FARM KITCHEN.

FRUIT ON THE MENU.

Passion Fruit Flummery.

Place 2 cups water in a saucepan with ½ cup lemon juice and 2 dessertspoons gelatine and allow to soak until gelatine is soft. Add 1 cup sugar and bring to boiling point. Mix 1 tablespoon plain flour with a little of the water until smooth, and add to liquid and stir until mixture boils. Continue to boil for a few minutes, then allow to cool. Beat until quite frothy and add ½ cup passionfruit pulp. Fill mould and set in ice chest.

Baked Apple Savoy.

Put a little marmalade in the bottom of a well-buttered fireproof dish. Cut 4 slices of brown bread about ½ inch thick, then cut into dice. Place these on top of marmalade. Beat 2 egg yolks slightly, add 1 tablespoon sugar, 1 pint milk, and a little vanilla. Pour over bread and allow to stand for about half an hour. Place in a pan of water and bake until almost set. Spread top with a little more marmalade and cover top with peeled, cored, and sliced apples. Sprinkle with brown sugar and a little cinnamon, dot with butter, and continue baking until apples are cooked. Serve cold.

Apple Surprise.

Wash ½ cup rice well and bring to boil in 1 cup water. Drain off water and add 1 pint milk, the rind of half a lemon, and 1 tablespoon sugar. Simmer until rice is tender, then add 1 dessertspoon butter. Continue to cook until moisture is absorbed. Press a thick layer in the bottom of a well-greased fireproof dish and place in 3 or 4 pared and cored apples with the cavities filled with raisins, dates, or sultanas and a dot of butter. Fill the dish with the rice, spreading it evenly over the apples. Cover with a greased paper and bake in moderate oven for about half an hour. Put ½ cup brown sugar in a saucepan with 1 tablespoon top milk, 1 heaped tablespoon butter, and ½ level teaspoon ground cinnamon. Boil until syrup is formed (about five minutes), pour over apples, &c., and bake for another half an hour. Serve hot or cold.

Pear Hedgehogs.

Peel and halve fairly large ripe dessert pears and cook in a covered casserole with as little water as possible, and using 1 cup sugar to 6 pears. Add ½ slice of lemon and a little stick cinnamon. Remove pears from syrup and allow to get quite cold. Mix ½ cup cake crumbs with a little sherry or rum, add 1 tablespoon chopped walnuts or almonds, and form into a paste. Fill cavities and join pears together with a toothpick. Whip ¼ pint cream, adding a little sugar and enough cochineal to colour a delicate pink. Cover pears with this, then roll in cornflakes. Place in ice chest until thoroughly chilled and serve with sponge fingers. An excellent dish to serve with ice cream.

Cherry Meringue.

Take 1 tin cherries, 2 eggs, ½ lb. short pastry, few chopped nuts, 1 dessertspoon castor sugar. Roll out the pastry and line a greased baking or sandwich tin. Cut out a round of greaseproof paper and put on top of the pastry, filling with rice or beans to keep it flat whilst baking. Bake in a fairly hot oven for twenty minutes. Then remove the beans and paper, brush over with white of egg and return to the oven for a further five or six minutes. When cold, fill with the cherries. Thicken a little of the syrup by stirring over low heat with the two egg-yolks. Allow to get cool and then pour over the cherries. Whip up the whites of eggs until stiff, fold in the castor sugar, pipe in whirls over the fruit, sprinkle with a few chopped nuts and return to an oven of much lower temperature to get firm and lightly brown. Serve hot, garnished with a few cherries, or it is equally delicious as a cold sweet.

Honey Tapioca.

Take 1 pint milk, 2 eggs, 2 tablespoons honey, 3 oz. sultanas, 2 tablespoons tapioca, 1 gill thin cream. Put the milk into a saucepan and bring to the boil. Sprinkle in the tapioca and simmer for thirty minutes. Remove from the stove and allow to cool a little. Beat the yolks of eggs and stir into the tapioca. Return to the stove and continue stirring until the mixture thickens. Add the honey and the sultanas and turn into a large basin. When cool, stir in cream, whip the whites of eggs until stiff and fold into the mixture. Divide into individual glass dishes and decorate with a fresh raspberry (or glace cherry) and strips of angelica. For special party occasions whip double cream until thick and pipe little rosettes on top of each dish.

Orange Wafer Gateau.

Prepare and cook wafers as follows:—Cream ½ cup butter well, gradually add ¾ cup sugar and beat until very light. Add 1 unbeaten egg and beat well. Sift together 1½ cups flour, 1 teaspoon baking powder, 3 tablespoons cornflour, add the grated rind of 1 orange, and add it alternately to butter mixture with ¼ cup milk and ¼ cup orange juice. Mix well and spread a small quantity on an inverted well greased and floured sandwich tin. Do not spread too near the edge, as the batter will run down the sides during the baking and spoil the look of the wafer. These wafers may be baked on a greased and lightly-floured oven slide and a round traced out the size of a sandwich tin. Bake in a moderate oven for about 10 minutes or until a golden brown. Turn wafer on to a cooler and continue to cook batter. Join layers with the following: Put 1 cup orange juice in a saucepan with 2 tablespoons lemon juice, ½ cup sugar, and 1 cup water. Bring to boiling point and add 2 tablespoons cornflour diluted with a little of the juice or water. Stir over gas until thick and quite clear. Remove from stove, beat in 1 egg-yolk, and 1 dessertspoon butter, a little at a time, then allow to cool. Spread a little on top of last layer and sprinkle with chopped walnuts or almonds. The wafers may be filled with ice cream and chopped fruit, which makes a delicious party sweet.

Orange Pie.

Line a sandwich tin or fireproof tart plate with the following: Cream 3 oz. butter well, gradually add 2 oz. sugar and beat well until creamy. Beat 1 egg and add 2 tablespoons milk, add gradually to butter mixture, then stir in 6 oz. plain flour sifted with 1½ teaspoons baking powder and a pinch of salt. Add 4oz. wheatmeal and form into a paste. Use as directed and bake in hot oven for about twenty minutes. In the meantime prepare filling. Mix ½ cup plain flour with enough cold water to form a smooth paste, then add ¾ cup sugar and beat well. In a saucepan put 1¼ cups boiling water, add diluted flour and stir into boiling water. Simmer for ten minutes, stirring now and again. Remove from gas and add 3 well-beaten egg-yolks, the grated rind of 1 orange, and the juice of 2 oranges. Cook without boiling for 5 minutes. Beat the egg-whites until stiff, gradually add ½ cup castor sugar and fold one-third into orange mixture. Fill prepared pastry case and pile the remainder on top rather roughly. Bake in a slow oven until set and a nice pale fawn colour.

Mixed Fruit Fritters.

This is a good way to use up oddments. Chop fruit in the same way as you would for fruit salad. Add enough good frying batter to bind fruit together. Add sugar to taste and a little lemon juice. Melt a little butter in a fry pan, add spoonfuls of the mixture, and flatten out a little. Cook over a moderate heat until well browned underneath, then turn and brown the other side. Dish up and sprinkle with castor sugar and serve.

Savoury Egg-Plant.

Peel 3 or 4 onions and fry in a little butter until soft, but not brown. Add 1 finely-chopped green pepper and cook a little longer. Meantime, place 1 large egg-plant in boiling water and cook for about 5 or 6 minutes. Remove skin and cut into slices, then into fairly large dice-shaped pieces. Add this to onion mixture and cook for about 15 minutes, keeping it stirred so mixture will not burn. Lastly, add 6 medium-sized tomatoes, peeled and cut in four, add pepper and salt to taste, and continue to cook for about another 10 minutes. Place in a fireproof dish, sprinkle with breaderumbs, dot with a little butter, and bake in a moderate oven for about thirty minutes.

ASTRONOMICAL DATA FOR QUEENSLAND

MAY, 1941.

By A. K. CHAPMAN, F.R.A.S.

SUN AND MOON. AT WARWICK.

May.	SUN.		MOON.	
	Rises.	Sets.	Rises.	Sets.
	a.m.	p.m.	a.m.	p.m.
1	6.17	5.21	9.54	8.55
2	6.18	5.20	10.42	9.47
3	6.19	5.19	11.29	10.41
			p.m.	
4	6.19	5.19	12.13	11.37
5	6.20	5.18	12.57	nil
				a.m.
6	6.20	5.17	1.40	12.36
7	6.21	5.17	2.22	1.36
8	6.21	5.15	3.6	2.39
9	6.22	5.14	3.51	3.44
10	6.22	5.14	4.38	4.50
11	6.23	5.13	5.29	5.57
12	6.24	5.13	6.23	7.4
13	6.25	5.12	7.20	8.10
14	6.25	5.12	8.20	9.11
15	6.25	5.12	9.20	10.7
16	6.25	5.10	10.18	10.58
17	6.26	5.10	11.14	11.43
				p.m.
18	6.27	5.10	nil	12.24
			a.m.	
19	6.28	5.10	12.9	1.2
20	6.28	5.9	1.3	1.38
21	6.29	5.8	1.55	2.13
22	6.29	5.8	2.46	2.48
23	6.30	5.8	3.36	3.23
24	6.31	5.8	4.27	3.59
25	6.31	5.7	5.18	4.38
26	6.31	5.6	6.10	5.20
27	6.32	5.6	7.0	6.5
28	6.32	5.6	7.51	6.52
29	6.33	5.6	8.41	7.43
30	6.33	5.5	9.28	8.36
31	6·34	5·5	10·13	9·32

Phases of the Moon.

4th May, First Quarter, 10.49 p.m.
11th ,, Full Moon, 3.15 p.m.
18th ,, Last Quarter, 11.17 a.m.
26th ,, New Moon, 3.18 p.m.

WORLDS BEYOND THE SUN.

THERE is a dearth of planets in the night sky this month, Mars alone being visible. The little planet Mercury, which is the nearest world to the sun, will be passing far beyond the luminary on 6th May. Therefore, this planet will not be visible until it appears on the other side of the sun, toward the end of the month, when it will be showing above the western horizon in the constellation of Gemini, setting about 6.30 o'clock.

Jupiter and Saturn, which have afforded so much interest for many months, are both too near the sun to be seen, Saturn passes on the far side of the sun on 9th May and Jupiter ten days later. In a few weeks both these planets will become morning stars. It will then be noted how Jupiter is moving with ever-widening distance to the eastwards of Saturn.

Venus, which was the brilliant Morning Star since last midwinter, has now passed the sun and become the Evening Star. As yet, however, it is too near the sun to be seen, but in a few weeks it will surprise us by shining brightly above the haze of the western horizon at dusk. At the end of May the Evening Star will not set until a quarter to 7 o'clock.

THE RED PLANET.

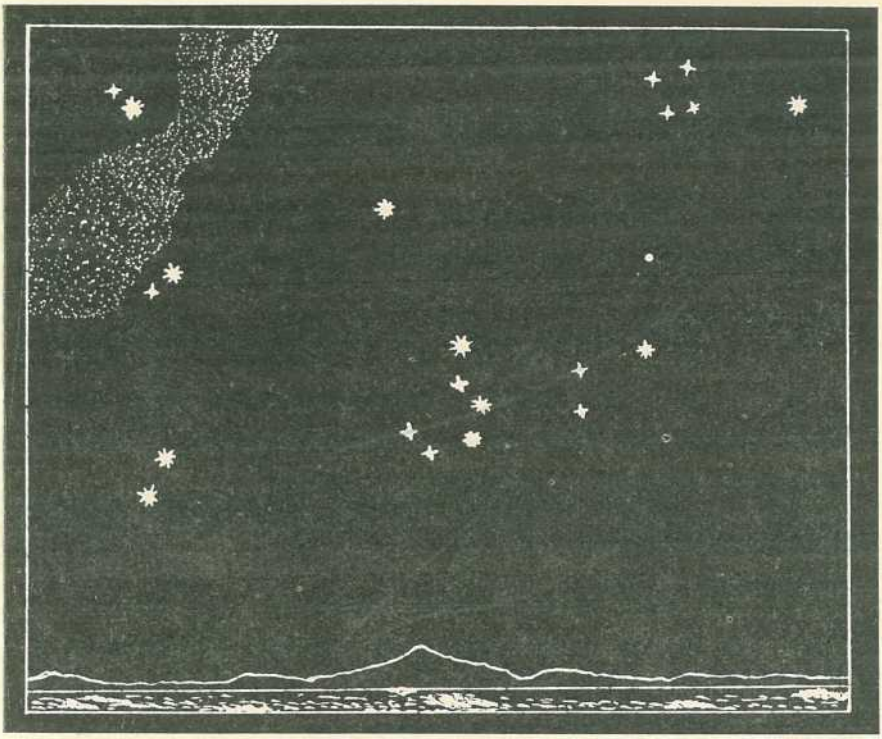
The only planet visible at the present time is Mars, the planet of so much romance, which rises a little after mid-night. Before dawn it is well up, shining with its well-known ruddy glow in the constellation of Capricornus, the Sea-goat. On 18th May, the moon, being in her last quarter, rises about mid-night, and Mars may be seen a little to the south of her—quite the brightest "star" in that rather dark part of the sky. The orbit of Mars is much more eccentric than the Earth's orbit so that at some oppositions the planet is considerably nearer to us than at others. These favourable oppositions always occur toward the end of August, for it is then that Mars is at its nearest to the sun. On 23rd August, 1924, there was a very close approach indeed, the earth passing Mars at a distance of 34,600,000 miles. At the last opposition which was on 23rd July, 1939, the planet was a little less than 36,000,000 miles away. At the next opposition, which will be in October, we shall be 38,000,000 miles from Mars; the opposition of 1939 being the most favourable since 1924. Taking advantage of these near approaches, astronomers go to a great deal of trouble to wrest a few more secrets from the Red Planet. Mars is the only planet, excepting the earth, which is not eternally enshrouded with dense clouds. Its solid surface can, therefore, be studied. With the growth of giant telescopes more and more markings are being seen, the most conspicuous, perhaps, being the polar caps which are probably composed of snow. These expand in the Martian winter and contract as the summer advances, sometimes disappearing altogether.

SPRINGTIME ON MARS.

In 1935 spring must have been early in the Martian southern hemisphere for the south polar cap began to melt unusually early. The snow cap had retreated as far as latitude 85 degrees south, a month earlier than in 1918, and two months earlier than in 1920. There were also large areas of cloud in some regions, which blotted out the surface markings over which they drifted. Mars is a most tantalizing object, because, with large telescopes, much detail can be seen and seasonal changes seem to take place, but as yet most of it is just beyond our ken, which makes us long to know more about our neighbouring world.

The remaining planets are always beyond our naked eye-sight. Uranus, like most of the others this month, is near the sun and will be passing beyond it on 17th May. Neptune is still near Beta in the constellation of the Virgin as was shown in the March journal. Being so far from the sun he appears to move through the heavens very slowly.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.



LOOKING NORTH ABOUT DARK.

IN the centre of the picture, just above the mountain peak, is the Sickle, which with the three stars to the right, or east, forms the constellation of the Lion. The stars in the forepart of Leo make a wonderfully well-formed sickle, hanging upside down in our southern skies, but in the northern hemisphere, where the forty-eight ancient constellations were devised, the sickle is upright, forming a conspicuous and rather arresting starry figure. Leo is the most famous of the zodiacal constellations. This distinction is due, probably, to the fact that when the ancient constellations were devised—perhaps nearly 5,000 years ago—the sun was in this constellation at the summer solstice. It may be that as the Lord, or King, of day was in Leo at midsummer, the brightest star was called "Little King," or, as we call it, Regulus. Regulus is a bluish-white star of tremendously high temperature, which gives it a luminosity of seventy times greater than our sun. However, its light rays, travelling 186,000 miles every second, has taken over seventeen years to reach us, and for that reason Regulus appears as a star barely of the first magnitude. The second brightest star in the Sickle is Gamma Leonis, whose colour contrasts strongly with Regulus. In a telescope Gamma is seen to be double—in fact, there is a third rather faint companion star.

HYDRA, THE WATER SNAKE.

If a line is drawn from Gamma to Regulus and continued, the chief star in Hydra, the Water Snake, is reached. This is a second-magnitude star, somewhat orange-coloured, known as Alphard, the "Solitary," as it is alone in a rather dark region. Alphard is sometimes called Cor Hydræ, the "Heart of the Water Snake." This is one of the ancient constellations and the longest in the heavens, extending, roughly, from west to east for 100 degrees. It is, perhaps, the darkest also, for all the stars excepting Alphard are small. Its dark, sinister, writhing form stretches from near the bright star Procyon, near the lower edge of the Milky Way, through Alphard, below Corvus, the four stars near the top right-hand corner, and on into the next constellation, Libra, which is well beyond the picture. Procyon and the small stars near it are the only two bright stars in Orion's dog, Canis Minor. The smaller star is sometimes called Gomeisa, the "Dim-eyed." It has been suggested that the name may be a corruption of the Arabic word "Al Ganus," the "Puppy," which would be very appropriate.

Across the Milky Way from Procyon is the brightest star in the heavens, Sirius, the great Dog Star; it is the chief star of Orion's greatest dog, Canis Major. Sirius is a most beautiful white, sparkling star, and on clear, cold nights its scintillations are wonderful. For long it was thought that Sirius must have a large dark companion, which would explain its otherwise unaccountable movements. When a large telescope was being tested some years ago, this companion was seen for the first time. Instead of being large and dark, as was expected, it was exceedingly bright and extremely small. For so small a body to have sufficient attractive force to sway Sirius, with a diameter of nearly 2,000,000 miles, it must be of enormous mass.

A TON IN A NUTSHELL.

It has been calculated that a piece of this White Dwarf, as these little stars are now called, as large as a walnut, would weigh a ton. Recently it was found that Procyon had a White Dwarf companion also, and its mass is even greater than that of the Sirian dwarf. The two bright stars below Procyon are Castor and Pollux, in Gemini. The higher one is Pollux. In the top right-hand corner are four third-magnitude stars forming a foursided figure; this is Corvus, the "Crow." The short side of the figure points to the bright white star Spica in the Virgin. The small dot half-way between Corvus and the Lion's tail, shows where Neptune is at the present time.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1941 AND 1940, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of years' records.	Feb., 1941.	Feb., 1940.		Feb.	No. of years' records.	Feb., 1941.	Feb., 1940.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	11·38	40	10·31	17·10	Gatton College ..	3·40	42	1·76	5·10
Cairns	16·15	59	30·98	17·11	Gayndah	4·17	70	1·43	7·40
Cardwell	17·08	69	9·47	22·39	Gympie	6·62	71	3·05	4·65
Cooktown ..	13·74	65	17·67	7·62	Kilkivan	4·95	60	0·90	5·80
Herberton ..	8·52	55	7·74	20·52	Maryborough ..	6·67	70	5·09	7·24
Ingham	16·97	49	19·21	29·22	Nambour	9·52	45	6·33	13·88
Innisfail	22·93	60	35·34	17·87	Nanango	3·95	59	1·00	5·05
Mossman Mill ..	19·16	28	30·88	18·67	Rockhampton ..	7·64	70	2·26	11·81
Townsville ..	10·95	24	5·91	23·75	Woodford ..	8·15	54	2·49	5·96
Central Coast.					*Central Highlands.*				
Ayr	9·58	54	2·85	20·87	Clermont ..	4·26	70	5·56	12·45
Bowen	9·01	70	3·30	25·10	Gindie	2·79	42	..	7·10
Charters Towers ..	4·63	59	5·24	12·28	Springsure ..	3·82	72	1·09	8·60
Mackay P.O. ..	12·16	70	6·81	37·20	*Darling Downs.*				
Mackay Sugar Experiment Station	11·90	44	6·87	38·62	Dalby	2·79	71	2·35	5·27
Proserpine ..	13·71	38	9·25	43·60	Emu Vale ..	2·53	45	1·35	6·14
St. Lawrence ..	6·47	70	8·26	11·38	Hermitage ..	2·39	35	..	4·96
South Coast.					Jimbour	2·69	62	2·45	5·88
					Miles	2·69	56	1·69	7·14
Biggenden ..	4·19	42	1·21	2·58	Stanthorpe ..	3·14	68	2·11	6·72
Bundaberg ..	6·41	58	3·00	9·02	Toowoomba ..	4·43	69	2·43	5·21
Brisbane	6·30	89	1·59	7·98	Warwick	3·01	76	1·39	5·46
Caboolture ..	7·76	65	3·44	7·87	*Maranoa.*				
Childers	6·48	46	3·88	5·54					
Crohamhurst ..	12·37	48	7·74	10·51	Bungeworgorai ..	2·32	27	..	8·04
Esk	5·28	54	0·68	6·87	Roma	2·92	67	..	8·62

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—FEBRUARY, 1941.

COMPILED FROM TELEGRAPHIC REPORTS.

Divisions and Stations.	Mean Atmospheric Pressure at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	..	86	75	92	12	71	5	1,767	21
Herberton	..	78	64	86	10	59	7, 8, 9,	774	19
Rockhampton	29·95	87	72	96	7	67	19	226	12
Brisbane	30·05	82	68	90	7	64	16	159	13
Darling Downs.									
Dalby	..	85	62	96	26	54	14	235	3
Stanthorpe	..	78	58	90	25	51	13	211	7
Toowoomba	..	75	60	84	12	53	13	243	10
Mid-Interior.									
Georgetown	29·87	92	71	96	25, 28	65	27	401	8
Longreach	29·94	94	69	101	13	63	14, 18, 21	109	4
Mitchell	30·00	87	61	95	11, 25	48	13	..	..
Western.									
Burketown	..	91	76	98	10	71	9	614	10
Boulia	29·89	100	74	107	11	67	4	..	..
Thargomindah ..	29·96	94	71	101	10, 24	62	27	..	..