ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

Vol. LV. 1 FEBRUARY, 1941 Part 2

Event and Comment

Expansion of the Tobacco Industry.

THERE was big scope for the expansion of the Australian tobacco-growing industry, and that expansion would take place if the economics of the industry were properly adjusted, said the Minister for Agriculture (Mr. Frank W. Bulcock) in the course of a recent announcement.

He was commenting on plans for the extension of tobacco production and the co-operation of the States with the Commonwealth in applying them.

Mr. Bulcock said that the Mareeba and Dimbulah districts of Queensland could grow tobacco which, of its class, was equal to any produced in the world. Tobacco production, equally with the production of other crops, depended on the return obtained by the grower. Tobacco growing had not made the maximum possible expansion in Australia because the fiscal policy had not favoured the grower. In recent years there had been some expansion, as the grower had acquired more knowledge of the processes of the culture and curing of a satisfactory leaf.

New Remedy for Worms in Sheep.

A LIMITED supply of phenothiazine will be available shortly for the treatment of worms in sheep.

This chemical in exhaustive scientific tests has proved effective against all except tape worms, but at the moment greatest importance is attached to its capacity to expel the nodule worm.

Another interesting feature of the discovery is its effectiveness against the so-called red worm in horses. Its great advantage in this respect is that it can be given in the feed.

In a recent statement the Minister for Agriculture and Stock (Mr. Frank W. Bulcock) pointed out that hitherto stocks of phenothiazine in Australia have been sufficient only for experimental purposes. Because of the war it has been extremely difficult to obtain supplies. Recently, however, a small consignment had been received, part of which will be made available in the near future to stockowners in this State.

Trees and Soil Conservation.

WHILE the planting of trees would assist in solving the problem of soil erosion, a more important preventive measure in Australia at present was that trees should not be destroyed, said the Minister for Agriculture and Stock (Mr. Frank W. Bulcock) in the course of a recent statement on rural problems.

The Minister was commenting on the cabled report that the planting of millions of trees in the "dust bowl" area of the United States had led to the reclamation of many farms. He said that the subject had been closely considered by his Department, and that only recently a Queensland officer had visited New South Wales to make a survey of the soil conservation methods adopted by the Bureau of Soil Conservation there.

The problem of soil drift was acute in some parts of Australia, said the Minister. In places, the central desert had extended, causing ruin to good pasture and grazing land. Trees served two purposes. They held the soil and protected it from the wind. Only trees that were of no use, or otherwise undesirable, should be removed. Indiscriminate ringbarking should be avoided, for ringbarking might, in some cases, create the conditions which had ruled in the American "dust bowl." There, it had cost the United States Department of Agriculture and individual States many millions of dollars to restore to productivity land which had been ruined by the destruction of trees or by misuse.

Erosion by wind force, which had had so serious an effect in the American "dust bowl" area, could be checked by trees, hence the need for their conservation.

Farming of the Future.

SOME remarkable developments are arising out of the war which must, in one way or another, have a profound influence on the future of agriculture in Australia, as well as elsewhere. The war, for instance, has led to an improvement in methods of industrial output, as well as to the discovery and use of new sources of power and energy.

Much of present-day research will have no real economic application when the war is over, but many of the discoveries now being made will be of considerable benefit when peace returns. We in Australia are, fortunately, far away enough from the actual scenes of conflict to have time for studying closely what the future world demand for primary products are likely to be. For example, after the war there is sure to be a heavy demand for wool and livestock in Europe, especially in the countries exploited so disastrously for their people by a ruthless invader. Besides food and clothing, the demand on the primary industries is

growing enormously for the raw materials of new manufacturing industries. Farming is becoming, therefore, not only a matter of scientific practice but also of scientific planning in association and in consultation with the other major industries of the Commonwealth, while our Governments are wisely giving close attention to world trends, both in industry and in agriculture.

New Uses for Maize.

OF especial interest to Queensland maizegrowers is the news that the United States Department of Agriculture is about to open a laboratory for the study of maize as an aid to industry associated with national defence. This will really be an extension of the work of investigation into the many industrial uses to which maize can be put, apart altogether from its uses as food for man and beast. It is proposed to explore the possibilities of maize as a base for synthetic rubber, plastics, fibres, and motor fuel. Last year yarn, buttons, poker chips, and laminated boards made from a maize by-product were exhibited at the National Farm Chemurgic Conference, hence the possibilities sought by the research workers are not so very remote.

The by-product from which the articles mentioned are manufactured is a protein called zein, which constitutes about 10 per cent. of the whole maize. Its most practical use at present is for coating paper. It is oil and grease proof. Zein films are tasteless, odourless, and non-toxic, hence they are useful for food containers. Another use is in solid-colour printing using aniline dyes. It is claimed that by using zein, fugitive dyes can be made more light-resistant; and that bleeding dyes can be made more resistant to water. In a clear state, zein can be formulated to carry bronze and aluminium powders. It also is made into a plaster which can be moulded in combination with other resins. It has several other industrial uses which suggest the immense possibilities of a crop which is now so largely used as a food for farm animals.

The results of the research work now in progress will be awaited with interest, especially by those who foresee the effect these new developments must have on the future of our primary industries.

Back to the Horse.

WITH war conditions necessitating the rationing of imported oil and petrol, and the introduction of more economical methods in the farming industries, there has been a marked swing back to the horse, especially in the Southern States.

Prospects for the horse-breeder have been materially brightened by recognition of the national importance of the horse, and of the obligation to the breeders who are now straining every resource to maintain their stud establishments at a high standard. This encouragement is warmly welcomed by breeders of Clydesdales and other utility horses. It not only enables them to plan ahead and build up for the future, but it will place the horse-breeding industry in Australia on a much sounder footing than it has been since the tractor began to push the horse out of its regular farm job.

Growing interest in heavy farm horses, the Clydesdale particularly, has been reflected by increased sales by horse-breeders and bigger entries in country shows for the utility horse classes. The horse is by no means a back number.

The Soils of the Nambour, Woombye, and Palmwoods Districts and their Suitability for Pineapple Culture.*

L. G. VALLANCE, M.Sc., Assistant Research Officer.

THE soils of the Nambour, Woombye, and Palmwoods districts vary considerably in their suitability for pineapple culture because of fundamental differences in their physical and chemical characteristics. A series of soil investigations has been carried out in order to determine the nature of these differences. The various soils were first classified, the unit of classification being the "soil type." Each soil type was then examined in order to gain a knowledge of (*a*) its capacity to supply moisture to growing crops, (*b*) the conditions of aeration and drainage which exist in it, and (*c*) the amount of plant foods it contains.

In the area surveyed, two main soil groups occur, each of which is composed of a number of soil types. The two groups are distinguished primarily by the colour of the surface, sub-surface, and subsoil layers. Since this colour difference is an indication of physical and chemical changes, it provides a convenient means of identification. The soils are described as follows:—

Group 1.—The soils of this group are dark brown to reddish brown on the surface. The reddish tinge increases with depth, and this intensification in colour is a definite characteristic of the subsoil. These soils usually occur on the long, more or less unbroken ridges near the township of Woombye, which extend generally southwards to Palmwoods.

Group 2.—This group of soils is much lighter in colour than those described above. The colour of the surface layer is greyish brown, and it is usually shallow and overlies a yellowish brown subsoil. This yellowish colour contrasts very sharply with the reddish nature of the subsoils of Group 1.

DEFINITION OF SOIL TYPE.

In order to recognise any particular soil type, it is necessary to consider the surface, sub-surface, and subsoil layers as one complete unit. The surface layer, or as it is more commonly called, the "surface horizon," is that portion of the topmost soil, which, because of its relatively high organic matter content, is somewhat darker in colour than the soil immediately underlying it. The "sub-surface horizon," as the name indicates, occurs directly below the surface horizon to which it is similar in texture. However, it is lighter in colour since there is a decrease in the amount of organic matter present. The "subsoil" underlies the sub-surface layer. It differs from the surface and sub-surface in that it contains practically no organic matter, and the percentage of clay is much higher. The increased amount of clay in the subsoil is due to the removal of the finer particles from the surface and sub-surface horizons by water percolating downwards, and

* The second of a series of soil surveys covering the major pineapple-producing areas in southern Queensland has been completed. The work was carried out in the Nambour, Woombye, and Palmwoods districts, and a report on the data obtained was published in the August and September, 1940, issues of this Journal. As this report was necessarily technical in nature, it has been considered advisable to present separately a short non-technical discussion of the soils concerned, with particular reference to the practical aspects of pineapple culture in the districts surveyed.

its subsequent deposition at the lower levels. The nature of these three horizons and the various depths at which they occur define the soil type.

Although the roots of the pineapple plant are confined chiefly to the surface and sub-surface horizons, it is not possible to determine the suitability for pineapple culture of any soil type by an examination of these two layers alone. The conditions of moisture availability, aeration, and drainage occurring in the root zone is of utmost importance to the health of the plant. While these conditions are inherent properties of the surface and sub-surface layers themselves, they are influenced to a large extent by the nature of the subsoil, and the depth at which it occurs. For instance, underneath a sandy surface horizon, which is open and porous, a tight, clayey subsoil almost impermeable to water,

Plate 23.

Shallow Phase of Palmwoods Sand.—The formation of large, compact clods in the dry, upper portions of the subsoil indicates the clayey nature of this zone.

may occur, even at a shallow depth. (Plate 23.) During prolonged wet periods the porous surface material may suffer from temporary water logging, since the excess moisture cannot drain away from the root zone, owing to the relatively impervious subsoil. This condition will be aggravated if run-off water is received from higher slopes.

During the survey of the Nambour, Woombye, and Palmwoods districts, it was found that a considerable variation occurred in the characteristics of the surface, sub-surface, and subsoil horizons of the various soil types. Before describing these variations it may be advisable to define the meanings of some of the terms used in the descriptions.

SOIL TEXTURE.

Soil texture is an important characteristic which may readily be determined in the field. Various terms are used to describe the texture of a soil. The most commonly used terms are: sand, sandy loam, loam,

sandy clay loam, clay, clay loam, and sandy clay. Since a soil is a mixture of particles whose sizes range from relatively coarse material (sand) to very fine material (clay), its texture will depend on whether the coarse or fine particles predominate. A sandy soil or sandy loam will contain a high proportion of sand in preference to clay, while a loam or a clay soil is characterised by a much larger proportion of clay. The determination of the texture of a soil or subsoil should always be carried out on a moistened sample. Conclusions made from the examination of a dry soil are often misleading, e.g., unless the sample is wetted, a clay which is slightly granular in appearance may be mistaken for a sandy soil. The following procedure is recommended for determining texture:—Soil held in one hand is slowly moistened with water and the water is added cautiously until the soil is quite wet, but not sloppy. The soil is then kneaded with the fingers of the other hand. If free water oozes from the soil after it has been well kneaded, too much water has been added. This may be remedied by the addition of a little more soil. The "feel" of the soil is noted during the kneading process. The texture can now be determined since the various textures will impart the following characteristics to the moistened soil:—

Sand.—A soil which may be classified as a sand will be loose and incoherent. It will not stick or bind at any moisture content. If the wet sample is squeezed between the fingers the individual sand grains can be felt, and it will be evident that a large number of them are present. There is no plasticity and the soil cannot be moulded. With a further addition of water the mass will fall apart.

Sandy Loam.—A soil possessing this texture is slightly more coherent when moist than a sand. It shows a very slight degree of plasticity, and, therefore, when it is squeezed in the hand it will mould itself into a lump. However, this is loose and friable and falls apart readily. A large number of sand grains are present. There is no trace of stickiness.

Loam.—In this texture class, the proportions of sand and clay present are such that neither of these two constituents predominantly influences the "feel" of the moist sample. The "loaminess" is readily recognised since the sample does not feel sandy, nor is there any suggestion of stickiness. When the sample is kneaded it becomes definitely plastic and may be moulded into blocks or cubes. These are porous, and under slight pressure break readily with the formation of large cracks. The moist soil may be rolled into a rope-like form between the palms of the hands. This is not flexible and breaks with slight bending.

Sandy Clay Loam.—The features which distinguish this texture class from a normal loam are the presence of sand particles, which can be felt in the moist sample, together with a stickiness imparted by an increased clay content. It is most aptly described as a sticky sandy loam.

Clay.—A clay soil will absorb a considerable amount of water. When wet it is noticeably sticky and exhibits a high degree of plasticity. It may be moulded into numerous shapes. Pressure on these moulded forms produces indentations, or a change of shape, rather than a disruption of the mass. It may be rolled into long threads the ends of which may be joined to form a ring.

Clay Loam.—As the name indicates, a wet soil of this texture will possess a "feel" which is intermediate between that of loam and clay. A loamy tendency is apparent but a definite stickiness is also noticeable. It is possible to roll it into long threads, the ends of which may be joined with little difficulty.

Sandy Clay.—This has a high clay content and therefore possesses almost the same degree of plasticity and stickiness as a clay soil. It contains, however, a noticeable proportion of sand, which can be felt when the moist sample is rubbed between the finger and thumb. Usually, it is composed of sand and clay with only a small proportion of particles whose sizes are intermediate between these two extremes. The organic matter content is generally low, and a sandy clay texture occurs most commonly in subsoils.

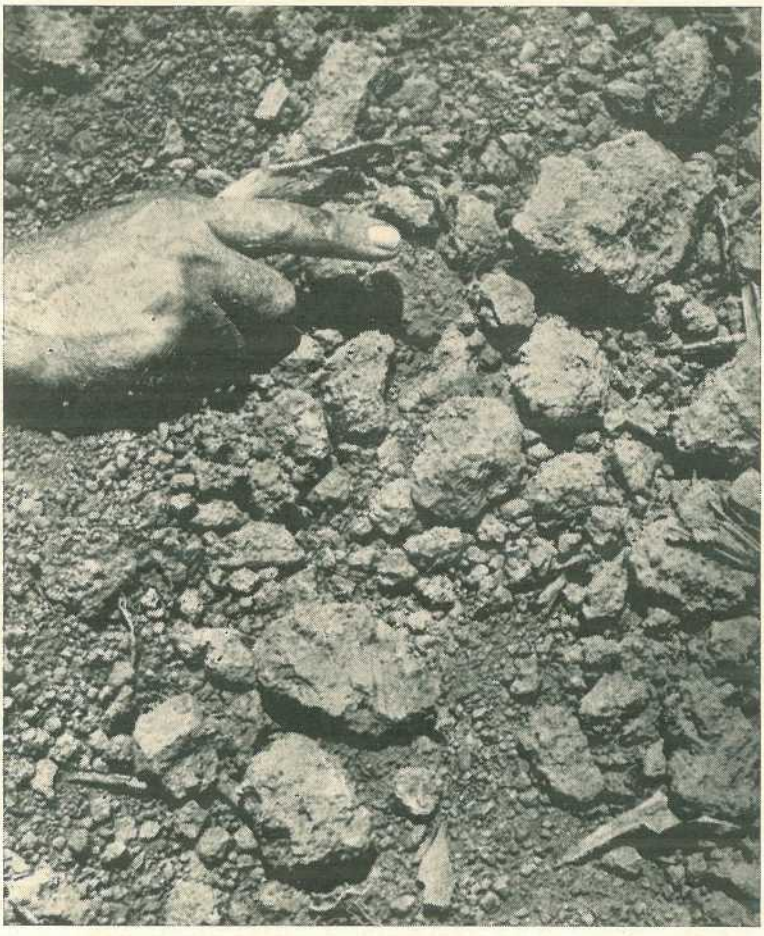

Plate 24.

CLODDY STRUCTURE.—The formation of these large, hard clods is typical of a soil which is low in organic matter and contains a relatively high percentage of clay. In the Nambour, Woombye, and Palmwoods districts a persistent cloddy state indicates a soil less suitable for pineapple culture than one in which a crumb structure is present.

SOIL STRUCTURE.

The term "structure" as applied to the soil is often confused with texture. It is, however, an entirely different property. The texture is seldom apparent to the eye, but is recognised most conveniently by the sense of *touch*. Structure, however, can be *seen*, since it is the state reached when the small particles of the soil form visible aggregates. Cloddiness is a definite form of structure. Although texture and structure are separate properties, the structure of a soil is often dependent upon its textural characteristics, and certain textures often give rise to characteristic structures. In general, it will be found that the lumps or clods become larger and more compact as the clay content increases.

The soil organic matter also plays an important part in the formation of structure. Its chief function is to reduce the size of the clods by rendering them porous and friable. In this state they readily break down into a loose mass of small soft "crumbs," about one-quarter inch in diameter. Such a soil is readily permeable to water, has a high moisture supplying power, and is well aerated. It is particularly suitable for pineapple culture. A "nutty" structure is one in which the aggregates are ½ to 2 inches in diameter. When the soil lumps are 4 to 10 inches wide the structure is termed "cloddy." In the Nambour, Woombye, and Palmwoods districts, a persistent cloddy state usually indicates a less suitable soil for pineapple culture than one in which a crumb structure is present, since it implies a low organic matter content in conjunction with a relatively high percentage of clay. (Plate 24.)

In the loams and clay loams of the area, the presence of a favourable soil structure is essential, for its presence means that there is a satisfactory system of passages between the soil aggregates or lumps thus allowing the free entry of air and the removal of excess moisture. This greatly improves the drainage of the heavier surface soils. Moreover, since the rate of penetration is increased, there is less loss of water by surface run-off. Consequently, not only is erosion decreased, but the replenishment of the moisture content of the sub-surface and subsoil layers is facilitated.

Structural aggregates do not form in the sands and sandy loams. However, water movement is not restricted in these, since the high percentage of sand present maintains a loose and porous condition in the soil.

SOIL TYPES OCCURRING IN THE AREA.

From an agricultural point of view the soil types which are most commonly used for pineapple production in the Nambour-Woombye-Palmwoods area may be conveniently discussed by grouping them according to the texture of their surface horizons.

The Loams.

Throughout the area there is a widespread distribution of soils whose surface horizons are typically loam in texture. Because of this and other similarities in their sub-surface and subsoil horizons, these soils form a definite soil type, which has been termed the Woombye loam. It occurs about the township of Woombye, and extends generally towards Palmwoods and Diddillibah. In general, it is developed on the long, gentle and frequently unbroken ridges which occur in these areas.

The Woombye loam is readily recognised by its dark brown to dark reddish brown colour, and the loam texture of its surface and sub-surface horizons; this texture persists without appreciable change to a depth of 12 inches. At this depth, the texture becomes noticeably heavier and may be classed as clay loam, the colour of which is red to reddish brown. The subsoil, which occurs at a depth of about 20 inches, is also typically reddish in colour. Its texture, however, is moderately heavy, and is described as clay.

A well-developed crumb structure is usually present in the surface horizon, and this provides a favourable environment for the root development of the pineapple plant. The sub-surface and subsoil horizons are well drained, provided there is sufficient slope to ensure the removal of excess surface water. However, the favourable structural condition of the surface soil depends largely upon the amount of soil organic matter present. In the virgin state there is a good supply of humus, but in many instances this has depreciated with continued cultivation. Consequent upon this loss, there is a deterioration of the originally favourable structure. The soil becomes a mass of very fine particles and, when dry, is dust-like in appearance. On wetting, the individual particles swell, resulting in a tightly packed soil. Excess water will not drain away and, therefore, the access of air to the roots is decreased. Because the pineapple plant is sensitive to any decrease in the supply of oxygen to its rooting system, such a soil condition adversely affects its growth during prolonged periods of wet weather. Furthermore, since the penetration of moisture is slow, much of the water from sudden storms will be lost in the run-off. During the spring and early summer, when conditions are normally dry, the maintenance of a supply of available soil moisture is largely dependent upon storm rains; but, if the surface layer does not readily permit the penetration of these rains, the sub-surface and subsoil horizons will remain dry during this part of the growing period.

Because the ability of the Woombye loam to withstand very wet or very dry conditions is largely determined by its structural features, it is essential to maintain its organic matter content as close as possible to the original level. Cover crops are helpful, but the most effective way of replenishing the organic matter content of pineapple land before replanting is by returning the whole of the old pineapple plants to the soil. The practical difficulties this presents are being largely overcome by the use of the tractor-powered rotary hoe. The benefit resulting from this is twofold; in addition to maintaining the humus content at a satisfactory level, large quantities of nitrogen, phosphoric acid and potash, contained in the old plants, are conserved.

When the Woombye loam is being prepared for pineapples, it should be ploughed as deeply as possible. This will open up the sub-surface horizon, thereby improving the percolation of water through this layer. Unless erosion has occurred, the clay subsoil is well below plough depth and there is little danger of mixing this unsuitable material with the upper layers. The use of a rotary hoe should be avoided when the sub-surface is in a moderately sticky or plastic state, otherwise a compacted layer is formed immediately below the disturbed soil. Trampling during harvesting and other operations cannot be avoided, but the effect of this is not serious when the Woombye loam is

in a favourable structural condition. However, if the soil has been reduced to a dust-like state by excessive cultivation and loss of organic matter, the surface will soon become tight and compact. In ratoon crops growing on soil of this type, it is a good practice to open up a double furrow down the middle of the inter-row space in the winter. While this has a beneficial effect on drainage generally, it also permits the development of new roots from higher up the parent stem since the depth of the root zone is increased by the soil which is thrown up against the base of the plant. The root damage which is caused by plouhing such a furrow at this time of the year is negligible.

The Woombye loam has a higher wilting point than the sands and sandy loams of the district, that is, it must contain considerably more moisture before the water is available for plant growth. For this reason it is important that the soil should be maintained in a condition in which it can make efficient use of the characteristically intermittent rainfall of the Nambour-Woombye-Palmwoods area. The storage of water in the surface and sub-surface horizons depends upon the permeability of these layers. As a means of reducing moisture loss by evaporation, mulching of the surface soil is recommended on old land. Peanut shells, sawdust, and paper mulch are excellent for this purpose. If paper mulch is used, it should not be laid down on a dry soil. The paper is waterproof; therefore the dry soil under the paper can receive its water only from the soil which has been wetted outside the paper. The lateral movement of moisture in the Woombye loam is very slow, and tests have shown that the dry soil under the paper will remain in this state for some considerable time. An additional benefit derived from the use of mulch is that it prohibits the beating down effect of the rain on the soil of the plant rows. This is particularly important during the early stages of growth, since the pineapple plant does not produce an adequate cover for the soil until eight or nine months after planting. The use of surface mulches on the Woombye loam also serves to maintain a loose and friable and, consequently, well-aerated soil condition.

When selecting land of the Woombye loam type, it is particularly important to avoid depressions and areas in which the surplus surface water cannot readily drain away. Pineapples growing on these areas are susceptible to wilt and top rot. A sloping site is preferable, and the plant rows should be given sufficient fall to ensure the removal of run-off water. Each row should carry its own water only, and, if this is taken off by cross drains at intervals not greater than one chain, erosion will be reduced to a minimum.

The Woombye loam may be very successfully utilised for pineapple culture. With careful management and adequate fertilization the production from replanted areas compares favourably with that from new land.

The Sandy Loams.

A group of soils which are extensively used for pineapple production in the Nambour-Woombye-Palmwoods area are characterised by a sandy loam surface horizon. This group contains three main soil types, as follows:—(*a*) Woombye sandy loam, (*b*) Coe's Creek sandy loam, and (*c*) Palmwoods sandy loam. The Woombye soil is the most important of the three. It occurs on the same slopes and in close

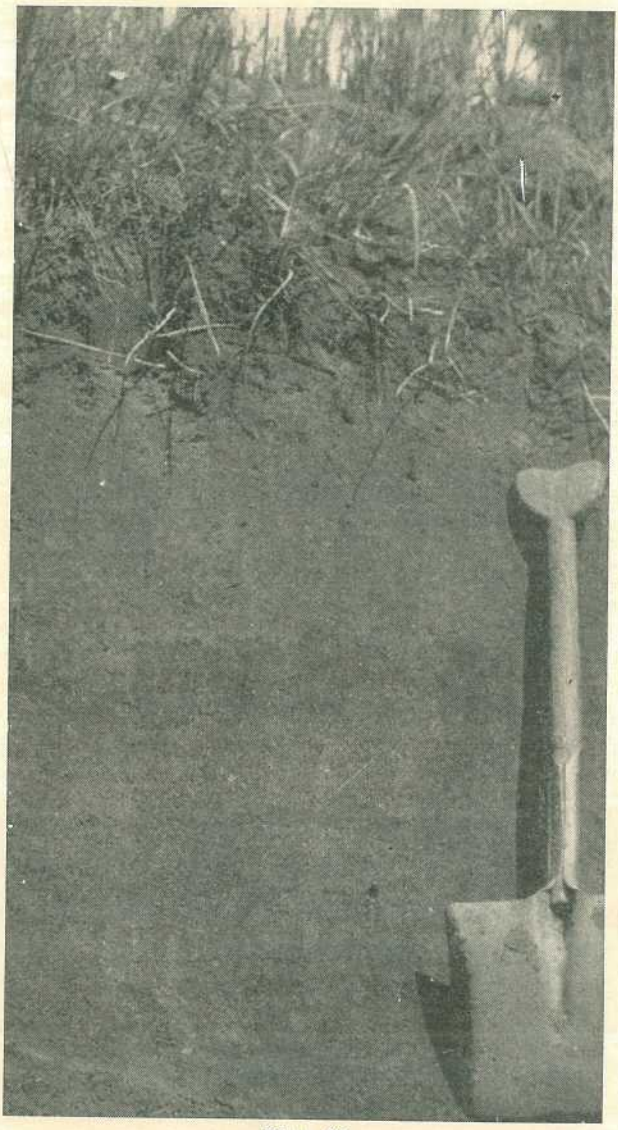

Plate 25.

Woombye Sandy Loam.—Note the absence of a clayey subsoil. The sandy loam surface horizon grades almost imperceptibly into the sub-surface and subsoil horizons. This is in marked contrast to the Palmwoods sandy loam (Plate 26), which shows an abrupt line of demarcation between the surface and sub-surface horizons and the subsoil horizon, due to the increased clay content of the latter.

association with the Woombye loam, to which it is very similar in colour and general appearance. The surface horizon is dark brown, grading into dark reddish brown in the sub-surface. The subsoil is red, and this colour is typical of both the Woombye loam and Woombye sandy loam. The sandy loam surface layer, usually about 6 inches deep, overlies a sub-surface horizon the texture of which is intermediate between sandy loam and loam. The subsoil proper begins at 15 inches

and the texture of this horizon, which extends to a depth of 42 inches, is but slightly heavier than sandy loam. (Plate 25.)

Because of the favourable texture of its various horizons, the Woombye sandy loam is a well-drained soil. It is therefore admirably suited for pineapple culture. A high moisture-supplying power enables it to withstand dry weather to a greater extent than the Woombye loam. Nevertheless, it is important that the soil organic matter should be conserved by every possible means, since a climatic feature of the district is the prevalence of long dry spells. As in the case of the Woombye loam, cover cropping between plantings is beneficial, and the turning in of the old pineapple plants is also a valuable practice. An occasional deep ploughing will serve to loosen up the sandy loam—loam sub-surface which has a tendency to compact after prolonged cultivation. In order to minimise this tendency the land should not be rotary-hoed when the moisture content of the sub-surface horizon imparts even a slight suggestion of stickiness to this layer.

While the drainage of this soil is normally good, it is important to make provision for the disposal of surplus water received from higher levels. A well-planned system of water channels will also decrease erosion of the valuable surface horizon. Since the topography varies greatly between individual areas, it is impossible to lay down hard and fast rules regarding the placement of drains to carry away surplus water. In general, however, it is advisable to lay out the crop rows in the direction of the slope, unless the fall is greater than one in six, in which case the rows should be angled slightly. In either case, cross channels, about 10 inches wide by 10 inches deep, should be provided at intervals of not more than 1 chain.

Plate 26.

PALMWOODS SANDY LOAM.—The increased clay content of the subsoil sharply differentiates this horizon from the sandy loam material of the upper layers.

From an agricultural point of view, there is not a great deal of difference between the Coe's Creek sandy loam and the Palmwoods sandy loam. Both of these soils differ considerably from the Woombye sandy loam in the nature of their subsoils. In marked contrast to the open porous nature of the lower horizons of the latter soil, the Coe's Creek and Palmwoods soils possess subsoils which contain a considerable amount of clay. (Plate 26.) Since some coarse sand is also present, the texture can best be described as sandy clay. The colour is yellowish brown and this again distinguishes these soils from the Woombye sandy loam.

The surface and sub-surface horizons are sandy loam in texture and dark brown in colour. The combined depth of these two horizons is usually from 15 inches to 2 feet. Since the soils occur on steep, hilly country, a great deal of the sandy loam material has often been lost by erosion, and where this has occurred the suitability of these soils for pineapple culture is greatly reduced (Plate 27). However, provided the clayey subsoil does not come within 12 inches of the surface, and, provided also that there is sufficient slope to remove surface water, both

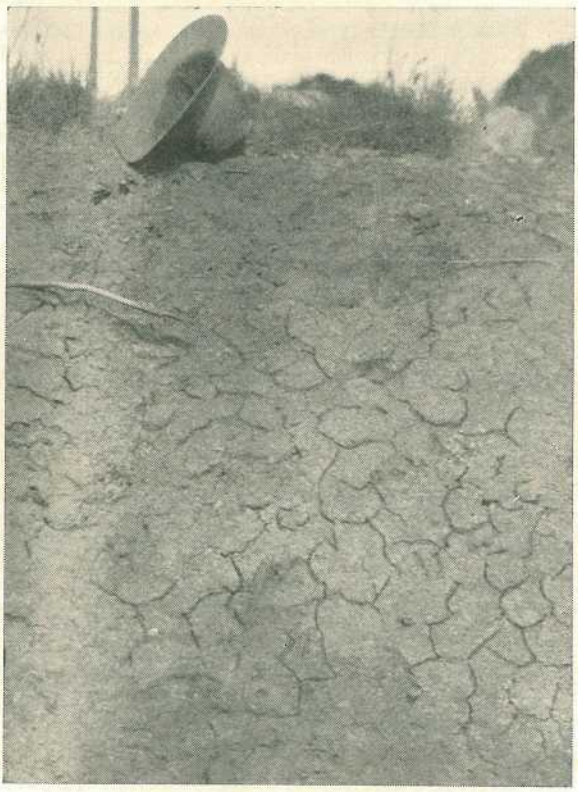

Plate 27.

Eroded Phase of Palmwoods Sandy Loam.—The presence of cracks on the dried face of the cut is an indication of a high clay content. Since the sandy loam surface and sub-surface horizons have been almost completely eroded, the clay subsoil now extends to within a few inches of the surface. The planting of pineapples on soils of this type is responsible for badly wilted patches in many areas.

these soil types may be planted to pineapples with reasonable success. Deep ploughing is not necessary before planting. Eroded areas should be avoided, as little can be done to ameliorate the unfavourable subsoil conditions. Even if the subsoil is opened up by deep ploughing or subsoiling, it rapidly resumes its original condition when saturated by rain. The moisture retention capacity of the surface and sub-surface horizons is good. As has already been pointed out for the previously described soil types, however, the loss of organic matter rapidly affects moisture availability. Thus, conservation of organic material will considerably increase the replant value of both of these soil types.

The Sand Types.

A great deal of country in the Nambour, Woombye, and Palmwoods districts is charcterised by a sandy surface soil. In these districts many sandy soils are successfully planted with pineapples, while others produce indifferent returns when planted to this crop. During the survey it was found that the major differences in productivity lay in the nature of the subsoils. Four main sand types were recognised, as follows:—

Palmwoods Sand.—The surface soil, which averages about 3 inches deep, is a dark brown to yellowish brown sand. It is somewhat darkened by organic matter, the content of which decreases sharply in the sub-surface horizon. In this latter horizon, the clay increases slightly, the texture being sandy loam to sandy clay loam. The subsoil usually commences at 12 inches deep. This is a sandy clay loam horizon, and is somewhat sticky when wet. Its colour is yellowish brown with a slight reddish tinge. On moderate slopes the drainage is good. This soil erodes easily, and in some cases the sticky clay loam subsoil was observed less than 4 inches from the surface. Such areas should be avoided when selecting land of this type for pineapple culture.

Coe's Creek Sand.—To a depth of 18 inches this type has a sand content of approximately 85 per cent. The colour is grey brown, becoming lighter with depth as the organic matter decreases. Although the clay content increases below a depth of 18 inches, there is still a considerable amount of sand present. The texture of this subsoil can best be described as that of a sandy clay loam, and its colour is greyish yellow or light yellowish brown. In some cases a band of river gravel is met with at depths varying between 2 and 3 feet. Normally the soil is well drained, but as it often occurs on very steep hillsides a considerable amount of erosion may have taken place.

Nambour Sand.—The Nambour sand occurs on many steep slopes in the Rosemount area and also in close proximity to the town of Nambour. It is a greyish brown sand. Very sandy material normally persists to a depth of approximately 2½ feet, below which is a horizon of broken sandstone and clay (Plate 28).

Rosemount Sand.—This soil type is of minor importance, and it occurs chiefly in the Rosemount and Diddillibah districts. The surface and sub-surface horizons are very sandy in texture. At 18 inches deep the proportion of clay increases sharply, and a sticky and almost impervious sandy clay horizon occurs. The soil is distinguished by a characteristic brown colour throughout the surface, sub-surface, and subsoil horizons.

The suitability of these sand types for pineapple culture depends upon the depth of the surface and sub-surface horizons. The steep slopes which these soils usually occupy are particularly subject to erosion so that, quite frequently, much of the sandy surface material has been carried away by storm water. In general, the sticky clay subsoil should be deeper than 12 inches from the surface; otherwise the land is of mediocre value for pineapple culture. Areas which are flat or low lying should be avoided. To avoid losses from wilt and top rot in the shallow phases of these sandy soils, it is essential that the plant rows should be laid out with sufficient fall to ensure the rapid removal of excess water. If there is very little slope the rows should be hilled before planting, in order to prevent storm water from breaking through the rows. An adequate number of cross drains should always be provided at short intervals, the length of the interval depending upon the degree of slope.

These sandy soils have a lower water holding capacity than either the loams or sandy loams. However, the wilting point is also low, so that pineapples growing on the sand types quickly respond to light showers. Nevertheless, it is essential, by every possible means, both to

Plate 28.

Nambour Sand.—The sandy surface and sub-surface horizons are about 2½ feet deep, and overlie a subsoil which consists of broken sandstone and clay. Note the deep root penetration and the overhang of the surface horizon, due to the greater content of organic matter than in the sub-surface horizon. The binding power of organic matter considerably retards erosion in sandy soils.

increase the moisture holding capacity of these soils by building up the soil organic matter, and also to reduce evaporation of moisture from them. With regard to the former, the most practical method is the turning in of the old pineapple crop, as recommended for the loams and sandy loams. Evaporational losses may be reduced by (*a*) close planting, which effectively shades the soil, (*b*) mulching of the soil, particularly on replant land, (*c*) control of weed growth, and (*d*) avoidance of excessive cultivation. The amount of cultivation which is necessary on these sandy soils once they are planted is practically limited to that required to keep down weeds. In the autumn, the soil which has been washed into the inter-row spaces from hilled rows may be lightly thrown back to the plant rows. During the spring, which is normally a very dry period, the surface should be disturbed as little as possible. Stirring the surface of sandy soils will not conserve the moisture of the lower portions; it merely increases evaporation in the disturbed area. Deep ploughing is unnecessary at any period.

Provided careful attention is given to the factors outlined above, these sand types will give very satisfactory results when planted to pineapples. They require little cultivation, and weed control is much easier than on the heavier soils. The most critical period in the life of the pineapple plant on these soils is during the first 12 months of growth. Once the inter-rows spaces are shaded by the plant leaves, however, loss of soil moisture is reduced, so that under proper management and adequate fertilizing these sandy soils produce healthy, vigorous plants which are able to withstand prolonged spells of dry weather.

The Clay Loam.

In the Rosemount portion of the area under review a soil occurs which has a clay loam surface texture, and which is very dark brown to black in colour. The sub-surface layer, which is slightly heavier than the surface layer, is a light clay. The combined depth of these two upper layers is about 12 inches. Beneath these is a greyish brown clay subsoil, about 6 inches thick. This overlies broken, rubbly rock, which is shaley in appearance.

As yet this soil, the Rosemount clay loam, has not been used extensively for pineapple culture. Provided certain conditions, particularly as regards drainage, are fulfilled, however, it may be very successfully used for the production of this crop. Although the texture is relatively heavy, the surface horizon possesses an excellent crumb structure because of its high organic matter content. Consequently it provides a favourable zone for the development of the roots of the pineapple plant. Unfortunately, the surface horizon is never very deep, and a heavy clay subsoil usually occurs at about 12 inches. For this reason young plants, although they make very good growth in the early stages, are apt to be severely affected by top rot during a wet winter. Losses from this disease may be virtually eliminated by running the rows with the slope, thereby giving the inter-row spaces sufficient fall to carry away excess water. On flat land or at the bottom of a slope, the beds should be hilled prior to planting.

CHEMICAL CHARACTERISTICS AND FERTILIZER REQUIREMENTS.

In order to determine the plant food content of the various soil types a large number of samples were submitted to chemical analysis. The results of these analyses have been summarised as follows:—

Organic Matter Content.

The Rosemount clay loam has been found to contain a very satisfactory amount of organic matter, viz., 5·0 per cent. organic carbon. This is by far the highest organic matter content of any of the soil types of the area. In the case of the Woombye loam, there is a sharp drop to values ranging from 2·0 to 3·0 per cent. Although this may be regarded as very fair, it is not far above the minimum required to keep this medium heavy soil in good structural condition. The importance of conserving the organic matter content of this soil type has already been stressed. The Woombye sandy loam, which is lighter in texture than the Woombye loam, contains practically the same amount of organic carbon. Of all the soil types of the area, this is the one most suitable for pineapple culture. Its high capacity to store and supply moisture is directly related to its sandy loam texture and relatively high organic matter content. The Coe's Creek sandy loam and Palmwoods sandy loam contain 1·5 to 2·0 per cent. organic carbon. These values are significantly less than those of the Woombye loam. Of the sand types, the Coe's Creek sand and Palmwoods sand contain the largest amounts. The values are low and vary from 1·0 to 2·0 per cent. The organic matter contents of the Rosemount sand and of the Nambour sand are both very low and are frequently less than 1·0 per cent.

Nitrogen.

The average nitrogen content of the soils examined is less than 0·1 per cent. Moreover, a great deal of this is present in a form which is not available to plants, so that the amount of available nitrogen which is contained in these soils is wholly inadequate for the successful production of pineapples. A dressing of at least 100 lb. of sulphate of ammonia should be given annually to every 1,000 plants, and fertilizer trials now in progress indicate that this amount could probably be increased with advantage.

Potash.

The amount of potash in the soil types varies considerably. In some, the content of available potash (calculated as sulphate of potash) is approximately 870 lb. per acre to a depth of 12 inches; in others it falls to below 280 lb. per acre foot. Experimental work has shown that even the larger of these two amounts is insufficient to support a well-grown pineapple crop without the addition of potassic fertilizers. For pineapples grown in the Nambour-Woombye-Palmwoods area it is recommended at present that every 1,000 plants should receive annually not less than 20 lb. of sulphate of potash, though experiments now in progress indicate that increased yields may result from even larger applications of this fertilizer constituent.

Phosphoric acid.

In all the soils of the district there is a pronounced deficiency of readily soluble phosphoric acid under virgin conditions. The average content found was equivalent to a dressing of only 50 lb. of super-

phosphate per acre. It is evident, therefore, that the profitable production of pineapples on these soils necessitates the regular application of phosphatic fertilizers. Superphosphate is an excellent medium for supplying the additional phosphoric acid required on these soils. It should be applied at the rate of not less than 30 lb. annually to every 1,000 plants.

The general lack of available plant foods which characterises the soils of the Nambour, Woombye, and Palmwoods districts is common to the majority of coastal soils of southern Queensland. For successful pineapple production in these areas, therefore, it is evident that the fertilizer programme adopted should be one in which the three main plant foods —nitrogen, phosphoric acid, and potash—are supplied in adequate quantities. In addition, it is essential that the fertilizer programme should be correctly *balanced*, i.e., the plant foods should be applied in the proportions in which they are required by a given plant crop when grown on a particular type of soil, since insufficiency of one constituent at any one time may limit the extent to which the others can be utilised.

A balanced fertilizer programme, which will ensure that pineapples grown on any of the various soil types of the Nambour-Woombye-Palmwoods area will receive the amounts of nitrogen, phosphoric acid, and potash recommended in the preceding paragraphs, is as follows:— "10-6-10" mixture applied at the rate of 50 lb. per 1,000 plants in the spring and again in the autumn, supplemented by 25 lb. of sulphate of ammonia per 1,000 plants in midsummer and again in midwinter. A handful of "10-6-10" mixture to every four plants is approximately equivalent to 50 lb. per 1,000, and, similarly, a handful of sulphate of ammonia applied to seven or eight plants gives a dressing of approximately 25 lb. per 1,000. Both of these fertilizers should always be placed well into the base leaves.

Soil Acidity and Sulphur Requirement.

The pineapple plant is sensitive to the acidity of the soil in which it is growing. The degree of acidity of a soil may be measured and is usually termed the "pH value." Thus, a soil which has a *low* acidity has a *high* pH value, i.e., as the amount of acidity increases the pH value decreases. In the Nambour, Woombye, and Palmwoods districts, pineapples make their best growth on soils which are definitely acid, and, therefore, have a somewhat low pH value. Unless the desired degree of acidity is present the plants are stunted and yellowish green to yellow in colour. Moreover, the growth is "spiky," the leaves being characteristically narrow and erect. A plant of this type is markedly susceptible to attack by root-destroying fungi and other disease organisms. Wilt is often prevalent on soils which are not sufficiently acid.

The various soil types in the area surveyed do not show very great differences in their pH values. In general they lie within the range pH 5·6 to 6·0. This is somewhat higher than desirable, since previous work has shown that for optimum growth the acidity of these soils should be maintained in the neighbourhood of pH 5. Therefore, it is necessary to adjust the acidity by the application of powdered sulphur. This should be broadcast evenly over the ploughed ground some four to six weeks before planting, and then harrowed in, since the sulphur requires to be intimately mixed with the soil before the reaction takes

place. The amount of sulphur required varies with the initial pH and also the texture of the soil: in general the higher the pH value, or the heavier the texture, the greater the dressing which should be applied. The sulphur applications required to bring each of the various soil types of the district to the desired degree of acidity have been calculated, and are given in the accompanying table.

TABLE I.

Sulphur Requirement of Soil Types.

Initial pH.	6·5–6·0.	5·9–5·8.	5·7–5·6.	5·5–5·4.
	lb. per acre.	lb. per acre.	lb. per acre.	lb. per acre.
Clay loam	..	..	500	300
Loam	600	500	400	300
Sandy loams	500	400	300	200
Sands	400	300	200	200

QUEENSLAND SHOW DATES FOR 1941.

February.

Stanthorpe ..... 6th to 8th
Killarney ..... 14th and 15th
Warwick ..... Postponed
Clifton ..... Postponed

March.

Allora ..... 7th and 8th
Pittsworth ..... 11th and 12th
Millmerran 14th
Goombungee 15th
Toowoomba ..... 24th to 27th

April.

Dalby ..... 1st and 2nd
Tara ..... 4th and 5th
Chinchilla ..... 8th and 9th
Miles 16th
Nanango ..... 23rd and 24th
Kingaroy ..... 30th and 1st and 2nd May

May.

Monto ..... 1st to 3rd
Goondiwindi ..... 2nd and 3rd
Longreach ..... 5th to 7th
Mundubbera ..... 7th and 8th
Blackall ..... 12th and 13th
Gayndah ..... 14th and 15th
Murgon ..... 15th to 17th
Beaudesert Show ..... 14th and 15th
Beaudesert Campdraft ..... 16th and 17th
Mitchell ..... 21st and 22nd
Biggenden ..... 22nd and 23rd
Ipswich ..... 27th to 30th
Gympie ..... 29th to 31st
Kalbar 31st

June.

Maryborough ..... 5th to 7th
Lowood ..... 6th and 7th
Childers ..... 9th and 10th
Boonah ..... 11th and 12th
Bundaberg ..... 12th to 14th
Gladstone ..... 18th and 19th
Rockhampton ..... 24th to 28th
Toogoolawah ..... 27th and 28th

July.

Proserpine ..... 4th and 5th
Charters Towers ..... 10th to 12th
Nambour ..... 10th to 12th
Rosewood ..... 11th and 12th
Townsville ..... 15th to 17th
Laidley ..... 16th and 17th
Cleveland ..... 18th and 19th
Gatton ..... 22nd to 24th
Cairns ..... 22nd to 24th
Innisfail ..... 25th and 26th
Atherton ..... 29th and 30th
Crow's Nest ..... 30th and 31st
Home Hill ..... 31st July and 1st August

August.

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

September.

Imbil ..... 5th and 6th
Rocklea 13th
Beenleigh ..... 19th and 20th

The Distribution of the Sheep Body Louse, *Bovicola ovis*, in Queensland.

F. H. S. ROBERTS, D.Sc., Animal Health Station, Yeerongpilly.

THREE species of lice have been recorded from sheep in Queensland—namely, the body louse or red-headed louse, *Bovicola ovis*, the foot louse, *Linognathus pedalis*, and *Linognathus ovillus*, which in other countries infests the face. The presence of *L. ovillus* in this State must be regarded, however, with some doubt. It has never been seen by the writer, who considers that in the past it has been confused with the foot louse.

During recent years the Department has viewed with concern reports that lice are gradually extending their distribution within the State and were appearing in localities in the West, where lice had never previously been seen. As a first step towards the control of these pests, stock inspectors throughout the State were requested to report on the status of the infestations within their respective districts. From these reports, together with information already in the Department's possession, it was shown that the body louse constituted by far the more important species. Whilst the foot louse appears to have a wide distribution extending as far west as Cloncurry, Longreach, Winton, and Charleville, it occurs in only more or less isolated localities.

The accompanying map shows the distribution of the body louse as known at present. Permanent infestations may be said to occupy a rough triangle in the sheep country, bounded on the east by the edge of the sheep country, and on the west by a line drawn through Aramac, Barcaldine, Blackall, and Charleville to the interstate border. The apex of the triangle is located south of Hughenden and Prairie. Isolated infestations, it will be observed, are shown west of Cunnamulla and Barcaldine. Body lice have been reported from these localities, though it is not known whether lice are still present there. There are also a few areas east of the true sheep country where lice have been reported in isolated flocks—e.g., around Brisbane, on the North Coast, in the Dawson Valley, and on the Atherton Tableland south-west of Cairns.

Undoubtedly the most heavily-infested areas include the Darling Downs and the Springsure-Jericho-Clermont-Emerald area. Extending west from these areas the infestations gradually thin out to eventually confine themselves to isolated localities.

The conditions governing the distribution of sheep lice in Queensland are in the light of our present knowledge a matter of conjecture. It is not intended here to enter upon a discussion of the relative importance of the many possible factors which may be concerned. It may be of interest, however, to merely mention those factors which come to mind, such as stock movements, rainfall, atmospheric humidity, temperature, certain wool characteristics associated with climatic variations, and possibly variable methods of sheep management.

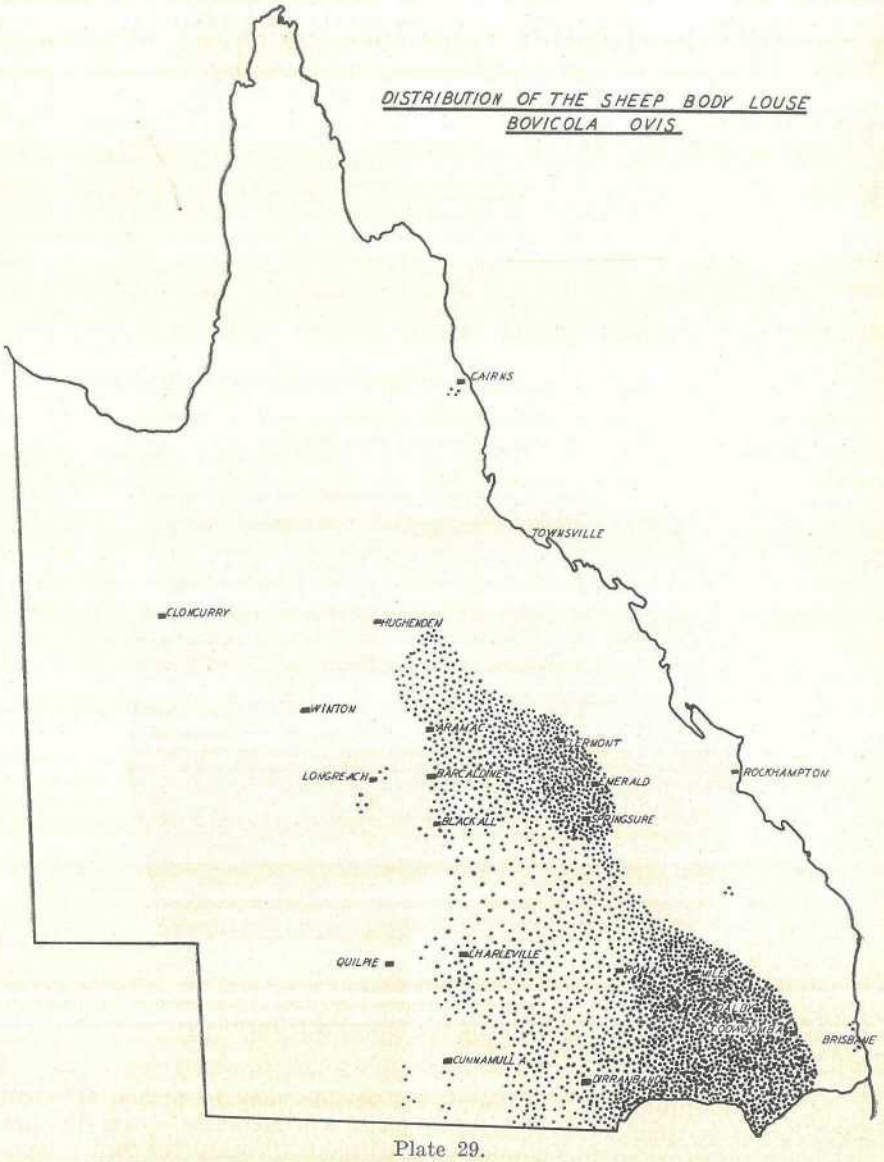
DISTRIBUTION OF THE SHEEP BODY LOUSE
BOVICOLA OVIS
CAIRNS
TOWNSVILLE
CLONCURRY
HUGHENDEN
WINTON
ARAMAC
EMONT
LONGREACH
BARCALDINE
MERALD
ROCKHAMPTON
BLACKALL
SPRINGSURE
QUILPIE
CHARLEVILLE
CUNNAMULLA
BRISBANE

Plate 29.

Harvesting and Packing Cantaloupes.

J. H. GREGORY, Instructor in Fruit Packing.

WHEN sending cantaloupes or rock melons long distances every care should be taken in their handling. Observations have shown that up to 15 per cent. of fruit is damaged during transit to market as a result of bad handling alone. Bags are not recommended as picking containers, the best type of container being a basket or can with solid sides. A kerosene tin cut lengthways and fitted with a handle makes a suitable container.

The fruit should be kept as cool as possible at all times and should not be rolled or tipped. In Australian districts indication of maturity is not generally of a definite nature. The method adopted in America is to study the way the stalk falls or "slips" from the fruit, the manner in which the skin is lined or "netted," and the ground colour of the skin. A combination of these is taken as a guide.

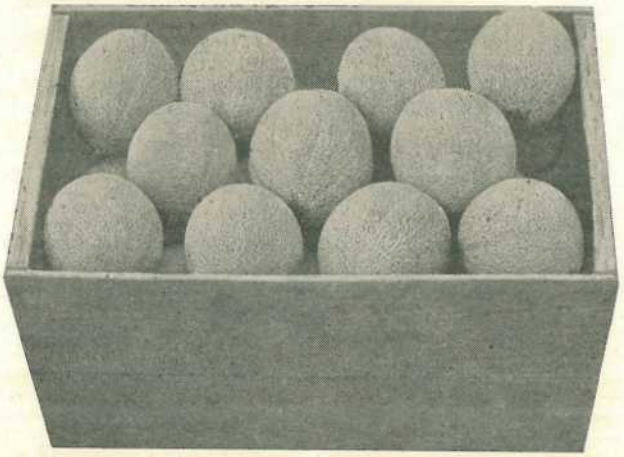

Plate 30.

SHOWING THE METHOD OF PACKING THE 2-1 PACK.—This pack contains three layers and, as illustrated, would contain the following in each layer:—1st layer, 11; 2nd layer, 10; 3rd layer, 11—total, 32.

For shipping short distances the melons may be picked at "full slip," that is, just as soon as the melon will separate cleanly under moderate pressure of finger or thumb without affecting the rind.

At the commencement of the season it is possible to ship melons long distances at "full slip," but this practice is not recommended for mid and late season fruit. For long distances the fruit should be picked at the "half slip" stage, that is, when only part of the stem will pull away cleanly. At this stage it is recommended that the melons be cut. Before any melons are ready the "netting" on the fruit must be well raised up and rounded.

Yellow varieties should show a tinge of colour underlying the green ground colour of the skin. Green varieties lose their "flat," "dead"

greenish colour, becoming bright. In hot weather it is advisable to pick at least once every day. Pickers can soon become familiar with maturity by occasionally cutting and tasting specimens.

One is often impressed with the haphazard manner in which many of the products of the land are still marketed. Bags, loose heaps, and other unhygienic methods are used to bring in and display these goods. It has been found possible to use methods of packing for all small types of melons, enabling first-rate articles to be obtainable on the market.

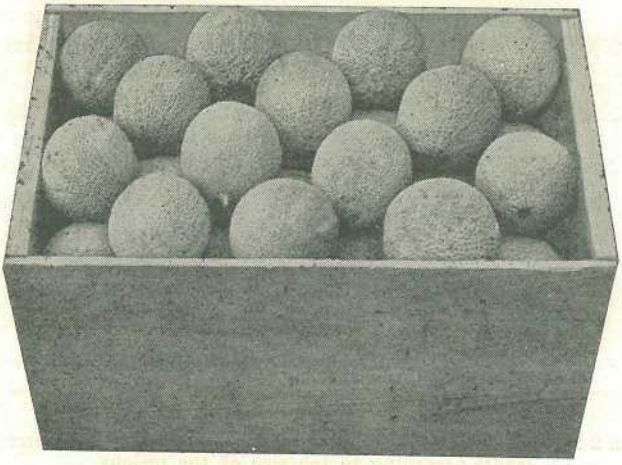

Plate 31.

Showing the Method of Packing the 2-2 Pack.—Each layer contains the same number of melons.

Rock melons are no exception to the general haphazard ways of handling commodities for market. It is possible to use the same method of packing for melons as for apples and other fruit, to assist in placing them on the market in a better condition. It has been found that the standard bushel case as made for apples is the most satisfactory type of container. The internal dimensions of this case are 18 inches long by 11½ inches wide by 10½ inches deep. The illustration will serve to show the packing method used. The same system of diagonal packing as is used for all fruit packing has been adopted in this pack. One layer is a replica of another, each melon in every layer except the first fitting into the "pockets" or spaces of the layer beneath. By using this method, it is quite easy, when the pack is finished, to mark the correct number or "count" of the contents of the case. Care in handling is vitally necessary, and no difficulties should be found if common sense is used.

The following are the principal features to be borne in mind:—

1. Grade the melons into approximately the same sizes before beginning to pack.

2. Place the flower or bottom end of the melons in the pockets or spaces for protection, as it is this part of the melon which softens first when ripening.

3. Place the second and successive layers in the pockets of the layers beneath.

4. When counting some of the 2-1 packs, such as that illustrated, it should be noted that the top and bottom layers contain one more than the centre layer—viz., top layer, 11; second layer, 10; bottom layer, 11—total, 32.

5. Pack $\frac{3}{4}$ to 1 inch above the top of the box and gently ease into position before nailing lid on.

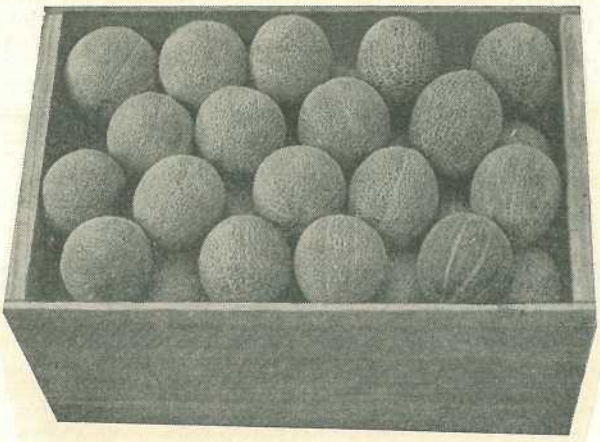

Plate 32.

ANOTHER 2-2 PACK ILLUSTRATED.—2-2 packs can contain either three or four layers according to the size of the melons.

6. A piece of wood, 3 inches by 2 inches, is placed under one end whilst easing the fruit into position with a gentle bump.

7. Always stack the packed cases on their sides when carting or railing to market.

8. Brand the number of melons in the case clearly upon its end.

The same type of packing may be used if packing the fruit in the tropical fruit case, $24\frac{3}{4}$ inches long by 12 inches wide by 12 inches deep.

Stencil the agent's brand on both ends of the case to avoid extra handling.

FRUIT JUICES AS SUMMER DRINKS.

In a warm climate, people should be induced to drink their fruit as well as eat it. There has been an extraordinary increase in the quantity of fruit juice consumed in America, and this has had a remarkable influence on the food habits of the whole nation. Great strides have been made in nutrition research, and commerce has been quick to adapt itself to the new food technique. In all these changes the fruitgrower has come definitely into the picture. Primary products have hitherto found their markets without science or system, although they are just as adaptable to modern merchandising methods as those of the manufacturer.

Primary producers, obviously, should keep on organizing themselves and their industry, especially on the marketing side. Rigid standardisation of high-grade products, duly branded and guaranteed, and widely advertised, is the chief requirement. With summer still with us, it would be an excellent plan to concentrate on advertising our wonderfully nutritious fruit juices—natural juices, not synthetic substitutes.

Queensland Butter Production.

G. B. GALLWEY, A.F.I.A., A.A.I.S., Inspector of Accounts.

THE accompanying tables cover the operations of all butter factories in Queensland for the year ended 30th June, 1940.

The make and pay figures are compiled from the monthly returns which each factory is required to furnish under *The Dairy Produce Acts*. Consequently, the figures show the total quantity of butter made by the factory and the quantity of each grade—actually the grades into which the butter has been made.

The pay figures show the total of butter paid for and the quantity of each particular grade for which the supplier has received payment.

There is a natural relationship between both sets of figures, and a scrutiny of them will show whether the quantity of butter manufactured in grades can be equitably reconciled with the quantity paid for in grades.

While it is admitted that it is not possible to make the same amount of butter as is paid for, the discrepancy as shown in many instances in these published figures suggests the consideration of necessary action by directorates and managements of dairy associations in respect of the correct grading of cream and the manufacture and payment for butter in accordance with the true grade.

Over-run is shown as that actually obtained, and the quantity paid to suppliers. It will be noted that there is considerable variation among different factories. It is considered that actual over-run should not exceed 3 per cent. Investigations on this matter are being undertaken.

Particulars showing the percentage of each factory's output submitted to official grading have been included this year. This percentage represents the butter sold for export or on the Brisbane market. Butter sold within the State direct from the factory is not graded.

The official gradings of butter indicate the result of the factory gradings when submitted to the Commonwealth and State graders.

Butter is packed as choice, first, and second. Particulars are shown in the tables of the number of boxes submitted under each grade, the quantity and percentage that is true to grade, and the quantity and percentage that has been de-graded—in other words, the opinion of the graders on the factory gradings. It should be noted that where no percentages are shown the factory has not submitted any butter of that grade for official grading.

The markets for which butter is graded are: Export Brisbane, Interstate, and East.

As this is the second year in respect of which these tables have been prepared, it is interesting to note the reaction of the various factories.

For the year ended 30th June, 1939, comments were furnished to each factory. The figures now published indicate that in some cases a decided improvement has been made in the general result of the operations; in others the position has remained stable, whilst some factories have made no attempt to take steps to rectify what are serious discrepancies.

After the compilation of the results of the 1941 operations, serious consideration will have to be given as to the steps necessary to improve the position of those factories which do not respond voluntarily.

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED 30TH JUNE, 1940

Factory.		Make and Pay in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Malanda	Made	3,053,988	3,053,988	..	..	..	93,615 lb.	94,694 lb.	15·3
	Paid	3,055,067	3,052,258	..	2,809	..	3·1 %	3·2 %	
Bushy Creek	Made	127,107	..	127,107	..	..	3,707 lb.	3,721 lb.	..
	Paid	127,121	..	127,121	..	..	3·0 %	3·0 %	
Daintree	Made	168,151	..	167,174	..	977	5,430 lb.	5,430 lb.	3·1
	Paid	168,151	..	167,174	..	977	3·1 %	3·1 %	
Evelyn	Made	532,911	530,837	..	2,074	..	16,390 lb.	16,802 lb.	4·0
	Paid	533,323	531,976	..	1,347	..	3·1 %	3·2 %	
Fraser	Made	8,086	..	8,012	74	..	Underrun	..	..
	Paid	10,341	..	10,267	74	..	2,255 lb.	..	
Millaa Millaa	Made	999,702	987,534	..	12,168	..	33,039 lb.	31,729 lb.	6·6
	Paid	998,392	987,143	..	11,249	..	3·4 %	3·3 %	
Silkwood	Made	69,708	..	65,652	..	4,056	Underrun	..	..
	Paid	71,024	..	66,794	..	4,230	1,316 lb.	..	
Gladstone	Made	2,739,768	445,166	1,129,651	1,143,671	21,280	53,688 lb.	51,653 lb.	78·7
	Paid	2,737,733	302,417	1,364,664	1,070,652	..	1·9 %	1·8 %	
Biloela	Made	2,883,048	711,952	1,588,608	582,488	..	52,271 lb.	51,795 lb.	79·0
	Paid	2,882,572	649,150	1,700,696	532,693	33	1·8 %	1·8 %	
Bundaberg	Made	2,414,513	909,512	1,154,065	350,936	..	46,157 lb.	56,897 lb.	66·9
	Paid	2,427,986	913,059	1,198,657	316,270	..	1·9 %	2·4 %	

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED 30TH JUNE, 1940—*continued.*

Factory.	Official Grading of Butter Submitted as Choice (Boxes).					Official Grading of Butter Submitted as First (Boxes).				Official Grading of Butter Submitted as Second (Boxes).		
	Total.	Choice.	First.	Second.	Pastry.	Total.	First.	Second.	Pastry.	Total.	Second.	Pastry.
Malanda	8,344	7,728 92·6%	616 7·4%	..	..	..	..	..	..	..	..	..
Bushy Creek ..	..	..	..	..	..	..	..	..	..	..	..	..
Daintree	..	..	..	..	..	93	..	93 100%	..	..	..	..
Evelyn	..	..	..	..	..	388	327 84·3%	61 15·7%	..	37	37 100%	..
Fraser	..	..	..	..	..	..	..	..	..	..	..	..
Millaa Millaa ..	302	302 100%	..	..	..	682	682 100%	..	..	195	65 33·3%	130 66·7%
Silkwood	..	..	..	..	..	..	..	..	..	..	..	..
Gladstone ..	334	301 90·1%	33 9·9%	..	..	18,350	18,215 99·3%	135 ·7%	..	19,806	18,718 94·5%	1,088 5·5%
Biloela	4,285	2,817 65·7%	1,468 34·3%	..	..	26,350	24,752 93·9%	1,598 6·1%	..	10,035	9,603 95·7%	432 4·3%
Bundaberg ..	6,729	6,729 100%	..	..	..	16,331	16,279 99·7%	52 ·3%	..	5,757	5,656 98·3%	101 1·7%

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED 30TH JUNE, 1940—*continued.*

Factory.		Make and Pay in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Mackay	Made	835,267	683,293	134,319	17,655	..	4,243 lb.	21,748 lb.	2·1
	Paid	854,781	639,260	149,403	66,118	..	1·5 %	2·6 %	
Monto	Made	4,221,610	1,656,800	2,319,240	245,570	..	86,982 lb.	95,871 lb.	81·4
	Paid	4,230,499	1,614,546	2,427,712	188,241	..	2·1 %	2·3 %	
Rockhampton	Made	2,471,653	1,053,439	962,724	455,490	..	11,613 lb.	39,727 lb.	33·6
	Paid	2,499,767	563,289	1,501,043	435,435	..	·5 %	1·7 %	
Wowan	Made	2,399,323	172,085	1,223,042	962,924	41,272	42,314 lb.	55,922 lb.	75·3
	Paid	2,412,931	446,561	1,062,156	904,214	..	1·8 %	2·4 %	
Gayndah	Made	2,231,374	1,532,194	541,876	157,304	..	77,232 lb.	77,136 lb.	97·6
	Paid	2,231,278	1,600,491	521,770	109,017	..	3·6 %	3·6 %	
Maryborough	Made	1,227,950	662,076	483,638	82,236	..	51,060 lb.	52,988 lb.	40·2
	Paid	1,229,878	650,921	509,674	69,283	..	4·3 %	4·4 %	
Biggenden	Made	2,599,769	2,093,753	486,920	19,096	..	94,740 lb.	94,889 lb.	98·2
	Paid	2,599,918	2,164,804	430,565	4,549	..	3·8 %	3·8 %	
Kingaroy	Made	5,132,073	4,797,971	110,320	223,782	..	254,147 lb.	251,098 lb.	77·1
	Paid	5,129,024	4,866,406	97,395	165,223	..	5·2 %	5·2 %	
Mundubbera	Made	3,470,560	3,044,624	310,912	115,024	..	119,317 lb.	119,454 lb.	97·0
	Paid	3,470,697	3,093,127	302,825	74,745	..	3·6 %	3·6 %	
Wondai	Made	3,773,996	3,201,732	529,648	42,616	..	150,202 lb.	150,558 lb.	96·8
	Paid	3,774,352	3,262,854	482,779	28,719	..	4·1 %	4·1 %	

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED 30TH JUNE, 1940—*continued.*

Factory.	Official Grading of Butter Submitted as Choice (Boxes).					Official Grading of Butter Submitted as First (Boxes).				Official Grading of Butter Submitted as Second (Boxes).		
	Total.	Choice.	First.	Second.	Pastry.	Total.	First.	Second.	Pastry.	Total.	Second.	Pastry.
Mackay	..	..	..	..	..	..	..	..	..	317	203 64·1%	114 35·9%
Monto	21,111	17,417 82·5%	3,694 17·5%	..	..	36,069	34,653 96·5%	1,416 3·5%	..	4,377	3,626 82·9%	751 17·1%
Rockhampton ..	..	..	..	..	..	6,438	4,639 72·3%	1,799 27·7%	..	8,392	7,616 90·8%	776 9·2%
Wowan	..	..	..	..	..	14,282	10,450 73·2%	3,832 26·8%	..	17,927	16,749 94·0%	1,178 6·0%
Gayndah	26,287	24,418 92·9%	1,835 7·0%	34 ·1%	..	9,487	7,858 82·9%	1,629 17·1%	..	2,958	2,134 72·2%	824 27·8%
Maryborough ..	3,232	1,492 46·1%	1,712 53·0%	10 ·3%	18 ·6%	4,205	3,298 78·4%	907 21·6%	..	1,378	753 54·6%	625 45·4%
Biggenden ..	36,594	22,634 61·9%	12,263 33·5%	642 1·7%	1,055 2·9%	8,498	6,876 80·9%	1,477 17·4%	145 1·7%	477	345 72·4%	132 27·6%
Kingaroy	64,508	62,108 96·3%	2,400 3·7%	..	..	2,108	1,333 63·2%	775 36·8%	..	4,104	3,606 88·0%	498 12·0%
Mundubbera ..	52,376	28,130 53·7%	24,111 46·1%	135 ·2%	..	5,633	2,117 37·6%	3,516 62·4%	..	2,056	1,716 83·4%	340 16·6%
Wondai	54,883	45,058 82·09%	9,806 17·88%	19 ·03%	..	9,390	7,554 80·5%	1,836 19·5%	..	959	792 82·6%	167 17·4%

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED 30TH JUNE, 1940—*continued.*

Factory.		Make and Pay in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Nanango	Made	3,142,160	1,744,736	1,248,072	149,352	..	77,336 lb.	76,271 lb.	97·8
	Paid	3,141,095	2,368,145	721,554	51,396	..	2·5 %	2·5 %	
Murgon	Made	4,102,966	3,543,788	528,050	30,128	..	111,435 lb.	112,533 lb.	93·3
	Paid	4,104,064	3,646,551	441,118	16,395	..	2·7 %	2·8 %	
Proston	Made	1,938,599	1,541,229	362,986	34,384	..	38,733 lb.	39,265 lb.	98·2
	Paid	1,939,131	1,615,617	299,892	23,622	..	2·0 %	2·0 %	
Cooroy	Made	1,640,898	1,258,306	342,440	40,152	..	45,365 lb.	46,312 lb.	93·9
	Paid	1,641,845	1,362,301	254,445	25,099	..	2·8 %	2·9 %	
Gympie	Made	7,954,812	7,312,438	508,480	133,894	..	211,920 lb.	213,295 lb.	94·4
	Paid	7,956,187	7,482,133	383,762	90,292	..	2·7 %	2·8 %	
Chinchilla	Made	2,618,348	902,900	1,327,368	386,792	1,288	68,585 lb.	66,055 lb.	95·4
	Paid	2,615,818	999,638	1,324,707	291,059	414	2·7 %	2·6 %	
Toowoomba	Made	5,578,990	4,294,798	1,072,848	211,344	..	150,461 lb.	163,511 lb.	84·0
	Paid	5,592,040	4,305,593	1,074,283	212,164	..	2·7 %	3·0 %	
Clifton	Made	1,766,873	874,457	651,672	240,744	..	51,547 lb.	51,657 lb.	96·8
	Paid	1,766,983	887,459	667,381	212,143	..	3·0 %	3·0 %	
Crow's Nest	Made	2,075,640	1,523,144	481,768	70,728	..	62,299 lb.	62,329 lb.	99·3
	Paid	2,075,670	1,523,436	481,639	70,595	..	3·0 %	3·1 %	
Dalby	Made	4,237,191	1,895,327	1,861,552	478,184	2,128	130,486 lb.	132,192 lb.	93·9
	Paid	4,238,897	1,904,702	1,875,850	456,386	1,959	3·1 %	3·2 %	

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED 30TH JUNE, 1940—*continued.*

Factory.	Official Grading of Butter Submitted as Choice (Boxes).					Official Grading of Butter Submitted as First (Boxes).				Official Grading of Butter Submitted as Second (Boxes).		
	Total.	Choice.	First.	Second.	Pastry.	Total.	First.	Second.	Pastry.	Total.	Second.	Pastry.
Nanango	29,725	18,928 63·7%	10,797 36·3%	..	..	22,036	21,012 95·3%	1,024 4·7%	..	2,755	2,388 86·7%	367 13·3%
Murgon	58,665	51,492 87·8%	7,173 12·2%	..	..	9,418	8,346 88·6%	1,072 11·4%	..	472	214 45·3%	258 54·7%
Proston	26,940	21,400 79·4%	5,540 20·6%	..	..	6,491	4,913 75·7%	1,578 24·3%	..	588	514 87·4%	74 12·6%
Cooroy	20,788	15,491 74·6%	5,297 25·4%	..	..	6,040	5,577 92·4%	463 7·6%	..	708	622 88·4%	82 11·6%
Gympie	122,620	107,322 87·53%	15,269 12·45%	29 ·02%	..	9,177	6,382 69·6%	2,795 30·4%	..	2,293	1,842 80·4%	451 19·6%
Chinchilla ..	14,318	4,196 29·4%	10,031 70·0%	91 ·6%	..	23,783	19,804 83·3%	3,979 16·7%	..	6,535	5,283 80·9%	1,252 19·1%
Toowoomba ..	60,576	58,768 97·1%	1,808 2·9%	..	..	19,314	19,157 99·2%	157 ·8%	..	3,838	3,793 98·8%	45 1·2%
Clifton	14,569	12,072 82·9%	2,422 16·6%	75 ·5%	..	11,712	11,282 96·3%	430 3·7%	..	4,267	4,193 98·3%	74 1·7%
Crow's Nest ..	26,825	21,695 81·9%	4,800 17·9%	330 1·2%	..	8,662	8,058 93·2%	604 6·8%	..	1,328	1,274 96·0%	54 4·0%
Dalby	29,969	28,706 95·8%	1,263 4·2%	.. ..	..	33,277	33,091 99·4%	186 ·6%	..	8,527	8,254 96·8%	273 3·2%

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED 30TH JUNE, 1940—*continued.*

Factory.		Make and Pay in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Goombungee	Made	1,986,874	1,389,578	515,312	81,984	..	72,431 lb.	72,439 lb.	99·8
	Paid	1,986,882	1,395,932	513,284	77,666	..	3·7 %	3·7 %	
Jandowae	Made	2,978,078	1,660,118	937,104	379,512	1,344	100,470 lb.	100,613 lb.	98·6
	Paid	2,978,221	1,674,579	940,435	361,816	1,391	3·4 %	3·5 %	
Miles	Made	1,189,897	240,502	750,490	190,897	8,008	30,747 lb.	31,547 lb.	95·7
	Paid	1,190,697	240,901	750,549	191,241	8,006	2·6 %	2·7 %	
Killarney	Made	1,631,020	976,198	537,278	117,544	..	42,165 lb.	42,216 lb.	84·1
	Paid	1,631,071	984,640	553,661	92,770	..	2·7 %	2·7 %	
Milmerran	Made	1,689,824	572,720	857,250	246,694	13,160	30,193 lb.	30,341 lb.	99·2
	Paid	1,689,972	613,054	858,783	218,135	..	1·8 %	1·8 %	
Oakey	Made	5,835,966	4,584,030	642,264	518,560	91,112	223,620 lb.	225,286 lb.	92·2
	Paid	5,837,632	4,823,325	650,696	363,611	..	3·9 %	4·0 %	
Roma	Made	1,243,934	..	714,230	529,704	..	33,149 lb.	33,512 lb.	60·7
	Paid	1,244,297	152,384	631,147	458,994	1,772	2·7 %	2·8 %	
Warwick	Made	3,637,375	2,665,271	653,576	318,528	..	65,762 lb.	64,829 lb.	78·8
	Paid	3,636,442	2,685,290	668,234	282,918	..	1·8 %	1·7 %	
Allora	Made	1,650,792	1,188,966	436,275	25,551	..	45,445 lb.	47,702 lb.	97·5
	Paid	1,653,049	1,200,455	426,106	26,488	..	2·8 %	2·9 %	
Texas	Made	215,978	183,950	2,912	29,116	..	5,370 lb.	5,429 lb.	1·4
	Paid	216,037	106,341	82,112	27,584	..	2·5 %	2·5 %	

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED 30th JUNE, 1940—*continued.*

Factory.	Official Grading of Butter Submitted as Choice (Boxes).					Official Grading of Butter Submitted as First (Boxes).				Official Grading of Butter Submitted as Second (Boxes).		
	Total.	Choice.	First.	Second.	Pastry.	Total.	First.	Second.	Pastry.	Total.	Second.	Pastry.
Goombungee ..	24,388	21,136 86·66%	3,234 13·26%	18 ·08%	..	9,179	8,232 89·7%	947 10·3%	..	1,498	1,389 93·4%	99 6·6%
Jandowae ..	29,092	25,739 88·5%	3,353 11·5%	..	..	16,550	16,022 96·8%	528 3·2%	..	6,824	6,667 97·7%	157 2·3%
Miles	2,433	1,448 59·5%	985 40·5%	..	..	13,266	12,962 97·7%	304 2·3%	..	3,388	2,922 80·1%	476 19·9%
Killarney	14·681	9,633 65·6%	5,048 34·4%	..	..	7,739	7,374 95·3%	365 4·7%	..	2,083	2,021 97·0%	62 3·0%
Milmerran.. ..	9,675	8,748 90·42%	922 9·53%	5 ·05%	..	15,355	14,283 93·1%	1,072 6·9%	..	4,907	4,359 88·8%	548 11·2%
Oakey	72,963	59,057 80·9%	13,906 19·1%	..	..	12,184	10,990 90·1%	1,194 9·9%	..	10,968	9,181 83·6%	1,787 16·4%
Roma	..	..	..	..	..	4,271	4,143 97·0%	128 3·0%	..	9,212	9,173 99·6%	39 ·4%
Warwick	33,498	19,345 57·7%	14,066 42·0%	87 ·3%	..	11,912	11,101 93·2%	811 6·8%	..	5,741	5,596 97·5%	145 2·5%
Allora	20,497	17,508 85·5%	2,989 14·5 %	..	..	7,788	7,708 99·0%	80 1·0%	..	479	436 91·0%	43 9·0%
Texas	..	..	..	..	..	64	39 60·3%	25 39·7%	..	496	378 76·4%	118 23·6%

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED 30TH JUNE, 1940—*continued.*

Factory.		Make and Pay in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Inglewood	Made	21,818	16,162	1,344	4,312	..	137 lb.	394 lb.	25·9
	Paid	22,075	7,798	10,226	4,051	..	·5 %	2·0 %	
Caboolture	Made	3,127,316	2,789,618	336,522	1,176	..	81,568 lb.	81,396 lb.	83·7
	Paid	3,127,144	2,874,673	246,203	6,268	..	2·6 %	2·7 %	
Eumundi	Made	2,267,564	1,983,549	194,589	89,426	..	50,736 lb.	51,509 lb.	92·2
	Paid	2,268,337	2,021,904	187,064	59,369	..	2·3 %	2·3 %	
Pomona	Made	2,436,854	2,039,637	349,091	48,126	..	58,518 lb.	58,324 lb.	99·6
	Paid	2,436,660	2,183,409	233,551	19,700	..	2·4 %	2·4 %	
Dayboro	Made	408,534	..	391,278	17,472	784	Underrun	..	92·3
	Paid	421,228	335,055	74,885	11,288	..	12,694 lb.	..	
Esk	Made	2,615,695	1,299,054	1,136,201	180,440	..	84,915 lb.	84,920 lb.	94·4
	Paid	2,615,700	1,308,978	1,172,749	133,973	..	3·3 %	3·3 %	
Beaudesert	Made	4,480,242	3,799,410	654,472	26,360	..	218,255 lb.	217,646 lb.	96·0
	Paid	4,479,633	3,899,218	555,432	24,983	..	5·1 %	5·0 %	
Maleny	Made	2,263,896	2,186,840	45,696	31,360	..	70,968 lb.	71,397 lb.	91·6
	Paid	2,264,325	2,209,181	51,453	3,691	..	3·2 %	3·3 %	
Lowood	Made	676,861	492,337	178,430	6,094	..	18,577 lb.	18,341 lb.	97·1
	Paid	676,625	513,951	157,373	5,301	..	2·8 %	2·8 %	
College	Made	94,710	94,710	..	..	..	963 lb.	962 lb.	3·8
	Paid	94,709	87,863	5,811	1,035	..	1·3 %	1·3 %	

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED 30TH JUNE, 1940—*continued.*

Factory.	Official Grading of Butter Submitted as Choice (Boxes).					Official Grading of Butter Submitted as First (Boxes).				Official Grading of Butter Submitted as Second (Boxes).		
	Total.	Choice.	First.	Second.	Pastry.	Total.	First.	Second.	Pastry.	Total.	Second.	Pastry.
Inglewood	..	..	..	..	..	24	24 100%	..	..	77	77 100%	..
Caboolture ..	40,458	34,327 84·9%	5,308 13·1%	697 1·7%	126 ·3%	6,177	3,188 51·3%	2,989 49·7%	..	95	91 95·8%	4 4·2%
Eumundi	32,350	23,922 73·9%	8,428 26·1%	..	..	3,176	1,924 60·8%	1,252 39·2%	..	1,818	1,656 85·6%	162 14·4%
Pomona	35,581	12,233 34·4%	22,989 64·6%	359 1·0%	..	6,759	4,302 63·7%	2,457 36·3%	..	1,006	957 95·2%	49 4·8%
Dayboro	..	..	..	..	..	6,373	6,055 95·0%	318 5·0%	..	380	227 59·7%	153 40·3%
Esk	23,059	16,663 72·26%	6,089 26·4%	153 ·67%	154 ·67%	17,812	16,510 92·7%	1,072 6·0%	230 1·3%	3,319	2,929 91·0%	290 9·0%
Beaudesert ..	64,425	52,635 81·7%	11,790 18·3%	..	..	11,744	9,737 82·9%	2,007 17·1%	..	513	513 100%	..
Maleny	35,578	30,079 84·5%	5,499 15·5%	..	..	894	557 62·7%	337 37·3%	..	560	512 91·4%	48 8·6%
Lowood	8,348	6,935 83·1%	1,413 16·9%			3,287	2,951 89·8%	336 10·2%		106	78 73·6%	28 26·4%
College	64	..	64 100%	..	..	..	..	..	..	..	..	..

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED 30TH JUNE, 1940—*continued*.

Factory.		Make and Pay in Lb.					Overrun.		
		Total.	Choice.	First.	Second.	Pastry.	Actual.	Paid.	Make Graded.
									Per cent.
Booval	Made	4,741,962	3,572,364	734,462	433,820	1,316	89,666 lb.	90,705 lb.	79·7
	Paid	4,743,001	3,794,169	649,784	299,048	..	1·9 %	2·0 %	
Boonah	Made	4,492,503	2,772,774	1,488,951	230,778	..	120,750 lb.	120,902 lb.	94·6
	Paid	4,492,655	2,915,141	1,398,916	178,598	..	2·7 %	2·8 %	
Grantham	Made	2,653,728	1,703,170	644,568	305.990	..	92,732 lb.	93,570 lb.	96·2
	Paid	2,654,566	1,833,156	626,012	195,398	..	3·6 %	3·6 %	
Laidley	Made	2,113,507	1,812,770	239,705	61,032	..	65,748 lb.	65,804 lb.	95·8
	Paid	2,113,563	1,865,297	206,206	42,060	..	3·2 %	3·2 %	
Kingston	Made	6,818,280	6,498,128	2,408	317,744	..	208,627 lb.	209,220 lb.	99·7
	Paid	6,818,873	6,555,682	2,649	260,542	..	3·1 %	3·2 %	
Woodford	Made	2,104,800	1,970,059	134,741	..	..	52,003 lb.	51,620 lb.	98·1
	Paid	2,104,417	1,968,234	136,183	..	..	2·5 %	2·5 %	

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED 30TH JUNE, 1940—*continued.*

Factory.	Official Grading of Butter Submitted as Choice (Boxes).					Official Grading of Butter Submitted as First (Boxes).				Official Grading of Butter Submitted as Second (Boxes).		
	Total.	Choice.	First.	Second.	Pastry.	Total.	First.	Second.	Pastry.	Total.	Second.	Pastry.
Booval	43,573	37,918 87·1%	5,655 12·9%	..	..	15,916	15,377 96·7%	539 3·3%	..	8,027	6,951 86·6%	1,076 13·4%
Boonah	43,582	32,648 74·9%	10,884 25·0%	60 ·1%	..	28,095	26,543 95·9%	1,552 4·1%	..	4,166	3,814 91·6%	352 8·4%
Grantham ..	28,852	22,473 77·9%	6,379 22·1%	..	..	11,253	9,368 83·3%	1,885 16·7%	..	5,487	5,389 82·1%	98 17·8%
Laidley	30,696	20,763 67·6%	9,933 32·4%	..	..	4,072	3,799 93·3%	273 6·7%	..	1,373	1,362 91·9%	111 8·1%
Kingston	115,718	99,689 86·2%	16,029 13·8%	..	..	43	26 60·5%	17 39·5%	..	5,722	5,514 96·4%	208 3·6%
Woodford ..	33,956	24,945 73·47%	8,991 26·47%	20 ·06%	..	2,714	2,274 83·8%	440 16·2%	..	209	209 100%	..

Bull Indexing.

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THE separator, the milking machine, and improved farm implements have contributed largely to the elimination of the drudgery associated with old-time methods of dairying. Improvement in pastures and methods of farm management, including the provision of ensilage and the practice of balanced feeding of stock, are among other factors leading to a progressive increase in dairy production. On the manufacturing side, the Babcock tester, neutralisation, pasteurisation, and refrigeration have revolutionised the technique of butter and cheese making.

By improving the standard of dairy cattle, another very important contribution to the progress of the Queensland dairying industry can be made.

The only countries in the world which have shown any marked improvement in the average production of dairy cows are Denmark and Holland. The average annual production of butter-fat in Denmark was recently about 300 lb. per cow, New Zealand about 220 lb., and Victoria 180 lb. In other Australian States the figure has been placed at about 120 lb. per cow, which represents approximately the average annual production in Queensland.

HERD IMPROVEMENT.

The first step towards the improvement of dairy herds was the initiation and development of the Herd Book System, which sets out to tabulate the genealogical history of the families of each breed. The first definite method of selecting animals for their productive capacity was established in 1895, when organised herd-testing was instituted. Justification of this method is evidenced by the fact that there are now approximately between 4,500,000 and 5,000,000 cows being tested in many parts of the world.

Breeding for high production in dairy cattle is based on the generally accepted theory that milk yield and butter-fat content are characters which depend on Mendelian factors (genes), and that they are transmissible according to established Mendelian rules of heredity. Yield recording in dairying is based on this assumption, as also are the Advanced Registers founded on the herd-book and on the results of yield recording.

Until the introduction of Bull Indexing the breeder was faced with the difficulty that the milk and butter-fat yield could be ascertained only for the females of the dairy cattle.

IMPORTANCE OF BULL IN DAIRY HERD.

In a dairy herd the value of a bull is of greater economic importance than the value of the dam, for the number of the progeny of individual bulls is considerably higher than that of individual cows. A mature bull may sire forty calves yearly. In fact, a bull is generally accepted as being half the herd.

The earliest method of selecting bulls was based on the animal's external characteristics, some of which had no relation to the milk yield, while others were considered to indicate the power to transmit good or poor milk yields. This system has given indifferent results. The

probability of improving a herd by a bull selected on external characteristics has been estimated to be only one in five. Yuill quotes the results of a bull-indexing investigation in South Africa, which showed that twelve of the best Friesian bulls selected on their show-ring records had reduced the production of 109 of their daughters as compared with the yield of their dams by an average of 100 gallons of milk per cow per lactation.

Later on the milk yields of the sire's dam or other female ancestors was the measure used. While this was an improvement on the show-ring records, it assumed that the bull always transmits the productive capacity of his dam to his progeny. It has been proved that the prepotency of the sire or his power to transmit the trait of high production to his daughters is of more importance than the production factor inherited from his dam. The need to ascertain the measure of prepotency of a bull led up to the establishment of bull-proving by the Index System.

The United States Department of Agriculture is mainly responsible for the large scale adoption of the "proved bull" movement. In 1919 it began a campaign for the substitution of registered sires for grade bulls. In 1924 it moved a step further and advocated the use of bulls which were not only registered sires, but also of good conformation, sons of class AA cows, and sired by "proved" bulls. Proof, then, was accepted on the yield of ten daughters. This method was abandoned in 1926, when "proof" was ascertained from a comparison of the daughters' and dams' records. In 1934 a new feature was adopted by the inclusion of the herd level as an essential factor, with the result that bulls are now classed in their order of importance in accordance with their capacity to influence the level of the herd yield. The classes are three —meritorious, mediocre, and inferior.

In Queensland, owing to the many factors operating, it is not considered desirable to accept the figures for milk and butter-fat given in any bull index as definite, but rather as a broad indication of a sire's potentialities.

As pointed out previously, the United States Department of Agriculture leads the way in the "proved bull" movement, which has now a wide application throughout that country. The dam-daughter comparison of yields was instituted in 1926.

Despite the fact that this method had been abandoned by the United States Department of Agriculture some years previously, the Jersey Cattle Club of America, in 1932, adopted the average yield of the first ten daughters as the measure of the bull's capacity. In 1934 the proving of sires was initiated by the Holstein Friesian Association of America, using the Mount Hope Index. In 1931 the Bull Index system was adopted by the Guernsey Island Cattle Club and the English Suffolk Milk Recording Society, and in 1934 by the English Guernsey Cattle Society. In Australia the Victorian United Cow Test Association commenced a bull-proving system in 1931, and in 1936 it was adopted by the Red Poll Society in Victoria.

In Denmark, according to Yuill, 300 to 400 bulls are indexed and proved annually.

The authors of this article have prepared graphs and indices of some bulls used in Queensland herds. These will be found in the following pages.

PROVING A BULL.

The greater the number of records used in indexing a bull, the truer should be the resultant index in indicating the actual value of the bull for inheritance and powers of transmission of milk and butter-fat capacity. Yuill, of Victoria, recommends that there should be at least the yields of ten daughters from at least five tested dams. The United States Department of Agriculture considers that a sire is proved if he has five or more tested daughters from tested dams. It is essential, however, that the records of the daughters used for the index should not be selected arbitrarily, as the result would not be an average and would not give a true indication of a sire's worth. In practice, an endeavour should be made to assemble the records of all daughters of the bull and their dams as far as reliable records are available for both.

SIRE PROVING AND ITS APPLICATION.

According to Taussig, the results obtained up to 1936 by the United States Department of Agriculture in its bull-indexing campaign show that of 4,309 bulls only 2,242 were considered as "proved," for the number of daughters' records of the remainder was less than five, and was therefore considered insufficient. Of the proved bulls, 52 per cent. showed a production improvement capacity, and these were divided into three classes, viz., excellent, good, and fair; 6·8 per cent. had no noticeable influence on the production of their daughters and were placed in the class "undetermined"; 41·3 per cent. of the sires had an unfavourable production and were classed as "poor." Edwards and Hunter-Smith conducted an investigation on fifty-one sires of the best herds in Great Britain, and Norwood, reporting on the results of the investigation, stated that out of fifty-one bulls tested only eight had the effect of raising production, while twenty exercised a decidedly depressing influence. The 611 daughters of the bulls covered by the test averaged about 30 gallons of milk less than their 611 dams. Bull indexing has exposed the wide differences which may exist between the transmission value of sires and which is made evident from the results obtained in Queensland, as indicated by the three graphs published on page 133.

The great economic importance of bull indexing should be obvious from the above results, and suggests the desirability of its general extension in Queensland by placing more females under tests. This would greatly broaden the scope of the application of the index. Without dam-daughter tests it is impossible to have a Bull Index. Experiments on a large scale were carried out on artificial impregnation of dairy cows by Professor Sorenson, on the Island of Samso, Denmark, from 1st September, 1936, to 31st August, 1938. In 1937-38, 97·5 per cent. of cows artificially inseminated were in calf as compared with 95 per cent. by natural service. When the technique of artificial insemination has been developed to the stage where it could be incorporated in the ordinary routine of breeding practice, bull indexing would be of great value. By its application inferior bulls could be eliminated and the germ plasms of outstanding proved sires used for the artificial insemination of widely distributed dairy herds.

There are quite a number of systems enunciated by various authorities. Some are simple; some give a distorted index by working on a system of percentages; whilst others are further complicated by providing mathematical formulæ for all contingencies. Of those last mentioned, Taussig states "they are condemned to perish in a morass of figures," and recommends a simple form which could be applied more easily and which would receive more general acceptance.

As the indices of Queensland bulls shown in the succeeding pages are based on the celebrated "Mount Hope Commercial Index" (which will be dealt with later), no good purpose would be served by discussing here other methods proposed for determining a bull's transmitting ability.

The value of any bull index is influenced by many factors operating which affect the yields of both dam and daughter and which bear no relation to heredity. The most important of these are—the age of the animals, the effect of environment, the length of dry period before commencing lactation, calving period, feeding, &c. The age influence is neutralised by means of a correction factor. The influence of the other factors, generally speaking, is lessened by the fact that the index is prepared on the yields of the greatest possible number of dam and daughter pairs, with the result that the plus and minus influences are more or less balanced.

Another reservation as to the value of bull indices pointed out by Yuill is that the production level of a cow affects the capacity of a bull to increase or reduce the yield of the daughter as compared with the dam. A cow with a low yield capacity gives the bull an opportunity to raise the standard of the daughter, whilst a cow with a high yield limits or nullifies the bull's capacity to raise the production of the daughter. The Mount Hope Index applied by Hewitt to the Friesian herd of the Victorian Department of Agriculture Research Farm at Werribee shows that—(1) this index can be applied to both bulls and cows; (2) if both sire and dam have high Mount Hope Indices, the expectancy of obtaining high-yielding animals from the bull is increased by 80 per cent.

Using bull indices as a basis, the selection of a sire is greatly simplified and the continued use of sires having a high index for production in a herd concentrates in the germ plasm the genetic factors responsible for high production.

THE BASIS OF THE BULL INDEX.

That the average yield of the daughters is approximately half-way between those of their parents is the fundamental principle on which a Bull Index is based. This has been noted by investigators in various countries, particularly where the larger breeds, such as the Red Danish, Shorthorn, and Friesian have been crossed with a small, high-testing breed like the Jersey. Not only the milk and butter-fat yields, but also the size characteristics of the daughters were about midway between the two parents. Amongst these investigators was Count Arlefledt, of Denmark, whose observations were noted in the eighties of the last century.

In 1913, Nil Hansson, a Swedish investigator, proposed the first formula based on a comparison of dam and daughter butter-fat records on the assumption that the daughter's record is the mean between the dam, whose butter-fat record was directly available, and the transmission capacity of the sire, which cannot be directly established. Woodward was the first to apply Hansson's formula to a large number of cattle, limiting himself to the transmitting capacity of the bull with respect to *butter-fat* yield only. In the same year as Hansson enunciated his formula, viz., 1913, Professor W. H. Yapp, of Illinois, formulated an index placing the daughters midway between sire and dam, but this was done only for the *milk corrected yields,* allowing 4 per cent. to represent the butter-fat yield. This became known as the "Equal Parent Index" or the "Intermediate Index." The Equal Parent Index has a great advantage over others in that it is easy to calculate. This was the first definite step towards establishing an index. Dr. Goodale, Professor of Genetics at the Massachusetts Agricultural College, was the first to *prove* that progeny of high and low test parents also group themselves midway between the level of the sires and dams. This finding is accepted as being true, not only within a breed itself, but also of the progeny of crossed parentage.

These results led up to Dr. Goodale (now of Mount Hope Farm) formulating his now famous Mount Hope Index, placing the progeny midway between the parents for both milk and butter-fat levels. Dr. Goodale has prepared his index in two forms—i.e., the "Precise" and the "Commercial." The Precise Index is involved, whilst the Commercial Index is much simpler, and as Dr. Goodale recommends the latter for herd improvement work, it is unnecessary to discuss the former here. Kenrick and McDowal, of the American Bureau of Dairy Industry, also evolved an index based on the Equal Parent basis, the results from which practically coincide with the Mount Hope Commercial Index. In the latter the milk yield is age corrected and the actual test averaged, whilst in the former the test is ignored and both the milk and butter-fat yields are age corrected, where necessary, when a final comparison of the age-corrected yields of the daughters and dams can be made. In each case the daughters are placed midway between the dam and sire.

PREPARING A BULL INDEX.

The first question is to decide how many dam-daughter pairs should be established as a minimum on which to arrive at a sire's index. This question has already been dealt with earlier. It would appear, however, that in the early stages of bull indexing in Queensland the standard used by the United States Department of Agriculture., viz., five tested daughters from five tested dams, should be the accepted minimum as most likely to meet Queensland conditions for the present.

Having calculated out the average age-corrected yields of dams and daughters, the next step is to ascertain the bull's index, based on the assumption that the average yield of the daughters represents the average yield of the dams and the potential yield of the sire. For example, if the average yield of all the dams were 350 lb. and that of the daughters 375 lb., the index of the bull would be 400 lb. As previously explained,

this is arrived at by multiplying the daughters' average yield by two and subtracting the average yield of the dams thus—

375 lb. × 2	=	750
Subtract average of dams ..	=	350
Bull's index	=	400 lb.

Another method of arriving at the bull's index is to add to, or subtract from, the average yield of the daughters, the difference in yield between daughters and dams. The difference is added to the average yield of the daughters when the average yield of the dam is lower than the daughters, and subtracted from the daughters' average yield when the dam's yield is higher. (See example, page 132.)

AGE CORRECTION FACTORS.

This subject has also been a ground for contention amongst many of the world investigators. In the case of a junior two-year-old, the factors by which the yield of the cow of that age must be multiplied in order to estimate its probable yield when mature range between 1·5 and 1·3, according to different authorities.

The basis arrived at by Turner, an early investigator, is that a two-year-old cow gives 70 per cent. of its mature yield, a three-year-old 80 per cent., and a four-year-old 90 per cent. Professor Turner's figures have been adopted in British Columbia and also in Victoria. Turner's basis is considered to be about an average of the figures of all the investigators.

Yuill, of Victoria, has prepared an age-correction ready reckoner or table of age-corrected yields based on Turner's figures, which it is proposed to use in Queensland and which is published on pages 137 and 138, in the hope that it will assist farmers and others who are interested in Bull Index work. Yuill's explanatory notes on the ready-reckoner are as follows:—"The actual junior yields are found on the left-hand side of the page, while the six columns of age-corrected figures represent the expected mature equivalent of these records at the ages shown at the head of each column. The figures in the table can be used alike for gallons of milk or pounds of butter-fat. If pounds of milk are required, these can be found by multiplying the butter-fat yield by 10. Should the more exacting worker wish to secure closer results than to the nearest 10 gallons or 10 lb. as represented by each line on the chart, he can halve this increase by merely adding 5 to the figures on the left-hand column and halving the age-corrected figures. This can be done by adding the figures shown at the foot of each column. The following illustrations explain how the chart can be used:—A junior two-year-old has produced, say, 600 gallons (6,000 lb.) milk and 240 lb. butter-fat; the age-corrected figures are shown to be 840 gallons (8,400 lb.) milk and 336 lb. butter-fat. Had the figures been 605 gallons and 245 lb. butter-fat, the final figures could be found by adding 7 to each age-corrected yield—i.e., 847 gallons (8,470 lb.) milk and 343 lb. butter-fat. The range of the figures on the table cover milk yields up to 9,000 lb. and all likely butter-fat yields above 100 lb. It is unlikely that any junior cow yields will occur outside these limits; if so, they can be multiplied out by using the factor shown at the head of each column."

After all the age-corrected records of the sire's daughters have been assembled and averaged and his mates' records have been similarly

dealt with, the butter-fat percentage for each can then be obtained by multiplying the butter-fat by 100 and dividing by the milk yield, thus—

$$\frac{\text{Butter-fat average} \times 100}{\text{milk average}} = \text{average test.}$$

The average yields and tests of the mates and daughters of the bull are now shown in comparison, and the index of the bull shown as follows:—

Index.	Milk.	Fat.	Butter-fat.
	Lb.	Per Cent.	Lb.
17 mates of registered Jersey bull (25 records reviewed), averaged	7,569	5·32	403
17 daughters of registered Jersey bull (36 records reviewed), averaged	7,279	5·57	406
	− 290	..	+ 3
Index of registered Jersey bull, 17 D-d pairs (61 records reviewed)	6,989	5·85	409

The above is the index of a bull used in a Queensland herd.

This bull raised the butter-fat yield of the herd by only 3 lb., which is really negligible, but still he proved himself to be a sire of merit because he maintained the high standard of his mates. It will be observed that the milk yield of the daughters is less than that of their dams, but the average test and butter-fat are higher. To ascertain this sire's index for butter-fat it is necessary to subtract the difference in the milk yield from the milk yield of the daughters to give the sire's milk yield index, and add the difference in the butter-fat yield to that of the daughters. It is apparent that this bull reduced the average milk yield and raised the test and butter-fat yield. Sometimes a bull will raise the milk yield and lower the butter-fat yield; in some cases a bull will raise both the milk and butter-fat yields, and in other cases he will lower both.

Graphs showing the influence of three bulls used in Queensland on their respective herds are to be seen on page 133. For obvious reasons the names of these bulls cannot be given.

Bull "A." This bull, although four of his daughters' productions were lower than their dams, raised the average milk yield, test and butter-fat of all his daughters considerably above those of their dams. He is an outstanding registered A.I.S. bull, and a herd builder with a particularly high index of 637 lb. of butter-fat. The average yield of his mates was 489 lb. of butter-fat, which was raised to 563 lb. by their daughters.

Bull "B." This bull lowered the production of five of his daughters as compared with their dams and raised the production of four daughters above that of their dams; he lowered the average production of all of his daughters by 42 lb. of butter-fat as compared with their dams. Still his daughters average 485 lb. of butter-fat and his index is 443 lb. of butter-fat, so, although he reduced the standard of a very exceptional herd (viz., 520 lb. butter-fat average), he must be considered an excellent bull, and a long way above the average. He is a registered Jersey bull.

Bull "C." This registered Jersey bull lowered the milk yield, butter-fat and test of all of his daughters below his mates, and, incidentally, the production standard of the herd. He has an index of 178 lb. of butter-fat and must be considered an inferior bull and a herd destroyer, having reduced the average butter-fat yield of his mates from 362 lb. to 270 lb. in the case of their daughters.

It can readily be seen from the above that the index becomes the "measure" of a bull, just as a production record does of a cow, and that his influence on a herd is clearly indicated in his index.

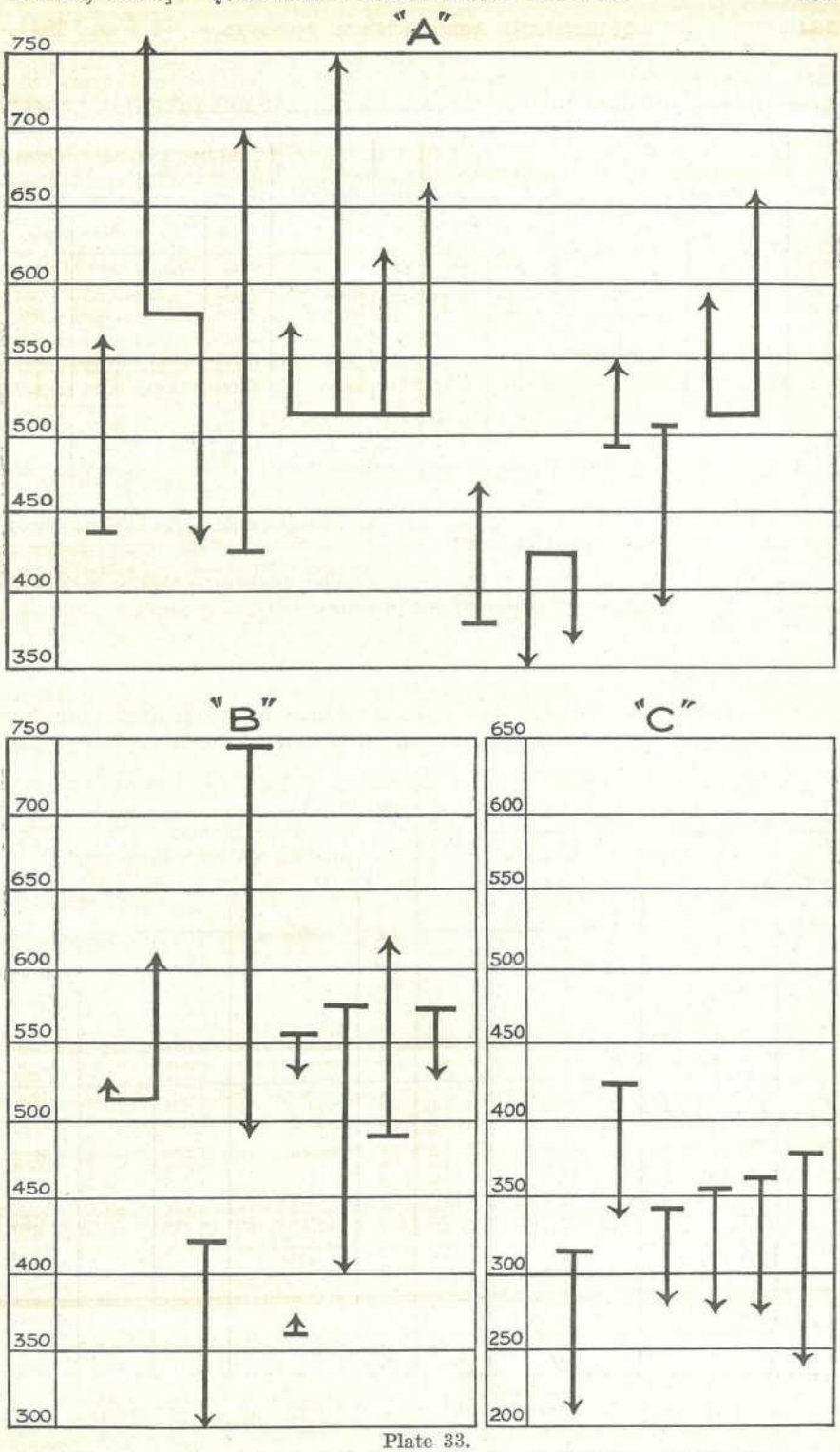


Plate 33.

[N.B.—The graphs depict the influence of the sires "A," "B," and "C." The arrow denotes the age-corrected production of a daughter, while the short horizontal line shows the production of the dam. If there are two or more vertical lines joined by a single horizontal line the arrows show the yields of two or more daughters of any dam. The figures represent the butter-fat yield in lb.]

HOW TO PREPARE ONE DAM-DAUGHTER PAIR, "ROSE" AND HER DAUGHTER "ROSY."

Age.	Dam.	Dam's Actual Yields.		Age Corrected Figures.		Age.	Daughter.	Daughter's Actual Yields.		Age Corrected Yields.	
		Milk.	Butter-fat.	Milk.	Butter-fat.			Milk.	Butter-fat.	Milk.	Butter-fat.
Yrs.		Lb.	Lb.	Lb.	Lb.	Yrs.		Lb.	Lb.	Lb.	Lb.
4½	Rose ..	8,413	427	9,085	460	2	Rosy ..	6,151	336	8,611	470
6	Rose ..	8,080	512	8,080	512	2½	Rosy ..	7,978	449	10,371	583
9	Rose ..	7,797	387	7,797	387	3½	Rosy ..	9,628	568	11,553	681
						4½	Rosy ..	9,401	545	10,435	605
						6	Rosy ..	9,857	510	9,857	510
						7	Rosy ..	7,410	353	7,410	353
						8	Rosy ..	8,260	401	8,260	401
						9	Rosy ..	9,424	589	9,424	589
				24,961	1,359					75,921	4,192
Average of one age-corrected and and two mature yields ..				8,320	453	Average of four age-corrected and four mature yields ..				9,490	524

[These are actual yields of a dam and her daughter in a Queensland herd; fictitious names have been substituted.]

NOTE.—*All dam-daughter pairs* should be arranged as above, so that an individual comparison of all age-corrected records can be made.

Having completed the age-correcting stage for each dam-daughter pair, a comparative list is made as shown below:—

REGISTERED JERSEY BULL.

Mates of Registered Jersey Bull.					Daughters of Registered Jersey Bull.				
Records Averaged.	Mates.	Age Corrected Yields.			Records Averaged.	Daughters.	Age Corrected Yields.		
		Milk.	Test.	Butter-fat.			Milk.	Test.	Butter-fat.
		Lb.	Per cent.	Lb.			Lb.	Per cent.	Lb.
3	Rose	8,320	..	453	8	Rosy ..	9,490	..	524
1	Gentle ..	6,925	..	379	1	Duchess ..	9,534	..	551
3	Roseland ..	8,320	..	453	6	Rosalie ..	8,334	..	491
3	Tottie.. ..	8,703	..	529	1	Lottie ..	6,487	..	423
3	Tottie ..	8,703	..	529	1	Princess ..	4,905	..	375
1	Etta ..	5,370	..	270	1	Ethel ..	4,622	..	243
1	Ettme ..	5,762	..	336	1	Kate ..	5,084	..	235
1	Dolly ..	8,412	..	416	1	Polly ..	6,571	..	277
1	Victoria ..	6,816	..	391	1	Victory ..	7,595	..	439
2	Queen ..	7,263	..	341	1	Mary ..	6,370	..	379
1	Canary ..	7,957	..	408	1	Choice ..	6,749	..	396
1	Sultana ..	7,050	..	371	3	Majesty ..	10,749	..	577
1	Fern ..	7,251	..	387	2	Success ..	7,745	..	425
1	Lady ..	7,262	..	357	2	Scotia ..	8,135	..	460
2	Starlight ..	9,191	..	496	3	Moonlight ..	8,581	..	433
1	Blonde ..	6,398	..	303	2	Brunette ..	6,814	..	370
1	Eileen ..	8,985	..	446	1	Noreen ..	5,986	..	313
27		128,688	5·32	6,865	..		123,751	5·57	6,911
Average yield of all mates		7,569	5·32	403	Average yield of all daughters ..		7,279	5·57	406

[In working out the index of a Queensland Jersey bull the above figures were actually obtained, but fictitious names have been substituted.]

THE TRUE MEASURE OF A BULL'S VALUE.

Bull Index or Yield of Daughters?

Notwithstanding the general acceptance throughout the dairying world of the Bull Index as the measure of a bull's powers of tranmission of productive qualities, there are still many who cling to the average yield of the bull's daughters as the true measure.

1A.	Milk.	Fat.	Butter-fat.
	Lb.	Per cent.	Lb.
29 mates of registered Jersey bull (43 records reviewed), averaged	7,277	5·73	417
29 daughters of registered Jersey bull (43 records reviewed), averaged	8,291	5·19	430
	+1,014	..	+13
Index of registered Jersey bull, 29 D-d pairs (86 records reviewed)	9,105	4·86	443

2A.	Milk.	Fat.	Butter-fat.
	Lb.	Per cent.	Lb.
9 mates of registered Jersey bull (10 records reviewed), averaged	9,162	5·75	527
9 daughters of registered Jersey bull (17 records reviewed), averaged	8,264	5·86	485
	— 898	..	—42
Index of registered Jersey bull, 9 D-d pairs (27 records reviewed)	7,366	6·01	443

A comparison of the Indices of Registered Jersey bulls 1A and 2A clearly shows the fallacy of that view.

By a remarkable coincidence both of these bulls have exactly the same butter-fat index., viz., 443 lb., but the variations otherwise are surprising. Bull 2A reduced his daughter's average milk yield by 898 lb. and their average butter-fat yield by 42 lb. as compared with their dams, but he raised the average test of his daughters.

Bull 1A raised the average milk yield of his daughters by 1,014 lb. and also their butter-fat by 13 lb. as compared with their dams, but he reduced their test. The impression might be gathered from those performances that bull 1A was the better bull, whereas they had exactly the same value as far as butter-fat yield was concerned, viz., 443 lb. Again the average butter-fat yield of the daughters of bull 2A was 485 lb. and that of bull 1A was only 430 lb. Judged by the standard of his daughters, bull 2A was superior because his daughters' recorded average was 55 lb. of butter-fat more than the daughters of bull 1A, when, as a matter of fact, they were both equal. These illusions arise from the fact that bull 2A was mated with cows whose average butter production was 527 lb. and bull 1A with cows whose average butter-fat production was 417 lb., a difference of 110 lb., which was reflected in their daughters' records. That these false impressions were held by practical stud herd

breeders is proved by actual facts. Bull 1A, having raised the production yield of his daughters compared with their dams, was eagerly sought after and finally purchased by another stud breeder at a good price, whilst bull 2A having reduced the production yield of his daughters compared with their dams, which had an exceptionally high average of production yield, was discarded and sold for a comparatively small sum to a farmer with a grade herd. Had bull indexing been in operation at the time he would never have been used outside a stud herd, for besides having a high butter-fat index he is one of the most fashionably-bred bulls in Queensland. It should be abundantly clear from the above that the average yield of a bull's daughters is *not* his true measure. The index of the bull arrived at after a comparison of the daughters' and dams' yields is his true value to the herd he enters.

PRODUCTION RECORDING IN QUEENSLAND.

The testing of animals for the advanced register follows on broad lines the principles set out in the rules of the Australian Pure Bred Dairy Cattle Production Recording Scheme. Under the scheme the animals tested are registered purebreds. They are identified by the tattoo mark by the Government official who carries out the weighing, sampling, and testing of the milk after supervising the milking. The production is estimated from the results of five twenty-four hour tests, taken at specified intervals over a lactation period of 273 days. Allowing five days after calving for the animal to return to normal, the first test is then taken thirty-three days later, and the remaining four at intervals of sixty days. From the results of the twenty-four hour test the yield of the milk and butter-fat for the 273 days is calculated. These are recorded under the names of the herd owners, and under the name of each sire a record is kept of the yields made by his daughters during their various lactations.

SELECTION OF A DAIRY SIRE.

In the selection of a young dairy bull, it is first of all necessary to consider the pedigree, the index of his sire and grandsire, the butter-fat test of his dam and granddam, and his own individuality. The intelligent use of bull indexing can play a role of major importance in the improvement of dairy herds if the young bull is indexed as soon as he has five tested daughters from five tested dams, thus giving an early indication of his prepotency value. In the selection of a mature bull, it would be advisable to secure one which has qualified through his mates and daughters for an index, so that through his index his value can be readily assessed.

LITERATURE CONSULTED.

In the preparation of this article free use was made of the available published literature on bull indexing, and in particular the work of S. Taussig, "The Problem of Proving Dairy Bulls," International Review of Agriculture, Rome, March, 1937, pp. 69T-81T, and W. J. Yuill, "Bull Indexing: New Methods Replace Old Ideas," Journal of the Department of Agriculture, Victoria. Melbourne, December, 1936, pp. 633-641.

TABLE OF AGE-CORRECTED MILK AND BUTTER-FAT YIELDS FOR USE IN BULL INDEX WORK.

The figures of the left-hand column represent the actual yields of a junior cow; those in the age-corrected columns are anticipated mature yields made by junior cows of the age shown at the head of each column, together with the correcting factor for each age. By adding a "0" to the gallon, yields can be converted into lb. of milk.

This column represents a junior cow's yield. The figures can be used for gallons of milk or 1 lb. butter fat.	Age at Beginning of Lactation and Correction Factors for Each Age.					
	2 years.	2½ years.	3 years.	3½ years.	4 years.	4½ years.
	1·4	1·3	1·25	1·2	1·11	1·08
	Age-Corrected Mature Yields.					
100	140	130	125	120	111	108
110	154	143	137	132	122	118
120	168	156	150	144	133	129
130	182	169	162	156	144	140
140	196	182	175	168	155	151
150	210	195	187	180	166	162
160	224	208	200	192	177	172
170	238	221	212	204	188	183
180	252	234	225	216	199	194
190	266	247	237	228	210	205
200	280	260	250	240	222	216
210	294	273	262	252	233	226
220	308	286	275	264	244	237
230	322	299	287	276	255	248
240	336	312	300	288	266	259
250	350	325	312	300	277	270
260	364	338	325	312	288	280
270	378	351	337	324	299	291
280	392	364	350	336	310	302
290	406	377	362	348	321	313
300	420	390	375	360	333	324
310	434	403	387	372	344	334
320	448	416	400	384	355	345
330	462	429	412	396	366	356
340	476	442	425	408	377	367
350	490	455	437	420	388	378
360	504	468	450	432	399	388
370	518	481	462	444	410	399
380	532	494	475	456	421	410
390	546	507	487	468	432	421
400	560	520	500	480	444	432
410	574	533	512	492	455	442
420	588	546	525	504	466	453
430	602	559	537	516	477	464
440	616	572	550	528	488	475
450	630	585	562	540	499	486
460	644	598	575	552	510	496
470	658	611	587	564	521	507
480	672	624	600	576	532	518
490	686	637	612	588	543	529
500	700	650	625	600	555	540
510	714	663	637	612	566	550
520	728	676	650	624	577	561
530	742	689	662	636	588	572
540	756	702	675	648	599	583
550	770	715	687	660	610	594
560	784	728	700	672	621	604
570	798	741	712	684	632	615
580	812	754	725	696	643	626
590	826	767	737	708	654	637
600	840	780	750	720	666	642
610	854	793	762	732	677	658

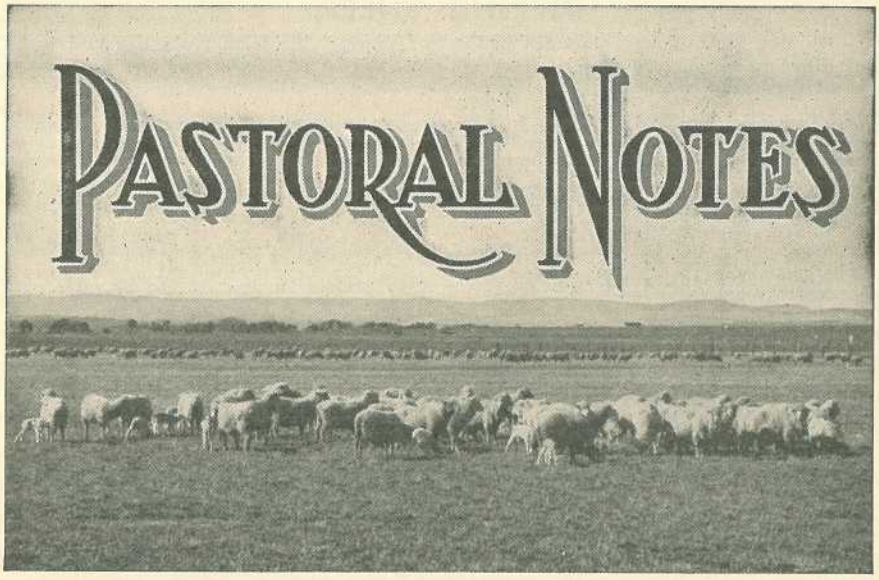
This column represents a junior cow's yield. The figures can be used for gallons of milk or 1 lb. butter fat.	Age at Beginning of Lactation and Correction Factors for Each Age.					
	2 years.	2½ years.	3 years.	3½ years.	4 years.	4½ years.
	1·4	1·3	1·25	1·2	1·11	1·08
AGE-CORRECTED MATURE YIELDS—*continued.*						
620	868	806	775	744	680	669
630	882	819	787	756	699	680
640	896	832	800	768	710	691
650	910	845	812	780	721	702
660	924	858	825	792	732	712
670	938	871	837	804	743	723
680	952	884	850	816	754	734
690	966	897	862	828	765	745
700	980	910	875	840	777	756
710	994	923	887	852	788	766
720	1,008	936	900	864	799	777
730	1,022	949	912	876	810	788
740	1,036	962	925	888	821	799
750	1,050	975	937	900	832	810
760	1,064	988	950	912	843	820
770	1,078	1,001	962	924	854	831
780	1,092	1,014	975	936	865	842
790	1,106	1,027	987	948	876	853
800	1,120	1,040	1,000	960	888	864
810	1,134	1,053	1,012	972	899	874
820	1,148	1,066	1,025	984	910	885
830	1,162	1,079	1,037	996	921	896
840	1,176	1,092	1,050	1,008	932	907
850	1,190	1,105	1,062	1,020	943	918
860	1,204	1,118	1,075	1,032	954	928
870	1,218	1,131	1,087	1,044	965	939
880	1,233	1,144	1,100	1,056	976	950
890	1,246	1,157	1,112	1,068	987	961
900	1,260	1,170	1,125	1,080	999	972
5	7	6·5	6·25	6	5·5	5·4

"TICK WASHING" CALVES AND ITS RELATION TO TICK FEVER.

Young cattle possess a natural resistance to tick fever, but this gradually grows weaker until at the age of twelve months for all practical purposes it ceases to exist. The foregoing applies to calves reared in clean areas and also (and this is the important point) to calves reared in ticky areas if such calves are sprayed so often and so regularly as to keep them entirely or almost entirely free of ticks. Under such conditions, the resistance to tick fever of calves in ticky areas at the age of twelve months will be little better than that of calves reared in clean areas.

The matter is worthy of close attention, as some farmers definitely overdo the treatment of calves for tick infestations. The belief is, of course, that the growth rate of the calves will be increased and their general wellbeing bettered, but, although this is true enough, it is, notwithstanding, a dangerous course to pursue, as mortality from tick fever is likely to follow at the age of eighteen months to two years or older.

Calves should be allowed to carry a reasonable number of ticks from a few weeks old onwards. In this way their natural resistance to tick fever will be continually reinforced, so to speak, so that at the age of twelve months it will be just as strong as it was during the first few weeks of life. In normal circumstances, this resistance will, if the animal is continually exposed to moderate numbers of ticks, be retained throughout life.



The Small Sheep Property.

WHEN money is available a small grazing selection frequently carries improvements fit for a much larger property. On the other hand, when money is scarce, the small holding often lacks even the bare improvements essential to the wellbeing of the sheep and the handling of the clip.

A property has a certain capital value, and unnecessary improvements merely mean over-capitalisation. Interest has either to be paid or allowed for this excess expenditure.

However, certain improvements are necessary in all cases.

A substantial boundary fence is essential, and, should the district be dingo-infested, netting and top netting are also necessary.

Next in importance is the water supply. If there is adequate natural water, the selector is fortunate. Failing natural water, wells, sub-artesian bores, surface tanks, or bore drains to conduct supplies from neighbouring bores must be provided. The type of watering facilities to be used is essentially a matter of economics. What pays best, particularly in drought emergencies, should be a guiding principle in the grazier's choice.

A horse paddock and yards for the handy working of house cows are among the first provisions to be made. This paddock should be handily situated to the homestead and should contain water.

Subdividing of the property for the convenient working of sheep is seldom given sufficient thought. It involves, not only the running of fence lines, but their construction in such a way that water is easily and continuously available to the stock. The fences should be substantially erected to obviate continuous drafting and boxing. Too much money may be spent in wrongly thought-out subdivisions, but, generally, the smaller the paddocks the better. The posts used for fencing should be of timbers proved in the district for their durability.

On a small holding, the shearing shed and drafting yards may be close together. The shed should be well constructed and properly designed, but not larger than necessary for the competent handling of the numbers of sheep ordinarily run on the property. The yards also should be constructed substantially, and their correct design for the drafting of sheep is of first importance. Where shed and yards are together, the latter should be so placed that the shed can be conveniently filled with woolly sheep.

The situation of the homestead should permit the easy working of the property, and its cost should be no greater than the improved value of the holding warrants.

DIPPING SHEEP.

Dipping is the only successful method of freeing the flock from lice and ked. For dipping, a recognised proprietary material should be chosen and the directions for mixing followed implicitly.

Ordinarily, dipping should be done within a month after shearing, but not before all cuts or wounds have healed. A fine day should be chosen for the job. Extremes of heat or cold should be avoided.

Sheep should never be dipped when in a heated state. Yard them, if possible, the night before.

Immerse the sheep completely. Allow them to drain and, if possible, dry in the shade. Avoid driving them long distances to paddocks after dipping.

Dipping pays, and, in addition, gives some protection against the blowfly.

CRUTCHING AND JETTING SHEEP.

There is often controversy as to whether crutching or jetting is the better method of combating blowfly attack. There should be no argument on this score, for, with the increasing severity of fly invasion, both methods have their place in the protection of the flock.

There is a school of thought which insists that the wool should be left on the crutch of the sheep and jetting alone resorted to. Other graziers pin their faith to crutching and will not consider jetting.

It is thought that, singly, either of these methods may be unsatisfactory to some extent, inasmuch as both methods should be used in conjunction. To get the greatest immunity from fly strike, the grazier is advised to carefully crutch when—or before if practicable—the first fly invasion is likely to occur. This should give the flocks immunity for about two months. Should further treatment then be necessary, jetting the previously crutched sheep is advised. Thus, with the intelligent combination of the two methods, reasonable protection should be assured.

SHEEP DRENCHING.

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

1. *Careless Mixing.*—Nicotine sulphate is a highly poisonous drug, therefore the mixing of the drench should be given every care. The nicotine sulphate is measured in fluid ounces and not in ounces weight.
2. *Careless Administration.*—The majority of ill-effects which have followed the use of this drench are due to careless administration. The dose given depends, not only upon the age, but also upon the condition of the sheep. The recommended doses are for sheep of various ages in fair to good condition. If the condition of the sheep is low, the dose should be reduced about one-fourth.

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

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

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

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

A LAMB-MARKING AND BLOWFLY SPECIFIC.

A lamb-marking and blowfly specific should be an antiseptic as well as a healing agent, and, besides killing the maggots present, it should give some protection to the sheep or lambs against maggots developing from a future strike and should be easily washed from the wool during the scouring.

A mixture recommended for use is made up as follows:—40 per cent. Shell dieselene oil or Vacuum 28-38 fuel oil; 55 per cent. fish, herring, or cod oil; 5 per cent. cresylic acid; and 0·1 per cent. sodium arsenite, or 1 lb. to 100 gallons.

For convenience in making 5 gallons of the mixture, take 22 pints fish oil, 16 pints fuel oil (not more than 875 specific gravity), 2 pints cresylic acid, and 1 oz. sodium arsenite.

To Mix.—Place the fish oil in a 5-gallon drum and add the sodium arsenite; shake well, and then add the cresylic acid and fuel oil. Should the weather be cold, heat at least some of the fish oil, and add the sodium arsenite and shake to secure a good suspension, and then add the other ingredients as above. The mixture should be well shaken before using, and shaken up occasionally to keep the sodium arsenite in suspension while in use. Apply with a clean brush or swab. In purchasing in quantities to make 100 gallons of the specific, the approximate price per gallon, including the container, has worked out at 3s.

RIGHT TYPE OF EWES FOR LAMB RAISING.

If merino ewes form the mother flock, the fat lamb raiser is handicapped in the matter of profitable weights at an early age, or, in other words, early maturity.

The ewe most suitable for the production of early maturing sucker lambs for export is got by the use of rams of one of the long-woolled breeds—such as the Romney Marsh, Border Leicester, or Lincoln—on the strongest, boldest type of merino ewe procurable. The ewe lambs from the resultant drop should be retained as the future breeding flock.

Pure-bred Corriedale ewes also are recommended as dams in a fat lamb raising flock.

On either type of ewe a Downs ram—such as the Southdown or Dorset Horn—should be used.

The ewe flock should be maintained in good strong store condition until lambing time. After lambing, no feed is too good for the ewe and lamb.

Under favourable conditions, fat lambs should be marketed at four months of age.

FAULTY SKIRTING.

A fault altogether too common, in the get-up of our clips, is faulty skirting. The work of skirting and rolling is, of course, under the direction of the classer and the responsibility is his. However, the actual work is very often done by inexperienced hands who are prone to treat every fleece in the same manner.

In the case of a free wool, there should be a definite reason for every piece of wool removed from the fleece. Frequently one comes across a line of wool in which the pieces and brokens exceed the fleece. When handling a free wool this proportion is very much too great. From a financial point of view, the grower is losing in actual money the difference between the prices of the pieces and brokens and the fleece wool for every pound of wool unnecessarily removed from the fleece.

Even a greater mistake is sometimes made in the case of a seedy line. This error consists of very heavy skirting in an endeavour to make a free line. Actually the very opposite should be practised—that is, the skirting should be as light as possible and the fleece wool prepared for market as a seedy line.

The wool from every flock shorn should be carefully examined and instructions given to the woolrollers as to what should be removed.

Indiscriminate skirting loses money.

ROTATIONAL GRAZING.

The practice of grazing paddocks throughout the year according to a prearranged plan of rotation—although highly successful in countries with a reliable rainfall—is not practicable, as a general rule, in Queensland. The main object of rotational grazing—the regular provision of short young grass—can, however, be achieved as far as weather conditions will permit by submitting each paddock to short and intermittent grazings, rather than to continuous grazing. In order that this practice of intermittent grazing may be applied in an efficient way, it is necessary to subdivide a fairly large number of paddocks, each of which may be grazed down by the available stock within a short period and then rested.

Broadly speaking, the system of management recommended for dairy pastures is to concentrate the producing stock on a paddock of young, leafy pasture for a few days, and when it has been eaten down fairly closely, transfer the stock to another paddock of young grass; and so on, coming back to the first paddock some weeks later, when good feed is again available on it.

Since the pasture in different paddocks may vary in its rate of growth, no definite orderly rotation may be possible, but each paddock may be grazed and spelled intermittently.

In selecting grasses, attention must be given to their adaptability to local conditions, period of growth and production, nutritive value, palatability, and suitability for grazing and hay making. The length of the grazing season is increased and the returns improved by the use of top dressing. Its practicability depends on the increased returns in terms of cash.

Rotational grazing does not involve so great an outlay, and is more a matter of pasture improvement by ensuring the economical use of herbage. The subdivision of holdings to provide rotational grazing appears to offer a ready means of immediate benefit through pasture management. And now is the time to act. It will be too late to achieve any advantage if it is left to make a start when the season turns dry.

HEREDITY IN SHEEP.

None of the domestic animals responds quicker to careful breeding than the sheep.

It may be taken, with some exceptions, admittedly, that like begets like—hence the importance of what is called prepotency in the sire. This power is especially important in the merino, when it is estimated that fully 80 per cent. of the animal's qualities are in the fleece.

To the careful student of breeding, prepotency in the sire is chiefly indicated in the head. This must be entirely masculine, with a bold eye, strong horn, well sprung, and with the head and neck well let into the shoulders. No matter how well a ram is covered, if the head is wrong disappointment usually follows his use in the stud.

The quality, conformation, and constitution of the ewes, too, is of great importance, and it is in the successful "nicking" of the sexes that the truly great studmaster shows that inherent gift which is born with him.

CROSSBRED EWES FOR FAT LAMBS.

As 98 per cent. of the sheep population of the State are of the merino breed, Queensland farmers are obviously at some disadvantage in respect of the right type of ewe for the production of the early maturing spring lambs.

In this connection, fat lamb-raisers, who are using long wool rams—such as Romney Marsh, Border Leicester, or Lincoln—should, in their own interests, retain some, at least, of the ewe drop as future breeders in their flocks.

There is no doubt that from a strict money point of view such a practice would pay. While the cry is always that crossbred ewes of the right type are either expensive or unprocurable, year in and year out ewe lambs are slaughtered in Queensland, which, if kept for breeding purposes, would have a most beneficial effect on fat lamb production. If farmers are not in a position to hold all the ewe drop from the long wools, they should, at least, retain some proportion each year with the idea of eventually working into a crossbred flock.

Control of Dairy Temperatures.

TEMPERATURES on the average farm sometimes present a difficult problem, but good dairy management depends largely on their regulation and control. The removal of animal heat from milk and cream as soon as possible after milking or separating, followed by storage in cool surroundings, will greatly lengthen their useful life by delaying the growth and development of bacteria. Together with straining, which serves to remove the visible dirt and so reduce the numbers of micro-organisms, control of temperature forms a method whereby the farmer can definitely increase the value of his product.

Straining.—Cow hairs, flies, dust, and dung particles and other foreign matter carry with them enormous numbers of bacteria, and should be kept out of milk by every possible means, for no amount of straining can remove bacteria once they have become free in the milk. Should some visible dirt gain entrance, however, the straining of each cow's milk through a cotton-wool disc immediately after milking will minimise the damage caused.

Straining should be done once only, and should take place before cooling or separating. The disc type strainer prescribed by the Dairy Regulations is preferable to any other, since each disc is discarded after use; provided that the metal parts are scrubbed and sterilized, there is no risk of recontaminating the milk as with a cloth which has not received thorough washing and boiling; also, the finer mesh of the wad will trap smaller particles than will a cloth. If a large quantity of sediment is being removed, the disc should be changed during milking.

Cooling.—Some form of cooling is necessary to counteract rapid bacterial development; and the most usual medium for the purpose is water. Adequate water is necessary for cooling, and if the supply is insufficiently cold an evaporating device or the use of ice may be required to bring the temperature of the cooled milk to 60 deg. Fahr. or lower, and cream to 70 deg. Fahr. or lower. If deep well water is available the maximum advantage in temperature can be obtained by pumping it direct to the cooler or trough when required. In the case of shallow well, surface, or tank water, some means of storing it, protected from the heat of the sun, must be devised if it is to be useful as a cooling agent.

An insulated tank, through which cold water flows and in which cream cans may be placed, is a fairly satisfactory arrangement for reducing the temperature steadily with constant stirring, which also aerates the cream; the water is then run to a trough for watering stock.

For cooling and aerating milk, the best type of cooler is the endless corrugated type, which can be used in conjunction with a water-bag evaporator (filled after each cooling in preparation for the next), or with a fixed tank to which water is pumped and flows through the cooler by gravity, or with a refrigerating unit using

brine. Such a cooler, having wide corrugations and no end plates, can be easily cleaned with a brush and has no awkward crevices. Porous cylindrical containers, large enough to hold a single can, working on the evaporation principle, are being used in some districts successfully, and have the advantage of being transportable and economical of water.

Refrigerating is a sure and certain way of improving quality, for although it actually does not kill harmful bacteria, it renders them dormant and unable to cause deterioration of milk or cream. Many farmers are coming to the conclusion that the improvement in grade resulting from refrigerating their product on the farm makes it financially economical. Very little bacterial growth takes place below 45 deg. Fahr., but the growth rate of the common milk types increases steadily above this, up to around 100 deg. Fahr., and is, of course, favoured by summer conditions. During sultry weather especially, extra care and precautions need to be taken with regard to cooling and cool storage of milk and cream.

Storage.—The Dairy Regulations provide for a suitable storage room for milk and cream, or for milk only a well-covered ventilated stand will suffice. A clean wet bag wrapped around a can will assist cool storage by insulation and by evaporation. Direct summer sunshine in Queensland has tremendous heating power, and the proper protection of cream left adjacent to the road awaiting the carrier is, therefore, also important. Thick timber roofing over the cream stand affords greater protection than galvanised iron, which is not permitted under the Dairy Regulations.

Careful temperature control right from the start is the key to safeguarding quality in either milk or cream production, for whatever purpose they may be required.

COWS CALVING AT SHOW TIME.

Competitors in dairy classes arrange usually for the calving of individual cows about show time, so that they may be brought before the judge with all their characteristics of production strongly in evidence.

Should calving be delayed until the show is in full progress, the noise and consequent excitement may cause the continuance of labour pains, although weakly, for many hours, thus exhausting the cow and, perhaps, endangering the life of a valuable calf. In these cases, it is advisable to seclude the cow in a quiet part of the building, where there is no traffic, where curious visitors may be excluded, and where any attention required may be given only by her regular attendant. In these surroundings the cow soon settles down, the pains become strong and effective, and the calf is born without any trouble.

Immediately the calf is dropped, it is advisable to tie the navel string, close to the belly, with strong thread or silk, which has previously been soaked in a suitable disinfectant, and to paint the part with strong tincture of iodine. Neglect of this precaution may allow the entrance of infection leading to fatal disease.

The calf should receive for the first few days all it will drink of its mother's milk, as the colostrum it contains acts as a laxative, removing offensive material from the bowels, and is essential to the future wellbeing of the calf.

If the cow has been subjected to great excitement through travel and strange surroundings, the first milk she yields should be discarded, for such milk may cause digestive disorder leading on to fatal diarrhœa. It is safe to feed the second and subsequent milkings to the calf.

WHOLESOME MILK.

Normal milk can only be produced by a normally healthy herd, fed on wholesome and non-taint producing fodders. If only one cow in the herd is not in normal health her milk production will be sub-normal, and, if mixed with the milk from the remainder of the herd, the quality of the whole may be seriously affected. Cleanliness should be exercised during the whole process of milking, and all utensils and surroundings kept clean.

If the milk is intended for human consumption, cooling and aerating will allow the feed flavours to be given off, and the reduction in temperature will check bacterial development.

A WELL-BUILT DAIRY HOUSE.

The cream house illustrated is erected on the property of Mr. W. G. Cope, Biloela, to the design of A. Lebsanft, manager of the Port Curtis Co-operative Dairy Association, Biloela.

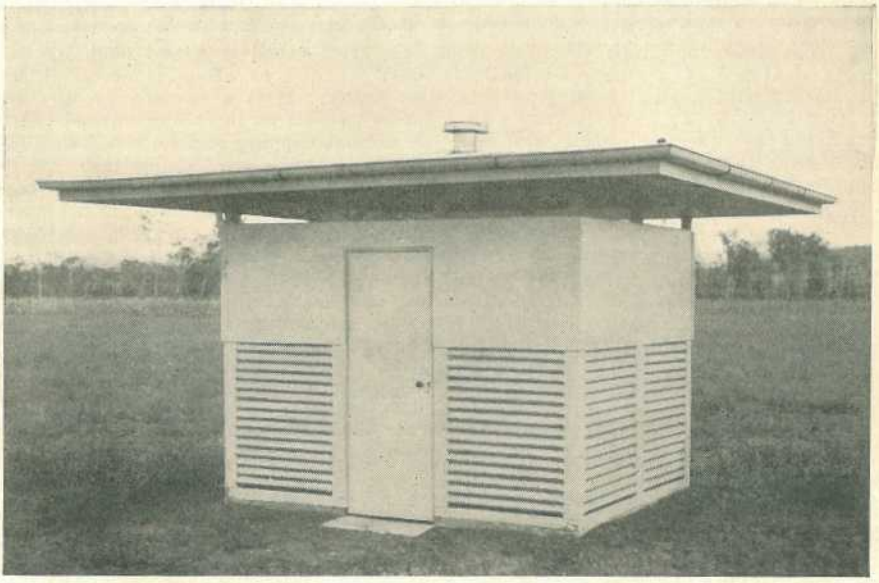


Plate 34.

The building is designed to afford better ventilation than is provided in the standard type dairy house. This is effected by the combination of louvres, ½-in. netting, and ventilator. The insulated roof and caneite walls are effective protection against the heat of the sun. The louvres completely exclude the sun's rays.

Specifications are as follows:—

Floor Area.—10 ft. by 8 ft.

Walls.—8 ft. high, consisting of louvres 3 ft. 6 in, Caneite 3 ft. 6 in., and ½-in. mesh netting 1 ft.

The Roof.—Overhangs the walls by 3 ft. and thus provides shade during the hot part of the day. Within the walls it is ceiled with T. and G. pine. The space between ceiling and roof is filled with sawdust. A ventilator is fitted in the centre of roof.

SOUND DAIRY PRACTICE.

Some dairy farmers—especially some who have only recently established dairy herds—are often unaware of the essential points for the satisfactory and cleanly production of milk and cream.

The bacteria responsible for the spoilage of milk and cream are to be found in large numbers on the farm, and if careful methods are not used they may enter from any or all of the following sources:—

(*a*) The udder, if the animal is not absolutely healthy, and if foremilk is not discarded.

(*b*) The cow's coat and skin, if not groomed before milking.

(*c*) Dust in the cowbail or dairy.

(*d*) The milker's hands, clothes, or person.

(*e*) Milk buckets and equipment imperfectly cleaned or not sterilised.

The health of the cow is, of course, of first importance, and the farmer must assure himself that every animal in his herd from which milk is being produced is in fit condition and free of any signs of disease.

Grooming the Cow.—Some preparation of the cow before commencing to milk is necessary in wet weather to remove the mud and dung splashed on the udder and teats, and, under summer or drought conditions, the dried dust, which is equally dangerous to milk quality.

The flanks and tails should be kept free from caked mud and dung by the occasional use of a currycomb, and the dust removed as often as necessary by grooming with a stiff brush dipped in clean water. It is a common practice on "model" farms to keep the hair on the flanks as well as the udder clipped short to avoid the collection of dust and dirt. Occasional clipping and regular grooming will make the daily routine of keeping the udder clean a very simple task. It is only when cows have been neglected that the washing of udder and flanks takes any length of time.

The udder and teats should be washed before each milking. This is best done with a cloth (preferably of the woven type) kept for the purpose, and a bucket of clean water, using a separate cloth, with a second lot of clean water if necessary, for finishing off the udder. A small amount of potassium permanganate (Condy's crystals) or some chlorine compound added to the water is an extra precaution observed by many farmers, which is advisable if there are any cases of sore teats, or where the water used is of doubtful purity. The teats are left damp, but not dripping, so that any remaining dust or loose hairs will adhere to the surface and not fall into the milk. Udder cloths must be washed out and boiled every day, otherwise they become a dangerous source of bacteria, and the object of washing the udder will be defeated. Both cloths and bucket should not be used for any other purpose.

With practice, this routine preparation of the cow for milking can be very quickly and yet thoroughly carried out. It can be done by a boy, and the time spent—one minute or less per cow—is negligible compared with the reduction in the number of bacteria gaining entrance to the milk and cream from this source.

COW'S AGE—EFFECT ON MILK.

How does the age of a cow influence the composition of milk? This is a question often asked. From the dairyman's point of view the fat is the most important constituent, and much experimental work has been carried out to determine how the fat test varies with the age of the cow. It has been shown that, with advancing years, cows produce milk containing a diminishing percentage of fat. The variation observed is not of any serious consequence, but it is nevertheless noticeable when average figures are taken. A cow of a high testing breed which shows an average test of 5 per cent. of fat as a young animal will decline to about 4.5 per cent. if she continues to produce to fourteen years of age.

It is sometimes thought that a heifer showing a low test as a two-year-old may improve as she matures. There are no grounds for such a belief, and any farmer building up hopes of this nature is likely to be very disappointed. The richness of milk is a matter of inheritance, and so far as is known nothing can be done to change it in an individual animal.

An interesting feature with this work is that mathematicians have taken an interest in it, and one man has actually worked out a formula for calculating the fat test for any specified age, provided that the average test for the first milking period is known.

The effect of age on the other constituents of milk has also been studied, and there is a decrease, with age, in all constituents except albumen, which increases slightly from year to year.

The effect of age on the fat test (richness) of milk should not be confused with the effect of age on milk production. There is a gradual increase in the quantity of milk produced from year to year until a maximum period is reached, after which the production figures show a slow decline. The age of maximum milk production for most breeds has been shown to be eight or nine years.

Meatmeal for Pigs.

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

Meatmeal, which is a by-product or abattoirs and meatworks, is sold under several trade names and some varieties contain a small percentage of bonemeal. It is a wholesome food, convenient to use.

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

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

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

Pigs thrive on a mixture of milk and meatmeal, or meatmeal alone, as the protein-rich portion of the diet. The quantities used should not exceed from ¾ to ½ lb. daily per pig from weaning to baconer stage, according as to whether good lucerne is available or not; and ½ lb. for each dry sow and 1 lb. daily for each sow with litter.

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

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

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

CASTRATION OF PIGS.

Male pigs should be castrated while they are very young, so that they may be fit for slaughter on attainment of the correct weights. The age recommended for the operation is six weeks, or two weeks before they are weaned.

As many beginners do not know how to perform the simple operation of castration, the Department of Agriculture and Stock has made available, free of cost, a very useful and well-illustrated pamphlet—"Castration of Pigs"—which gives detailed instructions in convenient form and in everyday language.

Demonstrations may be arranged, on application, in the course of the instructors' itineraries, either at gatherings where facilities exist for performing the operation, or at a slaughter-yard where young pigs are available. In the latter case it is preferable to demonstrate on a pig carrying more age, say, up to four months—and which can be killed and dressed beforehand. Demonstrating on a dressed porker simplifies procedure, and enables the instructor to explain it without the inconvenience of handling a live pig.

That a better knowledge of the operation of castration is essential is emphasised frequently by bacon curers, meat exporters, and slaughtering inspectors, who often come across carcasses of male pigs which have been castrated improperly. Partial, if not total, condemnation of the hindquarters—the result of abscess formation, the formation of tumours in the scrotum, callous or improperly healed tissue, or some other abnormality—is the inevitable result.

Castration should be done during cool, dry weather and before flies—blowflies, in particular—become numerous. Absolute cleanliness in all details, proper equipment, healthy growing pigs, and a correct knowledge of the job are necessary for success in the performance of the operation.

PIG BREEDING RECORDS.

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

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

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

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

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

CARE OF WEANERS.

To get best results from pigs they should be kept growing steadily from the time they are born until they are marketed. As about half the pig's ration is used to maintain body heat and physical energy, fast-growing pigs will ultimately require less food for maintenance than the slow-growing ones. Hence the practice of growing weaners slowly up to store stage and then feeding heavily for a few weeks is not recommended, particularly when food is plentiful.

Weaners should not be forced to experience sudden changes in diet after their dam has been removed; such changes will check their growth, and weaners so treated usually require extra time and food to prepare them for market.

Heavy weaning weights at eight weeks are evidence of good sows and proper management. At this time the young pigs should be practically independent of the sow if they have been trained to feed from a trough, and so there is little or no check to their growth when weaned. Pigs which weigh 40 lb. to 50 lb. at weaning time usually reach market weights sooner and on less food than weaners weighing 20 lb. to 30 lb. Therefore, proper attention to the weaners is important in any effort to market pigs quickly and economically. One of the rules of the piggery should be *heavy, healthy weaners.*

OILING PIGS.

In cool weather, pigs do not wallow in mud holes as they do in the warmer months and so they do not have their natural protection from body lice.

The pig louse is fairly large—about ⅛ inch in length—and easily seen if the pigs' hair is turned back, or if sucking pigs are examined around the thighs and under the belly.

Pigs which are heavily infested with lice are unthrifty and slow growing, become debilitated, and are more susceptible to diseases.

The control of lice should receive the attention of pig-raisers, for it is uneconomic to have lice-infested stock. Treatment with oil is practicable and inexpensive. Any oil applied to the pig's skin will destroy lice which come in contact with it. An oil in common use is crude petroleum oil. An efficient method of application is by spraying a very thin mist of oil through a pump spray, so that the pigs are completely covered with a thin film of oil. The oiling should be done in the late afternoon so that the sun will not cause the oil to "burn" the pigs. The pigs should be congregated in a race or pen or at the feeding trough, so that time and oil may be saved.

Three thorough oilings given at weekly intervals should assure complete control of pig lice.

PIG-FEEDING.

Grain enters largely into successful pig-raising. The price of maize often makes feeding problems difficult for the pig farmer. On the mixed farm every effort should be made to conserve the carbohydrate-rich crops—Swede turnips, arrowroot, and pumpkins—for the pigs. Molasses can be substituted for half the maize in a ration, but great care must be exercised in getting the pigs accustomed to this quantity. It should be done gradually.

Open grazing should be practised as extensively as possible; and, when porkers show a lean, unthrifty appearance, it will probably pay to carry them on to bacon weight. The farmer with a good stock of feed should be wary of buying more weaners than he can feed. If the separated milk supply is not sufficient, producers are strongly advised to use the meat meal now on the market. It is an excellent substitute.

While curdled separated milk has a slightly higher feeding value than fresh milk in pig feeding, the use of the former is not recommended as a general practice.

The usual method of souring milk on the farm is by holding it for a period in a vat or drum, which usually has an inside lining of decaying milk. This decomposing milk may contain not only the bacteria which cause normal souring of the milk, but also bacteria which are capable of decomposing the milk and turning it into a condition which is harmful to the pig. Further, when souring is practised under uncontrolled conditions, the feeding value of the milk may be greatly reduced by excessive souring.

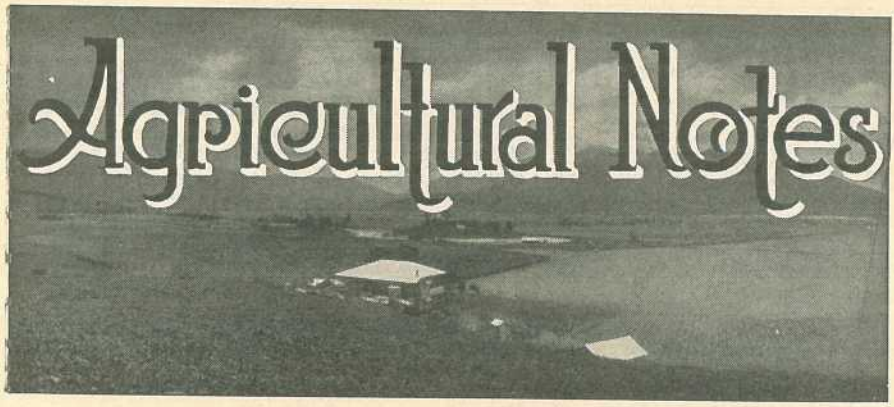
Considering the very slight advantage of good soured milk over good fresh milk, and the grave risk of an injurious decomposition of the milk when it is soured under the usual farm conditions, it is better to feed the milk fresh from the separator after the froth has been removed.

Milk should not be allowed to remain in the trough after pigs have had their meal. Any milk held over between one separating and the next should be kept in clean drums or cans, which are washed and scalded daily.

The sudden changing from sour milk to sweet milk, or from sweet milk to sour milk, in a pig's diet may readily cause digestive disorder.

Name and Address.	Name of Hatchery.	Breeds Kept.
F. J. Akers, Eight Mile Plains ..	Elmsdale ..	Australorps
E. J. Blake, Rosewood	Sunnyville ..	White Leghorns, Australorps, White Wyandottes, and Rhode Island Reds
W. Brown, Waterworks road, Ashgrove	Strathleven ..	White Leghorns
J. Cameron, Oxley Central ..	Cameron's ..	White Leghorns and Australorps
M. H. Campbell, Albany Creek, Aspley	Mahaca ..	White Leghorns and Australorps
J. E. Caspaney, Kalamia Estate, Ayr	Evlington ..	White Leghorns
J. L. Carrick and Son, Manly road, Tingalpa	Craigard ..	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	White Leghorns and Australorps
T. G. Crawford, Stratford, via Cairns	Rho-Isled ..	Rhode Island Reds
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme ..	Australorps, White Leghorns, and Rhode Island Reds
O. M. Dart, Upper Brookfield ..	Woodville ..	Australorps, White Leghorns, Langshans, and Rhode Island Reds
Dixon Bros., Wondecla ..	Dixon Bros. ..	White Leghorns
E. O. F. Eckert, Laidley ..	Laidley ..	Australorps, White Leghorns, and Langshans
F. G. Ellis, Old Stanthorpe road, Warwick	Sunny Corner ..	Australorps
Elks and Sudlow, Beerwah ..	Woodlands ..	White Leghorns and Australorps
B. E. W. Frederich, Oxley road, Corinda	Glen Albyn ..	Australorps
W. H. Gibson, Manly road, Tingalpa	Gibson's ..	Australorps and White Leghorns
Gisler Bros., Wynnum ..	Gisler Bros. ..	White Leghorns
G. Grice, Loch Lomond, via Warwick	Kiama ..	White Leghorns
J. W. Grice, Loch Lomond, via Warwick	Quarrington ..	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. and C. E. Gustafson, Tannymorel	Bellevue ..	Australorps, White Leghorns, 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	White Wyandottes, Light Sussex, Rhode Island Reds, Australorps, White and Brown Leghorns
F. W. R. Longwill, Birkdale ..	Nuventure ..	Australorps and White Leghorns
J. McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Brown Leghorns, and Australorps
W. S. MacDonald, Box 208, Babinda	Redbird ..	Rhode Island Reds and Anconas
F. McNamara, Vogel road, Brassall, Ipswich	Frammara ..	White Leghorns and Australorps
A. Malvine, junr., The Gap, Ashgrove	Alva	Australorps and White Leghorns
H. L. Marshall, Kenmore ..	Stonehenge ..	Australorps and White Leghorns
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Langshans
C. Mengel, New Lindum road, Wynnum West	Mengels ..	Australorps
J. A. Miller. Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, White Leghorns, and Brown Leghorns
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 Leghorns, Brown Leghorns, Australorps, Light Sussex, and Silver Campines
A. C. Pearce, Marlborough ..	Marlborough Stud Poultry Farm	Australorps, Langshans, Rhode Island Reds, Light Sussex, White Wyandottes, Khaki Campbell Ducks, Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Douglas street, Oxley Central ..	Pennefathers ..	White Leghorns and Australorps
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Brown Leghorns, Australorps, Langshans, White Wyandottes, Rhode Island Reds
G. R. Rawson, Mains road, Sunnybank	Rawson's ..	Australorps
J. Richards, Atherton	Mount View ..	White Leghorns and Australorps
W. G. Robertson, Bilson 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 ..	White Leghorns and Australorps
A. Smith, Beerwah	Endcliffe ..	White Leghorns and Australorps
A. T. Smith, Waterworks road, Ashgrove	Smith's ..	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
A. G. Teitzel, West street, Aitkenvale, Townsville	Crescent ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's ..	White Leghorns and Australorps
P. and K. Walsh, Cleveland ..	Pinklands ..	White Leghorns
W. A. Watson, Box 365 P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Atherton ..	Weaver's ..	Australorps, White Leghorns, Buff Leghorns, Wyandottes, Anconas, Indian Game, Rhode Island Reds, Barred Rocks, Buff and Black Orpingtons
H. M. Witty, Kuraby ..	..	White Leghorns and Australorps
P. A. Wright, Laidley ..	Chillowdeane ..	White Leghorns, Brown Leghorns, and Australorps



Grow More Fodder.

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

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

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

THE FALSE ECONOMY OF SMALL TANKS.

It would be interesting to know the amount of money which is actually wasted in Queensland in the course of a year on the excavation of so-called tanks. Anything with a capacity of less than permanency may be regarded as playing with the job rather than doing it.

Of course, the annual rainfall registration has to be regarded as a deciding factor. Generally, the drier the locality and the likelihood of recurring drought conditions, the larger and deeper the tanks should be.

No expense should be incurred on the construction of a tank, unless the supply of water to be stored is sufficient to last for twelve months without replenishment. To bring this to figures, it is estimated that a tank of 4,000 yards is the minimum excavation required to provide water for twelve months. Too often reliance is placed on an excavation which gives out, while there is plenty of feed. The false economy of this should be patent to all.

CROP ROTATION.

Rotation of crops is generally necessary in most systems of farming if the fertility and physical condition of the soil are to be maintained. Apparently, every crop requires some particular combination of plant foods, and by growing the same crop season after season on the same soil, a depletion of the main plant foods required by that crop results. Hence, after continuous cropping for some years, yields may become unprofitable. By growing different crops in rotation, the productivity of the soil may be maintained or even improved in the case of naturally inferior types of soil.

Rotational systems vary with the climatic conditions and the range of profitable crops.

Crops used in rotational systems in various parts of the world are frequently grazed off by stock, or harvested for fodder. Any accumulated manure is thus returned to the land. Where such systems are practised, the organic matter ploughed in as dung assists in maintaining the soil in a satisfactory physical condition. Where stock-raising is less important, a green manure must be included in rotations, which include nitrogen-requiring crops, to obviate any excessive depletion of nitrogen and organic matter. If climatic conditions are suitable, crops such as cowpea, soya bean, clovers, and other legumes can be grown and ploughed under as green manure. Such green manuring usually increases the yields of the following crops.

In dry areas green manuring has not proved so beneficial, as the organic matter decomposes rather slowly. Long fallows have therefore been developed, particularly in wheatgrowing districts. When the crop is harvested, the land is ploughed as early as possible and left in a rough state to trap all subsequent rains. If the crop is stripped, the standing straw should be burned before ploughing, otherwise it may be difficult to obtain a compact seed-bed, and there is some risk of the following crop being deprived of nitrogen.

Crop rotation has received little attention in Queensland, because of the natural fertility of soils which have only been cultivated for a comparatively short period. Climatic conditions have also favoured the cultivation of a particular crop within a well-defined area. As a result, crops such as wheat, cotton, peanuts, and arrowroot are more or less confined to districts which have proved suitable for their successful production.

The need for a more diversified farming system, using a variety of crops in rotation, is clearly necessary in some old cultivations where specialisation in one crop has both decreased fertility and impaired the physical condition of the soil.

Properly devised rotational systems can be expected to yield larger crops, to ensure economy in the use of manures, and generally result in the more profitable working of the available land.

FODDER STORAGE IN CENTRAL QUEENSLAND.

The importance of fodder conservation in Central Queensland cannot be too strongly emphasised, as the transition from an extensive to an intensive use of land has become not only desirable but necessary from an economic point of view. The irregularity of the summer and, more particularly, the winter rainfall makes it imperative to practise fodder conservation.

Adequate supplies of conserved fodder are essential to ensure continuous production of butter and other farm products. The following suggestions may assist in achieving the desired objective:—

Rotational grazing of both native and artificial grasses ensures the most profitable use of the pasture and requires the subdivision of the grazing area into small paddocks. By grazing each paddock in rotation, the grass is fed in its most nutritious form. The young green grass—continuously available when rotational grazing is practised—possesses a high protein content and little fibre, and the nutritive ingredients are very palatable and readily assimilated by stock. Under good seasonal conditions the stock will be unable to cope with the rapidly growing grass. The surplus should be cut when the seed head has just formed, and stored as reserve fodder.

Rhodes grass, so plentiful in the scrub or rain forest areas, as well as ordinary forest grasses, can conveniently be conserved, either as hay or ensilage. While the conservation of fodder as hay is very convenient, it is interesting to note that well-made ensilage is highly nutritive, and can be held for long periods without deterioration.

Hundreds of tons of valuable green feed, which could be converted easily into nutritious fodder, are allowed to waste away annually. During the present season enormous quantities of pasture have been allowed to seed and the nutritive value of the herbage lost. The value of this to the farmer, had it been conserved, would have been considerable.

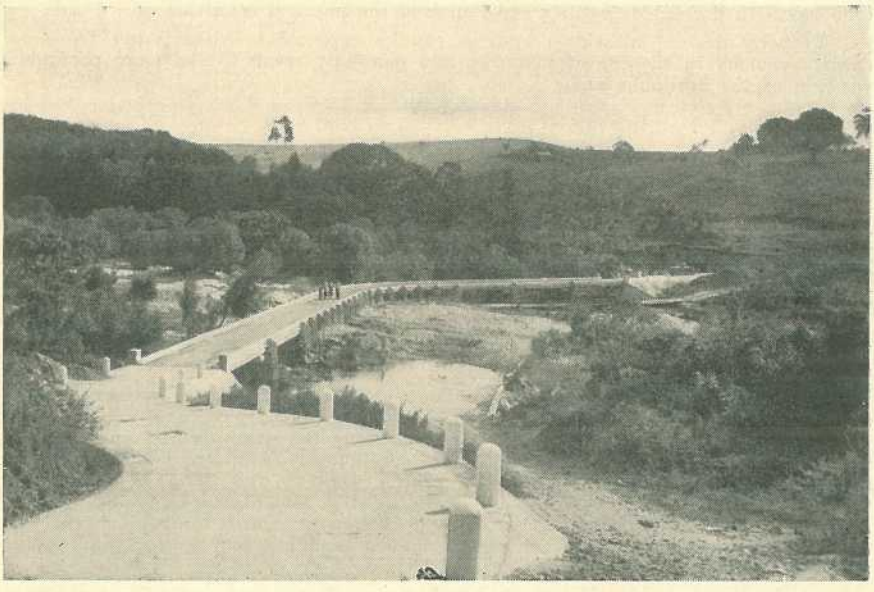
Lucerne stands supreme as the most useful of all fodders. Unfortunately, the crop needs rather special soil conditions, but when these are favourable, at least a small area should be sown. It is particularly adaptable to grazing and hay making, but the first cut or two from a new lucerne patch are often used in combination with some other form of fodder for ensilage.

The dry seasons which occur sometimes in Central Queensland demand quick-growing crops which recover rapidly after light rains. Sudan grass is better suited to these conditions than the millets. It gives heavy yields over a season's growth; it can stand repeated cutting, and provides feed well into the winter; it produces fine quality green feed, especially after the first cutting, and may be used for either hay or ensilage; and it will grow on comparatively poor soils.

Sorghums generally are especially valuable, as they provide both a bulky and nutritious fodder. Sorghum withstands dry conditions better than maize. It also thrives on poor as well as fertile soils, and provides green, succulent feed well into the winter. When grown for use with Sudan grass and cowpea an excellent combination of crops for ensilage is provided. Sorghum should be harvested for ensilage when the seed is in the dough stage and is best chaffed before the silos are filled.

The rainfall during the summer months is usually sufficient to produce summer fodder crops but, unfortunately, winter rains are rather unreliable. In the more favoured areas sufficient rains occur to ensure at least good fodder crops of wheat and oats.

The benefits to be derived from conserving fodders are being gradually appreciated by farmers. Excellent crops are at present being grown in some places in Western Queensland, where the bore water is suitable. Farmers in these favoured localities should utilise the available bore water for the production of fodder crops to some extent at least.



[*Photo.: Lands Department.*

Plate 35.

A ROAD TO A RAIN FOREST SETTLEMENT AREA, NORTH QUEENSLAND.

Packing-shed Equipment.

MANY growers carry on, season after season, with makeshift equipment, when, for a little time and a small expenditure of money, a properly equipped packing shed could be furnished.

Packing stands, nailing-down presses and benches, sizing machines, hammers, stencils, and other equipment should all be gone over and restored to a high state of efficiency. Simple designs for packing stands, nailing-down presses, and case-making benches can be procured, and are not hard to follow by anyone who is useful with a hammer and saw. Simple forms of sizing machines can also be made at home, while those growers who have commercial machines should overhaul them thoroughly, tightening up all screws and bearings, and, if necessary, renewing the padding in the bins and feed channels. Broken parts should be replaced and power plants overhauled. Broken handles in working tools should be renewed. Scrapers and packing needles should be sharpened and greased and packed away until required next season.

Complete sets of new stencils can be cut. A sheet of thin zinc, a small chisel, round, and flat fine-grain files, a hammer, and a piece of end-grain hardwood are the necessary tools. The designs of the letters to be cut can easily be made by obtaining stencils and copying them on to the zinc in the design wanted. The stencilled letters are then cut out of the sheet of zinc with hammer and chisel, and in that way an excellent stencil is made. Stencils are easily obtained, and there is no need to use blue crayon for marking cases.

When the overhauling of plant has been completed, growers should turn their attention to the cleanliness of the packing shed. Old cases and picking-boxes should be repaired or burned, a close inspection of the cracks and crevices being made for pupating insects, such as codling moths. Any shed-stored fruit which has rotted in the cases should be removed and destroyed and the cases thoroughly sterilized by completely immersing them in a 5 per cent. solution of formalin for at least one minute. Floors and other parts of the building affected by juice from rotted fruit should also be treated.

Close attention to these details will enable growers to make a clear start at the next harvesting period.

AN ALTERNATIVE FRUIT FLY LURE.

Recent fruit-fly trapping experiments in coastal citrus orchards indicate that an ammonia-pollard lure gives better results than the well-known ammonia-vanilla lure. The formula is:—Cloudy ammonia 1 teaspoonful, pollard 2 level teaspoonfuls, rain water 1 pint.

Traps containing this lure required changing every six days under normal conditions in the experimental orchards. In hot weather, when the rate of evaporation is high, or if large numbers of flies are caught, it may be necessary to renew the lure at shorter intervals. At each change of lure the traps must be washed thoroughly before they are refilled. The lure should be well stirred while the traps are being filled, as the pollard settles out rather rapidly if this precaution is omitted.

The ammonia-pollard lure has the apparent disadvantage of catching considerable numbers of other insects, such as blowflies, which tend to foul the traps. As the Queensland fruit fly is attracted as soon as the traps are put out in the trees, this is of no great importance.

This alternative lure is cheap and easily prepared, and growers of deciduous fruit may care to use it as an alternative to the ammonia-vanilla lure during the next few months.

PLANTING THE QUEENSLAND NUT.

Where it is proposed to plant an area of the Queensland Nut on open or forest ground, the land should now be got ready for planting time in August. Thorough deep ploughing of the area will be necessary to give the young trees a sufficient depth of a free soil in which to make a good root system. Subsoiling, if practicable, is also desirable.

When planting the young trees a good hole, at least 2 feet across and 18 inches in depth, should be dug so that the tap root—which is comparatively long—can be properly set vertically into the ground, and the secondary roots distributed evenly around the plant.

In digging the trees from a seed bed care must be taken to remove them as carefully as possible and to get a good length of the tap root with the plant. If the tap root is injured during digging, care should be taken to cleanly prune off the injured portion above the point of mutilation. If the tap root is too long, it can be pruned back about 8 inches.

It is advisable to soak the bed thoroughly the day before lifting the young trees, as this will make it easier to extract them from the ground without breaking the roots. Loosening the soil by making a trench, 15 to 18 inches deep, alongside the rows, will simplify digging.

The trees should be planted in the ground at the same level as they were in the nursery bed, or perhaps a little deeper. Excessively deep planting should, however, be avoided.

The young trees should be well watered at the time of planting, and also subsequently, should the weather be dry.

On open land, shade should be provided by driving sufficient stakes into the ground around them to support a light hessian or bag cover.

Very often the main stem of the tree is allowed to grow too high before the top is pruned off. This will result in an ungainly, lanky tree. With the Queensland Nut, as with fruit trees, pruning should aim at producing a sturdy-set tree, well-balanced and fairly open.

The young trees should not be allowed to grow beyond 2 feet in height on a single stem before the top is pruned back. Three side shoots nicely placed are later trained to make the framework of the tree.

Many young trees do not come away well on a single stem, this failure being due to a variety of causes, and a cluster of base shoots may arise as a consequence. It will then become necessary to select the strongest and best-situated shoot to form the tree, the others being cleanly cut away.

No matter whether the trees be planted amongst bananas, pineapples, or other fruits, or in the open, a good stake should be driven alongside each tree, both to protect and support it. Many young trees are destroyed or permanently misshapen by injuries caused during cultural operations, and some protection is clearly necessary.

Where young trees have grown very densely through too many low shoots having been permitted to grow, a certain amount of thinning out of surplus main branches, or of the secondary growths, will be necessary to open up the trees to light and air.

SELECTION OF NEW BANANA LAND.

Intending banana-growers would be well advised to give timely and serious consideration to the selection of new banana land before clearing ground for the 1941 planting.

Of late years bananas have been grown extensively and fairly successfully on inferior forest country, but the general experience is that a suitable aspect and good cultural methods have been the chief factors in successful banana planting.

The best aspect, of course, is the north-east or northerly slope, with standing timber on all four sides to give the necessary shelter from strong winds, and these aspects ensure the maximum amount of winter sunshine.

With sites facing any further into the east than north-east, great care should be taken that, as far as possible, the area is sheltered from the cold south-east winds. An efficient breakwind on the south side of an easterly patch should, therefore, be provided for in the clearing plan. The site chosen should be so situated that tall timber or hills at the top of the proposed area will not shut out the winter sun at an early hour.

A north-westerly slope is preferable to south-east, south, or south-westerly slopes if heavy belts of timber block the strong westerly winds. Many good bananas have been grown on westerly slopes of this description chiefly because the areas in question receive the sun during the whole of the afternoon.

All southerly slopes should be definitely avoided, more particularly if there is open country for any distance around the proposed area. Much more timber will have to be felled than actually required for planting to obviate the long shadows which standing timber at all close to the patch throw over the plantation. The limited period during which they are exposed to the sun is the chief objection to all southerly slopes.

A good warm-slope plantation will produce from two to three bunches to every one on the cold-slope areas. Production costs, particularly to the grower on leased ground, enter so largely into the picture that intending growers with a choice of ground should always choose a warm situation to gain the best results.

PAPAW SEED.

Now that the papaw planting season is at hand many requests are being received at the Department of Agriculture for sources of guaranteed seed, particularly of bisexual types.

For general information, it may be stated that until Departmental investigations which have now been in progress for several years are completed, the Department is not in a position to recommend any particular seed with certainty. Seeds have been sold by some seed sellers in the past as pedigreed seeds, but when they have been germinated and the plants have flowered they have been shown to be ordinary males and females. Fruit types also cannot be guaranteed unless particular pollination of the parent flowers is ensured by bagging at the correct time to prevent pollination from undesirable sources.

Growers are advised therefore for the time being to obtain seed from sources from which they know the seed has been selected by the growers for their own plantings over a period of years. Even with such seed they should not expect anything like 100 per cent. of fruit true to parent types.

THE FRUIT MARKET.

J. H. GREGORY, Instructor in Fruit Packing.

WHAT will 1941 bring forth? No overseas export of apples to Europe and almost a record crop of quality apples to dispose of; acquisition by the Commonwealth with its supporters and its opponents. The critics of acquisition would do well to reflect that, whatever its shortcomings, growers of quality fruit are guaranteed a price equal to 8s. 6d. per case, which is on a par with prices obtained for export fruit in normal years. Growers must also ask themselves, "What is there for us without this controlled marketing?" Anomalies will inevitably occur, but it is better that growers give their active support in endeavouring to overcome these difficulties rather than increase their troubles by means of passive resistance.

As the heavy supplies of apples in Australia must affect the sales of other fruits to some extent, it will be necessary for growers to make quality their aim when marketing citrus and tropical fruits. The problem this year will be to prevent, not only an oversupply of good fruit to the markets, but also an overmarketing of poor quality fruit. With this achieved, payable returns should be obtained for all fruits.

Prices during the last week of January were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Small, 5s. to 7s.; Sixes, 5s. to 8s.; Sevens, 6s. to 10s.; Eights and Nines, 9s. to 11s.

Sydney.—Cavendish: Inferior to 7s.; Sixes, 10s. to 13s.; Sevens, 12s. to 14s.; Eights and Nines, 13s. to 15s.

Melbourne.—Cavendish: Sixes, 10s. to 11s.; Sevens, 10s. to 12s.; Eights and Nines, 7s. to 13s.

Brisbane.—Lady Fingers: 2d. to 10d. per dozen. Sugars: 1d. to 6d. dozen.

Pineapples.

Brisbane.—Smoothleaf: 2s. to 6s. per dozen; 4s. to 7s. per case. Ripley: 3d. to 2s. 6d. per dozen; 2s. 6d. to 6s. 6d. per case.

Sydney.—Smoothleaf: 6s. to 10s. per case. Many poor lines on market.

Melbourne—Smoothleaf: 8s to 12s. per case. Market slow, and tendency for prices to ease.

Papaws.

Brisbane.—Locals: 2s. 6d. to 4s. bushel. Gunalda: 2s. 6d. to 4s. bushel.

Sydney.—8s. to 14s. tropical case.

Melbourne.—10s. to 14s. tropical case.

Monstera Deliciosa.

Brisbane.—3s. to 4s. 6d. dozen.

Mangoes.

Brisbane.—Locals: 5s. bushel. Specials: 7s. to 10s.

Sydney.—Commons unsaleable. Specials to 9s. bushel.

Melbourne.—Commons unsaleable. Specials: 8s. to 12s.

Passion Fruit.

Brisbane.—First grade, 8s. to 10s. half bushel; Seconds, 6s. to 7s. half bushel.

Sydney.—5s. to 9s.

Melbourne.—6s. to 8s.

CITRUS FRUITS.

Oranges.

Brisbane.—New South Wales Valencias: 12s. to 14s.

Lemons.

Brisbane.—Gayndah: 16s. to 24s. bushel.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Jonathan, 9s. to 14s. Granny Smith, only large sizes permitted, 13s. to 15s. Delicious, 11s. to 14s. Gravensteins, 10s. to 15s. Cookers, 8s. to 12s.

Pears.

Brisbane.—W.B.C., 4s. to 8s. Market easing.

Peaches.

Brisbane.—Stanthorpe, 3s. to 7s.

Nectarines.

Brisbane.—3s. to 6s. half-bushel.

Plums.

Brisbane.—4s. to 6s. Some Specials to 8s.

Quinces.

Brisbane.—Stanthorpe, 7s. to 8s.

OTHER FRUITS.

Grapes.

Brisbane.—Local Muscats, 5d. lb. Stanthorpe, 9s. to 10s. Stanthorpe White Grapes, 2s. 6d. to 5s. Black Prince, Coleman, 7s. to 8s.

MISCELLANEOUS VEGETABLES, ETC.

Watermelons.—2s. to 12s. dozen.

Rockmelons.—3s. to 5s. dozen.

Cucumbers.—3d. to 9d. dozen.

Pumpkins.—Brisbane, 3s. to 5s. bag. Sydney, 6s. cwt. Melbourne, 6s. bag.

Marrows.—Brisbane, 1s. to 2s. 6d. dozen.

Lettuce.—1s. to 1s. 6d. dozen.

Cabbages.—Brisbane: Stanthorpe, 4s. to 8s. bag. Locals, 1s. 6d. to 6s. dozen.

Beans.—Brisbane: Stanthorpe, 3s. to 5s. Specials higher.

Peas.—Brisbane: Stanthorpe, 4s. to 7s. bag. New South Wales, 8s. to 16s. per two-bushel bag.

Beetroot.—3d. to 9d. bundle.

Chokos.—4d. to 1s. dozen.

Carrots.—Brisbane, 3d. to 6d. bundle. Sydney, 12s. to 18s. cwt.

Tomatoes.

Brisbane.—Ripe, 2s. to 4s.; Coloured, 2s. to 5s.; Green, 2s. to 3s. 6d.

Sydney.—3s. to 6s. half bushel.

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 December, 1940 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (STANDARD, 350 LB.).				
Kyabram Marie 2nd	A. H. E. Black, Kumbia	12,249·5	546·73	Ledger of Greyleigh
Rosenthal Choice 15th	S. J. H. Mitchell, Rosenthal, Warwick	9,653·23	386·925	Rosenthal Musket
Burradale Shamrock 11th	A. H. E. Black, Kumbia	8,022·19	360·918	Burradale Eclipse
SENIOR, 3 YEARS (STANDARD, 290 LB.).				
Sunnyview Evelyn 7th	T. Ryan, Allora	9,248·5	359·917	Burradale Byron
Blacklands Thelma	T. Ryan, Allora	7,952·2	326·22	Blacklands Major
JUNIOR, 3 YEARS (STANDARD, 270 LB.).				
Penrhos Mayflower 3rd	Alex. Sandilands, junr., Penrhos, Wildash	6,449·5	275·683	Rosenthal Pendant's Price
SENIOR, 2 YEARS (STANDARD, 250 LB.).				
Kyabram Marie 5th	A. H. E. Black, Kumbia	7,259·47	317·809	Ledger of Greyleigh
Kyabram Marie 4th	A. H. E. Black, Kumbia	6,467·3	302·457	Ledger of Greyleigh
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Merravale Ruby 12th (Twin to Ruby 11th)	W. Soley, Malanda	10,568·0	342·964	Greyleigh Honorarium
Bingleigh Molly (251 days)	J. C. Meiers, Mount Mort	8,437·8	324·731	Blacklands Patrol
Chelmer Ivy	E. O. Jeynes, Raceview	7,966·0	318·402	Daphne's Elect
Penrhos Pansy 4th	A. Sandilands, junr., Penrhos, Wildash	7,320·13	303·824	Rosenthal Surprise
Glengarry Lady Primrose	G. Waugh, Glengarry, Peeramon	7,421·1	287·93	Glengarry Sultan
Penrhos Handsome 7th	A. Sandilands, junr., Penrhos, Wildash	6,247·74	243·697	Rosenthal Surprise
Penrhos Pansy 5th	A. Sandilands, junr., Penrhos, Wildash	5,463·25	232·004	Rosenthal Surprise
Merravale Ruby 11th (Twin to Ruby 12th)	W. Soley, Malanda	7,820·4	231·689	Greyleigh Honorarium
Navillus Olive 5th	C. O'Sullivan, Navillus, Greenmount	6,120·95	230·175	Alfa Vale Prince Henry
JERSEY.				
MATURE COW (STANDARD, 350 LB.).				
Daffodil of Linwood	F. W. Kath, Moffatt, *via* Dalby	10,013·57	585·76	Aerofoil of Banyule
JUNIOR, 4 YEARS (STANDARD, 310 LB.).				
Westbrook Safety 14th	Farm Home for Boys, Westbrook	8,805·65	437·236	Oxford Gem's Ambassador
SENIOR, 3 YEARS (STANDARD, 290 LB.).				
Oxford Faith	E. Burton and Sons, Wanora	6,422·25	366·945	Oxford Peer

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

Westbrook Safety 19th	Farm Home for Boys, Westbrook	7,347·6	364·18	Westbrook Prince 3rd
Peeramon Shirley	A. H. O. Koppen, Peeramon	5,502·55	342·635	Trinity Popcorn 2nd's Pioneer

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

Trinity Cute Daffodil	J. Sinnamon and Sons, Moggill	6,833·24	356·371	Samaris Cute Prince 3rd

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

Strathdean Fern's Crystal	S. H. Caldwell, Walker's Creek, Bell	6,307·04	353·421	Langside Noble Dreamer
Tecoma Sally	W. J. Semgreen, Tecoma, Coolabunia	3,994·45	275·652	Kathleigh Standard

AYRSHIRE.

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

Myola Joyce 2nd	R. M. Anderson, Southbrook	8,896·08	340·427	Benbecula Bonnie Willie

General Notes

Staff Changes and Appointments.

Messrs. L. G. Newton and G. R. Moule, University scholarship holders, who recently obtained their degree in veterinary science, have been appointed assistants to veterinary surgeons, Mr. Newton to be attached to the Animal Health Station, Yeerongpilly, and Mr. Moule to the head office of the Department of Agriculture and Stock.

Mr. A. J. Unwin (Treasury Department) has been appointed Deputy for Mr. E. A. Crosser as a member of the Rural Development Board during the latter's absence on leave.

Mr. G. B. Gallwey, Inspector of Accounts under *The Dairy Produce Acts*, Department of Agriculture and Stock, has been appointed also an inspector under *The Margarine Acts*.

Mr. C. N. Hall, of Epping, Sydney, has been appointed an inspector under *The Diseases in Plants Acts*. This appointment automatically vests Mr. Hall with authority to act as in inspector under *The Queensland Fruit and Vegetables Acts*, and has been made to permit of an inspector appointed under the New South Wales *Dried Fruits Act* to make inspections in Queensland under the newly gazetted *Dried Fruit Grading and Packing Regulations*.

Messrs. C. N. Barnham (Struck Oil, via Moongan), T. Scotney, J. E. W. Wright, J. C. Batt (councillors of the Gooburrum Shire Council, Bundaberg), and W. N. C. Dahl (Bucca) have been appointed honorary protectors of fauna.

The appointment of Mr. R. Kerwin (puntman, Norman River Crossing, Normanton) as an acting inspector of stock has been terminated.

The officer in charge of Police, Goondiwindi, has been appointed also an acting inspector of stock.

Millaquin Mill.

Regulations have been issued under *The Primary Producers' Organisation and Marketing Acts* empowering the Millaquin Mill Suppliers' Committee to make a further general levy for administrative purposes on suppliers of sugar-cane to Millaquin, at the rate of one half-penny per ton, during the current season.

Commodity Boards.

Orders in Council (2) have been issued under *The Primary Producers' Organisation and Marketing Acts* extending the operations of the Northern Pig Board for the period from 1st January, 1941, to 31st December, 1946, and the Cotton Board from 1st January, 1942, to 31st December, 1946.

Messrs. J. E. Foxwell (Kureen), D. Johnston (Malanda), C. W. Roseblade (Yungaburra), W. Scott (Peeramon), W. J. Sloan (Malanda), and H. S. Hunter (Director of Marketing) have been appointed members of the Northern Pig Board until 31st December, 1943.

The following have been appointed members of the Cotton Board until 31st December, 1943:—Messrs. F. R. Saunders (Wowan), E. Schuenemann (Goovigen), J. Warner (Thangool), E. J. Basson (Three Moon, Monto), H. F. Lindenmayer (Mundubbera), J. A. Peach (Ropeley East, Gatton), and H. S. Hunter (Director of Marketing.

Cane Prices Board Appointments.

Babinda Local Board.—Millowners' representatives: W. J. Ryan and N. Swendson; canegrowers' representatives: W. M. Simmonds and J. T. Trembath; chairman: F. W. Blake.

Goondi Local Board.—Millowners' representatives: A. H. Edwards and L. M. Smith; canegrowers' representatives, H. Klarwein and R. J. Wright; chairman, C. Burchill.

Hambledon Local Board.—Millowners' representatives: K. L. Cragg and J. G. L. Gillett; canegrowers' representatives: W. W. Chapman and W. D. Ishmael; chairman: E. L. Moore.

Invicta Local Board.—Millowners' representatives: H. B. Burstall and J. L. Mullins; canegrowers' representatives: H. F. Hecht and W. E. G. Smith; chairman: A. M. Taylor.

Isis Local Board.—Millowners' representatives: J. Alison and J. W. Clayton; canegrowers' representatives: W. M. Duncan and E. P. Noakes; chairman: E. H. Baker.

Kalamia Local Board.—Millowners' representatives: J. W. Gray and J. W. Inverarity; canegrowers' representatives: W. H. Ferguson and P. Sayers; chairman: A. M. Taylor.

Macnade Local Board.—Millowners' representatives: K. L. Coates and F. J. Waring; canegrowers' representatives: K. Livingston and W. A. Lyon; chairman: John H. Moore.

Marian Local Board.—Millowners' representatives: A. J. Coyne and R. J. Leck; canegrowers' representatives: G. Ollett and E. C. Walz; chairman: C. B. Buxton.

Mount Bauple Local Board.—Millowners' representatives: S. A. Cunningham and A. G. Morris; canegrowers' representatives: A. R. Greensill and R. A. Maike; chairman: J. A. Murray.

Mourilyan Local Board.—Millowners' representatives: G. R. Blair and H. G. Selby; canegrowers' representatives: G. F. Hudson and J. F. McCutcheon; chairman: C. Burchill.

Mulgrave Local Board.—Millowners' representatives: M. A. Doolan and H. N. Whitaker; canegrowers' representatives: E. M. Bennett and W. C. Griffin; chairman: P. M. O'Connor.

Pioneer Local Board.—Millowners' representatives: G. R. Ashwell and J. W. Black; canegrowers' representatives: B. S. Donovan and L. W. J. Hoey; chairman: A. M. Taylor.

Racecourse Local Board.—Millowners' representatives: N. Bennett and A. S. Hamilton; canegrowers' representatives: A. Franettovich and M. J. Sexton; chairman: H. L. Kingston.

South Johnstone Local Board.—Millowners' representatives: F. H. Gilmore and J. McFadden; canegrowers' representatives: W. J. Henderson and A. H. Reichardt; chairman: C. Burchill.

Victoria Local Board.—Millowners' representatives: A. B. Farquhar and F. J. Waring; canegrowers' representatives: E. L. Burke and G. G. Venables; chairman: John H. Moore.

Barley Advance Payment.

The Minister for Agriculture (Mr. F. W. Bulcock) has announced that the chairman of the Queensland Barley Advisory Committee (Mr. H. S. Hunter) had drawn his attention to the fact that the first advance on barley of the 1940-41 crop had been fixed by the Australian Barley Board at the following rates, viz.:—Chevalier, malting No. 1 quality, 2s. 9d. per bushel; No. 2 quality, 2s. 6d.; No. 3 quality, 2s. 1d.; feed quality, 2s.; Cape, malting No. 1 quality, 2s. 6d. per bushel; No. 2 quality, 2s.; No. 3 quality, 1s. 10d.; and feed quality, 1s. 9d.. All of these payments are subject to deduction for freight from country siding to Toowoomba.

These rates of first advance are considerably higher than the first advance paid by the Australian Barley Board last year.

The Board is anxious to get delivery of all new season's grain as early as possible, so that marketing arrangements may be proceeded with, and therefore it is in the interests of growers to make prompt delivery of such barley as is not required for their own feed and seed requirements.

The crops of all States have been considerably affected by drought, and as a consequence the new season's crop, plus a carryover of 1½ million bushels in South Australia, is expected to be approximately sufficient for Australian needs without leaving any surplus for export.

Last year the Board handled 11,600,000 bushels of barley in Australia, all of which has been sold to buyers, including the following sales to overseas countries, viz.:—Japan, 2,566,666 bushels; New Zealand, 828,455 bushels; Switzerland, 103,281 bushels; United Kingdom, 244,532 bushels; Belgium, 6,804 bushels; a total export of 3,749,738 bushels.

Answers to Correspondents

VETERINARY ADVICE.

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

Greasy Heel.

G.H.M. (Many Peaks)—

From your description your draught foal is suffering, as you suggest, from a a greasy heel. This condition is a difficult one to clear up, though the following treatment is effective, provided it is carried out with perseverance.

1. Clip away the hair from the affected part below the fetlock, taking care not to clip the tuft of hair from the ergot at the back of the fetlock.

2. Cleanse the area below the fetlock with a good disinfectant, such as safonia water. A little petrol, which is very effective for removing the matted discharge, may be used.

3. Keep the part clean. This is best done by placing a single strip of hessian loosely around the leg below the fetlock. With the movement of the foot, this hessian works around and keeps the surface of the affected part wiped free of discharge dirt.

4. Apply a dressing made up of—Turpentine, 2 parts; creosote, 1 part; olive or linseed oil, 2 parts. This dressing should be applied daily and a clean piece of hessian put on the pastern after dressing. The animal should be allowed to run on dry paddocks only.

5. The swelling of the lips appears to be due to the foal biting at the greasy heel, thus infecting the lips and gums. The swelling of the throat may be due to swollen glands.

It would be advisable to treat inside of the lips, cheeks, and gums with Gentian Violet 1 per cent. It should be applied once daily so that the tissues become a deep blue. When the inflammation subsides, discontinue the treatment. An endeavour should be made to prevent the foal reaching the dressing.

Gentian Violet solution may be obtained from a chemist.

Worms in Cattle.

M.L.D. (Landsborough)—

Adult cattle rarely suffer any ill-effects from worm infestation, the trouble usually being confined to younger animals.

The worm most commonly causing symptoms in calves in the stomach worm.

This may be treated by drenching with copper sulphate, 1 lb. in 2½ gallons of water. The rate is as follows:—

Animals 2-4 months old—1½ to 2 fluid oz.
Animals 4-8 months old—2 to 3 fluid oz.
Animals 8-12 months old—3 to 4 fluid oz.
Animals 12-18 months old—4 to 5 fluid oz.

This is given without preliminary starvation and should be repeated in fourteen days.

Tuberculosis in Pigs.

J.K. (Fassifern)—

Tuberculosis in pigs can usually be traced to infection in the dairy herd and the best way of dealing with the disease is to be submit the herd to the tuberculin test and eliminate all reactors. This action usually eliminates tuberculosis from the pigs. Pigs themselves are not usually tested. If you consider testing of your daily herd, it is suggested that you communicate with the Department of Agriculture and Stock stating the number of your cattle in the herd, including bulls, and calves over the age of three months.

The Feeding of Sorghums and Sudan Grass.

S.C. (Pilerwa)—

A crop of Sudan grass should be allowed to seed before stock are allowed to graze it, and it is certainly advisable to follow this practice for second as well as for first crops.

As to the feeding of grain sorghum to pigs, it is advisable to allow immature plants to wilt for twelve to twenty-four hours after cutting before feeding to the pigs. When feeding mature grain sorghum, there is practically no danger and the grain may be fed as gathered.

The active principle in the sorghums and sudan grass which poisons cattle is very potent, and often cattle show very few early symptoms except "bloat," and consequent laboured breathing, general discomfort, and finally death.

When cattle develop symptoms after feeding on sudan grass or sorghum, the following treatment will be effective:—

Give the affected animals a drench, consisting of 2 ounces of hypo-sulphite of soda (ordinary hypo) which may be obtained from any chemist, in about 1 pint of water. Repeat the dose every half hour if necessary.

Should the animals show extreme symptoms the left side should be punctured with an ordinary trocar and canula, and after the trocar has been removed the dose of hypo recommended may be poured down the canula, so that it enters directly into the paunch. The canula may be left in position and the dose repeated every twenty minutes.

Joint Ill. Scours in Calves.

F.A.B. (Roma)—

(1) Joint ill in baby calves is a condition caused by a germ which may gain entrance to the animal's body through the navel before it has dried up, or through the mouth. Irrespective of how the germ gets into the body, when once established the possibility of the calf growing into a useful cow is not really favourable and you were certainly wise to shoot and burn the affected animals.

(2) As you have a large number of calves you would be well advised to adopt immediate preventive measures. Carefully examine all calves for any symptoms of the disease and in your examination include the navel of each beast. Healthy animals, with a normal dried navel and showing no symptoms of scours, should be moved to fresh yards, and should be maintained in these yards and not returned to the old pens. New calves coming along should also be taken straight to the new yards, after their navels have been treated with some disinfectant such as tincture of iodine.

Any calves among those you have at present that have moist navels, unless they are very young, should be viewed with suspicion and should not be taken to the new yards until the navel dries up and there is no sign of joint ill. Calves which are scouring should not be taken to the new yards until they have recovered from this condition (treatment below). They should also be examined for joint ill before they are moved.

If it is your custom to bring the "springers" up to a yard near the dairy to calve, it is suggested that you change the yard, as the calves could pick up infection from this source.

(3) Calves which are scouring should be given 2 to 4 oz. of castor oil, depending on age and size of calf, and after twenty-four hours they should be put back on a diet of equal parts of whole milk and water. One cupful limewater should be added to each feed.

Mammitis.

J.F.G. (Brackenridge)—

It is suggested that the following treatment be adopted for mammitis in a dairy cow:—Keep the affected quarter empty by frequent strippings four to five times daily. The affected quarter should be frequently massaged with camphorated oil at each stripping. Very great care should be taken to prevent the spread of infection from the affected to clean quarters. It is suggested that a sample of milk from the affected quarter be forwarded with a covering letter to the Director, Animal Health Station, Yeerongpilly, for bacteriological examination. If the condition is found to be due to infection with mastitis organisms, a vaccine can be prepared for treatment of the animal. Information on the use of vaccine is supplied by the Director, Animal Health Station, Yeerongpilly.

Rural Topics

The Will to Win.

"What arms are more steadfast than loyal hearts!" as Chrysostom said. Here is a news item from England—

The Minister of Agriculture (United Kingdom) has acknowledged the return of a payable order issued by his Department in respect of the £2 per acre grant for the ploughing of old grass land to a well-known farmer. The farmer asked that the amount of his subsidy be placed to the credit of the national war effort, which shows that the "will to win" can be expressed just as willingly by paying out as by ploughing in.

Makers Learn from Users.

"Let the other fellow experiment" is a slogan that looks all right at first glance, but the implication is that the farmer should never get off the well defined road, or, say, out of the old well-worn rut. "Nothing venture, nothing win," and often it is a good thing to straddle the rut, or find a new way round. Take agricultural machinery, for instance. How often has the maker been indebted to the user; in fact, many of our modern farm implements and machinery units had their origin in the fertile brains of farmers who gave a lot of thought to the finding of easier and quicker ways of doing a job. Machinery makers acknowledge the value of many a suggestion that farmers have made for the more effective working of their field units. A famous agricultural machinery manufacturer, addressing a gathering of farmers, many years ago, said that "the makers must learn from the users." So, if we are satisfied always to let the other fellow experiment and do not use our own brains and opportunities, or keep the results of our own experience to ourselves, we may be guilty of mental laziness or, perhaps, carelessness, thoughtlessness, and even selfishness. The fact remains, however, that users do give manufacturers something more than useful hints, and that this form of co-operation is extremely valuable to rural industry generally.

New Veterinarians.

The day when veterinarians can cure every disease there is, and farmers never grumble about the cost, probably never will arrive. But it is certain that veterinary science is advancing rapidly and that farmers are appreciating more and more that close co-operation with their veterinarians can pay them rich dividends in healthier, more productive animals.

So the new graduates from the School of Veterinary Science within the University of Queensland are assured of the hearty goodwill of Queensland stockowners.

The Blow Fly's New Job.

Blowflies have uses undreamt of by sheepmen, to whom they are a perennial curse. In a seed-raising establishment at Ryde near Sydney they have been used as pollinators with outstanding success.

The object there is to experiment with various vegetable crops under glass with a view to raising pure seed, much more of which may be needed if oversea supplies are further restricted. The programme of work includes experiments dealing with the culture of the crops and the overcoming of problems in seed-raising technique.

In the Ryde experiments crops have been grown in tins in the open and transplanted to the glasshouses to run to seed, whilst other crops have been grown entirely within the glass houses.

To obtain effective pollination bees were introduced to the glasshouses, and, whilst they did a certain amount of good work, they were not wholly satisfactory because of their constant desire to travel further afield in search of nectar. This urge sooner or later led them to the glass where, in their endeavour to get out, they became exhausted and died.

So blowflies were bred and liberated, not only inside the glass houses, but also inside cheesecloth tents, which isolated certain uncommon vegetable varieties. The blowflies proved remarkably successful. They were rapidly attracted to the flowers by the smell, and so distributed the pollen most effectively. Good for the seedsman, but there is not much consolation in that for the woolgrower.

Fly Flapping and Trapping.

A gadget for alleviating fly-worry of farm and station stock is in effective use in many parts of the United States. We all know how animals suffer from the fly pest during summer, and especially after general rain.

This new device for brushing off flies is built like a cage, 7 feet wide, 6 feet high, and 10 feet long. It is open at both ends and the sides and top are fly-proof. Canvas flaps hanging from the ceiling and adjusted on frames attached to the floor brush the flies off every part of an animal walking through. The flies so disturbed are caught in large numbers in simple traps arranged on the walls of the structure.

The device is usually placed at a strategic point through which stock are most likely to pass—such as the entrance to a yard or shelter shed, or when going to water. Where and when flies are very troublesome, cattle and horses particularly are said to learn very quickly how to make use of this fly flap-trap.

The Value of Cotton Seed.

Although most of the present-day knowledge of the feeding value of cotton seed meal, cake and hulls is the result of more recent research and experience, historical records show that the Chinese fed cotton seed cake to cattle hundreds of years ago, while more than 150 years ago the London Society of Arts offered a gold medal for oil and cake made from cotton seed, having noted the value of the cake as a cattle feed. Cotton seed feed products are to-day standard stock feeds, and so Queensland cotton-growers are assured of a profit both for stock feed and fibre.

The "Master of the Swine Herd."

The champion Middle White boar, "Queen State Corona 2nd" 6140, a son of the imported "Watford Corona" 5949 and from "Watford Gracious Lady 37th" (imp.) 5948, owned by the Queen State Stud, the property of the Queensland Department of Agriculture and Stock, has been awarded the special silver medal presented by the National Pig Breeders' Association of England for the best Middle White animal penned. The medal is suitably endorsed and carries an illustration of an original woodcut representing the "Master of the Swine Herd."

Progeny of this boar have been awarded second prize over seventeen months, first prize over eleven and under seventeen months in boars; first and third prizes for sow over eleven and under seventeen months, and also have produced some of the winners in boar and progeny, sow and progeny, and the breeders' group.

Approximately 90 per cent. of the Middle White pigs penned at the 1940 Royal National Exhibition carried blood of the Watford Corona (imp.) strain, all being lengthy, well-developed pigs, typical of the latest improved British type.

The skeleton of the imported boar is being preserved for demonstration purposes at the Veterinary Science School, University of Queensland.

Tenderness in Wool—Effects of Feeding.

By breeding and improved nutrition, it is hoped to reduce the tenderness and break in fleeces which are characteristic of sheep running on some of the drier country in different parts of the Commonwealth.

Research men who have been studying the problem have found out that under poor conditions of growth the fibres of a staple may be only a third as great in one part of a wool staple as in another without a break in the fleece being noticeable. Their work has created much interest among graziers, and many stud sheep breeders have sent to them wool samples for analysis.

It is clear that better feed would, in many instances, overcome the tenderness and breaks in the wool of sheep grazed on the drier country of the continent. This leads to the question of determining the most economical means of improving nutrition under widely varying conditions. Selection and breeding also come into the realm of research on this problem.

The Effect of Fertilizers on Food Products.

A new branch of agricultural research has been undertaken by the United States Department of Agriculture. This deals with the improvement of the nutritional value of food through better fertilization. A laboratory has been established, and at this centre of effort it is expected that facts will be developed that will enable practice in soil management and crop production to be dovetailed more closely with human nutritional needs.

Farm Notes

MARCH.

PREPARATION of land on which it is intended to plant winter cereals should be well advanced. Sowings of lucerne may be made about the end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has many advantages, not the least of which is that weeds will not make such vigorous growth during the succeeding few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Seed wheat should be treated with copper carbonate for the control of bunt. For oats and barley seed, the use of formalin or a reliable mercury dust is advisable.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where the potato crop is subject to Irish blight, it is advisable to spray the plants for the control of this disease. Bordeaux mixture of 4.4.40 strength should be applied at least three times at intervals of ten days to a fortnight, commencing when the plants are about six weeks old.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for thirty-six hours and subsequently aerated and stored in airtight containers. The germination of the maize is not normally affected by this treatment if dry and mature when treated.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Because of the smallness of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be given to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials in dairying, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods planned for the successive sowings of seed.

Early-planted cotton crops should be now ready for picking, but this should not be done while there is any moisture on the bolls, either from showers or dew. Picked cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bags, or hessian sheets before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *Phalaris tuberosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops showing no promise of satisfactory yields of grain would be well advised to convert them into silage for winter feed. Green maize, especially when fed with lucerne or cowpea, is a valuable fodder. Where crops of Sudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage of converting into silage, it will be found that this method of conserving them has much to recommend it. If permanent storage facilities are not available on the farm, the stack method offers a practical alternative. Stacking with a framework of poles, and well weighting the fodder are necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full eave and held in position with weighted wires.

NOTICE TO READERS.

Because of the present necessity for strict economy in the use of paper, readers are requested to renew their subscriptions promptly. If renewals are unduly delayed, it may be impossible to supply back numbers of the Journal.

Address all renewals and other correspondence to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Orchard Notes

MARCH.

THE COASTAL DISTRICTS.

If the winter is favourable, all orchards, plantations, and vineyards should be cleaned up and the ground brought into a good state of tilth, so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations should be kept free from weeds, and suckering should be rigorously done. There is no greater cause of injury to a banana plantation than neglect to cultivate. Good, strong suckers will give good bunches of good fruit. Weedy, overcrowded suckers will only give small bunches of undersized fruit hard to sell, even at a low price.

Cooler weather may tend to improve the carrying qualities of the fruit, but care should still be taken to see that it is not allowed to become over-developed before it is packed; otherwise it may arrive at its destination over-ripe and consequently unsaleable. The greatest care should be taken in grading and packing fruit. Small or inferior fruit should never be packed with good, large fruit.

Growers who consider it necessary to deal with banana thrips are advised to apply to the Department for the latest information on effective procedure.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, shall be completed in the course of the month, and, as soon as the fruit is disposed of, plantations, which are apt to become somewhat dirty during the gathering of the crop, should be cleaned up. All weeds should be destroyed, and if bladey grass has got hold anywhere it should be eradicated, even though some pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be surface-worked and brought into a state of nice tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They may not be fully coloured, but they may be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered while still sour and green.

As blue mould may cause heavy loss in coastal citrus, especially in long-distance consignments, special precautions should be taken for minimising this loss. It should be remembered that the blue mould fungus will only attack bruised or wounded fruit; hence it is necessary to be careful that no injuries are caused by the clippers or finger nails during picking. Fruit should be cut and not pulled. Long stalks which may injure other fruit should be cut away.

The fruit should be carefully handled and accurately packed so as to avoid bruising. Any injured fruit should be discarded. In order to reduce the number of fungus spores present in the plantation, all waste fruit in the orchard or packing shed should be collected at frequent intervals and destroyed by fire or burying.

Fruit should be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The standard bushel case, the inside measurements of which are 18 by 11½ by 10½ inches, is the best for citrus. The fruit should be sweated for seven days before it is sent to the Southern markets, in order to determine what fruit has been attacked by fruit fly, and also to enable bruised or injured fruit liable to blue mould to be removed before despatch.

Growers are reminded that the control of the bronze orange bug is best achieved by spraying with the resin-caustic soda-fish oil mixture normally either late in March or early in April. Applied at this time of the year, the spray can give a mortality of 98 per cent. of the bronze bugs, which are then present solely in the very young stages. This spray also is very effective against several of the important scale insects infesting citrus.

Red scale is a pest to which citrus growers may shortly have to give attention, as it is considered that control is best established from the middle of March to early in April. Fumigation with hydrocyanic acid gas is most effective against red

scale, but success may also be achieved with white oils or with the resin-caustic soda-fish oil mixture evolved for the control of the bronze orange bug. Red scale, of course, is pre-eminently a pest of the hotter, drier citrus districts.

Strawberry planting may be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be followed carefully. The later varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been published by the Department, which advice and instruction should enable growers to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes. Those who are not expert cannot do better than follow the methods of the most successful packers.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of the want of water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening stage, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much moisture is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light watering is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

[*Photo.: Lands Department.*

Plate 36.

A "ROLL" ON THE SKIDS.—Queensland's wealth in wood is well illustrated by these logs ready for rail transport to saw- and ply-mills.

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.

CARE OF MOTHER AND CHILD.

Other Common Errors in Baby Management.

Last month we talked to you about four common errors in baby management, namely, failure to put baby to the breast and giving artificial food during the first few days, thinking mother's milk "does not agree" and retaining the binder after the navel has healed with the object of supporting the muscles of the abdomen and back. This month we are going to talk to you about other common errors.

Thinking that mother's milk and cow's milk should not be given at the same time—this is a mistake that still persists in the minds of many. Not only is it true that mother's milk can be given with artificial food, but it enables the artificial or unnatural food to be more readily digested. It is worth while making use of even a few ounces of mother's milk which is available, and it is always possible that the supply may be increased. The value of retaining mother's milk is shown in the case of a young baby fed artificially and suffering from a digestive upset in which it becomes difficult to find a suitable food. A baby six weeks old was brought to the Welfare Centre suffering from malnutrition. The history was that the mother "lost her milk" after she returned home from the hospital. The baby was put on to an artificial food which did not agree with him. After he recovered from the upset, he was graded gradually on to another food. As soon as he reached a strength sufficient to maintain his weight, he had another upset which was accompanied by vomiting and diarrhœa. At this stage some breast milk became available and this was used in conjunction with a weak mixture of the artificial food. Progress was slow at first, but as his power of digestion increased, baby began to put on weight and his condition gradually improved. The mother had passed through an anxious time. Another mother was in great distress after returning home because her baby was crying a great deal. Thinking she was "losing her milk" she had given baby some artificial food. She was advised to attend the welfare centre, and within a week baby was fully breast fed and mother and child were happy.

Keeping the breast for the night is frequently done because the mother thinks that she has not sufficient milk for baby. If the mother's supply is deficient, it is important that baby should be put to the breast regularly and given his mother's

milk before he is allowed any artificial food. This is the best way of increasing the mother's supply. If it is not done, her supply will diminish rapidly and the baby will soon be weaned. A mother is frequently mistaken in thinking that her supply of milk is insufficient. If she is in doubt, she should consult a Child Welfare nurse at one of the Centres (Baby Clinics) either personally or by letter.

Thinking that if baby is not thriving, it is because the mother's milk does not agree—failure to thrive should never be attributed to the quality of the mother's milk. It may be due to underfeeding, overfeeding, or feeding irregularly. The baby who fails to thrive on his mother's milk is likely to do worse on artificial food.

A mother not infrequently says that her milk is too "thin and watery" and does not satisfy her baby. In a case of this sort the trouble is usually due to faulty management such as has been already indicated. An analysis of the mother's milk often shows that the so-called thin and waterly milk is quite as nutritious as the creamy looking milk.

It has been shown that while in some cases of leakage there is an over-supply, in others the supply is insufficient for baby's needs, the leakage being due to lack of tone in the muscle. The nurse at the Maternal and Child Welfare Centre will help you to correct the condition.

Cleaning baby's mouth may be done immediately after birth, but it requires to be done gently. It should not be repeated in the case of a healthy baby. Nature keeps baby's mouth clean until he has teeth and goes on to solid food.

The practice of giving castor oil to a new-born baby is still common. The practice is harmful. Doses repeated at regular intervals frequently cause constipation.

It is extraordinary how many people swing, pat, or jog a baby while nursing him. This habit is almost universal. When a child becomes accustomed to the movement, he expects it always. It may cause vomiting, particularly when it is done after a meal.

How often is baby touched or handled unnecessarily. If the mother does not do it, almost every visitor does. The child's cheeks may be pinched, his nose or chin pressed or his hands squeezed. People should learn to admire baby without handling him.

Why Baby Sucks His Fingers.

In a healthy infant the instinct to suck is very strong. Most babies put their fingers and thumbs into their mouths during the early months. It often occurs when baby is over tired and requires sleep. A mother should stand by ready to remove the thumb or fingers as soon as baby falls asleep. If thumb or finger sucking occurs at other times, it may be a sign of boredoom and an interest should be provided for baby. He should be given a bone ring or something else as harmless which he can handle, or his mother may attract his attention in some way.

You may obtain information on all matters about infant and child welfare by visiting the nearest Maternal and Child Welfare Centre (Baby Clinic), or by writing to the Sister in Charge, or by communicating direct with the Maternal and Child Welfare Centre, Alfred street, Fortitude Valley, N.1., Brisbane.

IN THE FARM KITCHEN.

PINEAPPLES IN THE DAILY DIET.

Few people now dispute the fact that fruit is essential to health. Medical research has abundantly proved that many cases of malnutrition are caused by the absence of fruit from the daily diet. Digestive disturbances leading to disordered blood conditions are common symptoms of this deficiency, and local medical men are strongly urging the greater use of fruit. All fruits supply juices that aid digestion and help to keep the intestines free from harmful bacteria, contain vitamins, minerals and easily-digested energy sugars.

The body cannot store some of the health factors required by it—they must be replaced every day, and this is why the pineapple should be a daily article of diet in every household. Two slices a day, fresh or canned, are all that is necessary. When the fresh fruit is plentiful—usually in the months of February, March, April and July, August, September, October—and if distance does not prevent it, fresh fruit can be obtained. For the rest of the year canned pineapple can be purchased.

Sir William Arbuthnot Lane, one of London's leading dietetic authorities, after exhaustive inquiries relating to the properties of canned fruits, said no considerable proportion of the mineral salts is exhausted; the juice has definite nutritive value, the vitamins are, in most cases, left intact, and in some cases actually intensified.

Pineapples are regarded as one of nature's health correctives and healers. Their richness in vitamin A helps to prevent common colds and those eye ailments sometimes prevalent amongst children. At the first sign of a cold or when colds are prevalent pineapples should be eaten freely. Being rich in vitamin B they promote body growth. Because of their vitamin C content pineapples are recommended by doctors as a precaution against pyorrhoea which, according to the "Medical Press and Circular," is largely a dietary affection. Dr. J. R. Killian, an American scientist specialising in the study of nutrition, states that the fight against pyorrhoea and dental decay will be helped in the future by a liberal use of pineapple in the diet.

Pineapples are of great value in after treatment following tonsil removals and assist the stumps to heal. The pure juice is a proved reliable ferment for dissolving necrosed tissue in quinsy.

These benefits are available to all, as where the fresh fruit is unobtainable the canned pineapple—retaining as it does the properties of the freshly-picked fruit—may be used.

Its uses in the kitchen are many. Slices fresh or canned, served with cold meat, have an appeal which ensures their continued use, particularly with corned meat. To the busy housewife the pineapple presents an easy solution of the ever-present dessert problem. No dish is more quickly prepared or more appetising than grated pineapple, fresh or canned.

A fruit salad can be rapidly made by the use of pineapple, fresh or canned, and one or more of any fruits in season. For cooked desserts the pineapple may be served in a multiplicity of ways, and the following recipes are recommended:—

Pineapple Jelly.

Wash a good half-breakfastcupful of sago, put in a large jug with half-cupful water, 1 cupful sugar, 2 grated pineapples, and juice of 1 lemon. Put the jug in a pan of boiling water and stir until clear, then put in moulds until cold. Serve with custard or grated pineapple.

Pineapple Fritters.

Put flour in basin, add pinch of salt, baking soda and cream of tartar, the usual quantities to each pound of flour, 1 tablespoonful sugar, and 1 egg to each pound of flour. Mix all together with milk, or half milk and half water, to a nice batter, dip in pieces of pineapple and fry to a nice brown. Condensed milk may be used if fresh is not available for the batter, by mixing at the rate of 1 tablespoonful to a pint of cold water. This mixture of batter may be used for bananas, mangoes, or apples, or any fruit that is used for fritters.

Pineapple Pie.

Two cupfuls grated pineapple, 1 cupful water, 1 cupful sugar, 2 tablespoonfuls breadcrumbs. Line pie-dish with paste, mix pineapple, water, sugar, breadcrumbs, and yolks of 2 eggs, bake, and when cool beat up the white of eggs and put over pie.

Pineapple Turnovers.

Make a flaky pastry from 2 cups self-raising flour and half-cup dripping. Cut out shapes the size of a tea plate, put a spoonful of chopped pineapple and a little sugar on each fold, press over the edges of the pastry together, and bake in a brisk oven. The turnovers are better served with hot custard.

A delicious pineapple drink may be made in either of the following ways:—

Pineapple Syrup.

Keep the skins of your pineapples and boil slowly and well in plenty of water. Strain through cloth and add sugar to taste. This makes a delicious drink and retains all the medicinal qualities of the pineapple.

Pineapple Water.

Peel a medium-sized pineapple and cut it into pieces, pound it to a pulp, and mix with it 1 pint of boiling syrup and the juice of 1 lemon, and let it all stand covered for two hours; now strain, and add 1 quart of water, and ice.

ASTRONOMICAL DATA FOR QUEENSLAND

MARCH, 1941.

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

SUN AND MOON. AT WARWICK.

Feb.	SUN.		MOON.	
	Rises.	Sets.	Rises.	Sets.
	a.m.	p.m.	a.m.	p.m.
1	5.44	6.24	8.9	8.10
2	5.45	6.23	9.0	8.46
3	5.46	6.22	9.51	9.23
4	5.47	6.22	10.42	10.2
5	5.48	6.21	11.33	10.43
			p.m.	
6	5.48	6.20	12.24	11.29
7	5.48	6.19	1.15	nil
				a.m.
8	5.48	6.17	2.5	12.18
9	5.49	6.16	2.54	1.11
10	5.49	6.15	3.42	2.7
11	5.50	6.14	4.29	3.7
12	5.51	6.12	5.15	4.9
13	5.51	6.11	5.59	5.13
14	5.52	6.10	6.44	6.18
15	5.53	6.10	7.29	7.23
16	5.54	6.9	8.16	8.29
17	5.54	6.8	9.4	9.34
18	5.54	6.7	9.56	10.38
19	5.54	6.6	10.49	11.40
				p.m.
20	5.55	6.4	11.44	12.37
21	5.55	6.3	nil	1.30
			a.m.	
22	5.56	6.2	12.40	2.19
23	5.57	6.1	1.36	3.4
24	5.57	5.0	2.32	3.45
25	5.58	5.58	3.26	4.24
26	5.59	5.56	4.20	5.0
27	5.59	5.55	5.12	5.35
28	6.0	5.54	6.3	6.10
29	6.0	5.53	6.53	6.45
30	6.1	5.53	7.45	7.21
31	6.2	5.52	8.36	8.0

Phases of the Moon.

6th March, First Quarter, 5.43 p.m.
13th ,, Full Moon, 9.47 p.m.
20th ,, Last Quarter, 12.51 p.m.
28th ,, New Moon, 6.14 a.m.

" SCENES OF WONDER APPEAR IN THE SKY."

A COMET was discovered, some time ago, at Harvard. It has been increasing in brightness and, according to calculations, it should become a spectacular object, probably before this is published. It should be seen in the dawn. It is moving in a very elongated orbit, which will soon carry it too near the sun to be seen.

We have watched the morning star, Venus, herald the morn for many months, until now the radiant planet is lost in the greater radiance of the coming sun. Mercury will be also in the brightening dawn, near Venus, on 3rd March. However, Mercury is rising in the morning sky, and by 25th March he will have reached his greatest altitude above the eastern horizon, 28 degrees at sunrise. As the planet is of south declination, he should be well seen as a brilliant star more than a quarter away from the horizon to overhead. Mercury moves quicker than any of the other planets, and should, therefore, be looked for a week or ten days before 25th March, and watched while he rises to his "greatest elongation" and then declines to the eastern horizon again.

ECLIPSES.

The full moon will occur, this month, on 13th March when she will be so nearly in line with the earth and sun that about one-third of the lunar disc will pass through the dark shadow which is thrown out into space by the earth to an average distance of 859,000 miles. About five minutes to 9 o'clock something unusual will be seen at the edge of the moon; slowly a dark bite will appear which will grow larger for an hour, after which it will retreat until by a little before 11 o'clock all sign of the moon's excursion into the earth's shadow will be gone. The moon will pass on her way in radiant beauty to Last Quarter and then, on 28th March to New Moon, when she will pass directly between the earth and the sun, causing a solar eclipse. At this time the moon is almost at her greatest distance from the earth, causing her to appear a little smaller than the disc of the sun, leaving a brilliant ring or annulus of sunlight around the black disc of the moon. This is known as an annular eclipse. Unfortunately, it will not be seen in Australia, for it begins well to the east of New Zealand, passing across the South Pacific and half of South America. Lima, the capital of Peru, will be within the eclipse track, which will extend across Peru and half way across Brazil. There will be a partial eclipse over all South America, New Zealand, and most of the South Pacific.

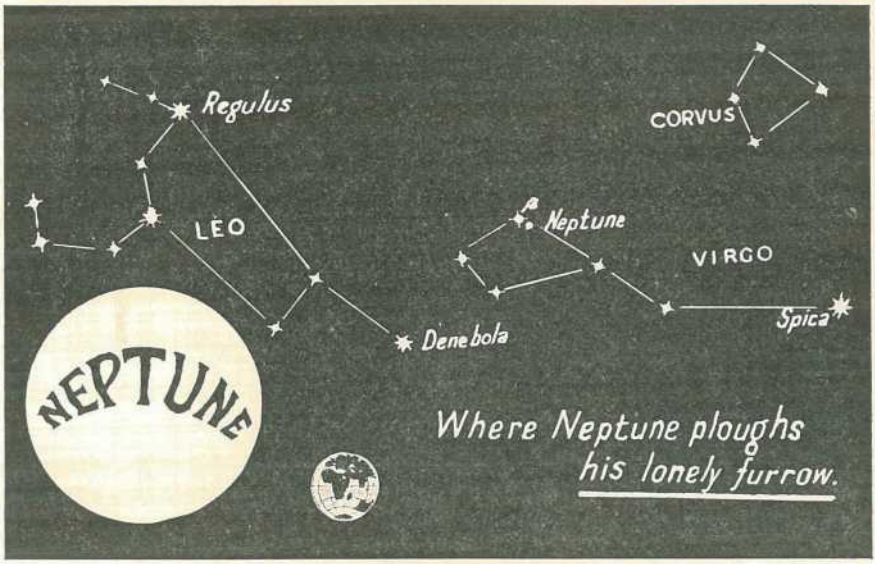
AUTUMNAL EQUINOX.

On 21st March the sun will have reached the equator on his way to take summer to the northern hemisphere. We have noticed the mornings and evenings drawing in already, but after the autumnal equinox this will be more noticeable. At the times of the equinoxes the day and night are of equal duration over the whole earth, and one may see the sun rise and set due east and west, which does not occur at any other time of the year.

The twin "stars" of the western evening sky, Jupiter and Saturn, are now parting company. They made their final bow to each other on 21st February. Jupiter will now move off to the eastward, leaving the slower moving Saturn behind. It will be about twenty years before they meet each other again.

This month, on the 17th, the distant planet Neptune will be in opposition to the sun, and, therefore, on the meridian at midnight. This far-flung world, for ever beyond the naked eyesight of man, may be seen in a telescope quite near the third magnitude star Beta Virginus, in the head of the Virgin. Out in the cold and darkness of space, 2,793 million miles from the sun, Neptune ploughs his lonely furrow, taking 165 years to get round the sun once. As he was only discovered seventy-seven years ago, he has not journeyed half round the sun since man knew of his existence.

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



The illustration will serve to show where Neptune will be at opposition, on 17th March. Looking due north, high in the sky, at midnight, the well-known figure of the Lion will readily be seen. Turn the map until Leo is oriented similar to the original Leo in the sky and all the other stars will be in their correct positions. Regulus, which means "little king," is in the handle of the sickle in Leo. From the centre of the curved blade came the wonderful Leonid star-showers every thirty-three years, but they failed in 1899 and have not appeared since. The ancients, who devised the starry figures, saw in the sickle the massive head and forepart of a lion, his fore paws outstretched. Behind the sickle is his body and tail ending in the bright star, Denebola. There are many Denebs among the star names and it always means "tail." It does not take much imagination to clothe this starry skeleton in a lion's skin.

The next zodiacal constellation is Virgo (only a part of which is shown. According to the Greeks this represented Proserpine, who brought spring and summer to the earth each year. Most old star maps show an angel bearing an ear of corn; the goddess of the harvest. Spica, the bright white star, means an ear of grain. Corvus, the Crow, consists of four stars of mag. 3. Sailors call it the "spanker sail," because of its resemblance to a spanker. The short side of the figure points almost directly to Spica.

There are many more stars than are shown, but those shown make an easy guide to the constellations and the position of Neptune.

The large and small discs show the comparative sizes of Neptune and the earth. At opposition Neptune is at his nearest to the earth, even then he is no fewer than 2,716,500,000 miles. From him the sun would have no appreciable disc, but there would be sufficient sunlight for visual purposes for eyes like ours, were there any there.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1939 AND 1940, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of years' records.	Dec., 1940.	Dec., 1939.		Dec.	No. of years' records.	Dec., 1940.	Dec., 1939.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	7·08	39	0·89	4·89	Gatton College ..	3·65	41	10·09	3·05
Cairns	8·46	58	1·38	1·04	Gayndah	4·13	69	4·78	4·55
Cardwell	7·99	68	0·12	0·81	Gympie	5·37	70	6·05	5·02
Cooktown ..	6·46	64	0·44	0·99	Kilkivan	4·49	61	2·87	3·56
Herberton ..	5·63	54	0·53	4·11	Maryborough ..	5·00	69	3·94	4·24
Ingham	6·69	48	1·53	1·81	Nambour	6·53	44	4·55	3·05
Innisfail	11·38	59	1·25	1·55	Nanango	3·75	58	8·57	3·77
Mossman Mill ..	9·70	27	2·05	4·37	Rockhampton ..	4·72	69	2·51	3·53
Townsville ..	5·11	23	0·18	0·67	Woodford ..	5·40	53	3·62	4·13
Central Coast.					*Central Highlands.*				
Ayr	3·86	53	0·07	2·58	Clermont ..	3·74	69	2·61	2·92
Bowen	4·30	69	0·59	1·89	Gindie	2·68	41	..	1·14
Charters Towers ..	3·18	58	1·10	1·59	Springsure ..	3·20	71	2·98	2·90
Mackay P.O. ..	6·92	69	0·79	3·10	*Darling Downs.*				
Mackay Sugar Experiment Station	7·74	43	1·06	3·44	Dalby	3·31	70	5·07	4·90
Proserpine ..	7·31	37	0·36	3·38	Emu Vale ..	3·41	44	7·97	3·45
St. Lawrence ..	4·64	69	2·35	3·26	Hermitage ..	2·94	33	..	..
South Coast.					Jimbour	3·28	52	6·12	6·03
					Miles	3·06	55	5·42	1·39
Biggenden ..	4·58	41	4·47	4·52	Stanthorpe ..	3·56	67	3·12	2·85
Bundaberg ..	5·08	57	5·27	9·90	Toowoomba ..	4·42	68	6·17	5·98
Brisbane	4·82	88	7·82	3·28	Warwick	3·40	75	9·80	3·07
Caboolture ..	5·11	53	10·76	3·80	*Maranoa.*				
Childers	5·59	45	7·30	4·82					
Crohamhurst ..	6·98	47	9·10	2·52	Bungeworgorai ..	2·77	26	..	0·90
Esk	4·59	53	7·61	4·52	Roma	2·50	66	4·05	1·43

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—DECEMBER, 1940.

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	..	90	78	95	24	72	3	44	7
Herberton	..	86	64	95	24	58	24	53	3
Rockhampton	29·95	90	72	100	22	68	16, 17	251	10
Brisbane	30·02	83	68	95	23	64	15	782	11
Darling Downs.									
Dalby	..	87	65	92	16	59	24	507	10
Stanthorpe	..	82	59	92	8	50	7	312	12
Toowoomba	..	77	61	84	3	57	25	617	14
Mid-Interior.									
Georgetown	29·88	98	73	105	25	61	24	271	7
Longreach	29·86	103	74	113	20	64	2	164	4
Mitchell	29·92	92	68	100	4, 16	53	24	414	9
Western.									
Burketown	..	97	77	106	25	70	12	191	5
Boulia	29·79	105	76	113	6	62	25, 26, 27	2	1
Thargomindah ..	29·84	100	73	112	19	62	24, 25, 26	..	..