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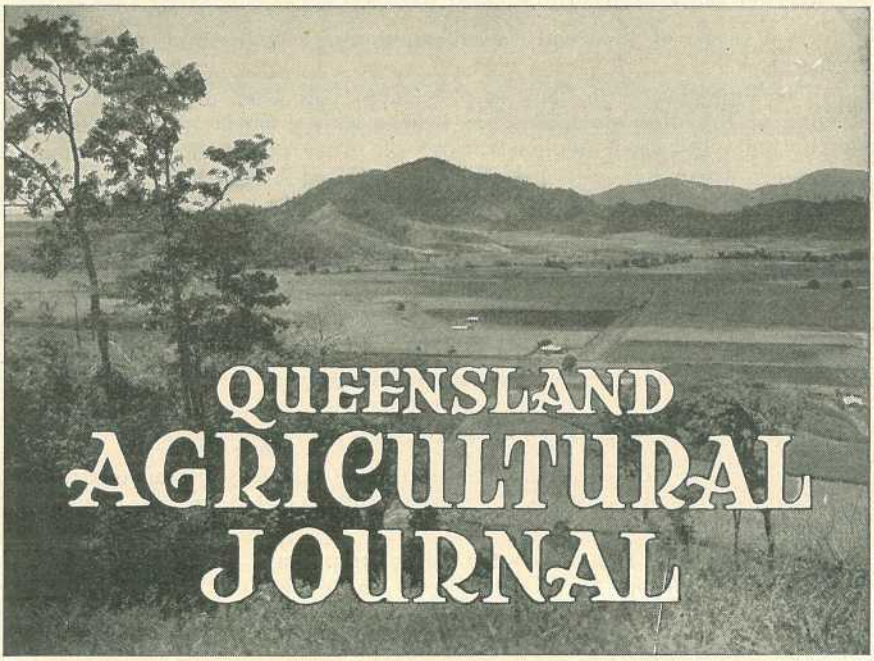

Vol. LII. 1 DECEMBER, 1939 Part 6

Event and Comment

A Year of Record Production.

IN his annual report to the Minister, Hon. Frank W. Bulcock, the Under Secretary of the Department of Agriculture and Stock, Mr. R. P. M. Short, has presented a comprehensive review of the conditions of primary industry throughout the State, from which the following salient points have been taken:—

The statistical position of the pastoral industries reveals an increase in all classes of livestock. Of the total meat exports from Australia, Queensland contributed 51·84 per cent.

The immediate outlook for the beef industry is bright, but the Department has urged a continuance of effort to improve the quality of meat products so that, whatever may be the outcome of the present international situation, Queensland meat exports will hold a good position in markets abroad.

Animal health services have been well maintained, and the work of the stations at Yeerongpilly and Oonoonba has been co-ordinated.

It has been shown that introduced pastures on tropical coastal lands will not only fatten stock, but also will produce prime beef—approximately 80 per cent. being graded (most of it actually exported) as first-grade chilled beef. Because of the fact that these pastures can be maintained in the green state throughout the year, it is possible to so arrange grazing that cattle can be turned off in any particular month.

Animal dietetic and bio-chemical work formed an important section of the animal health work. In a broad programme of investigation,

problems of sufficient economic importance to merit systematic exploration were studied.

As a result of the good season, an increase in lambing percentages is expected.

The importance of flock improvement has been stressed, and the classing of breeding stock also has been a salient point in departmental instruction. Practical demonstrations on other points in flock management were also given as a regular instructional service.

Fat lamb production has increased as an outcome of the assistance given to the industry by the introduction of suitable breeding stock from the Southern States and New Zealand. The most satisfactory experience of the year was a definite improvement in type as well as an increase in the number marketed.

A series of drought-feeding trials has been designed under conditions representing serious seasonal adversity.

A substantial increase in inquiries indicates that producers are appreciative of the benefits of sound stock-feeding practice.

The yield of raw sugar in Queensland for the 1938 season constituted a further record, exceeding the previous highest (that of 1937) by some 13,000 tons.

Seasonal conditions were such that plump grain was a characteristic of every wheat crop, and the harvest was exceptionally heavy. The estimated production of 8,500,000 bushels from 450,000 acres is more than 3,000,000 bushels in excess of the previous record harvest from 272,316 acres in 1930-31.

Breeding, selection, and observation plots produced satisfactory results at several locations in the Darling Downs and Maranoa districts. Varietal trials in the Callide and Dawson Valleys were similarly successful.

Early maize crops were unprofitable for grain in most districts. Good average returns were obtained from the late-sown crop. Pure seed maize improvement work was continued in the Mary Valley, Murgon, Lowood, and Kilcoy districts.

Returns from barley, oat, and canary seed crops were influenced by the favourable season on the Darling Downs, but increases in acreage and production were disproportionate as compared with wheat.

A reduction in both the number of cotton-growers and acreage has to be reported. This decline, however, is considered to be only temporary.

Grain sorghum cultivation is gaining rapidly in importance, particularly on the Darling Downs and in districts where maize often fails as a grain crop.

It is many years since such large quantities of summer fodder crops were produced. A substantial proportion of the surplus has been converted into silage for winter feeding and as a dry-time reserve.

Some increase in the conservation of hay as well as silage has been observed.

Tobacco auction values were well maintained at approximately the previous year's rates. The demand continues keen for all grades of bright leaf.

Good yields and high average prices were the experiences of potato-growers.

Peanut-growers also had a good year, yield and quality being satisfactory throughout.

Both winter and summer fodder crops were produced in abundance. In conservation practice, a remarkable advance was made on the Atherton Tableland, where, with the assistance of the Bureau of Rural Development, forty-four new pit silos of the concrete collar type were constructed and filled during the autumn months.

The number of silos of different types constructed in Queensland during the year exceeded greatly the number built in any previous year.

Interest in pasture management is extending in every dairying district, and has resulted in a strengthening demand for seed and rootlets from the departmental grass propagation plots.

New district offices of the Department have been established at Bundaberg, Monto, Gympie, and Kingaroy.

Satisfactory conditions prevailed generally throughout the fruit-growing districts.

The research activities of the Department have continued to expand.

Agricultural investigation comprised work on various problems associated with field crops. Other investigations covered the control of plant diseases and pests, the identification and study of plants reputedly poisonous to stock, pasture problems, and soil bacteriology. Very promising results have been achieved in many fields and much important data have been recorded.

By the end of the year dairy production had attained the highest level ever recorded in Queensland.

The drive for quality improvement in cheese has led to much activity in the rebuilding or remodelling of factory premises.

The approximate value of the dairy industry to Queensland for the year was £10½ millions.

To provide supplements to the ordinary pastures, fodder conservation in stack and silo is becoming more widely practised in the dairying districts. Instructional and advisory effort has been directed towards making this form of provision for dry seasons a routine practice on every farm. The attainment of an equilibrium between crop production and fodder provision is another objective.

In addition to building up fodder reserves, farmers are giving more attention to the nutritional aspects of animal husbandry. The fact that proper nutrition is a factor of first importance in any stock improvement scheme is becoming more broadly appreciated; likewise, the fact that the level of nutrition determines the level and degree of that improvement.

Fodder provision and pasture improvement are, therefore, regarded as cardinal points in departmental policy.

Accelerated progress was the general experience in the pig industry during the year. Prices were maintained on a more satisfactory and stable basis.

Better farm practice has resulted in healthier stock; and there has been a steady improvement in the quality of pork and bacon pigs marketed either as feeders or breeders. The export trade in pig products has expanded considerably.

Expansion also marked the year in the poultry industry, and increased production has been the experience throughout the State.

The year was, generally, the most productive in the history of Queensland.

Pineapple Culture in Queensland.

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

Chapter I.—HISTORY AND ECONOMIC IMPORTANCE.

INTRODUCTION.

THE pineapple is a native of South America. While its original habitat is generally believed to have been the dry, upland forest country in the hinterland of Brazil, evidence exists that it was introduced there from Paraguay by tribes of conquering Indians. Historical records indicate that the pineapple was first brought to the attention of western civilisation by Christopher Columbus and his companions, who found the plant growing on the island of Guadelope, in the West Indies. Repeated references to the highly palatable qualities of this "strange new fruit, shaped like a pine cone," were made by subsequent explorers of the New World, and before the end of the sixteenth century the pineapple had become widely established in tropical countries through the agency of Spanish and Portuguese missionaries and navigators. Its introduction into India has been traced back to 1548. So favourable for its growth were the conditions in this and other countries to which it was introduced that it quickly escaped from cultivation and grew wild, notably in the Philippines, Formosa, and the Hawaiian Islands.

During the latter half of last century, the production of pineapples under shadehouse conditions became one of the principal industries of the Azores, and these islands now supply most of the fresh pineapples sold in European countries. South Africa also sends a small quantity of fresh pineapples to the London market, but the development of this trade has been hampered through want of a satisfactory method of storing the fruit over the period required for its transportation to Great Britain. Experimental shipments of fresh pineapples from Queensland to England have failed for the same reason.

About thirty years ago, Florida annually contributed more than a million cases of pineapples to United States markets, but to-day the American trade draws its supplies of fresh pineapples chiefly from the West Indies. In addition, the Hawaiian Islands ship small quantities to ports on the Californian coast.

Little trade in fresh pineapples takes place to or from other countries, more than 90 per cent. of the world's production at the present time being utilised for canning purposes. In a little more than forty years, pineapple-canning has become one of the important food-preserving industries of the world, and it now ranks as the second biggest fruit-canning industry, the gross value of the product being exceeded only by that of canned peaches.

Uncertainty exists as to the country in which pineapple-canning was first carried out. It is known, however, that a cannery was operating in Malaya in 1895, and that two years before this efforts were being made to establish the industry in Hawaii. Between them these two countries now produce about 85 per cent. of the world supply of

16,000,000 cases annually, the Hawaiian Islands alone contributing around 70 per cent. The remainder is produced by Formosa (11 per cent.), Queensland (2 per cent.), other countries (2 per cent.).

HISTORY OF THE PINEAPPLE INDUSTRY IN QUEENSLAND.

Nearly twenty years before Queensland was proclaimed a State, pineapples were being cultivated around Brisbane, and the Smooth Cayenne variety, long regarded as being pre-eminent for canning purposes, was grown in Queensland for nearly fifty years before it was first introduced into Hawaii. In fact, Queensland was one of the countries from which the Hawaiian industry drew its original supplies of Smooth Cayenne planting material.

The history of the introduction of the pineapple into Queensland is somewhat obscure. Early records indicate, however, that the first plants were probably brought from India about 1838 by Mr. Hand, a German missionary, but pineapples are said to have been grown near Sydney, New South Wales, as far back as 1824. It is recorded that Mr. Hand propagated pineapple plants in Brisbane on a site near the existing Treasury Buildings, and when he left Brisbane—a few years later—he gave them to Mr. T. C. Wagner, of the German Mission Station at Nundah, on the outskirts of the city. From this mission station planting material was subsequently distributed amongst the

Plate 258.

A Pineapple Field at Nudgee, near Brisbane, which has been fruiting continuously for more than fifty years without replanting. In this old-established field the Smooth Cayenne and Queen varieties occur mixed together in the same rows.

neighbouring settlers. In 1903—sixty years later—one of Mr. Wagner's original plantings was still in existence at Nundah, at which time it was reported to have been "healthy and strong." Several very old plantations are still under cultivation in the Brisbane area. Plate 258 shows a portion of a plantation at Nudgee which was planted more than fifty years ago.

From the original plantations at Nundah pineapple cultivation soon extended to other farming centres in the vicinity of Brisbane. As the early settlers had to rely solely on horse-drawn conveyances for the marketing of their perishable produce, proximity to centres of population was one of the chief factors determining the location of pineapple plantations in Queensland until late in the last century. Consequently, for nearly sixty years the industry remained centred close to Brisbane. The development of railway and other transport facilities provided access to other markets, however, particularly the capitals of the Southern States. To meet the increasing demand which followed the opening-up of these markets, extensive plantings of pineapples were made in the coastal districts north of Brisbane, particularly in the vicinity of Woombye. At the same time, small areas were planted to meet local requirements in various other coastal localities all the way from Port Macquarie (in New South Wales) to Cooktown (in North Queensland)—a range of latitude extending over 1,100 miles. Thus, the initial development of the pineapple industry in Queensland took place in response to

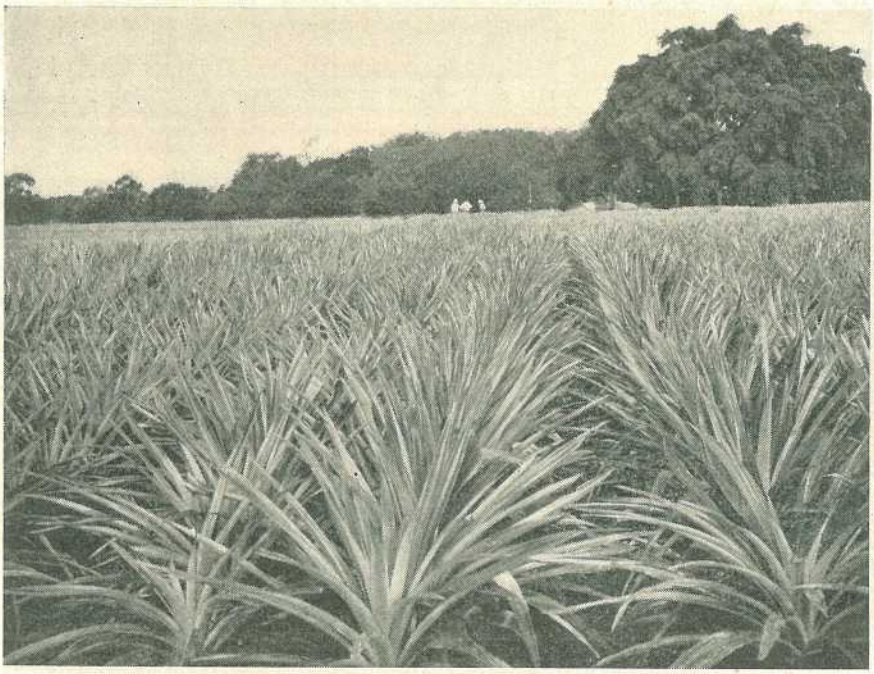

Plate 259.

A PINEAPPLE FIELD TRIAL AT BOWEN, NORTH QUEENSLAND, FOURTEEN MONTHS AFTER PLANTING.—The land on which this trial is located has been under cultivation for twenty-six years.

a demand for the fruit in a fresh condition, and it was not until production began to exceed this demand that serious attention was given to the development of a canning industry.

For many years the production of pineapples expressly for canning purposes was regarded as being uneconomic, and only during glut periods was fruit available for this purpose. In consequence, pineapple-canning was first taken up as a subsidiary to jam and sauce manufacture by factories located in Brisbane. From 1920 onwards, however, there was a very sharp rise in production, due largely to extensive plantings which had been made in soldier settlement areas in Southern Queensland, and, to absorb the surplus fruit from these areas, the Queensland State Government erected a modernly-equipped cannery in Brisbane. This cannery was subsequently taken over by private enterprise, and it still handles the bulk of the pineapples canned in Queensland. Because of the fact that all of the existing canneries are located in Brisbane, the great bulk of the pineapples now canned in Queensland are drawn from the narrow strip of coastal country which extends from Brisbane (in the South) to Gympie (in the North)—a distance of about 100 miles. Recently, however, increasing attention has been given to pineapple-growing in several coastal districts in the northern part of the State—notably around Ayr, Bowen, and Rockhampton (Plate 259). The growth of the pineapple-canning industry in Queensland since 1929 is illustrated by the following production figures, expressed both in 1½-bushel cases and in tons:—

	Canneries.		Fresh-fruit Markets.		Total.	
	Cases.	Tons.	Cases.	Tons.	Cases.	Tons.
1929	210,300	5,258	355,246	8,881	565,546	14,139
1930	297,630	7,441	338,016	8,450	635,686	15,891
1931	222,642	5,566	502,461	12,560	725,103	18,126
1932	298,107	7,453	460,326	11,508	758,433	18,961
1933	387,083	9,677	474,339	11,859	861,422	21,536
1934	321,233	8,031	468,056	11,701	789,289	19,732
1935	369,220	9,230	460,966	11,524	830,186	20,774
1936	418,033	10,451	389,931	9,748	807,964	20,199
1937	358,535	8,963	415,794	10,395	774,329	19,358
1938	689,350	17,234	627,826	15,696	1,317,176	32,930

While there has been a marked increase in the total annual production during the past ten years, a greater proportion of this increase has been absorbed by the canneries than by the fresh-fruit markets. The increased production has resulted from several causes, but partly it is attributable to a lowering of production costs through increases in the average acreage yield.

Between 1932 and 1938 the average yield per bearing acre rose from 5·4 to 9·3 tons—an increase of 72 per cent. Among the factors responsible for this yield increase are: (1) Closer spacing of the plants, giving increased plant populations; (2) more efficient fertilizing practices; and (3) reduced losses from diseases.

BASIS ON WHICH THE QUEENSLAND PINEAPPLE INDUSTRY IS ORGANISED.

In most countries where pineapple-canning ranks as an important industry the crop is grown either by the canners themselves (Hawaii and the Philippines)—in which case large-scale methods of production are employed—or by a system of tenant farming whereby the canneries or large estates lease small areas of land to individual growers. The latter system has long been in vogue in Malaya, and has recently been adopted in Fiji. In Queensland, however, production has always been carried on solely by small independent landholders. Individual plantations vary in size up to a maximum of 50 acres, but where the cultivation of this crop provides the sole source of income the planted area averages from 8 to 10 acres. Apart from the consideration of finance, the economic limit to which any single plantation may be extended varies with the locality, since the supply of casual labour required for planting, weeding, and harvesting the crop is subject to considerable fluctuation in certain districts. In general, however, individual plantations rarely exceed 20 acres in extent.

Since the basic production unit of the Queensland pineapple industry is a small holding on which the owner carries out most of the cultural operations himself, it is not practicable to utilise mechanical aids to the same extent as they are employed on the large-scale plantations in Hawaii. Consequently, it has been necessary to devise cultivation practices especially suited to local requirements. In some cases these have been adapted from the accumulated experience of other countries, particularly Hawaii, but many have been worked out especially for Queensland conditions.

Chapter II.—GENERAL CHARACTERISTICS OF THE PINEAPPLE.

BOTANICAL RELATIONSHIPS.

The pineapple belongs to a family of plants known as the *Bromeliaceæ*. This plant family is indigenous to tropical America and the West Indies, and includes 850 species or representatives, of which the pineapple is the only one of any economic importance. Most of the plants belonging to the *Bromeliaceæ* are epiphytes—that is, plants which cling to others for support without deriving nourishment from them—but a number of species in this family are terrestrial in habit, included among which is the pineapple. Although the pineapple is a terrestrial plant, its epiphytic relationships are indicated by its ability to remain alive for months without contact with the soil. This attribute not only allows planting material to be transported over long distances, but also makes it possible for autumn-plucked slips to be stored for planting in the following spring. A curious epiphytic representative of the botanical family to which the pineapple belongs is the so-called Spanish moss, *Tillandsia usneoides* L., which festoons trees in the sub-tropical regions of the south-eastern United States (Plate 260).

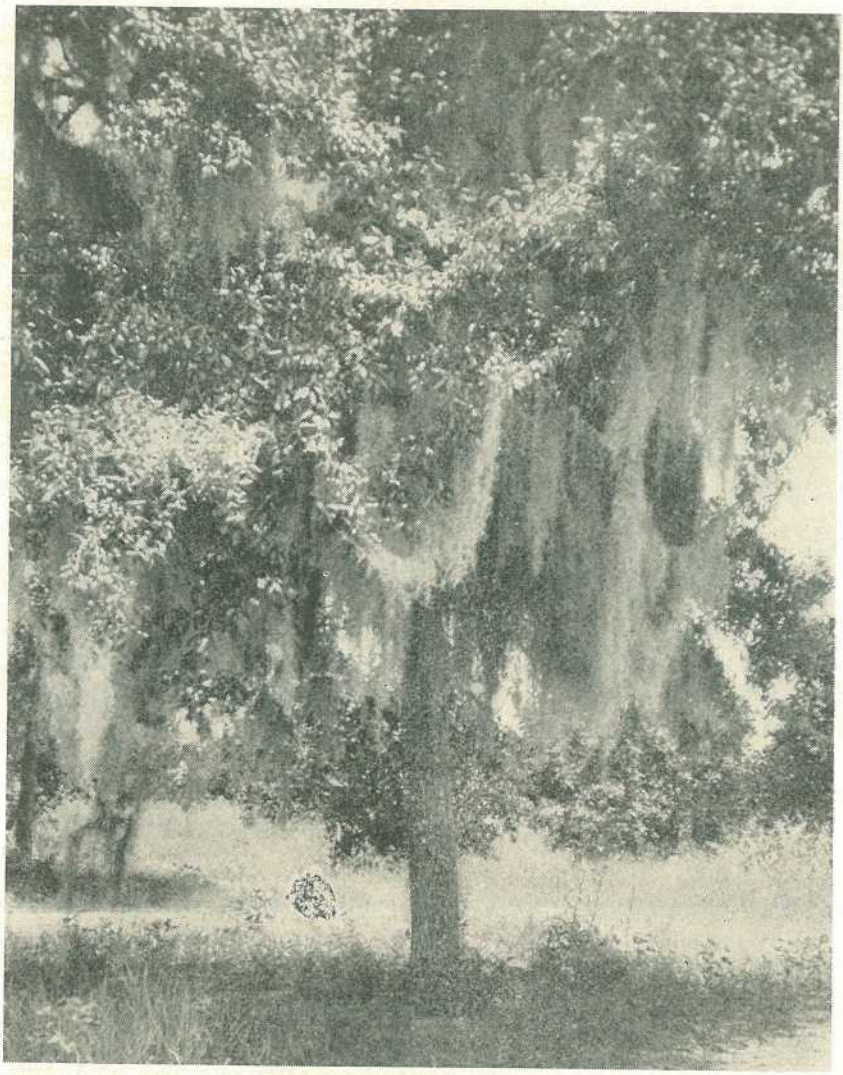

Plate 260.

Spanish Moss, *Tillandsia usneoides* L., an Epiphytic Plant belonging to the same Botanical Family as the Pineapple, which grows on trees in the sub-tropical regions of the south-eastern United States.

All of the cultivated varieties of the pineapple belong to the species *Ananas sativus* (Lindl.), but the progenitor or ancestor of this species appears to have been the grasslike, wild Brazilian pineapple *Ananas michrostachys* (Lindl.) (Plate 261). During the centuries that it has been

Plate 261.

A PRIMITIVE PINEAPPLE NATIVE TO BRAZIL.—*Ananas michrostachys* (Lindl.), which is probably a progenitor of the cultivated species *Ananas sativus* (Lindl.).

under cultivation, the size and edible qualities of the pineapple fruit have been greatly improved, and anyone lacking the requisite botanical knowledge would not readily perceive the relationship which exists between the present-day varieties of commerce and their wild progenitors.

Like many plants with epiphytic relationships, the pineapple is adapted to a xerophytic habit of growth—i.e., its anatomical structure enables it to live and reproduce itself under relatively arid conditions—and its original habitat was probably a dry upland forest.

THE PLANT STRUCTURE AND ITS FUNCTIONS.

The pineapple plant (Plate 262) consists essentially of a short, stout stem with a restricted but dense root system arising from the leaf axils at its base, and with fleshy, narrow, stiff, troughlike leaves radiating spirally from the aerial portion. The plant normally attains a height of from 2 to 4 feet—depending on the variety and on the conditions of growth. About a year after planting, a flower bud forms in the apex of the stem and protrudes on a short, thick stalk, to develop into the fruit.

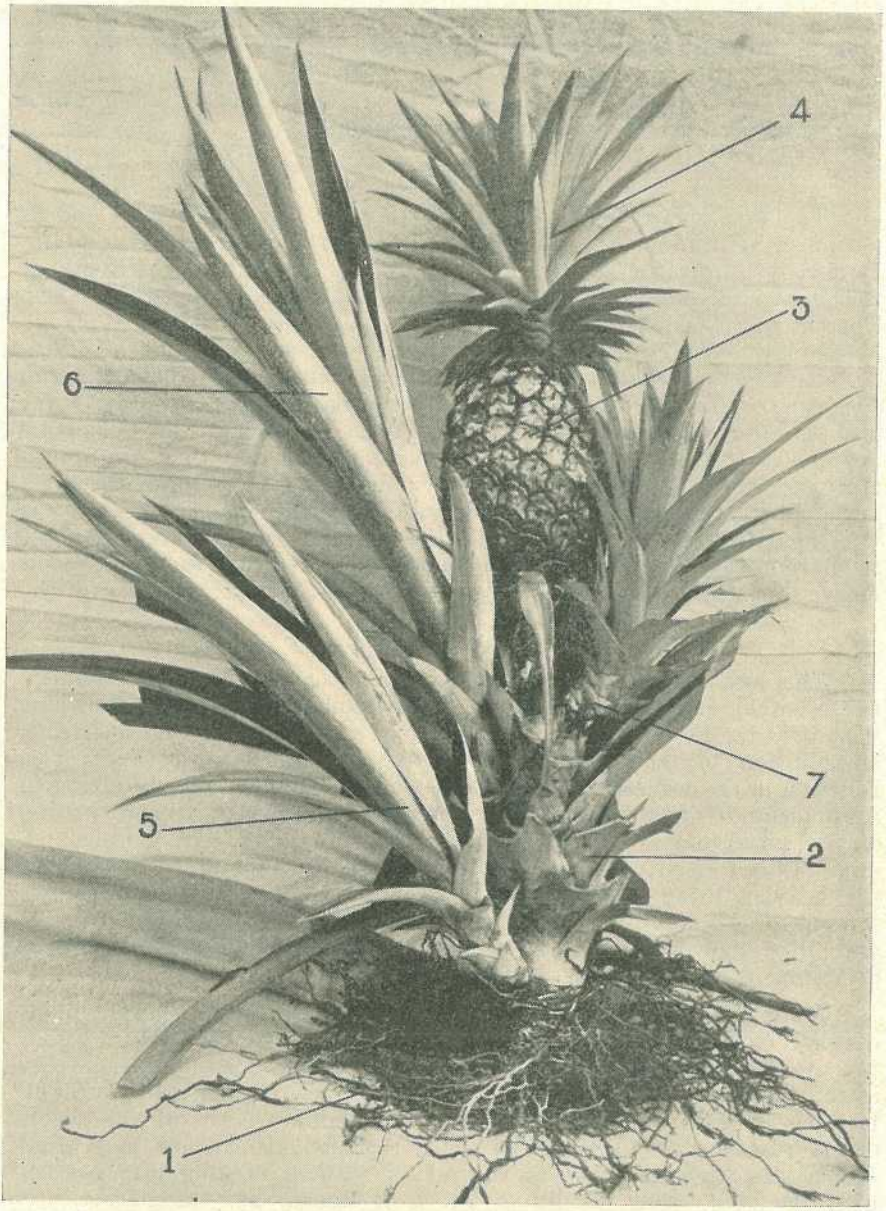

Plate 262.

A Plant of the Smooth Cayenne Variety with the Leaves cut away to show the Various Plant Parts—viz., (1) roots; (2) stem; (3) fruit; (4) top or crown; (5) ground sucker; (6) sucker; (7) slip.

Only one fruit is produced from each stem. Succeeding crops are produced by shoots which develop from near the base of a fruiting plant, either above or below ground level. These shoots are commonly known as "suckers." Offshoots may also develop from the fruit stalk proper. These latter shoots are known as "slips," to distinguish them from suckers, from which they differ in several respects, but chiefly in that

each is attached to a primitive or abortive fruit which forms a basal knob. The fruits of cultivated varieties are normally seedless, but both suckers and slips, as well as the shoots which develop from the tops of the fruit—namely, the crowns—provide vegetative organs from which the pineapple may be commercially propagated.

The Stem.

The stem serves both as a support for the leaves and fruit and as a connecting link between the roots and the aerial portions of the plant. It develops from the core of the shoot used for planting. Growth of the plant is accompanied by a lengthening and broadening of the stem. The extent to which the stem may elongate is determined, not only by hereditary influences, but also by environmental and nutritional factors. A long-stemmed plant is undesirable, because it is usually high suckering, with the result that, in the ratoon crops, fruits fall over into the inter-row spaces and may be wasted. The stems of low-set plants are almost completely enveloped by the leaves, so that they are apparently stemless. In addition to its other functions, the stem of the pineapple plant also serves as a storehouse for starch; after the fruit is harvested, starch accumulates in the stem to a very marked degree. It is from these starch reserves in the parent stem that sucker offshoots derive much of their nourishment during their early stages of growth.

The Roots.

The root system of a terrestrial plant constitutes the mechanism (1) whereby it obtains anchorage in the soil and (2) through which it absorbs the greater part of its supply of water and mineral nutrients. In addition to their role as absorptive organs, however, roots also function in the assimilation of certain plant foods, particularly nitrogen. An inadequate or damaged root system is reflected in a stunting or wilting of the aerial parts of a plant, especially the leaves. In Queensland, crop failures resulting from deranged or diseased roots are responsible for heavier losses to the pineapple industry than all other causes combined. Therefore, a proper appreciation of the role played by roots and the conditions necessary for their healthy development is a pre-requisite to success in pineapple culture.

Mode of Root Development.—The roots of the pineapple plant develop from buds in the leaf axils at the base of the stem. Under favourable conditions of moisture and temperature, roots will develop in this manner from any of the offshoots produced from a mature plant. Rooting is facilitated by stripping off the lower leaves of the shoots before planting. Unless this is done, the elongating roots may wind around the stem underneath the leaves without coming into contact with the soil. This condition, which is known as "tangleroot," is most prone to happen in the case of suckers because of the close manner in which the leaves of these shoots are appressed to the stem; it rarely occurs when plants are propagated from slips or crowns, both of which have a relatively open structure.

The development of adventitious roots in the axils of the lower leaves is a characteristic of the pineapple plant and differentiates it from most other crop plants. For a long time it was assumed that the axillary roots which develop in the leaf axils above ground level absorbed the water and nutrients which lodge in them, even in the embryonic stage, but investigation has partly disproved this view. It has been ascertained that an axillary root performs none of the normal

functions of a root until its tip grows out beyond the base of the leaf sheath which tightly encases it, because, in this region, the leaves are so closely appressed to the stem of the plant that water or nutrients in solution are unable to penetrate to the embryo roots.

The Spread of Roots in the Soil.—The pineapple is essentially a shallow-rooted plant and, in soils which favour its development, the spread of the roots is not very extensive. Most of the roots are concentrated in the first 6 inches of soil, and, while a few may attain a length of 3 feet or more, the bulk of them do not extend laterally for more than a foot from the base of the plant unless (*a*) the soil is compacted or otherwise poorly aerated, or (*b*) the plant is suffering from a deficiency of iron. Because of its limited root spread, the pineapple utilises fertilizers to best advantage when they are applied at or close to its base.

Conditions Influencing the Development of Roots and Root Hairs.—Under favourable conditions of temperature and moisture, soil-inhabiting roots are freely produced from the leaf axils at the base of the plant stem. Except at the extreme tips, they are covered throughout their length by a dense mat of root hairs. Development of root hairs begins almost immediately after the root bud has swelled and continues to follow the root cap for the life of the root. Absorption of water and mineral plant foods takes place chiefly through the root hairs. Consequently, the normal functioning of the plant is dependent on the development of a root system adequately supplied with root hairs, and the extent to which this requirement may be attained is determined by the soil environment. In fertile, well-aerated soils the roots branch freely, but they are comparatively short, thick, and fleshy, of considerable tensile strength, and densely covered with root hairs. In closely-compacted or waterlogged soils, however, or where the plants have been set at too great a depth, the roots which develop are few in number, brittle, spindly, and almost devoid of root hairs. Such roots may be from two or three times as long as those produced under more favourable conditions, but, despite the greater average length of the individual roots, their weight and volume is relatively small.

Provided moisture and temperature conditions in the soil are favourable, new roots are produced at frequent intervals throughout the life of the plant. In South-eastern Queensland, root development is almost entirely inhibited during the coldest period of the year—i.e., from the middle of June to the middle of August—but it is prolific in the warmer months, particularly during the rainy season. A growth rate of more than 3 inches per week has been noted for individual roots at this time.

Relationships between Roots and Leaves.—In the pineapple plant, the water and dissolved nutrients absorbed by any one root are not distributed freely throughout the entire plant body, since each root is connected with a particular leaf by means of a bundle of fibres which serve as conducting channels for the absorbed materials. Although a certain amount of diffusion takes place, most of the nutrient solution absorbed by any one root is supplied to a single leaf. The oldest roots—i.e., those at the extreme base of the plant—are connected with the oldest leaves, and a similar relationship exists for all other roots and leaves. Consequently, the slowing-down in the rate of new root production which occurs during the winter months is reflected in a corresponding curtailment of new leaf growth. Similarly, death of individual roots

results in the wilting and drying-out of the leaves which are dependent on them. In the event of a general failure of the root system, the supply of water and nutrients to the leaves is almost completely cut off and the entire plant collapses. This condition is commonly referred to as "wilt." General root failure in pineapple plants may arise from either parasitic or environmental causes, and these are discussed later in connection with diseases.

Ageing and Death of Roots.—Death of the oldest roots is a normal occurrence, and is not associated with the development of symptoms of disease or malnutrition. As old roots at the base of the stem die, new ones emerge from higher up to take their place in the same way as old leaves are replaced by new ones as soon as they have fulfilled their function. In fact, both the decay of old and the development of the new roots and leaves is interrelated. As pineapple roots become older, they take on a hard, brown, corky appearance and, although the internal tissues retain their healthy silver colour, old roots are not able to take up and transport as much water and nutrients as are younger and more strongly-growing ones, because death of the root proper is preceded by death of the root hairs. Normally, roots die as soon as they cease to function and, consequently, conditions which inhibit root activity are predisposing towards root decay. This explains why a large proportion of the roots of pineapple plants grown in South-eastern Queensland die during the cold winter months. Because loss of water through the leaves—i.e., transpiration—is slowed up very considerably by cold, cloudy conditions, relatively heavy root failure has little or no perceptible effect on the health of the plant at this time. Should the cold winter months be followed by a prolonged period of dry weather in the spring, however, the inability of the depleted root system to maintain a flow of water to the leaves in excess of that lost by transpiration—the rate of which has been accelerated by the rising seasonal temperatures—will result in a general loss of colour and turgor from the leaves, accompanied by dying-back at the tips and, where soil conditions are highly unfavourable, may give rise to the developments of characteristic wilt symptoms.

The Leaves.

In all green plants the leaves perform the function of synthesising starches and related energy-providing and tissue-building substances by combining carbon dioxide gas obtained from the air with water absorbed by the roots. This is effected in the chlorophyll—the green colouring matter of the leaves—through the agency of sunlight. On the efficiency with which the leaves carry out their photosynthetic function depends both the vigour and the productivity of the plant as a whole.

General Characteristics.—The leaf of the pineapple plant is typically long and narrow and tapered to a point at the tip. The edges are both curved upwards. Thus the leaf is a troughlike structure, and as such it is peculiarly adapted for the collection and conduction of the moisture which falls on it in the form of rain or dew. The leaf is thickest along its middle, but the thickness of the leaf, like its texture, varies according to the growth conditions which obtained during its development. A tough, woody texture is related to adverse environmental influences, while a high degree of succulence denotes particularly favourable growing conditions. The leaves of vigorous young slip plants come in the latter category, while those of starved or otherwise poorly developed plants tend to woodiness.

Width of Leaves.—The width of pineapple leaves varies, not only with their age, but also with the conditions under which they have been grown. The widest part of a leaf is usually about one-third of the distance up from its base. Other things being equal, width of leaf is a measure of rate and vigour of growth. The leaves of young plants propagated from slips are noticeably wider than those produced by plants which have been propagated from suckers, because their rate of growth is faster, due to the more abundant and more efficient root systems of the plants. Planting at too great a depth, particularly in the case of suckers, results in the development of narrow, stiff, spiky leaves. This condition is symptomatic of a poorly-developed and poorly-functioning root system, and is especially prone to occur on shallow, compact soils. Narrow, spiky leaves also tend to develop under conditions of shade and drought.

Anatomy of the Leaf.—Anatomically, pineapple leaves show pronounced adaptation to dry or semi-arid conditions. In cross-section, it is seen that the leaf is crescent-shaped and that its upper surface is protected by a waxy and highly-impervous membrane. Underneath this is a layer of colourless water-storage tissue which does not quite extend to the margins, while below this again is the tissue which contains the green chlorophyll and in which synthesis of starchy substances takes place. This latter part of the leaf is traversed longitudinally by bundles of fibres which serve both for the conduction of fluids and as supports for the softer tissues which surround them. The pineapple leaf contains a considerable proportion of tough, silky fibre and, in the Philippines, fibre obtained from the leaves of a wild variety is used for weaving a fine, linen-like fabric known as "Pina cloth." Like the upper surface, the under surface of the leaf is also protected by an impervious waxy membrane. Unlike the smooth upper surface, however, the under side of the leaf is grooved longitudinally in a series of tiny parallel furrows at the bottom of which are located the stomata, or breathing pores. During dry periods, water is removed from the storage tissue in the upper part of the leaf, causing it to shrink, with the result that the furrows on the under surface contract, thus reducing the loss of water from the leaf by closing the stomatal openings. As withdrawal of water from the storage tissue during dry periods reduces the thickness of the leaf, measurements of leaf thickness can be employed, where irrigation is practicable, to determine the times when a watering would prove beneficial. The furrows on the under side of the leaf are covered over their entire length with a dense mass of tiny, mushroom-shaped projections which are known as "trichomes." These trichomes give the "bloom" or mealy appearance to the under side of the leaf. They are considered to perform the dual function of protecting the leaf against undue water loss from the stomatal openings and of absorbing water from the surface of the leaf, particularly in the region of the white tissue near its base. For this reason, trichomes are sometimes referred to as "leaf hairs."

Spininess of Leaves.—The edges of the leaves may be smooth and unbroken, or serrated. The presence or absence of serrated or "spiny" leaf edges is an hereditary characteristic, and, consequently, varieties differ in this regard. The Smooth Cayenne variety is so named because of the normal absence of spines on its leaf edges, except for the few which may occur close to the tip of the leaf, and in Queensland the Queen variety, which has serrated leaves, is known as the Rough or Common Rough, to distinguish it both from the Smooth Cayenne and the Ripley Queen. A large proportion of the mutations or bud sports which occur

in smooth-leaved varieties possess spiny leaves and, in the Smooth Cayenne variety, spiny-leaved suckers are frequently encountered on normal smooth-leaved parent plants. There is some evidence to indicate that this tendency of smooth-leaved varieties to throw spiny-leaved bud sports is stimulated by adverse growing conditions, such as drought. Spininess of the leaves is an objectionable characteristic because it interferes with the easy handling of the crop. Since it is also an hereditary one, however, the tendency of the Smooth Cayenne variety to revert to this character may be checked by careful selection of planting material.

Orientation of the Leaves.—The leaves develop vertically from the growing point of the stem, but as they emerge from the heart of the plant they incline outwards. Plants or ratooning suckers should be spaced in a manner that will allow mature leaves to spread to an extent permitting of their adequate illumination. In low rainfall areas, where sunlight is intense, closer planting is not only permissible but often desirable than in localities where cloudy conditions prevail. Crowding of the plants, by reducing illumination of the leaves, results in slower synthesis of sugars and starches. Once leaves droop below the horizontal position, however, they retain little functional value. The leaves are arranged spirally on the stem in a manner that effectively shades the soil around the base of the plant. This shading both reduces evaporation

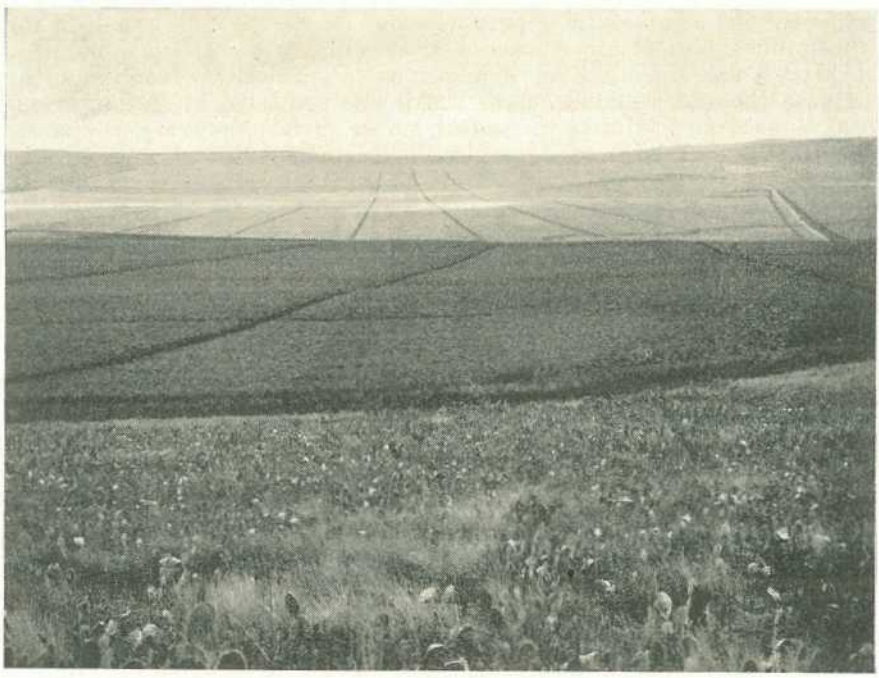

Plate 263.

PORTION OF THE HAWAIIAN PINEAPPLE COMPANY'S PLANTATION ON THE ISLAND OF LANAI, showing the semi-arid nature of the country as indicated by the character of the natural vegetation in the foreground. The mean annual rainfall over the greater part of this plantation, which is more than 12,000 acres in extent, ranges from 15 to 30 inches.

from the soil area from which the plant draws the bulk of its moisture requirements, and also assists in maintaining a relatively limited and even range of soil temperatures.

The manner in which the leaves are orientated also ensures that most of the moisture falling as rain or dew within a radius of about 2 feet of the stem is intercepted before it reaches the ground and that it is conducted to the soil at the base of the plant around which the roots are congregated. The ability of the pineapple to derive an appreciable proportion of its moisture requirements from dews is of special significance during periods of drought or where the crop is being cultivated under low-rainfall conditions. The establishment of extensive plantations under the arid conditions existing on the islands of Molokai and Lanai, in the Hawaiian group, has been made possible largely because of the heavy dews which are experienced in those regions (Plate 263).

Leaf Colour.—In apparently normal plants of the same variety leaf colour may vary from a brownish yellow-green through various shades of olive to a rich dark-green or a fresh pea-green. The pronounced yellow colouration of the leaves, known as chlorosis, which is symptomatic of malnutrition, arises from an extreme deficiency of either iron or nitrogen. In plants suffering from nitrogen deficiency, the chlorotic symptoms are most evident in the oldest leaves, the young heart leaves remaining moderately green, but the reverse is the case with iron deficiency. This is because iron contained in plant tissues is immobile, in contrast to nitrogen, which may be translocated or moved from mature or ageing tissues to actively-growing regions where the demand is greatest.

Colour variations in the leaves of plants which are not suffering from disease or any obvious nutritional disturbance are influenced by (*a*) varietal characteristics, (*b*) the stage of development of the plant, (*c*) temperature, (*d*) sunlight, and (*e*) the supply of iron and nitrogen.

Different varieties of crop plants frequently possess a distinctive shade of green in their foliage, and the pineapple is no exception in this regard; in fact, plants of the Queen and Ripley Queen varieties are commonly distinguished on this basis. The leaves of pineapple plants also present characteristic colour differences according to the stage of development which the plant has attained; in the early stages of growth the leaves of plants receiving adequate sunlight and nourishment are usually pea-green, but as they advance towards maturity the leaf colour intensifies until, at the time the flower buds appear, it is a dark olive-green, suffused with purple. This purple colour, like the reddish colour seen at other times and under other conditions, is due to a pigment (anthocyanin), which is formed from sugar contained within the leaf tissues. Since this pigment is produced to a much greater extent in some varieties than in others, it largely accounts for the characteristic differences in leaf colour which different varieties possess. In a given variety, however, the degree of leaf pigmentation varies considerably with changes in climatic and other environmental factors, since it develops only under conditions which favour the conversion of starch into sugars. Such conditions include a low rate of nitrogen absorption, and this accounts for the highly pigmented leaf colour—the so-called "winter colour"—which pineapple plants frequently assume in South-eastern Queensland during the months of July and August. The partial failure of the root system which occurs at this time is responsible for a

pronounced falling-off in the amount of nitrogen supplied to the leaves, even though an amount more than adequate for the needs of the plant may be present in the soil. In effect, this results in a condition of nitrogen starvation, and, in addition to mild chlorotic symptoms, the leaves develop pigment from the sugars contained in their tissues, even though the total amount of sugars present may not be high. The characteristic pigmentation of the leaves of wilt-affected plants results from similar causes in an aggravated form.

Shading exerts a pronounced effect on leaf colour, because light is essential for the synthesis, not only of the starch from which the red pigment is derived, but also of chlorophyll—the constituent of the leaf which gives it its basic green colour. For this reason, leaves which develop in the shade are almost invariably devoid of red pigment, and are frequently very lacking in green colour as well. Typical results of the effect of shading on leaf colour may be observed among the basal leaves of vigorously-growing plants in any densely populated field, and even more striking examples are provided by pineapple plants which are growing in the shade of papaw or other trees. Where illumination is intense or under conditions of nitrogen deficiency, a certain degree of shading may be beneficial in that it helps to balance the photosynthetic activity of the leaves with the intake of mineral nutrients. This partly explains how the practice of cultivating pineapples under shadehouses came to be established in Florida and other countries before the heavy nitrogen requirement of pineapples was fully recognised. Trimming or pruning of leaves during the winter months—once a common practice in Queensland—affects leaf colour in a manner similar to shading, since it reduces both the water and nitrogen requirements of the plant.

Provided there is no lack of available iron, a heavy supply of nitrogen is reflected in the leaf colour of a pineapple plant almost as markedly as a deficiency. The absorption of a quantity of this element in excess of the normal requirements of a plant results in the development of either a bright pea-green or a dark, almost black-green leaf colour—depending on the age of the plant—and a soft, flabby type of growth which is in marked contrast to the fibrous, woody tissue which is formed under conditions of nitrogen deficiency. The practical significance of the colour changes which take place in pineapple leaves at various stages of growth and under different environmental conditions, lies in the fact that they provide an indication of the growth status of the plant at any given period, and thus, if intelligently interpreted, may be used as a guide to both the fertilizer requirements of the crop and the most suitable times for applying it. Further attention is given to leaf colour in relation to fertilizing practice in the section dealing with the use of fertilizers.

The Fruit.

The pineapple fruit is not a true fruit in the botanical sense, but is a sorosis or collective fruit formed by the coalescence of a large number of individual fruits, or, as they are more commonly termed, "fruitlets." The fruit is borne in the centre of the plant on a stalk about an inch thick and 6 to 8 inches long. This stalk is a prolongation of the stem of the plant, and it passes right through the fruit to form a central core on which are attached the fruitlets which make up the fruit. The core is terminated by a growing point from which a rosette of leaves develops to form the "top" or "crown" which surmounts the fruit.

Development of the Inflorescence or Flower Head.—The flower bud from which the fruit develops normally appears at the apex of the stem in the heart of the plant from ten to fifteen months after planting. Its appearance is preceded by the development of a general reddish colouration in the young leaves surrounding the apex of the stem. Prior to this, however, a diffused red colouring is noticeable on the white tissue at the bases of these heart leaves and its appearance is the first visible indication that a flower-head is about to emerge. In the spring and autumn, development of the flower-head in the growing point of the stem begins about six weeks before pigmentation of the heart leaves becomes evident, and a similar period elapses before the first flowers appear. Blossoming commences at the base of the flower-head and proceeds upwards in spiral fashion. It takes from three to six weeks for all of the florets on a flower spike to open, the rate of blossoming being retarded by cold conditions. The flowers are usually violet in colour, though there is some variation even in the same variety; they are relatively inconspicuous, since each is borne in the axil of a bright-red protective bract. After flowering has finished, these bracts change to a green colour and develop to form the "scales" which partially cover the fruitlets or "eyes" at maturity.

Period Taken by the Fruit to Reach Maturity.—In summer, the fruit reaches maturity in about four and one-half months after blossoming is completed, though varieties differ somewhat in this regard. During the colder months of the year, however, the development of the fruit takes much longer; flower-heads which blossom in May are not usually ready for harvesting before late December. In South-eastern Queensland, fruits of the Smooth Cayenne variety, which develop during this period, are characterised by abnormally protuberant and sharp pointed "eyes." For this reason, they have come to be known as "prickly eyed" or "Christmas" pineapples, to distinguish them from the normal flat-eyed type of Smooth Cayenne fruit.

Ripening of the Fruit.—As the fruit approaches maturity, the colour of the skin generally begins to change from green to yellow. Change of skin colour does not constitute an infallible index of ripeness, however, because the development of red and yellow pigments in the skin of the fruit is influenced by the same factors as development of pigment in the leaves. Under certain conditions, it is possible for the skins of immature fruits to be fully coloured and for that of fully ripe fruit to remain quite green. An extreme example of premature development of skin pigment is afforded by the colouring-up of partially grown fruits which occurs on wilt-affected plants.

Because the degree and extent of skin colouration which accompanies ripening is determined by the conditions under which the fruit develops, attempts to define the minimum stage of maturity acceptable to either canneries or fresh-fruit markets by so-called "colour standards" can never be wholly successful. With a little practice, snapping a finger against the side of a partially coloured or green-skinned pineapple is a reliable method of determining whether it is ripe, since a ripe fruit emits a dull pinking sound, and an immature one a hollow ring. In the case of fruit that are more than three-quarters coloured, tapping is unnecessary, as they are obviously ready for harvesting.

Ripening in the pineapple fruit begins at the core and proceeds outwards to the skin. The basal tissues ripen some time in advance of

those towards the top, but it is always advisable to pick the fruit before this stage is reached in order to avoid the development of an over-ripe condition in the lower portion. Ripening is associated with a marked accumulation of both sugars and acids in the fruit tissues. While sugars continue to accumulate right through the ripening process, however, the acids begin to decompose in the later stages. In yellow-fleshed varieties, the development of yellow pigment, principally carotin, takes place chiefly in the final stages of ripening. Accumulation of sugar in the tissues ceases when the fruit is picked, though the acid content may continue to increase if it is not fully mature. The sugar and acid content of a ripe pineapple fruit—the two constituents which chiefly determine its eating quality—is greatly influenced by the conditions under which it is grown. Factors influencing fruit quality are discussed in a subsequent chapter.

Fruit Size and Weight.—Within certain limits, fruit size is an inheritable characteristic, and varieties may be loosely defined as either small or large-fruiting types. The Queen is an example of the former, while the Smooth Cayenne is the best known of the large-fruiting varieties. Size is not strictly synonymous with weight, since the extent to which small cavities or pore spaces occur in the flesh of the fruit varies considerably, but the two are generally closely correlated. Although weights up to 14 lb. have been recorded for individual Smooth Cayenne pineapples, well-grown fruits of this variety average between 5 and 7 lb. Fruits of the Queen variety, however, normally do not exceed about half this weight.

Apart from hereditary influences, the size of a pineapple fruit is determined by (*a*) the number of fruitlets which go to make up its structure and (*b*) the extent to which these fruitlets develop during the period of fruit growth and ripening. The number of fruitlets is fixed at the time the flower bud forms in the growing point of the parent stem, and, consequently, it is influenced by the vigour of growth at this time. On the other hand, the size to which these fruitlets develop and the degree of porosity which their tissues present are determined by the growth status of the plant after flowering has taken place. Marketable fruits of the Smooth Cayenne variety may consist of anywhere from 100 to 200 fruitlets or "eyes." In South-eastern Queensland, fruits of this variety which mature during March and April, generally contain fewer fruitlets and are of a smaller average size than those picked during the late winter and spring months, though the flesh of the summer-maturing fruit is usually closer-textured and possesses fewer pore spaces. This is because flowering for the summer crop occurs in the dry spring months and is preceded by an unfavourable growth period, while the development and ripening of the fruit takes places under highly favourable growing conditions; conversely, the flowers which develop into winter-maturing fruit are formed at a time when the plants are making vigorous growth, while ripening of the fruit occurs at a time when the growth rate is at its minimum.

Fruit Shape.—In general, fruit shape is a varietal characteristic, and as such is hereditary. Cultivated varieties or strains of varieties have conical, cylindrical, or barrel-shaped fruits. For both canning and fresh consumption, cylindrical or barrel-shaped fruits are preferred to conical ones: in the former case, because they yield a higher recovery of slices; and in the latter, because they are easier to pack. In the late winter and spring months, however, a pronounced tendency towards a

conical shape is generally evident in the fruits of all varieties. Hybrids resulting from the cross-pollination of cultivated varieties may produce grossly freak-shaped fruit, and, to a lesser degree, the same tendency is often exhibited by bud sports (mutations). The "bottle-neck" type of Smooth Cayenne is an example of this tendency. Plants throwing objectionably shaped fruit should be pulled out on sight to obviate any risk of their being used as sources of planting material.

Seediness in Pineapple Fruits.—Pineapple fruits are usually seedless because the flowers of the cultivated varieties are normally self-sterile. Pollination by insects rarely occurs, owing to the effective protection afforded the reproductive organs by the floral envelope. Occasional seedy fruits do occur, however, particularly in the Smooth Cayenne variety, but these almost invariably result from self-pollination in bud sports. Consequently, the production of seeds in pineapple fruits may be regarded as an inheritable characteristic, but since seediness is much more prevalent in some seasons than in others there is evidence to indicate that its occurrence is to some extent influenced by the climatic conditions obtaining during the blossoming period. Obviously, the elimination of seedy stock is difficult owing to the fact that the character cannot be determined without destroying the fruit.

Suckers and Slips.

These offshoots from the main axis of the plant have fundamentally different origins. Suckers arise from the stem of the plant and are vegetative outgrowths, while slips, which sprout from the fruit stalk, are essentially rudimentary reproductive organs. The buds from which the slips develop begin to grow before blossoming of the flower-head is completed. Production of suckers is favoured by conditions which favour vegetative growth, while the reverse tends to be true for slips. Under Queensland conditions, a much heavier production of slips is associated with summer-maturing than with winter-maturing fruit, because, as previously pointed out, conditions are not usually favourable for vigorous vegetative growth at the time the summer-crop flowers appear.

Suckers are borne in the axils of leaves on the stem proper: slips in the axils of bracts on the fruit stalk. Slips also differ from suckers in that primitive or abortive fruits develop at their bases. These appear to be subordinate flower-heads in which processes leading to the development of a fruit are inhibited at an early stage, after which growth of the terminal shoot becomes dominant. In the Smooth Cayenne variety, a type of shoot intermediate between suckers and slips sometimes develops in the vicinity of the junction of the fruit stalk and plant stem. These shoots possess the characteristic loose, open structure of a slip, but lack the abortive fruit or knob which distinguishes the latter type of shoot. In Hawaii, these intermediary shoots are known as "hapas," from the Hawaiian word meaning "half." Several different names are applied to slips in Queensland, some of which find usage only in certain localities. Names in common use are "gill sprouts," "buttons," "nibs," and "robbers."

The number of suckers or slips which may develop from an individual plant is determined not only by the environmental conditions affecting the vigour of the parent, but also by inheritance factors. Certain varieties consistently throw more suckers than others, e.g., the Queen, or Common Rough, which is very prolific in this regard. Plants of the Smooth Cayenne variety rarely produce more than four suckers, and usually not more than three, but their capacity for slip production

varies considerably. In this variety, a free suckering habit is usually correlated with a weak slipping tendency, and *vice versa*. A tendency to excessive slip production is a very objectionable characteristic, since development of slips on the parent plant takes place at the expense of the fruit. However, varietal strains can be selected and maintained in which the tendency to slip production exists only within defined limits. This fact has important practical applications, since slips are preferred for propagating purposes. Slip production occurs chiefly in the first or "plant" crop.

Ratooning.

Only one fruit is produced at the apex of any individual stem. After the fruit has been harvested, the portion of the fruit stalk remaining in the plant dries out and dies, and the leaves, which have fulfilled their function, begin to droop and wither. Long before the fruit is mature, however, suckers begin to develop from buds in the leaf axils towards the base of the plant. The points along the stem at which these suckers arise may be located either above or below ground level. The latter are referred to as "ground suckers" to distinguish them from those arising on the aerial portion of the stem. They shoot only from vigorously growing plants, and never very abundantly. The suckers are first nourished by the parent stem from the reserves of starchy materials stored in its tissues. Those which are not removed, and which receive adequate light and nourishment go through the normal vegetative and reproductive growth cycle and, about a year subsequent to the harvesting of the plant crop, another crop of fruit matures on them, which is known as the first-ratoon crop. As the first-ratoon fruit is developing on the primary suckers, these latter produce secondary suckers, which, in turn, produce the second-ratoon crop. In practice, the crop which is harvested in the year following the first-ratoon crop, is termed the "second-ratoon" crop, but an appreciable proportion of this crop is generally produced by late-flowering primary suckers. The delayed flowering in these "holdover" suckers, as they are called, results from shading or other repressive influences brought about by overcrowding. Ground suckers are apt to suffer particularly in this regard, and usually do not fruit until the second year. Moreover, the fruit produced by ground suckers, like that of second ratoons, is generally small and of poor quality.

To some extent, the delayed fruiting of ratoon crops can be obviated and the fruit size and quality improved by systematic thinning of the suckers. Unless this is done, or the rows have been widely spaced, a plantation rarely remains profitable after the second-ratoon crop has been harvested, because of the progressive reduction in the size of the fruit, and a consequent diminution in the yield. In the early days of pineapple-growing in Queensland, regular thinning of ratoon fields was assiduously carried out and, because of this and of the wide spacing of the rows which was then customary, it was possible, by careful cultural methods, to maintain such fields in profitable production over very long periods (Plate 258). When the production of fruit for fresh consumption is a prime consideration an advantage possessed by old ratoon fields over young plantations is that peak crop periods tend to disappear, since flowering is spread over most of the year. Consequently, the high prices secured during periods of scarcity compensate to some extent for the low average yields obtained.

(TO BE CONTINUED.)

Influence of Seasonal Conditions on the Development of Cercospora Leaf Spot of the Banana, with Special Reference to the Control Programme.

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THE fungus *Cercospora musæ*, which is responsible for the leaf spot of bananas here considered, has been known in the East Indies since the early part of this century, but was not regarded as a serious banana parasite until it became associated with a destructive epidemic in the Sigatoka district of Fiji in 1913. Ten years later it appeared in epidemic form in Queensland. More recently—in 1933—the organism appeared in Trinidad, and has since spread rapidly through the banana-growing areas of the West Indies and adjacent countries, where the disease probably now ranks next in importance to Panama disease.

In Queensland at the present time, leaf spot does not appear to be present in the extremely virulent form characteristic of the first few years of its introduction. A similar reduction in intensity seems to have taken place in Fiji. The rapid destruction of leaves characteristic of infection of an epidemic nature scarcely provides time for effective spore production, and would particularly affect the fungal population available for over-wintering purposes; hence it is possible that the more virulent strains have gradually become eliminated in favour of those of moderate effect.

Some doubt exists as to how much loss can be directly attributed to Cercospora leaf spot and how much to the association of this disease with unfavourable growing conditions and other diseases. Environmental conditions contributing to leaf spot damage in Queensland have been discussed by Simmonds (1933), and in New South Wales by Magee (1936). In Fiji, Parham (1934) has discussed various factors connected with soil, location, and cultivation in relation to the occurrence of banana diseases, particularly leaf spot. Poor drainage or a mechanical condition of the soil affecting the normal water relationships of the plant, is considered specially detrimental. In the West Indian region a number of workers, including Stell (1936, 1938), Smith (1937), and Larter (1938), Ward (1938), and Roger (1938), have commented on the association of severe leaf-spot damage with unfavourable growing conditions. Ward makes the statement that in Jamaica "severe damage has only taken place on lands which cannot be considered first-class banana lands for the sustained cultivation of the banana crop." This summarises in a general sense the opinion of the majority of authors cited here.

Development of the use of Fungicidal Control Measures.

While it is generally admitted that the choice of a suitable site for banana-growing will considerably reduce the damage resulting from the presence of leaf spot, it is not always economically possible to obtain such sites. Moreover, in years when climatic conditions favour the development of the disease, appreciable loss may occur even in good areas. Hence attention has been directed to the control of the disease by means of fungicides. In Queensland, applications of a copper carbonate dust did not prove successful (Simmonds, 1933). In a later experiment,

using Bordeaux mixture as a wet spray, in February and March, good control was obtained of speckle, but with regard to leaf spot the spray was only slightly effective. In Fiji, Surridge (1933) and Parham (1934) report the use of a number of different fungicides, but with indifferent results. A few years ago Magee (1936) stated that dusting experiments carried out in New South Wales showed no promise of success. In Queensland the position was taken that on the steep hillsides and with the poor water supply typical of plantations in this State, spraying operations in a normal season would scarcely be likely to justify the expense and labour involved. A more practical solution appeared to be the practice of bagging the bunches so that the fruit would fill out and mature normally in spite of leaf defoliation. The various advantages of this practice have been stressed by Mitchell and Miles (1936). The poor results which attended these earlier efforts at fungicidal control can be attributed in part to the empirical nature of the work, which was not based on a thorough knowledge of the complex relationships existing between the fungus, host plant, and meteorological conditions. The lack of efficient spreading agents to assist in effectively covering the waxy banana leaf was also a drawback.

With the spread of *Cercospora* to the West Indies and the losses suffered there, renewed attention has been focussed on the disease. The excellent work of Stahel (1937) on the biological relationships of *C. musæ* with the banana plant greatly contributed to the practical solution of control measures dependent on the application of fungicides. More efficient spreaders have also enabled a more effective covering of the leaf. As a result, the control of Cercospora leaf spot by the application of copper fungicides is now being practised in parts of the West Indian region, where economic considerations permit, with some success (Stahel, 1937; Ward, 1938). Renewed interest has also been taken in this question in New South Wales, and Magee and Foster (1938) have recorded good results from the application of 1-1-10 Bordeaux mixture plus Agral made according to several different schedules of an exploratory nature. It is possible that, with the additional knowledge now available, a modified spraying programme might be both practical and beneficial in certain favourably situated Queensland plantations.

While the possibility of obtaining a fungicidal control for leaf spot was still under consideration in Queensland, data were collected regarding the influence played by seasonal and weather conditions on the development of the disease. The object in view at the time was to determine the period at which sprays could be most effectively applied. With the reawakening of interest in this question, it is thought that the data, incomplete as they are, may be of considerable interest to those at present working on the subject and may lead to a quicker realisation of the most efficient and economical spraying schedules. Observations have been made in connection with natural field infection with *C. musæ* and with a small number of artificial inoculation experiments. Most of the work was carried out during the years 1933 and 1934.

The Life History of *Cercospora musæ* on the Banana.

As it is important to understand the biological relationships between *C. musæ* and the banana plant, a brief review will be made of Stahel's (1937) work on this subject, commenting on any features which do not appear to apply under Queensland conditions. According to this author, conidia germinate in a film of water, and the germ tube commences an

epiphyllic existence which may last from four to eight days, depending on the extent moisture is present on the leaf. The germ tube then penetrates through a stoma and commences a parasitic existence of about twenty days in the air chamber between two veins. The initial streak stage, consisting of a faint greenish-brown line 5 to 10 mm. long, is eventually produced as a result. After this stage is reached, brown hyphæ grown out through the stomata of the mature streak and extend in an epiphyllic manner for 2 to 3 mm. around the streak. Infiltration of the underlying tissue takes place by a guttation process, and the fungus penetrates the infiltrated tissue from the outside through the stomata. This results in the production of a narrowly elliptical brown spot—the brown stage. One or two days after the second epiphyllic stage commences, acervuli may start to form below the stomata of the brown area. After one or more weeks, during which spore production may take place, the brown spot dries out in the centre and becomes grey.

From observations which will be described in more detail later it appears that the different developmental periods are not necessarily always of the same duration as given by Stahel. Moreover, it is doubtful whether the second epiphyllic stage of the fungus and the infiltration are of as general occurrence as one would infer from his writing.

By artificially inoculating banana leaves on both surfaces, Stahel showed that the lower surface was very much more susceptible than the upper. He also deduced from sixty-two inoculations on the lower surface that the two youngest leaves are by far the most susceptible, the third is much less so, while the fourth and fifth are scarcely susceptible at all. This is not fully in accord with the inoculation experiments described below.

As a result of the incubation period, lesions may not become noticeable until the infected leaf is the second to the fourth from the top, depending on the rate of growth of the plant. In Queensland the first appearance of new streaks is most commonly seen on the fourth youngest leaf, though it is quite frequently seen on the third and the fifth. It must be remembered that Stahel's experiments were carried out with the Congo variety of banana, and those in Queensland with the Cavendish.

Artificial Inoculation Experiments.

Four artificial inoculation experiments have been carried out in Queensland, and these are of interest in connection with the field observations to be recorded later. These experiments were all carried out in the departmental plot in Brisbane where no leaf spot or other disease was present to confuse the result. As *C. musæ* does not form spores in artificial culture, spores were, perforce, obtained from suitable fruiting material collected in the field. For inoculation a suspension of the spores in water was applied by means of an atomiser. By regulating the number of squirts, approximately equal amounts of inoculum were applied to each leaf or half-leaf in each experiment. Except in the case of Experiment IV., the plants were moderately young. The leaves are numbered from the youngest down. The nature of the experiments was as follows:—

Experiment I.—Two plants inoculated on 11th January, 1933. Spore suspension applied to the upper ten leaves of each—on the right-hand side of the leaf to the upper surface, and on the left-hand side to the lower. Spore germination in banana-leaf infusion was 80 per cent.

Experiment II.—One plant inoculated 26th January, 1933. Spore suspension applied to the top ten leaves over the whole of either the upper or lower surface as follows: Leaves 2, 4, 6, 8, 9 on the upper side, and leaves 1, 3, 5, 7, 10 on the lower side. Spore germination in leaf infusion was 66 per cent.

Experiment III.—One plant inoculated 20th February, 1933. Suspension applied to both surfaces of six inoculated leaves. Four leaves enclosed in glacene sleeves for varying periods and sprayed at intervals with water to ensure the presence of moisture or, at least high humidity. The period of enclosure was as follows: Leaves 4 and 9 no glacene; leaves 5, 6, 7, and 8 enclosed for 64, 24, 16, and 40 hours respectively. Spore germination in leaf infusion was 85 per cent.

Experiment IV.—One plant about three-quarters grown inoculated 9th March, 1939. Suspension applied to leaves 2, 3, 4 and 5 on the right-hand side of each to the upper surface and the left-hand side to the lower surface. Leaf 1 was not unfurled, and a varying amount of inoculum was applied to the inner and outer surfaces of the funnel.

After inoculation, the plants were kept under observation and the first appearance of lesions of the streak stage noted. The streaks were marked with Indian ink when first observed so that any fresh developments could be distinguished. (In Experiment IV. the total number of streaks were recorded at each examination.) The time at which streaks subsequently passed to the brown stage was also recorded. The results from these four experiments are summarised in Tables I. and II.

TABLE I.

THE NUMBER OF LESIONS DEVELOPING ON BANANA LEAVES SPRAYED ON THE UPPER OR LOWER SURFACE WITH A WATER SUSPENSION OF CERCOSPORA MUSÆ.

Experiment.	Surface.	Positional Number of Leaf from Youngest Down.										Totals.
		1	2	3	4	5	6	7	8	9	10	
I. ..	Upper	0	*158	21	0	0	0	*39	0	0	0	218
	Lower	2	*143	21	19	1	0	*51	0	0	0	237
II. ..	Upper	..	7	..	31	..	0	..	0	0	..	38
	Lower	274	..	280	..	36	..	0	..	..	0	590
III. ..	Both	..	..	..	5	*46	*72	*8	*13	4	..	..
IV. ..	Upper	0	16	92	276	491	..	..	..	..	..	875
	Lower	65	630	1,123	703	462	..	..	..	..	..	2,983

* Leaf enclosed in glacene sleeve for certain period (*see* text).

In a general sense, Stahel's contention that it is the youngest leaves which are most susceptible to infection holds for the Cavendish banana in Queensland, but it is evident that, provided conditions are suitable—and moisture may be the most important factor in this respect—quite extensive infection may take place in leaves older than the third youngest—for example, the fourth and fifth.

The lower surface of the leaf is definitely more open to infection than the upper. The proportion in favour of the lower surface—including the figures for Experiment I., which may be abnormal—is over three to one.

The development on those leaves enclosed in a glacene sleeve emphasises the important part played by the presence of moisture in

infection. The limited interpretation which may be placed on Experiment III. suggests that the minimum period for which moisture must be present to ensure satisfactory infection lies between sixteen and twenty-four hours.

Influence of Environmental Conditions on Infection Judged from the Artificial Inoculation Experiments.

An attempt was made to correlate the time of infection and length of the developmental periods shown in the inoculation experiments with the prevailing weather conditions and thus have information available to apply in the field. Exact meteorological data were available for this purpose from the Brisbane Meteorological Office.

The development of the streak stage in the four experiments just described and data regarding temperature, humidity, and rainfall are contained in the accompanying graph on page 638. It is unfortunate that, owing to the writer's absence, the first two observations on Experiment IV. were rather widely separated. It should be noted that in Experiment IV. each unit represents eight times the number of streaks as in I., II., and III.

The temperature recorded is the average of the daily minimum and maximum. Rainfall is given for the twenty-four hours, midnight to midnight, with anything less than ten points omitted. A distinction has been made between effectual (continuous line) and non-effectual (broken line), the difference being that in the case of the former the rain has fallen more or less continuously throughout the day. "Day" is used here in the sense as distinct from the night. The reason for this differentiation will be discussed later. High relative humidity has been indicated by a cross, which signifies that on the day marked the humidity was 80 per cent. or over at each of the 9 a.m., 3 p.m., and 9 p.m. readings. It should be noted that after 7th March the temperature, rainfall, and humidity data refer to 1939—the year in which Experiment IV. was carried out.

Below the base line horizontal lines indicate the incubation period from the probable data of germination to the appearance of the first visible streaks. In the case of leaves enclosed in glacene, the dates of inoculation and germination probably coincide. In other cases, germination is assumed to have taken place on the first day that suitable conditions, judging from weather records, occurred. Confirmation of the dates selected is available in some instances. For example, a consideration of the detailed daily weather information shows that germination in the case of Experiment II. evidently took place on 27th January. The first streaks appeared on 24th February. The first streaks from Experiment I., no glacene, appeared at the same time as these, and it can be inferred that germination in the case of the latter experiment was delayed until 27th January also. Although actual proof that the dates selected are the correct ones is not forthcoming, there is strong circumstantial evidence that in most cases they are so.

The nature of the rainfall is important from the point of view of providing conditions suited to germination and infection, especially in view of the early epiphyllic existence of the fungus. Simmonds (1933) states that spores of *Cercospora musæ* take from twelve to eighteen hours, or even longer, to germinate. Stahel (1937) records that a film of moisture is required for the growth of the germ tube, and the results

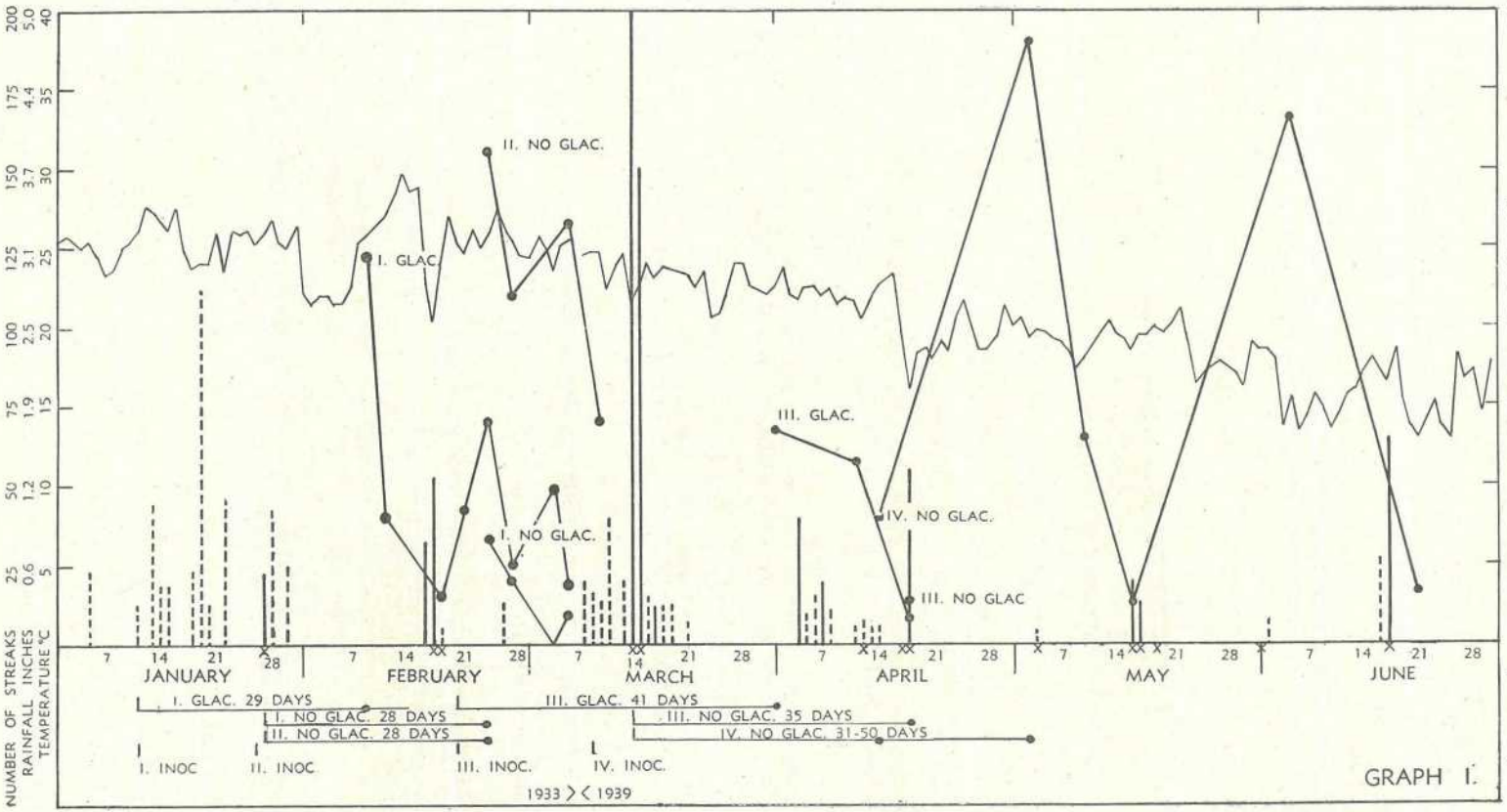

II. NO GLAC.
I. GLAC.
III. GLAC.
IV. NO GLAC.
I. NO GLAC.
III. NO GLAC
NUMBER OF STREAKS
RAINFALL INCHES
TEMPERATURE °C
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
I. GLAC. 29 DAYS
I. NO GLAC. 28 DAYS
II. NO GLAC. 28 DAYS
III. GLAC. 41 DAYS
III. NO GLAC. 35 DAYS
IV. NO GLAC. 31-50 DAYS
I. INOC
II. INOC
III. INOC.
IV. INOC.
1933 > < 1939
GRAPH I.

Plate 264.

of Experiment III. just described suggest that at least sixteen to twenty-four hours' continuous moisture may be necessary for satisfactory completion of the infection process. These points suggest that heavy dews or night rains would be insufficient to initiate infection. In the different artificial inoculation experiments, a comparison between the time of appearance of streaks when moisture was supplied artificially and when germination was dependent on natural precipitation, considered in conjunction with the rainfall record, indicates that more or less continuous moisture for at least a day and night period is required to initiate infection, and for specially high infection longer periods are necessary. Rainfall of short duration, even though heavy, does not appear to have been efficient for this purpose. This hypothesis is supported by the results of field observations which will be described later. Hence rain is not considered to be effectual unless it falls throughout the greater part of the day time. Heavy dew or intermittent showers may supply sufficient moisture during the night. In the same way, high humidity, to exert a determining influence, must continue through the warm as well as the cooler parts of the day.

The effect of temperature is fairly well defined. The length of the incubation period required before streaks develop increases with decrease in temperature. The period over which new streaks may appear as a result of the one inoculation also lengthens at the same time. The times taken for the streak and brown stages to develop after germination are given in Table II.

TABLE II.

DAYS INVOLVED IN THE DEVELOPMENTAL PERIODS WHEN BANANA LEAVES ARE ARTIFICIALLY INFECTED WITH CERCOSPORA MUSÆ.

Experiment and Date of Inoculation.	Glacene or no Glacene.	Germination to Streak Stage.	Initial Streak to Brown Stage.	Shortest Period from Initial Streak to Fruiting.
		Minimum Maximum.	Minimum Maximum.	
I. 11–1–33	In glacene	29 — 54	3 — 23	16
	No glacene	28 — 38	3 — *14	5
II. 26–1–33	No glacene	28 — 42	2 — 29	9
III. 20–2–33	In glacene	41 — 57	8 — 23	11
	No glacene	35 — 35		
IV. 9–3–39	No glacene	31 — 71	19 — *103	33
Extremes for the series ..		28 — 71	2 — 103	5 — 33

* Approximate.

The minimum period from germination to the development of the streak stage appears to be about a month, but this may extend to over two months. The streaks either pass rapidly in the course of a few days to the brown stage or this transition may be delayed for as long as three months should cool weather intervene. In Experiment IV. leaves which were the first and second youngest at the time of inoculation exhibited a few streaks, passing to the brown stage nearly six months later, when these leaves were commencing to show signs of failure due

to old age. Providing moisture conditions are suitable, spore formation is probably possible as soon as the brown stage is reached, but is usually delayed, awaiting rain or heavy dews to stimulate development.

The appearance of streaks in peaks of development subsequent to the first appearance is of interest and difficult to explain satisfactorily. In a few instances this might be due to germination in a second period of more favourable weather, but the length of the incubation periods do not permit of this explanation in many cases. A more probable explanation is that the fungus is present within the tissues in an inactive or latent condition, and requires a lowering of resistance on the part of the host such as might occur with the ageing of the leaf or as a result of a sudden drop in temperature.

Although not shown on the graph, it is a matter of frequent observation in Queensland that quite a number of the initial streaks never reach the brown stage or that their transition to this stage is considerably delayed. This phenomenon also appears to be linked with host resistance, since streaks which have been dormant for long periods have been observed to pass to the brown stage as the leaf ages or is weakened by the invasion of other fungi. It is possible that growing conditions exert their influence on leaf-spot development by accelerating or retarding the transition of the streak to the brown stage, on the appearance of which actual damage depends. For example, Croucher (1938) records a case arising out of fertilizer trials in Jamaica where excess phosphate, in the absence of adequate potash, was conducive to premature leaf-ripening, which, in turn, affected the severity of leaf-spot attack.

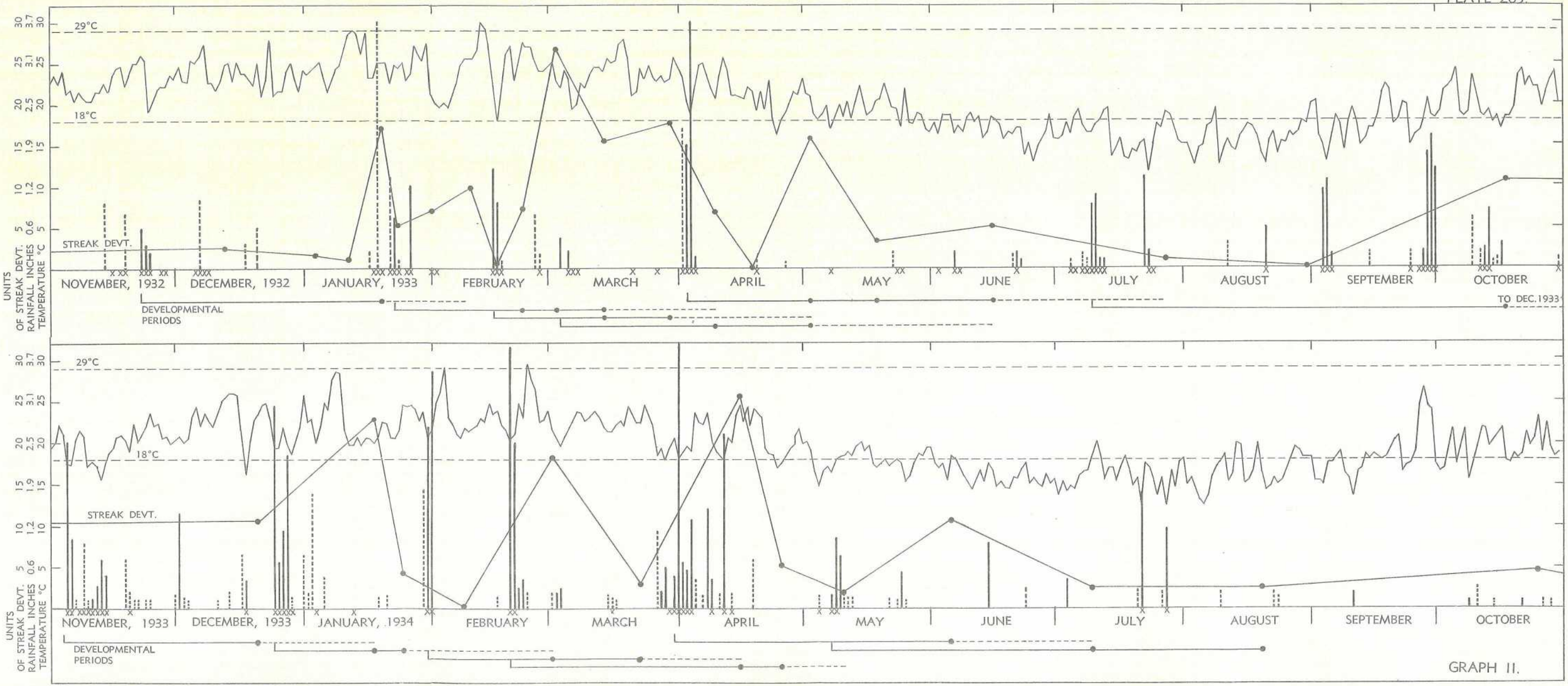
Field Observations.

The artificial inoculation experiments just recorded were supplementary to field observations directed to obtain more comprehensive information on the effect of seasonal conditions on leaf-spot development. This work was carried out over the period from September, 1932, to December, 1934. Detailed observations were restricted to the plantation of Mr. F. J. Calvert, Mount Mellum, via Landsborough, but were supplemented by notes taken from time to time elsewhere.

At Mount Mellum several plants, varying in number during the course of the work from five to ten, were selected for observation purposes. These plants differed in age, but were at least half-grown rather than younger, and several bunched during the course of the experiment. The plantation was visited as opportunity permitted, the visits being more frequent during the summer months, when leaf spot is more active in its development. At the time of visiting, the leaves on each plant were numbered in series for record purposes, and observations were made for streak development. The number of new streaks was recorded for each leaf. When not too numerous, all fresh streaks were marked with Indian ink so that any subsequent developments could be distinguished. Note was also taken of the time at which the streaks passed into the brown stage. The time when individual leaves died and the reason for their death were also recorded.

Meteorological data were obtained as a result of assistance rendered by Mr. Calvert. In addition to recording actual precipitation, Mr. Calvert supplied details of the nature and approximate duration of the rainfall and relevant comments on the weather in general. Humidity and temperature were recorded on seven-day charts by a thermo-hygrograph situated near the plantation.

PLATE 265.



GRAPH II.

The relevant data have been expressed graphically in Graph II. When recording the number of streaks present, it was necessary at times to make an estimate if the spots were too numerous to count satisfactorily. To obtain a numerical basis for graphical representation, streaks, when numerous, were counted as 50, and very numerous, as 100. This, on the average, is considerably on the low side, so that the peaks were actually relatively higher than recorded. The average number of new lesions per plant examined divided by five gave the unit employed in the graph.

Below the base line horizontal lines connect each main peak outbreak with the probable date or dates on which infection occurred, as in the previous graph. In addition, a dotted line extends to the date on which 50 per cent. or more of the original streaks had passed to the brown stage. This represents the approximate date on which the result of the particular infection would become obvious in the plantation.

The method of expressing the meteorological data is essentially the same as for the first graph. Continuous and interrupted lines distinguish between effectual and non-effectual rainfall. The former represents a day which was overcast throughout, with rain falling continuously throughout the greater part. The latter represents a fall of short duration during the day or night, or continous rain falling only at night. Humidity is recorded by indicating with a cross those days on which the relative humidity was 80 per cent. or over throughout the whole twenty-four-hour period. Horizontal dotted lines mark off the temperature range within which the fungus *Cercospora musæ* is capable of 75 per cent. of its maximum growth.

Influence of Rainfall and Humidity.

Rainfall is important from the point of view of providing suitable conditions for the initial germination and development of the germ tube, and later for the production of spores on the mature spots and their dissemination. In linking an outbreak of streaks with a particular period of rainfall, the hypothesis discussed in connection with the artificial inoculation experiments has been made use of—namely, that, for infection to take place, more or less continuous rain for the whole of one day and moist conditions during the night are required. Working on the hypothesis of effectual and ineffectual rainfall, it has been possible to link each outbreak with a previous period of suitable wet weather. In making this correlation, advantage has been taken of the knowledge that the leaves are most susceptible in their younger stages, and, when tracing back the infection date, the day that a suitable fall of rain occurred when the particular leaf was in its susceptible stage was taken to be the date required. The information gained in the inoculation experiments regarding the dormancy periods at different times of the year has also been considered, and it has not been necessary to postulate infection, unless of a very minor nature, at any period other than during rainfall conditions of the nature described.

While one day's continuous rain is considered essential for satisfactory germination, it is probably necessary to have this supported by one or more days' additional rain or by several days on which the humidity is exceptionally high throughout the twenty-four hours. It will be noted that for the majority of points at which infection is judged to

have occurred such conditions have prevailed. The few days of epiphyllic existence which Stahel has described would certainly suggest the need for these conditions.

It will be noted that high humidity readings are, for the most part, associated with rainfall, and particularly with those periods in which infection has probably occurred. This high relative humidity supplements the effects of the rain by preventing evaporation of the surface film on the leaf, and ensures against desiccation of the germ tube during short intervals of clear weather.

Although not brought out in the graph, another very important function of rain is connected with the production and dissemination of spores. Stahel (1937) has recorded that conidia are produced only when the lesions are covered with a film of water such as produced by heavy dew or drizzling rain. A similar state of affairs evidently exists in Queensland, since the production of heavy crops of conidia after a day or two of wet weather has been a matter of common observation. Spore dissemination, no doubt, takes place readily by means of air currents, but it must be remembered also that the broad, flat leaves of the banana are specially adapted to distribution and reception of spores by means of raindrops, particularly by splashing from the old lesions below to the under highly susceptible surface of the young leaves above.

It will be noted that the year 1933 had a comparatively dry summer compared with the wet year 1934. However, although the falls were light in the former case, there were sufficient rainy periods to give rise to approximately the same number of peak outbreaks in 1933 as 1934. Although not brought out in the graph, infections in 1934 were more intense. This is reflected in the records of the actual cause of leaf failure in the observation plants over the two years. Throughout 1933, 1·5 leaves per plant died from leaf-spot attack as the major cause, while 12·7 died as a result of speckle and for natural reasons. In 1934, 6·8 leaves per plant were judged to have died from leaf-spot infection as the major factor, and 8·2 from other causes. In both years many leaves, at the time of their failure, were affected by more than one disease. Where the proportions were such that a decision regarding the major cause of death was difficult, half a leaf was allocated to each cause in computing the above figures.

A winter rainfall associated with abnormally high temperatures such as occurred in July, 1933, is scarcely likely to be repeated very frequently. In this instance it had the effect of providing an abnormally high streak and brown-spot development in the early summer months following. This would be expected to accelerate the ensuing summer outbreaks.

Influence of Temperature.

The most striking feature shown by the graph is the effect of temperature on the development of the disease. The temperature relationships of *C. musæ* have been worked out by Simmonds (1933). The optimum for vegetative growth is about 25 degrees to 26 degrees C., and that for spore germination and germ-tube development is somewhat higher. A fair spore germination is possible at lower temperatures, but the time required may be extended to as long as forty-eight hours. For practical purposes, the temperature range within which it is possible to obtain a growth equal to 75 per cent. or more of the maximum is considered of more use than the optimum itself, since the latter by no

means lies at the centre of the range over which normal vigorous growth is possible. For *C. musæ* this 75 per cent. maximum range lies between 18 degrees and 29 degrees C.

It is obvious that, in Queensland, summer temperatures are those most suited to leaf-spot development. As soon as the average daily temperature approaches the 18 degree C. line there is a marked falling-off in leaf-spot development. During the five or six cooler months—from May to October—the disease is practically at a standstill. This quiescence is aided by the fact that these months are also the driest. The infection occurring in July, 1933, is of interest. A period of effectual rainfall commencing on 10th July and supplemented by further showery weather and high humidities chanced to coincide with a period of abnormally high temperature, with the result that a moderate incidence of leaf spot developed in late spring. According to leaf records, it is very unlikely that the streaks recorded for October were due to infection later than this July period.

Although infection and development of the fungus is at a minimum during the cooler months, there is a somewhat paradoxical position created by the effect of the disease on the plant appearing at its maximum during these months. Quite a lot of the infection occurring during the summer months does not make its appearance in the brown stage until April or later, and it is not until this stage is reached that the disease can be considered an agent in leaf destruction. With the advent of cooler weather, the rate of leaf production decreases considerably, so that the replacement of diseased leaves by younger healthy ones is of little consequence and a greater proportion of the plant's total leaf area is destroyed. In the case of the older plants, the most prolific bunching takes place in Southern Queensland from December to March. Those bunches thrown during February and March, and possibly some of the earlier ones, will not mature until well into the winter. The last leaves of these plants pass through their suceptible period during the time of maximum leaf-spot activity in January and February, and consequently are liable to heavy infection. This results in the death of these leaves during the autumn and winter months, with the resulting spectacle at this time of bunches hanging from plants which are practically devoid of leaves.

Another temperature effect, and one which was brought out also in the artificial inoculation experiments, is the lengthening, as temperature falls, of the minimum incubation period required between germination and the appearance of the streak stage. The maximum period taken for the streaks to develop is also extended in the same way. For example, the minimum incubation period for January and February infection is approximately a month, and the maximum seven to nine weeks. Later in the year the minimum may be as long as, or longer than, the previous maximum, and the maximum itself extends to three and a-half months.

The time taken for the streak to pass into the brown stage does not appear to be so definitely related to seasonal temperature, which suggests there is little further vegetative growth on the part of the fungus associated with the transition to this stage.

The trend of temperatures over some periods in 1933 was higher than in 1934, and this is reflected in a shortening of the developmental periods in certain cases in the former year as compared with the latter.

There is also an indication of another temperature reaction which cannot at the present time be definitely established. This is the suggestion that the transition from the streak to the brown stage is stimulated by a sudden fall in temperature. It will be noted that the points at which 50 per cent. or more of the streaks of any one infection have passed to the brown stage is preceded in most cases by a fairly substantial fall in temperature. It is conceivable that with a tropical plant like the banana a sudden drop in temperature would affect the physiological activity of the tissues. Jones (1938) has shown that a sudden drop in soil temperature induces definite physiological changes in the gardenia plant, including a rapid senescence of the older leaves. A similar effect, if less pronounced, may occur in the case of the banana.

Application of Data to Spraying Procedure.

The observations discussed in the preceding paragraphs cover only a two-year period which, however, included years of distinctly different rainfall and temperature types. The information derived from them can therefore be considered reasonably reliable and has a very direct bearing on the conduct of a spraying programme. Simmonds (1933), as a result of indirect experiments carried out in 1930, suggested the association of heavy outbreaks of leaf spot with periods of prolonged rainfall and high humidity occurring five to seven weeks previously. A period of delayed development, rather than a cumulative multiplication, was considered to account for the long interval between the infection point and the epidemic outbreak. This hypothesis has been confirmed by the present investigation. Leaf-spotting appears to result from a series of distinct germination points closely related to rainfall. The early streak stages resulting from a single infection period do not necessarily appear together, but may appear in a series of more or less marked waves, giving a false impression of a multiplication of infection points. The period required from germination to the appearance of the first streak symptoms is rarely less than a month, and may extend during the autumn and winter to over three months, with the period for the production of the obvious necrotic brown stage even longer. This is very misleading from the point of view of timing applications of a fungicide.

In both 1933 and 1934 the last infection period which produced a noticeable wave of leaf-spot development occurred in early April. It is doubtful whether the amount of spot development in either of these cases was of sufficient consequence to merit consideration in the control programme. (At the peak of 3rd May, 1933, less than half the streak development was due to the April infection.) This would suggest that March would be the last month in which spraying would be justified, and even then earlier application would be of greater importance.

In the early part of the summer the first definite peak does not occur until January. There are several reasons for this. In the first place, temperature conditions are on the low side until October. Secondly, as a result of the long winter period of *Cercospora* inactivity, most of the affected leaves have reached the senescent stage by the time spring arrives. These die and are replaced by new healthy spring growth. Hence, by the time the weather is sufficiently warm for further fungus activity to take place, the source of spore inoculum is at a minimum and requires a little time to accumulate again. Furthermore,

the spring rainfall normally occurs as thunderstorms of short duration and is of the non-effectual type. Possibly, a December infection is the first to be taken seriously. However, the checking of earlier ones such as may occur in November, even though they be less severe, may serve a useful purpose in reducing the future source of inoculum.

There now remain for consideration the months of January and February. Without any doubt, these are the ones during which protection is most necessary under Queensland conditions. In both years the main outbreaks, apart from the first, could be traced to infections taking place in these two months. It is during January and February that temperature conditions are most favourable and the rainfall of the type most suited to infection.

Another question which comes up for consideration is the stage in the growth of the plants at which a supply of healthy leaves is most needed. As a result of the dormancy displayed by the fungus and the continued production of leaves, young plants usually have at least four to six green functioning leaves even when leaf spot is prevalent. This is apparently sufficient to carry the plant through the critical autumn and winter period until better conditions prevail. Once the bunch is thrown, the position is different. No further leaves are produced, and infection advances more or less rapidly, so that in an epidemic year the developing bunches may be left without any protection, and are then subject to sun-scald and poor development. It is therefore most important that the last half-dozen or so leaves appearing before the bunch should be ones protected from fungal invasion. Unfortunately, from this point of view, the normal tendency is for bunches to be produced more abundantly during that part of the year when leaf spot is at its worst. More than 50 per cent. of the year's total production of bunches may be expected to appear during the months of December to April, inclusive, and all of these are liable to more or less defoliation.

The rate of leaf production at different times of the year is of some importance. According to unpublished data kindly supplied by the Horticultural Section of the Division of Plant Industry (Research), this rate varies on well-grown plants from three to four leaves per month from November to February to not more than one a month in the middle of winter. Hence, provided infection periods are sufficiently widely spaced, any one application of fungicide made in the summer-time will protect a greater number of leaves than at any other time. On the other hand, if protective measures are not taken, a greater number will be available for infection at this time.

The information available with respect to the timing of sprays may now be summarised as follows:—

(1) The months during which serious infection is liable to occur are December to March, inclusive, with January and February the most important of the four. In certain seasons this period may also include the later half of November and the first half of April, although the developments having their origin in these two months can be expected to be definitely less extensive.

(2) The majority of bunches for which protection is required make their appearance during the months of December to April. Since serious early infection is unlikely, a fungicide applied to protect January bunches should normally be in time to protect December bunches also, and a prior application for them is rendered unnecessary.

(3) During the summer months, with a normal rate of leaf production, it would be necessary to apply a fungicide at intervals of between a week and a fortnight to ensure that all leaves are protected. This, of course, would be impracticable in most cases, and the number of applications has to be based on economic considerations. These are largely determined by the topography of the plantation, source of an adequate water supply, and the financial position of the grower.

According to the number of applications considered practicable, certain theoretical recommendations, based on the data contained in this paper, can be made regarding their timing. These are as follows:—

Four applications: Early December, early January, late January, late February.

Three applications: Early December, mid-January, and mid-February.

Two applications: Early January, early February.

Other applications, the advantage of which could scarcely be predicted without experimental evidence, are a spray in early November to reduce the initial source of inoculum, and one in March to reduce the latter end of summer infection.

The theoretical recommendations given above receive some practical confirmation from a report by Magee and Foster (1938) on spraying experiments recently carried out by them in New South Wales. The spray used was 4-4-40 Bordeaux mixture + Agral III. and was applied so as to cover the lower surface of the two youngest leaves. Excellent control of leaf spot was obtained by monthly applications from mid-December to mid-April. Good control was obtained by applications in January and February. Only fair control was obtained by applications in January and April; December, February, and April; and December, March, and May. In the last three schedules it is evident that the important period of January and February was neglected for periods when infection is normally light. It is understood that further experiments are projected in New South Wales, and it will be of interest to see how much further theoretical deduction will be borne out in practice.

In spraying the banana plant, it is useful to remember that the smaller amount of infection occurring on the upper surface allows the operator to neglect this and concentrate on covering the lower surfaces. The application can be further simplified by spraying not more than the four youngest leaves, as serious infection of any older than these is unlikely. Once the bunch has emerged and all young leaves have been satisfactorily sprayed, it is doubtful whether any further benefit will be obtained by covering the leaves a second time. The leaves should be resistant to attack by the time the spray is washed off them. Only those plants likely to bunch during the months of December to April, inclusive, need receive a spray.

Acknowledgment.

Very grateful acknowledgment is made of the valuable assistance rendered by Mr. F. J. Calvert, formerly of Mount Mellum, in connection with this work. The meteorological records for which he was entirely responsible form the basis on which the discussion rests.

Summary.

The influence of meteorological and seasonal factors on the development of banana leaf spot (*Cercospora musæ*) is discussed for conditions in Southern Queensland. The discussion is based on artificial inoculation experiments and field observations, the results of which are presented graphically, together with the relevant meteorological data.

The effect of temperature, in a broad sense, is to limit the activity of the fungus to the warmer months of the year. It also determines the length of the dormancy period, during which evidence of the presence of the parasite in the form of necrotic symptoms is absent. The type of rainfall is the factor determining the actual infection rate, and, to be effectual for germination, rain must fall more or less continuously throughout at least one day.

The peak outbreaks of the disease have been traced to their probable infection date, and on the data thus obtained theoretical recommendations are made with respect to the timing of sprays. January and February are the months in which control measures are most necessary.

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Fodder Conservation Scheme on the Atherton Tableland.

L. WOOD, Field Assistant.

DETERIORATION of pastures on the Atherton Tableland during the past fifteen years has become a matter of deep concern to the dairy industry. Officers of the Department who have made a close study of this problem are of the opinion that the damage to a large extent is caused by a white grub, the larvæ of a scarabæid beetle. The grub, being a voracious feeder, attacks the grass roots during its feeding stage, which extends over a period of approximately twenty months. So great is the resultant damage to the pastures that acre after acre of dead grass and bare patches may be observed throughout the affected areas.

The necessity for fodder conservation on a wide scale, as a consequence, becomes more and more evident as infestation extends. Having this in mind, and with a view to assisting farmers in the affected areas in the construction of silos, the Government stationed an officer in the district to specially advise and assist in this work. As the construction of a silo presents difficulties to the average farmer, often because of the lack of definite constructional details, this assistance is appreciated accordingly.

The concrete collar type of silo is regarded as the most suitable for the Atherton Tableland, which is composed mostly of red volcanic soil to a depth well below that required for a pit silo. This type, being much cheaper and simpler in construction, is, naturally, preferred to the tower silo in localities where the soil and subsoil are suitable. This can be determined by an examination of a well in the vicinity and the strata through which it has been sunk, or by boring. The suitability of the soil in which it is proposed to construct a concrete collar type of pit silo is obviously of first importance, for the possibility of the pit caving in must be considered. Following are the particulars of the actual construction of such a silo:—

The sinking of the pit presents the biggest difficulty, because of the scarcity of suitable labour. The labour cost, which includes the placing of the concrete collar, the erection of the covering shed, and the sinking of the pit, is approximately £36; but much of this outlay can be saved if the farmer does the work himself.

A shed covering, 8 feet high, 24 feet long, and 18 feet wide erected over the pit is necessary as a protection from weather, especially during the wet season.

To facilitate the digging of the pit, and the emptying of the silo when filled and as required, a hoist is placed in position under the shed. This hoist is usually hinged on to one of the posts or pivoted to a heavy sill-piece, to allow it to swing over the pit and around to the outside of the shed, as illustrated (Plate 266).

When sinking the pit, the earth, or spoil, is hoisted out of it in a large drum with a hinged bottom and a lever catch attachment. The drum full of spoil is pulled to the surface by a horse, lifted clear of the

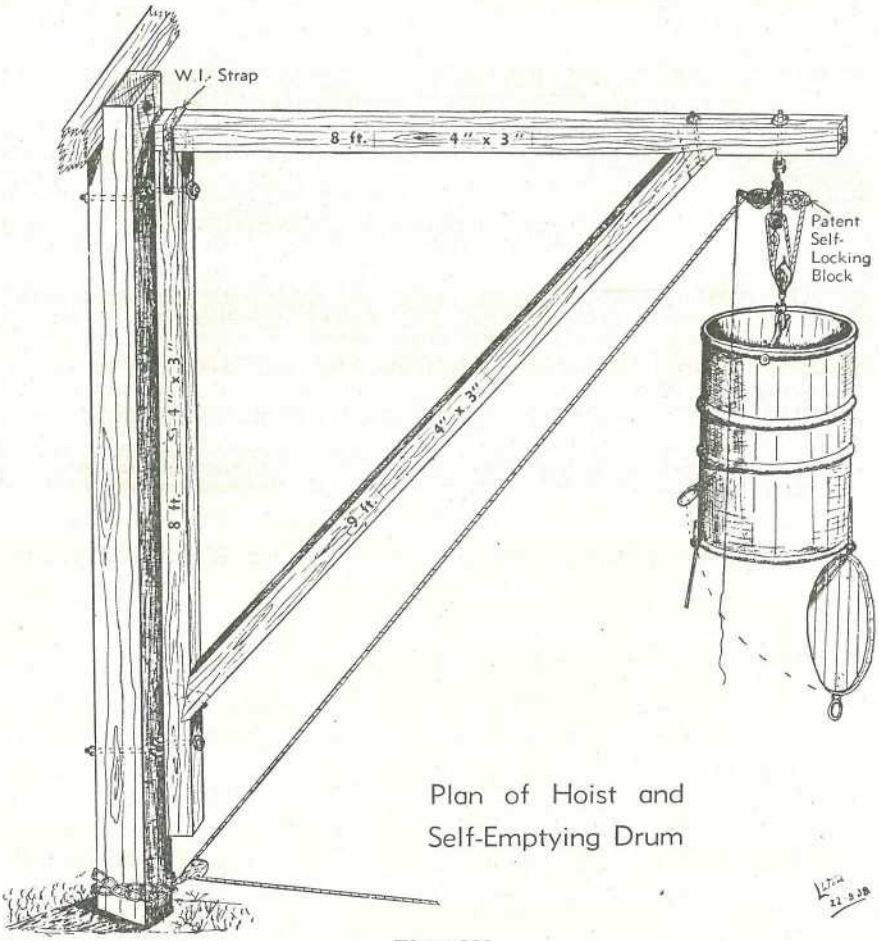


Plate 266.

pit, and, while the drum is suspended in the air, the catch is released, the hinged bottom of the drum drops, and the contents are deposited on a dray or where it may be easily removed afterwards with a horse and scoop (Plate 267).

With the hoisting gear is a patent self-locking pulley which locks and keeps the load in any position without tying or holding the hoisting rope, as the locking device comes into action the moment the rope is slackened. This self-locking block ensures safety for the man working in the pit.

Moulds for use in the concrete work have been made available by the Department, and the only cost to the farmer for their use is for transport.

The moulds designed for the construction of silos are built in sections 5 feet 3 inches long and 3 feet high, having eight inside and eight outside sections, which are bolted together to form a circle 14 feet in diameter and 4 inches thick.

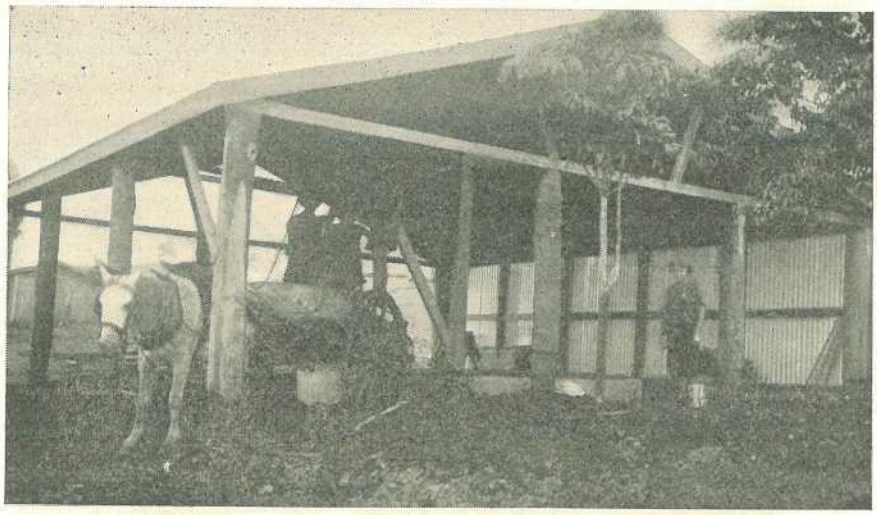


Plate 267.
REMOVING THE SOIL FROM THE PIT WITH HORSE AND DRAY ON THE PROPERTY OF T. M. BRADY, MALANDA.

In constructing a silo, it is necessary to first mark out a circle 14 feet 8 inches in diameter and excavate this to a depth of approximately 4 feet. This depth is usually sufficient to ensure that the collar is placed well below the loose surface soil. The ultimate depth of the pit is usually twice the diameter—that is, a pit 14 feet in diameter should be, say, 28 feet deep.

In excavating the pit, it is best to allow 3 or 4 inches of the wall to be removed in the trimming.

To trim the walls, a piece of timber is placed across the diameter of the excavation, and held in position with pegs. Through this timber a

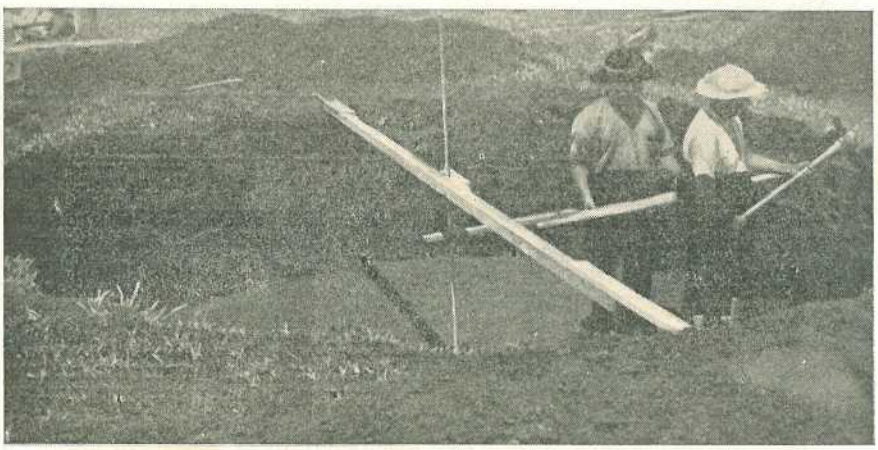


Plate 268.
TRIMMING THE PIT.

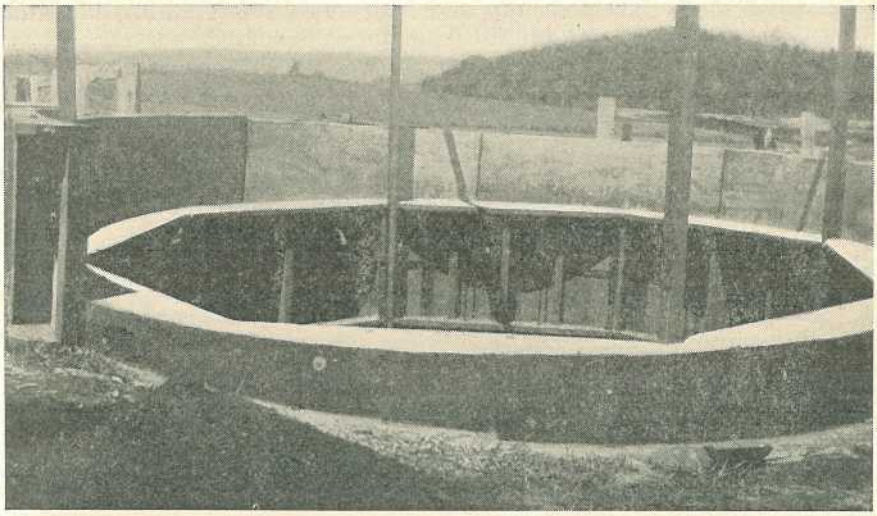


Plate 269.
The Moulds in Course of Removal, G. Waugh's Farm, Peeramon.

hole is bored to allow a length of piping to be placed vertically in the centre of the pit. A board half the diameter of the desired excavation in length is then made to revolve around the pipe, which is kept plumb. This board acts as a guide or indicator, so that the walls may be trimmed perfectly true with a sharp mattock or old adze, as illustrated (Plate 268). When the walls have been trimmed and the bottom of the pit levelled, the inside set of moulds is placed in position and filled with concrete.

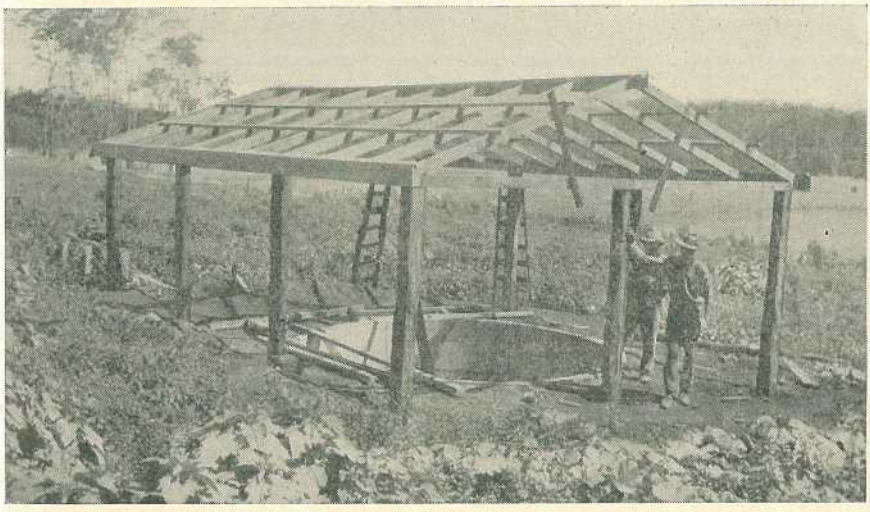


Plate 270.
Covering Shed in course of Construction, J. Aitcheson's, Kulara.

If handled carefully, the moulds may be removed the following day, and be set up for the next lift and filled again. It is not necessary to use the outside set of moulds until the top of the pit is reached (Plate 269). When both sets of moulds are used, it is necessary to place spacing pieces between to ensure that the correct thickness of the wall is maintained. After the moulds have been removed, a circular wall of concrete 4 inches thick, 14 feet in diameter, 1 foot 6 inches above and 4 feet below ground-level remains. This forms the top collar of the pit.

The erection of the shed covering is now proceeded with, and provision should be made to allow space at one end of the shed to give some protection from the weather for the workmen engaged in filling

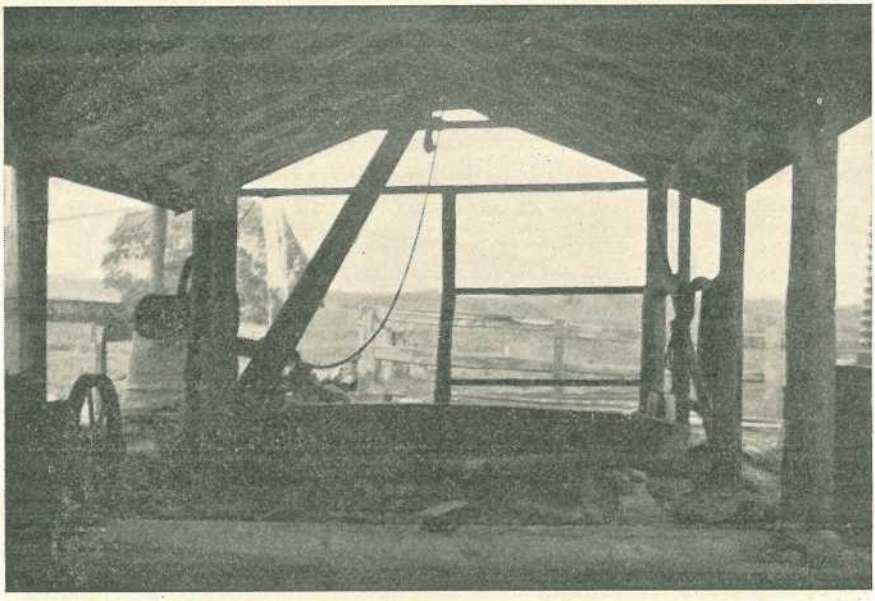


Plate 271.
HOIST IN POSITION ABOVE THE SILO, G. WAUGH'S FARM, PEERAMON.

and emptying the silo. It was found that a shed 18 feet wide, 24 feet long, and 8 feet high with a gable roof proved quite satisfactory and not too expensive, as well as having the advantage of being quite easily extended if necessary (Plate 270). As previously mentioned, a hoist is erected under the shed and over the silo to facilitate the sinking of the pit and the emptying of the silo (Plate 271).

The cost of the material required for the construction of the concrete collar, shed, and hoist amounted to approximately £37 10s. As crushed metal was very difficult to obtain, river gravel was used in proportion of 6 parts gravel to 1 part cement, which is quite a satisfactory mixture. The following is a detailed list of the material used and its cost. Allowance should, of course, be made for price variations for material in different districts. These figures are merely given as a general guide.

	£ s. d.
For Shed—	
Posts, 5 x 5—9/10 ft.	
Plates, 4 x 3—2/18 ft., 2/24 ft.	
Rafters, 4 x 2—20/10 ft.	
Corner braces, 4 x 2—4/10 ft.	
Collar-ties, 4 x 2—4/12 ft.	at 42s. 6d.
Roof braces, 3 x 1½—4/14 ft...	per 100
Roof battens, 3 x 1½—8/25 ft.	super
Fascias, 7 x 1—2/25 ft., 4/10 ft.	13 14 6
Ridge board, 7 x 1—1/25 ft.	
Hoist, 4 x 3—2/8 ft., 1/9 ft.	
28 sheets, 10 ft. iron, at 6s. 5d. per sheet	8 19 8
Ridgecapping, 5 lengths, at 2s. 11d. length	0 14 7
Nails, Springhead, 5 lb.	
Nails, 3 x 9, 5 lb.	0 6 5
Nails, 4 x 8, 3 lb.	
Bolts for posts, 9/5½ in. x ½ in.	
Bolts for " C " ties, 8/4½ in. x ⅜ in.	0 13 2
Hook and eyebolts for hoist	
Wrought iron strap for hoist	
Concrete Collar—	
18 bags cement, at 7s. 3d. per bag	6 10 6
4 cubic yards gravel at 12s. per yard	2 8 0
30 yards " K " wire-netting reinforcement	1 0 6
	£37 10 4

To fill a silo 14 feet in diameter and 28 feet deep, 80 tons of green fodder is necessary. The most satisfactory crop combination for this purpose is maize and cowpea, sown together and harvested when the grain becomes glazed and is just in the doughy stage. The reason for a legume-maize mixture is that the legume adds valuable protein to the mixture and so increases its nutritive value (Plate 272).

Plate 272.

MAIZE AND COWPEA IN COMBINATION ON J. KILLORAN'S FARM, EAST BARRON.—This crop went 16 tons to the acre.

If it is found necessary to grow the cowpeas separately from the maize, it is essential that the two be chaffed together, as the legume will rot if it is ensiled in layers, because it does not contain enough carbohydrates to create fermentation.

In cutting the crop, it was found that two men using cane knives were able to cut as much material in a few hours as it was convenient to chaff up each day. The cut material is transported to the silo by a

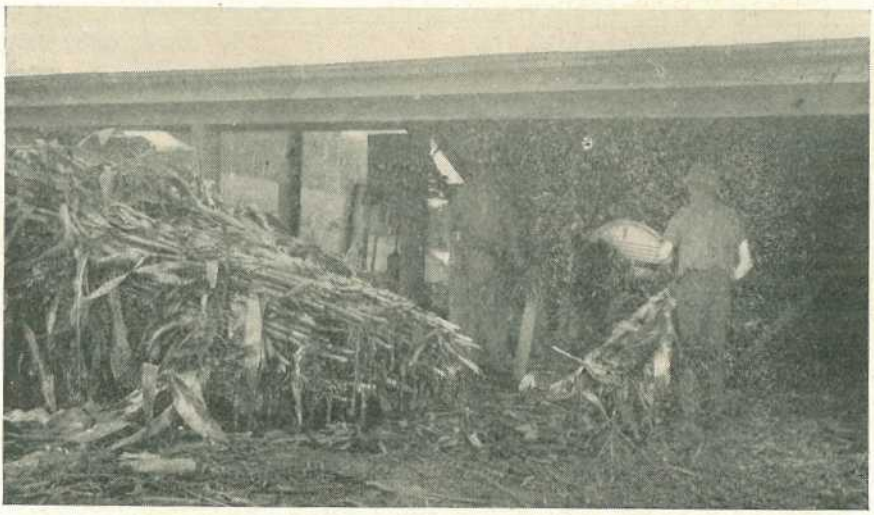


Plate 273.
CHAFFING THE CROP FOR SILAGE, H. JOY'S PROPERTY, YUNGABURRA.

horse and dray or slide (Plate 273). As it is not desirable that the silo be filled in less than ten days, this arrangement is quite suitable to most dairymen.

Perhaps by no other means could such timely action be taken to avert the economic consequences of a plague such as exists on the Tableland, and the farmers in the affected area are hopeful of a reasonable counterbalance for the pastures impoverished by the white grub.

That there is a keen appreciation of the advantages that may be gained by the construction of a silo is amply demonstrated by the response to the departmental assistance in the construction of over forty silos since the introduction of the scheme.

A Classification of Millets.

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

ALTHOUGH some of the commonest crops sown by farmers in Queensland are included in the millet family, probably there is greater confusion with respect to naming and classification of the members of this family than is experienced with any other crop or group of crops.

Millet seeds of various kinds are often submitted for identification, and seed received is regularly misnamed by the sender. The word "Panicum" is commonly misused to cover practically all millets, and white panicum and Japanese millet are confused or incorrectly designated.

In order to simplify the classification of the millet family, a table has been drawn up giving the separate groups based on seed-head appearance, the scientific and common names, and using colour as a means of distinguishing between otherwise similar seeds.

MILLETS.

Botanical Names.	Common Names.	Colour of Seed.
FOXTAIL MILLET—		
Setaria italica Beauv.	**Giant Setaria** **Giant Panicum** **Liberty Millet**	Yellow .. ..
Setaria italica Beauv.	**Dwarf Setaria** **Hungarian Millet** **Panicum**	Yellow .. ..
**Setaria italica* var. *rubrofructa* Bailey	Siberian Millet Kursk Millet	Red ..
**Setaria italica* var. *stramineofructa* Bailey	German Millet Golden Wonder Millet	Yellow ..
**Setaria italica* var.	Manchurian Millet	Yellow
**Setaria italica* var. *nigrofructa* Bailey	Brown-seeded Setaria	Brown to black
BARNYARD MILLET—		
Echinochloa crusgalli var. *edulis* Hitche syn. *Panicum frumentaceum* Roxb.	**White Panicum** Billion Dollar Grass Sanwa Millet Teosin Siberian Millet	Creamy grey .. ..
Echinochloa crusgalli var. *edulis* Hitche syn. *Panicum crus-galli* L.	**Japanese Millet**	Fawn
**Echinochloa colona* Link	Shama	Light fawn

* Not grown in Queensland.

The names in **heavy type** are the accepted common names in Queensland.

MILLETS—*continued.*

Botanical Names.	Common Names.	Colour of Seed.
MARESTAIL MILLET—		
Panicum miliaceum L.	**White French Millet**	White
	Proso Millet ..	..
	Hog Millet	..
	Broom-corn Millet ..	..
**Panicum miliaceum* L.	**Red French Millet** ..	Red
	Proso Millet ..	..
	Hog Millet	..
	Broom-corn Millet ..	..
**Panicum miliaceum* L	Other coloured French Millets	Black, brown, and green
	Proso Millet ..	..
	Hog Millet	..
	Broom-corn Millet ..	..
**Panicum miliare*	Eutki Millet ..	Dark grey
	Little Millet of India	..
CATSTAIL MILLET—		
Pennisetum glaucum R. Br.	**Pearl Millet** ..	Grey
	Pencillaria	..
	Egyptian Millet ..	..
	Mands Wonder ..	..
	Forage Plant ..	..
	Indian Millet ..	..
	African Millet ..	..
FINGER MILLET—		
**Eleusine coracana* Gaertn.	Ragi Millet ..	Red
BROOM SORGHUM—		
Sorghum vulgare Pers. var.	**Broom Millet** ..	Brown

* Not grown in Queensland.

The names in **heavy type** are the accepted common names in Queensland.

The expressions Foxtail, Barnyard, Marestail, Catstail, Finger, and Broom Sorghum are indicative of the "groups" into which the particular millets fall.

Of course, the colours indicated are only approximate, and relate to freshly-harvested seed.

See the March, 1938, *Queensland Agricultural Journal* for further information relative to Giant and Dwarf Setaria (Panicum).

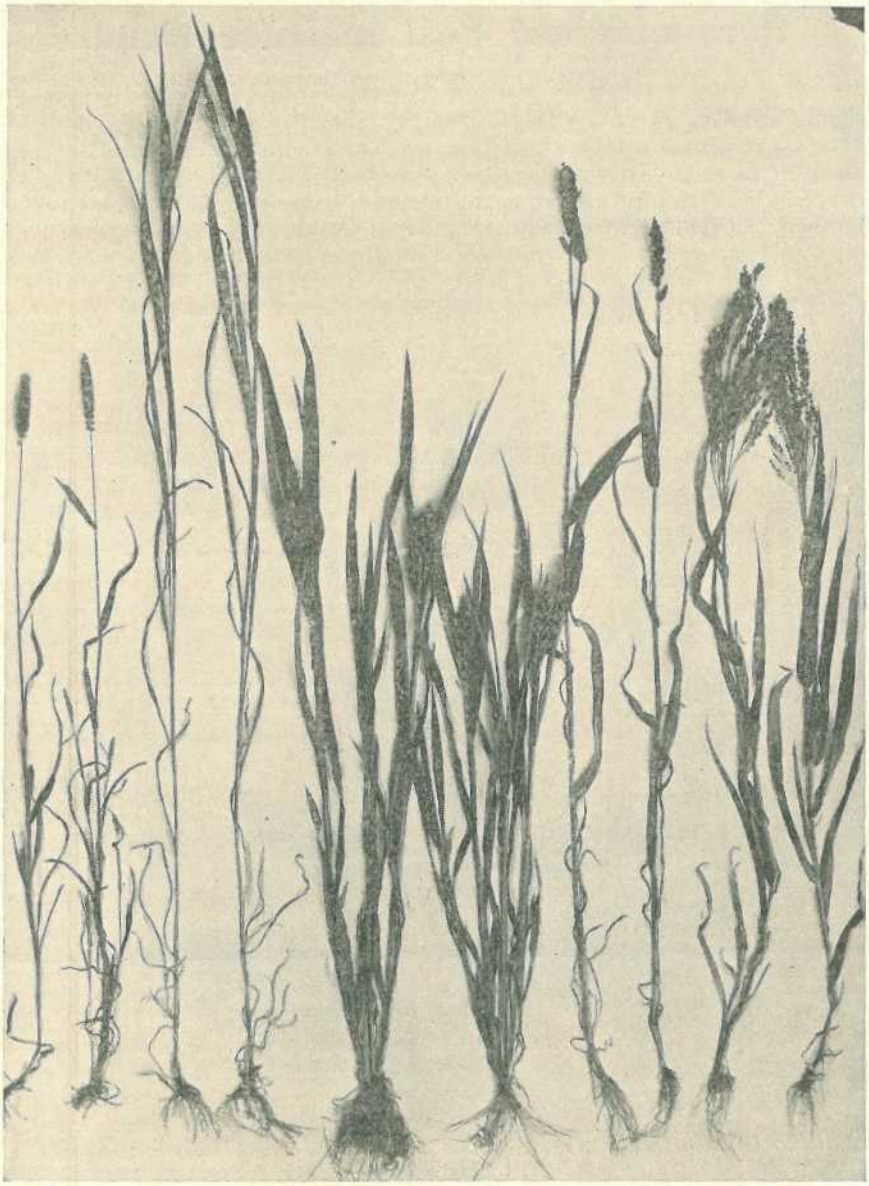


Plate 274.

A. B. C. D. E.

A. Dwarf Setaria (Hungarian Millet).
B. Giant Setaria (Giant Panicum).
C. White Panicum.
D. Japanese Millet.
E. White French Millet.

Hoary Cress (*Lepidium draba*), a possible Serious Weed Pest in Queensland.

C. T. WHITE, Government Botanist.

SPECIMENS have recently been received at the Department of Agriculture and Stock of Hoary Cress (*Lepidium draba*) from the Darling Downs. This is a very serious weed pest in the wheatfields of the Southern States, and illustrations and a description of it are given herewith so that farmers may recognise it should it make an appearance on their properties. It is possible that the climate of Queensland may be too warm for its general spread, but, if it gradually becomes acclimatised, it certainly has great possibilities as a most serious pest.

Plate 275.
HOARY CRESS PLANT AND FLOWER.

Description.—Hoary Cress is a perennial weed characterised by the possession of long, white, underground runners, almost any part of which, when broken, is capable of forming a fresh plant. In the seedling stage, or early stages from sucker growth, it forms a rosette of leaves which are stalked. Later on, flowering stems, 1 foot to 18 inches—sometimes longer—are developed. These leafy flowering stems bear

leaves which are sessile—that is, not contracted at the base into a stalk. They are mostly 2 to 3 inches long and ½ to 1 inch wide. They are usually of a greyish-green colour, and are somewhat like cabbage leaves on a small scale, though much thinner in texture. The flowers are small, white, and are borne in great abundance. Each individual flower possesses four petals. The seed capsules are about one-eighth inch across and are divided into two compartments. The seeds are about one-twelfth inch long, are broad and flatly egg-shaped, dark-brown to purplish in colour, and have a full surface.

Distribution.—The plant is a native of Europe and Western Asia, but is now naturalised in most temperate countries. It is a very serious weed pest in parts of England, but is generally regarded as a naturalised alien there, and is thought to have been introduced in 1809 by troops returning from the continent.

Plate 276.
The Seed Head of Hoary Cress; Inset, a Seed Pod.

Botanical Name.—Lepidium (from the Greek *lepis,* a scale, referring to the seed-pods, which are small and scale-like). *Draba* is the name of an allied genus of plants. The word is a Greek one meaning acrid or biting, and refers to the biting taste of many plants of this family.

Properties.—In the Southern States the plant is regarded as having very little value for fodder. Should it be eaten by stock, it is likely to give a turnip or mustard flavour to milk and cream. It is not known to possess any poisonous or harmful properties.

Eradication.—The plant has been subject to investigation by Mr. A. Morgan, Weeds Research Officer of the Victorian Department of Agriculture, and illustrations and some observations are taken from an article by him in the "Journal of Agriculture of Victoria," January, 1934.*

* "Hoary Cress Control," by A. Morgan, B.Agr.Sc., Weeds Research Officer, Department of Agriculture, Victoria—*The Journal of the Department of Agriculture of Victoria,* Vol. XXXII., Part I., page 1, January, 1934.

In this article Mr. Morgan states: "There are five available methods of control, each of which has particular value under certain conditions, which will be outlined briefly. The methods are:—

(*a*) Persistent regular cultivation;
(*b*) Salting;
(*c*) Carbon bisulphide;
(*d*) Chemical herbicides, particularly arsenicals, applied as sprays; and
(*e*) Plant competition."

Cultivation.—In experiments at the State Research Farm, Werribee, shallow fortnightly cultivations, using a weed-knife attached to a cultivator, caused the death of all plants after the treatment had been persisted with for two years. Naturally, this method, because of the time and labour involved, can be used only on small areas, and in circumstances where ordinary routine is not seriously interfered with. The process is one of slow starvation of the plants, and there does not appear to be any means of reducing the amount of work involved. In very small patches the plants could be cut down with the hoe instead of the cultivator. *Ordinary cultivation stimulates the growth of the weed,* and, because of the danger of distributing roots over clean ground, it is advisable to refrain from cultivating such patches.

Salting.—In dry-farming areas having reasonably permeable subsoil, salting is the most satisfactory method of attack when a suitable cultivation programme cannot be carried on. The amount per acre required varies greatly with the density of the infestation. In small patches it is better to dose each plant showing with a small shovelful of salt. Plants which reappear should be treated in a similar manner, and it is necessary to examine the soil at intervals and resalt the few extraordinarily persistent plants which do not yield readily to the treatment. The second and successive applications, if done within reasonable time (up to two months), do not present a formidable problem.

The quantity of salt required will vary according to the density of the infestation—from 5 tons per acre upwards. A patch of 10 yards by 10 yards of moderately dense infestation, will require about two bags of salt for the first treatment. As with cultivation, the treatment, to be successful, must be persevered with. The salt, naturally, has a deleterious effect on the soil, but this is not necessarily permanent, and at Werribee it has been noted that a particularly good crop was obtained on salted areas five years after salting.

Carbon Bisulphide.—Carbon bisulphide, a volatile liquid, familiar on account of its use in rabbit extermination, may be used effectively against Hoary Cress in soils which are sufficiently permeable. Another essential is that the soil should be reasonably dry, but not so dry as to allow the escape of the gas formed. A rapid diffusion of the gas is to be aimed at; if the diffusion is too slow, the concentration of the gas in the soil air, a few inches away from the bores, may not be sufficient to kill the roots. The usual procedure is to bore or punch holes to 18 inches deep, 18 inches to 2 feet apart each way, pour in 1½ to 2 oz. of carbon bisulphide, and seal the hole immediately.

This is probably the most expensive weed eradicant in modern use, but in small patches under good conditions its effectiveness justifies the

expenditure. Some economy may be effected in very porous soils either by reducing the dosage per hole or by putting the holes down at greater distances apart; the limits of adjustment in these directions can be determined with certainty for the particular conditions only by experiment.

This treatment is useless under irrigation conditions, or near drains or dams. If the holes be put in too deep, the bisulphide gas, which is heavier than air, although it kills the roots at a certain depth, may leave untouched roots near the ground surface. These quickly re-enter the sub-soil, since carbon bisulphide exercises no permanent poisoning effect on the soil.

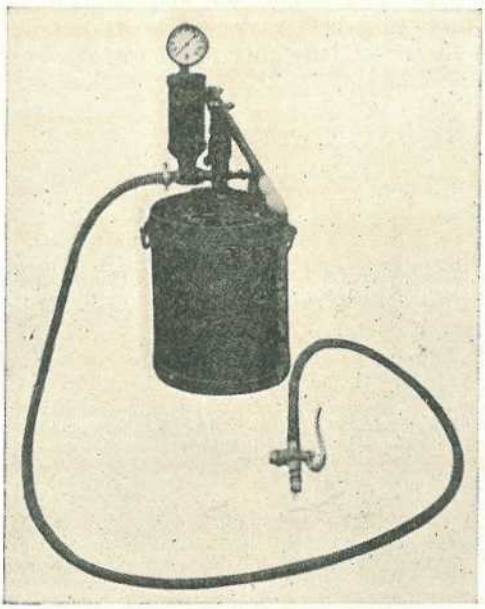


Plate 277.
A Suitable Spray Pump.

Chemical Sprays.—Mr. Morgan found, under conditions at Werribee, that the arsenical sprays were more satisfactory than the chlorates, and recommended a 6 per cent. solution of arsenic pentoxide applied as a misty spray. More recently, however, he advised the use of an arsenite spray (known as Craft's acid arsenical) as being cheaper and equally effective. A stock solution is made by mixing 4 lb. of white arsenic and 1 lb. of caustic soda in 2½ pints of water, stirring until dissolved, the spray solution being prepared by making up 1 part of stock solution in 100 of water, and adding slowly, and with constant stirring, 5 parts of sulphuric acid.

In England, H. C. Long, in "Weeds of Arable Land," published by the Ministry of Agriculture and Fisheries, states that farmers have been successful in treating the weed there with solutions of copper sulphate and sulphate of ammonia. The latter is used at the rate of 2 cwt. sulphate of ammonia in 60 gallons of water.

Botanical Reference.—Lepidium draba Linnæus Species Plantarum 645, 17, 53.

Tomato Culture in Queensland.

H. J. FREEMAN, Senior Instructor in Fruit Culture.

THE tomato plant thrives under warm climatic conditions, and all the year round, in one district or another in Queensland, tomato-growing occupies an important place in rural economy. Fertile soil and abundant moisture are required for its successful cultivation, and, if these are not always present naturally, they may be supplied by judicious fertilizing and irrigation in one form or another.

The tomato has a wide range of uses; it may be eaten as a fresh fruit like an apple, sliced in salads, or it may be made into soups, sauces, pickles, jam, or used in other ways; while its possibilities for use in combination with other foods are only limited by the housewife's creative fancy.

Plate 278.

TRELLISED TOMATOES REQUIRING PRUNING.—Eight thousand plants to the acre.

Botanically, the tomato belongs to the family Solonaceæ. It is a near relative of the potato, and is susceptible to many of the diseases to which the potato is subject. Ordinarily it is easy to grow, but as a commercial field crop it requires care, skill, and an extensive knowledge of methods of disease control. Heavy crops are often obtained on newly burnt-off hillside scrub land, but, for continuity of commercial production, land which may be easily cultivated by either horse or motive power is desirable. Latterly, there has been a change-over from the old system of allowing the plants to grow naturally on the ground, in favour of trellising, and, although some excellent results have been and still are being obtained from the old system, staking and trellising are recommended because of the earlier maturity, better quality, and heavier yield of the resultant crops. In addition, a staked or trellised crop is easier to pick, as well as spray or dust for disease and pest control.

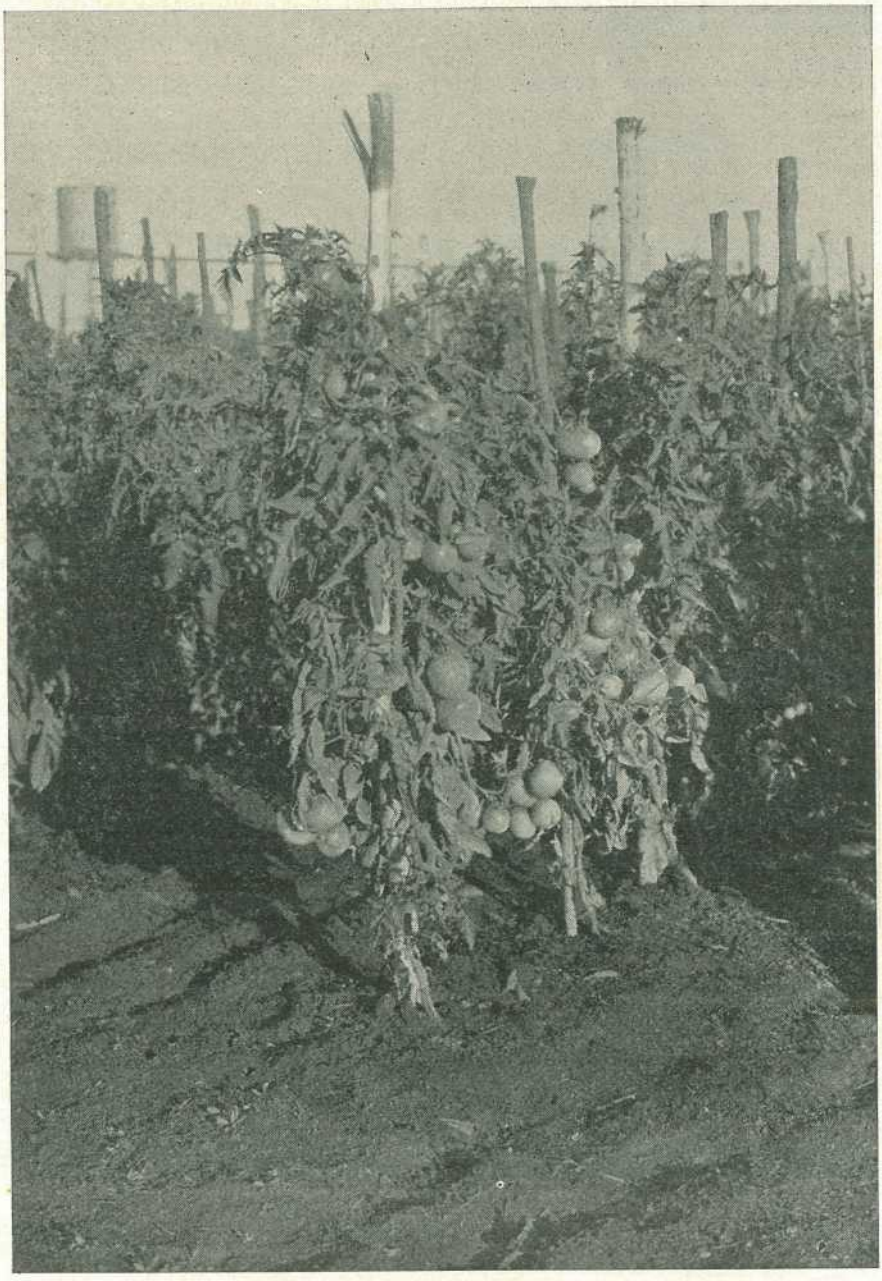


Plate 279.
STAKED BREAK O' DAY.—Showing a good crop.

As a protection against possible dry periods, irrigation in some form or other is important. The value of a good irrigation plant, therefore, cannot be too strongly stressed. The commercial grower also should be prepared to use precautionary and control sprays or dusts, in order to guard against several diseases and pests capable of ruining an entire crop.

In Queensland, there are three chief tomato-growing districts, each having its special season:—

(1) The Bowen district, specialising in a winter and spring crop;

(2) Stanthorpe, specialising in a summer crop;

(3) The coastal area from Rockhampton southwards and particularly in the south-east corner, specialising in spring, summer, and autumn crops.

Plate 280.

TRELLISED TOMATOES REQUIRING NO PRUNING.—Three thousand plants to the acre.

Soil Requirements.

Almost any reasonably good soil will grow tomatoes, provided the site is above frost-level and is sheltered from heavy winds. Good, well-drained, alluvial loams of average fertility and well supplied with humus to ensure the retention of moisture are best, but excellent crops also are produced on basaltic soils in elevated situations. Nitrogen is one of the essential elements for tomato-growing, but its presence in the soil in excessive quantity is not desirable, since it tends to over-development of the plant and foliage at the expense of the fruit. Excessive growth, being succulent, also is more subject to fungous disease attack. So that soil which by ordinary standards may be regarded as being very rich may not be so suitable as one of good average fertility and to which the right fertilizer can be supplied, when necessary, in the proper proportions.

Seed.

Perhaps, nothing is more essential to a successful tomato crop than good seeds, or plants from good seed stock. The best of planning and management and proper soil preparation will be of little use if inferior seeds or plants are used.

Many growers prefer to save their own seeds, claiming that thereby they know they are of the very best quality. This practice has much to recommend it, provided it is done properly. Selection of fruit for seed should be made, *not* from fruit in the packing shed, but while it is still on the plant. Points to be carefully noted as a guide are:—

(1) Mark plants showing prominently vigour and correct type of growth;

(2) Observe the profusion of blooms, both lower and top, and the adaptability of the plant to set fruit under local conditions;

(3) The capacity of the plant to carry the crop to maturity;

(4) The shape of the fruit and its carrying and ripening qualities;

(5) Select fully-matured late fruit from these special vines, the necessary records of which show them to be right up to standard.

There are several methods of preparing tomato seed, but for commercial growers either of the following is recommended:—

1. Select fully ripe fruit. Cut the fruit in halves and place it in tubs or kerosene tins. Place the full receptacles under cover and allow them to stand for five or six days, during which time rapid fermentation of the fruit will occur. Do not add water, as there is enough juice in the fruit to make a good liquid cover; tomato seed will not germinate while immersed within its own juice. On the sixth day skim off all floating seeds and fermented pulp. Pour the remainder into a fine sieve and wash several times under running water. What is left of fermented pulp will be washed away and fine, clean seed will remain. This seed should be dried in the shade and stored away in suitable containers in a dry room until required for use.
2. Use only full, ripe fruit. Cut the fruit in halves and squeeze it on to hessian or some similar material. Dry the squeezed pulp in the sun, and when all the moisture has evaporated from it, gather and rub it briskly to separate the seeds. Some winnowing will be necessary, after which the seed should be stored in a suitable container and kept in a dry place.

Ordinarily, 27 lb. of fruit is required to make up an ounce of commercial seed, which should produce approximately 2,000 plants.

Seed-beds.

Several methods of raising seedlings are practised, but perhaps the most common is to raise the plants in prepared seed-beds. Grown thus, the seedlings can be watered and cared for more easily than is possible when the seed is sown in the field. It is most important that the plants should be kept disease-free and vigorous, and, because of this, they should be regularly sprayed. Tomatoes are very susceptible to soil troubles,

such as nematodes and fusarium wilt; therefore, seed-beds should always be made on new soil. If necessary, the soil should be sterilised by one of the recognised methods before planting.

There are various ways of sterilising soil, such as by the use of formalin and cheshunt compound. Probably the most efficient way is to apply intense heat to the soil before sowing the seed. This method is described in detail in a departmental pamphlet—"Tobacco Growing in Queensland," from which the following paragraphs have been taken:—"Before further preparing the seed-beds for sowing, the soil should be sterilised. There are several methods of doing this—such as by steaming, the application of boiling water, solutions of formalin or similar agents; but the most effective in general estimation and recommended for Queensland growers is by the application of direct heat from the firing of tree branches, brushwood, or similar heat-giving material, piled on the beds to such an extent as will, when fired, produce sufficient heat in the soil to cook a 4-oz. potato buried 3 inches deep or an egg buried 5 inches deep. It is difficult to state the exact amount of material for burning purposes, but the equivalent of poles 3 inches in diameter laid side by side is regarded as likely to prove satisfactory. Successful sterilisation of the soil is most readily accomplished when the amount of moisture therein is what is regarded as satisfactory for cultural operations. Excess of moisture is as undersirable as deficiency, since in either case the penetration of the desired heat in the soil is less easily permitted.

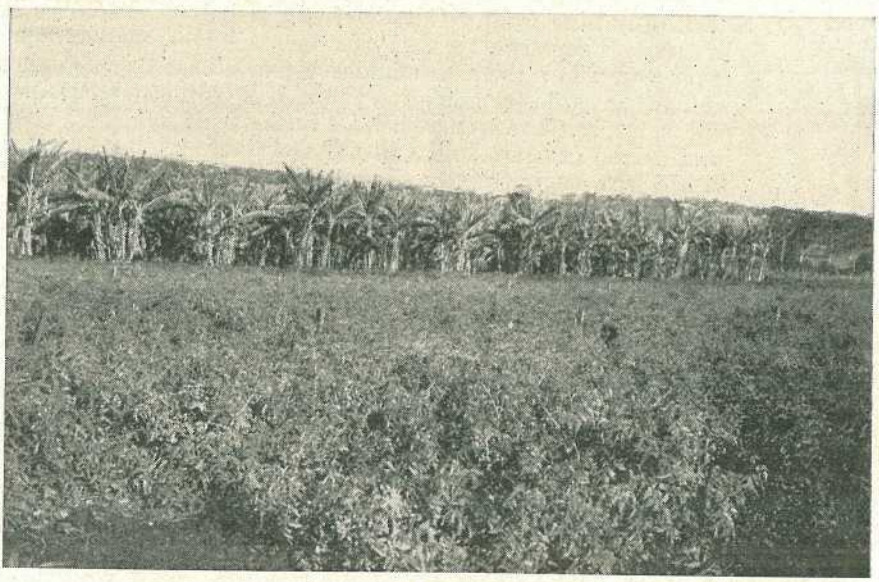


Plate 281.
A GROUND CROP OF TOMATOES PLANTED 6 FEET BY 6 FEET, EQUAL TO 1,200 PLANTS TO THE ACRE.

"Properly burnt beds show a more or less reddish tinge of colour, while the soil is rendered more friable and breaks easily to a fine powder. The object of burning the beds as well as the soil for a couple of feet surrounding them is to destroy any fungus spores, weed seeds, insect or other life therein, that may cause damage to the young plants.

"The time to burn the seed-bed is preferably a few days or a week before it is desired to sow the seed.

"After the fire has burnt out and the soil has become sufficiently cool, all unburnt pieces of wood and large charcoal should be removed, and beds and paths, disarranged when placing the firing material thereon, trimmed up to proper shape. The fine ashes from the firing should now be thoroughly incorporated with the soil of the seed-beds, which at the same time should be reduced to the desired degree of fineness by digging and raking back and forth to a depth of 3 inches and finally levelled off."

Plate 282.
Furrow Irrigation in a Trellised Tomato Patch.

It is not a wise policy to raise seedlings twice in succession in the same ground. Seed-beds should be made in sheltered positions, but open to the sun. They should be well dug and reduced to a fine tilth, and then allowed to stand a day or two to settle before planting. The beds should be thoroughly moistened before sowing the seed, thereby minimising the amount of watering necessary until the seedlings are showing above the surface of the bed. The seed should be sprinkled on the surface and covered lightly with sifted sandy loam, gently firmed by light pressure with a flat board. A light covering of dry straw assists germination by keeping the beds damp. The straw should be removed immediately the tiny seedlings appear above the ground. Only in extreme cases is the provision of shade necessary. Subsequent treatment consists of watering the beds when necessary, and spraying the young plants with Bordeaux mixture, 3-3-40 strength (increase strength to 4-4-40 once the plants have established themselves after transplanting), at regular intervals in order to keep the young growth covered. Most growers transplant when the young seedlings are from 6 to 8 inches high.

In districts marketing late winter and early spring crops, seed is usually sown during April and May. Where climatic conditions are suitable and irrigation available, seed may be sown almost at any time to provide for a continuity of harvest. Normally six weeks will lapse between the sowing of the seed and the planting out of the seedlings.

Transplanting.

Before setting the plants in the field, it is advisable to subject them to the process of "hardening off," which is done by withholding water for a week or ten days before removal from the seed-beds. As a result, the plants will tend to become tougher and will thus be better able to withstand the shock of transplanting.

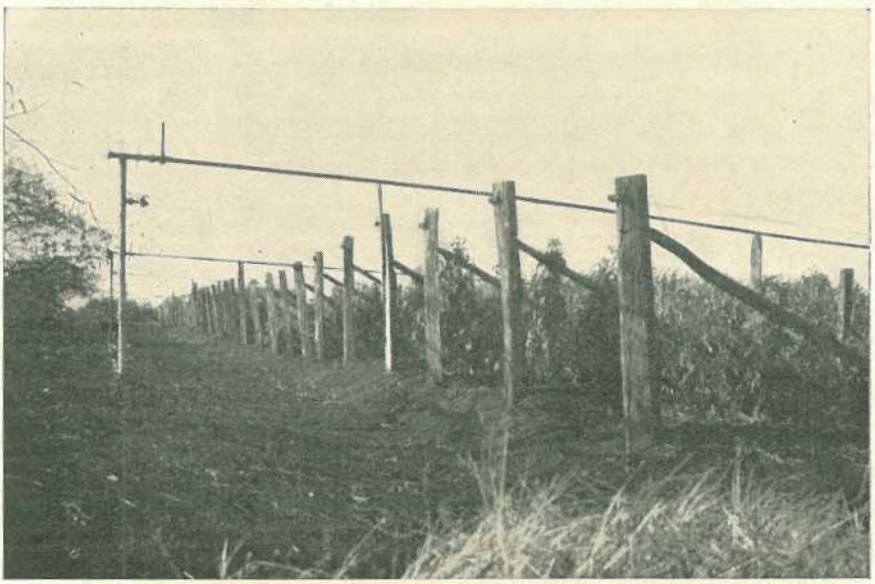


Plate 283.

OVERHEAD IRRIGATION IN TRELLISED TOMATOES.—Note also the wire strainers on the end posts.

Two or three hours before digging the plants, the beds should be given a good watering to facilitate the removal of the plants without unduly damaging the roots. The plants should be kept moist and fresh while the planting proceeds. All leaves, except the undeveloped crown leaves, should be pinched or cut off to minimise transpiration until the root system is re-established. The best method of planting out is to dibble the holes and water in each plant. The plants should be set as nearly as possible at a depth ranging from 3 to 6 inches, according to the size of the seedlings. Transplanting provides an opportunity for the selection of the best plants and for discarding those which are small, spindly, or malformed. Only the best should be used. A well-grown plant is an important factor in the production of a profitable crop. In coastal areas south of Rockhampton it is almost impossible to successfully transplant tomato seedlings after the third week in June and before the last week in August.

A second method of planting tomatoes is to sow three or four seeds together direct in the field at the desired distances apart and in rows where the plants are to be grown. This system ensures that there are no broken roots to provide ingress for fusarium wilt, and the plants do not have to suffer the shock of transplanting. However, sufficient rainfall is always necessary to make satisfactory germination and growth, while attack from cutworms also has to be guarded against. The application of fungicidal sprays also is more difficult. If the grower is prepared to face these disadvantages, then planting direct in the field is recommended, particularly in districts where transplanting in June is necessary to harvest an early spring crop for the Southern markets. With a good strike, some thinning is necessary.

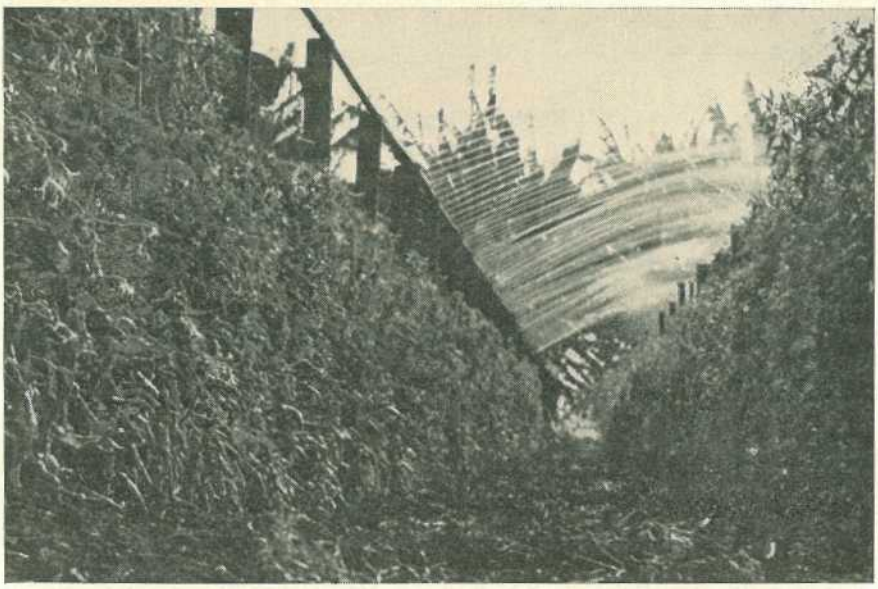


Plate 284.

Overhead Irrigation in Trellised Tomatoes.—Each nozzle delivers approximately 10 gallons an hour.

Possibly the most efficient method of all for the grower who will take the trouble to avoid every risk is to prepare tubes of bitumen roofing material and grow the seedlings in these. The procedure is as follows:—Wooden trays are constructed about 3 feet by 2 feet to hold the tubes. The tubes are made of pieces of bitumen roofing material rolled up and held together by a loop of string. One end should be plugged. The grower from whom this idea originated uses plugs cast in cement, but short pieces of round timber would do equally well. The tubes should be filled with compost and stood upright in the trays, and two or three seeds put in each.

The first advantage of this method is readily apparent, for the trays of seedlings can be kept clear of cutworms and other pests, and, if necessary, carried to shelter during inclement weather. When the seedlings have produced their first rough leaves, the trays are carried

to the plot, a hole dibbled, the plug removed, leaving the plant with its roots quite undisturbed *in situ*. Eventually one plant only is left, the remainder being pinched out.

The second advantage is that the seedlings can be planted out safely in any reasonable weather, since the roots suffer no disturbance and, remaining unbroken, are less liable to be attacked by wilt. By the time of planting, the plants also shall have attained a fair size and risk of loss from pests is less.

It is claimed that tomatoes grown by this method are several weeks ahead of those planted in the usual way. The trays, tubes, and plugs will all last for years, and, since most of the preparation can be done during odd moments or on wet days, little extra trouble is really incurred. It is actually an adaptation of the gardener's practice of pricking out his seedlings into thumb pots or seed-boxes preparatory to planting them out in the flower-beds.

"Buck" Tomato Plants.

Quite recently attention has been directed to the necessity for culling out "buck" or unprofitable plants before transplanting. The term "buck" is applied to a class of plants known to exist in certain varieties, particularly in some Chinese types. As young seedlings, these plants are sturdier than the others, with short internodes and numerous leaves with small branches. Experience has shown that, if such a plant is allowed to grow, it develops a multitude of sturdy laterals, all producing distorted bud clusters, and at 6 inches high might have as many as twenty to thirty branches with distorted bud clusters. The crop produced is light, and generally each fruit is misshapen. Throughout the life of the plant the growth is somewhat dwarfed and the top growth remains quite rosetted. Against this, the desirable type of plant is less sturdy, but strong, with long internodes, with practically no laterals in the early stages, and has an open normal top growth. These plants produce the heaviest yields, and the fruit is true to type.

Douglas records that in New South Wales varieties—such as Intermediate, Paterson, Short, Australian Dwarf Red, Yellow Top, Salad's Special, and Planter's Favourite—produce up to 20 per cent. of "buck" plants.

Planting Systems and Pruning.

It is necessary to differentiate between the methods used for obtaining a quick crop off new scrub or lantana land and those adopted by established market gardeners. In the former case, the plants are usually set out 4 to 6 feet apart (approximately 2,000 plants to the acre) in roughly cultivated ground and are allowed to spread unpruned over the land. The same practice of allowing the plants to grow naturally is adopted by some growers working on cultivated tomato fields. In the Bowen district, where good land is plentiful, the plants are set out 10 ft. and 12 ft. apart, on the square, and allowed to grow without pruning. The objection, however, to growing tomatoes on the ground, is that the resulting crop may be anything from extremely good to a total failure, according to the weather, if water is unavailable, and disease and pest incidence. Much fruit is often lost through slug and insect damage, or is scalded through resting on the hot ground.

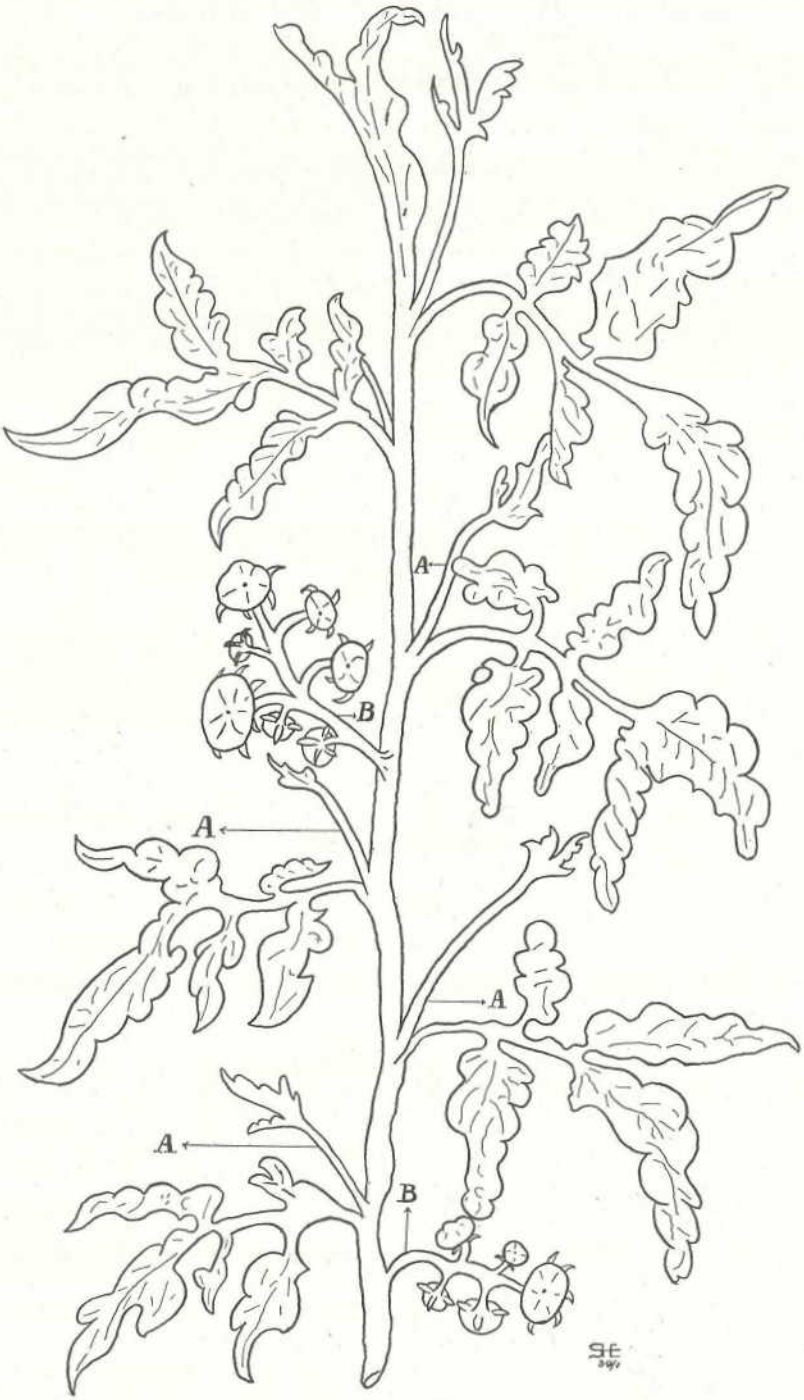


Plate 285.

Drawing Representing the Main Stem of a Tomato Plant, and Illustrating the Method of Pruning.

In recent years, staking and trellising methods have found much favour, particularly on well-sheltered land.

Pruning the tomato consists of the removal of the laterals which arise from the bases of the leaves as soon as possible after their appearance, the leaves only being allowed to remain. This causes the production of fruiting growths from points on the main stem between the leaves.

Plate 285 illustrates a main stem of a tomato plant showing leaves and lateral growths ("A") arising from their bases. The laterals, when removed, cause the growth of the fruit-bearing shoots (shown as "B"). Pruning diverts the growth of the plant from the production of a lot of vegetative growth to the production of more and better fruit.

The fruit produced by either the staking or trellising methods is grown under the best possible conditions. Sprays and dusts for disease and pest control can be applied with greater economy and efficiency, the result being a high percentage of first-quality fruit and a heavier crop. Cultivation also can be continued close to the plants, thereby conserving moisture and suppressing all objectionable weed growth. There is a minimum risk of damage to the fruit, and the crop reaches maturity in advance of fruit grown on plants on the ground. Harvesting is quicker and more satisfactory, since the matured fruit ready to pick can be seen at a glance without having to pull the plants about. After the crop has been harvested, posts, stakes, and wiring can be removed and stacked until required for erection on another site the following season.

Staking.

Hardwood stakes are placed 15 to 18 inches apart in rows which are 3 feet 6 inches to 4 feet apart. Each stake should be 6 to 7 feet in length, and when driven into the soil should retain a height of at least 5 feet. At the distances stated, approximately 8,000 stakes are required to the acre, and, as one plant is set to each stake, a corresponding number of plants is required. The plants are trained from the outset to single stems. All lateral growths arising from the bases of the leaves are pinched out as soon after forming as possible, the leaves only being left (see Plate 285). The single stems are tied every 12 to 18 inches to the stake by strips of soft rag or binder twine. The ties are made loosely so as not to constrict the expanding stem and are positioned beneath a leaf. The actual action consists in passing the tying material round the plant stem immediately below a leaf, crossing it over itself, and then passing it round the stake twice before knotting, so that the plant is attached to the stake by the loops of a loosely made figure eight. The growing tip is pinched out when the plant reaches the top of the stake.

Trellising.

One method of trellising is to set heavy hardwood posts firmly in the ground 4 feet apart at opposite ends of the field. These are solidly stayed and bored to carry two plain wires of, say, 12-gauge. The top wire is strained at about 4 feet 6 inches high, while the lower is strained at approximately 1 foot from the ground. Good hardwood stakes bored and driven into the ground every 12 feet are all that are required for intermediate supports. The young plants are set out about 15 inches apart beneath the lower wire, trained to two stems, and enabled to

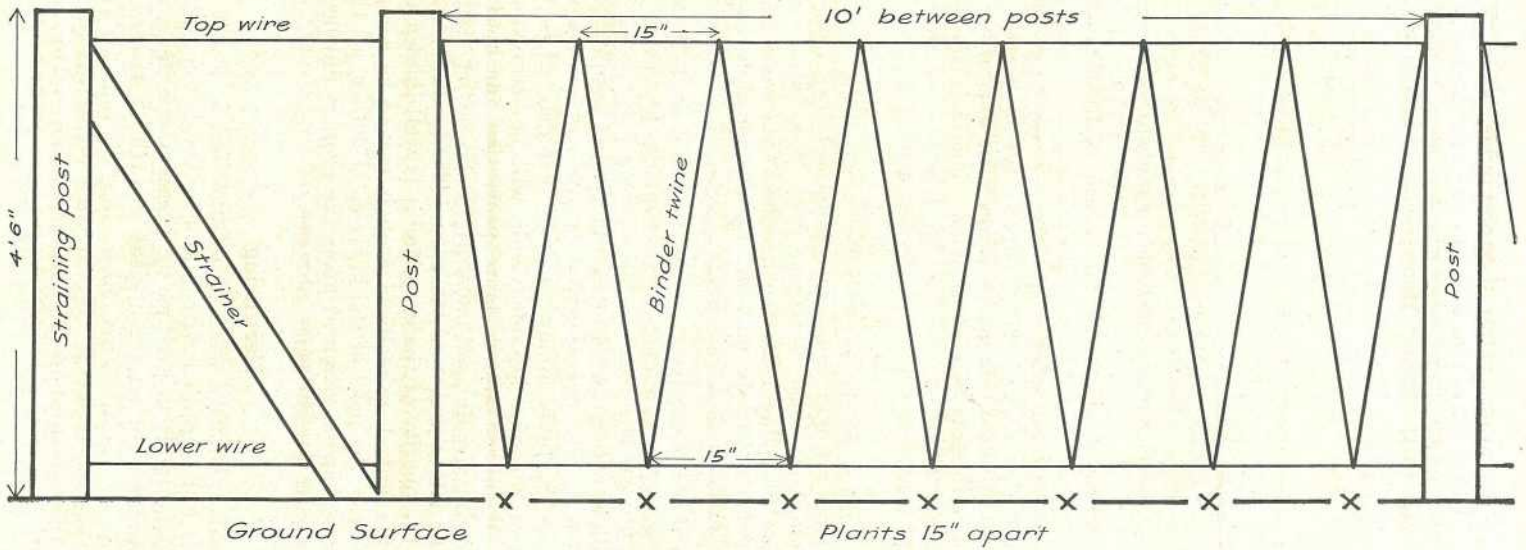


Plate 286.

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

reach the top wire by means of strands of binder twine tied in "V" fashion as shown in Plates 278 and 286. By this method, the plants are pruned and the tips pinched out when the top wire is reached, as has been explained under the heading "Planting Systems and Pruning."

Another method of low trellising which obviates the necessity for pruning is set out hereunder. Reference should also be made to Plates 280 and 287.

At each end of the cultivated field place short hardwood posts 2 feet 6 inches in the ground and 2 feet 3 inches high, (4 feet 9 inches over all). These should be set at a slightly backward angle and be well stayed, to better stand the weight on the wires of the vines and fruit. Five feet is sufficient to allow between each row. Hardwood droppers (Plate 287, Fig. 3) 3 feet 3 inches in length should be placed in line and driven into the ground every 12 feet so that the actual height is 2 feet 3 inches, thus corresponding with the strainers at each end. Each dropper should have two holes bored through it—one almost at the top, and the other about 15 inches below the first. These holes need be only of ordinary nail-bit size (No. 5), being big enough to carry a short wire pin made from No. 10 or 12 gauge galvanised or steel wire. The wire pins (Fig. 4, Plate 287) carry the cross-arms. The top cross-arm (Fig. 1, Plate 287) should be 2 feet by 1½ inches by ½ inch sawn hardwood with the pin-hole in the centre and a ½-inch sawn slot in each end. The lower cross-arm (Fig. 2, Plate 287) should be 12 inches by 1½ inches by ½ inch sawn hardwood with a centre pinhole and a ½-inch sawn slot in each end. Two top wires are run from either side and very near the top of the strainers. Similarly, two wires are run from either side of the strainers at about 10 inches from the ground. The wires are strained tight, the cross-arms placed in position, and attached to each dropper with a wire pin, which is then bent over.

The plants are planted between the wires, spaced about 2 feet 6 inches to 3 feet apart (approximately 3,000 plants per acre). The first laterals are spread over the lower wires, and the later laterals over the top wires, and allowed to grow towards the ground again. No pruning is required, therefore the transmitting of disease by medium of the pruner's hands or knife is almost entirely avoided. Because of the greater number of laterals, heavier yields will be harvested, and the greater amount of foliage affords more protection for both fruit and soil, thereby ensuring greater soil moisture in the earlier stages and less sunburning in the latter stages of the crop. These plants, having more vigour, prolong the quality of the crop, for it is well known that, ordinarily, the last of a staked or trellised crop is not to be compared with the fruit marketed at the peak of the harvest. Further, all the material used in this system can be removed after the crop is finished and used again year after year for the same purpose.

Fertilizing.

As mentioned previously, the tomato does best in a soil of medium fertility which is well supplied with humus. The heavy application of stable manure alone tends to produce an excess of nitrogen, and, consequently, an abundance of succulent leaf growth at the expense of a satisfactory crop of fruit. This effect may be neutralised by the application of from 150 to 300 lb. of a mixture consisting of 2½ parts of superphosphate to 1 of sulphate of potash per acre. This will tend to counteract vine growth and materially increase the yield.

LOW TRELLIS TO AVOID PRUNING.

Fig 1. Top Cross Arm 24" x 1½" x ¾" made of sawn hardwood with hole bored for wire pin and sawn slots in each end.

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

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

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

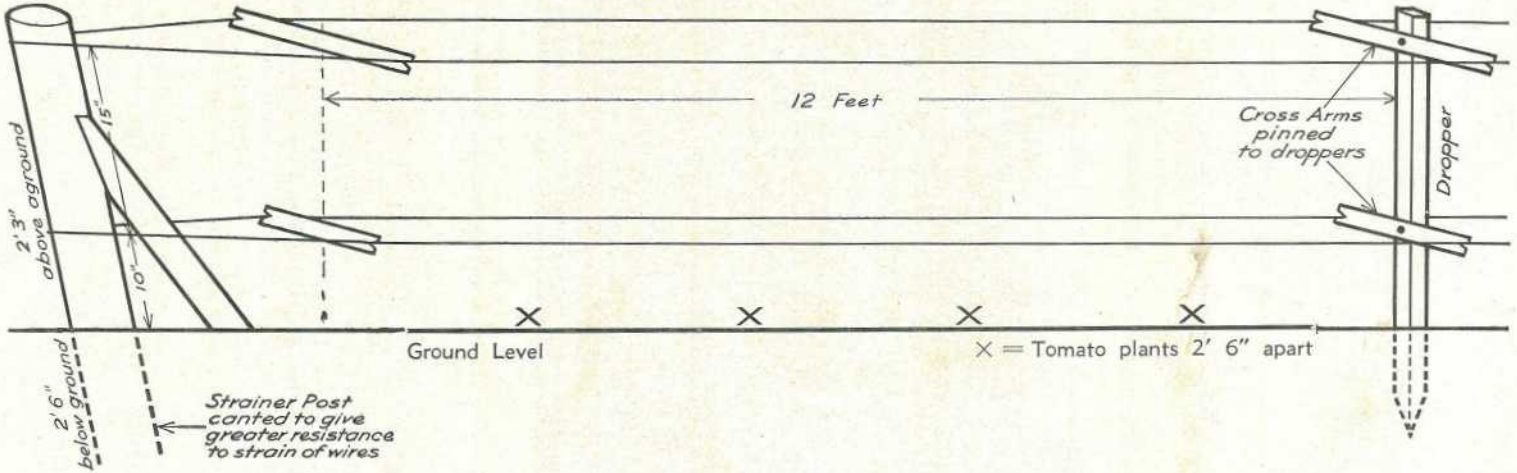


Plate 287.

On average soils a complete fertilizer, such as 4-12-12 or 4-16-12, applied at the rate of 500 to 1,000 lb. to the acre, according to the degree of fertility, should prove most beneficial. Such a formula as 4-12-12 is obtained by mixing together 420 lb. sulphate of ammonia, 700 lb. of superphosphate, 560 lb. bonedust, and 560 lb. muriate of potash, to make 1 ton of fertilizer. The formula 4-16-12 would require a greater amount of superphosphate. The chief fertilizer firms supply ready-mixed fertilizer to these formulæ ordinarily, but under present war conditions a shortage of potash may necessitate some alteration in the potash percentage. In some tomato areas outside the State, potash has been eliminated entirely from tomato fertilizers. A mixture containing six parts of superphosphate and one part sulphate of ammonia, used at the rate of 560 lb. per acre before planting and 780 lb. as a top or side dressing when first fruit is about an inch in diameter, has given excellent results, and on new soils particularly this mixture is worthy of trial. The

Plate 288.
A GOOD CROP OF FRUIT ON TRELLISED VINES.

fertilizer should be applied in the row and mixed well with the soil some days before setting the plants. A side or top dressing of from 500 to 700 lb. of sulphate of ammonia or nitrate of soda and superphosphate (1 part sulphate of ammonia or nitrate of soda to six parts of superphosphate) applied after the first fruits have set, in either one or two applications, is recommended for most soils. The more fertile loams and new basaltic areas require less fertilizer. For top-dressing, the fertilizer is broadcast in and around the plants and worked in with a dutch hoe. For side-dressing, the method is to open shallow furrows about 2 inches deep on both sides of the rows, about 9 inches from the plants, and apply the fertilizer along these small furrows, which should then be covered in with loose, friable soil, using a scarifier for this purpose. In average soils the application of lime to tomato ground does not seem directly to benefit the tomato crop, but is often beneficial to the soil and to other

crops planted in rotation. It is important that the humus content of the soil should be kept up, and rotating the land with green crops should be undertaken. In considering this, regard for nematode control arises, for, unfortunately, the tomato is highly susceptible to these soil inhabitants, and most of the areas devoted to market-gardening are infested to a varying degree. Non-susceptible green crops are, therefore, most desirable, and *Crotalaria goreensis* is recommended as a leguminous crop, in addition to, say, giant panicum and early-maturing varieties of maize.

Varieties.

New tomatoes are constantly being evolved and experimented with, and occasionally a particularly good variety is discovered. The Department of Agriculture and Stock is endeavouring to improve those at present grown and to better their resistance to diseases. There is a number of varieties which are more or less standard, and new growers, after ascertaining why preference is given locally to those most generally grown, would be wise to make a selection from these—

Early varieties.—Marvana, Earliana, Earliwinner, Kondine Red, Bonnie Best, Break o' Day, and June Pink.

Mid-season.—Marglobe, Burwood Prize, Pritchard, Bowen Buckeye, Norton, and Red Marhio.

Late varieties.—Targinnie Blue, Ponderosa, Australian Large Red, and Improved Stone. (Though very large, Ponderosa is not greatly favoured, on account of its irregular shape).

The following varieties are of wilt-resistant strains:—Break o' Day, Marglobe, Red Marhio, Bowen Buckeye, and Norton. Much has been said in favour of wilt-resistant varieties, and in districts subject to wilt damage more excessive plantings of these varieties is recommended.

Between the earliest and the latest maturing varieties in the one season is a difference of, approximately, thirty days—*i.e.*, if all plants were planted on the same date. Earliana is one of the quickest to mature, while Ponderosa usually is the slowest of the recognised commercial varieties.

Pests and Diseases.

In Queensland the main diseases affecting tomatoes are Irish blight, fusarium wilt, bacterial canker, target spot, septoria leaf spot, blossom-end rot, and the virus diseases spotted wilt, mosaic, and big bud. The more important pests of tomatoes include cutworms, corn-ear worm, green vegetable bug, Rutherglen bug, tomato mites, and nematodes.

Information regarding these and other pests and diseases is obtainable from the Under Secretary, Department of Agriculture and Stock, Brisbane.

The Packing of Lady Finger Bananas.

J. H. GREGORY, Instructor in Fruit Packing.

THE Lady Finger banana is a popular fruit on Southern markets, and for it satisfactory prices are usually obtained. Because of its smaller size, the quality of the fruit is considerably reduced if the method of breaking the hands into single fruits is adopted.

The most popular packing method is with full hands, contrasting sharply with the method of breaking into singles as with Cavendish bananas.

The illustrations with these notes show the method of packing clearly. The pack is governed by the size of the hands. Three packs are used to cover all sizes. The system of placing the fruit is the same in all packs, the difference being in the placing of the hands for fillers in the small sizes. The three packs are—

Small (Plate 289)—Single line of hands down the centre of the case placed crosswise, with a line of hands used as fillers on each side. The fillers are placed lengthwise in the case and in a way which will give the best results in making the pack firm and snug.

Medium (Plate 290)—Single line of hands placed across the case, but touching one side, with a layer of fillers down one side.

Large (Plate 291)—Single line of hands placed across the case.

The method of packing is to place the first layer of fruit shank end down (Plate 289).

The fruit is pressed together as tightly as possible without damaging or wrenching the shank ends. The top layer is then placed upon this with the shank end up (Plate 290).

Because of the irregularity of the shape of many of the hands, it will often be necessary to fill gaps. This should be done by using clusters of fruit, care being taken to avoid using singles or small clusters. The fruit of a lesser grade should be used for breaking into part hands for filling. With most sizes, two layers of fruit will fill the case.

The height of the fruit in the case may be varied when necessary by slightly tilting the hands. With the smallest fruit to bring the fruit to the correct height, a layer is placed in the middle of the case flat on the ends of the fruit in the bottom layer (Plate 291).

With extra large fruit, the top hands may be placed the reversed position to the bottom hands, to assist in lowering the height of the fruit in the case. To obtain the best pack, packers are advised to always place the most evenly shaped hands in the centre layers. The finished case should have the fruit slightly above the top of the case. This is eased into position before nailing down by gently bumping the ends of the case while holding the fruit in position; a short 3-inch by 2-inch board should be placed beneath the end of the case while this is being done. The use of a lidding press is unnecessary.

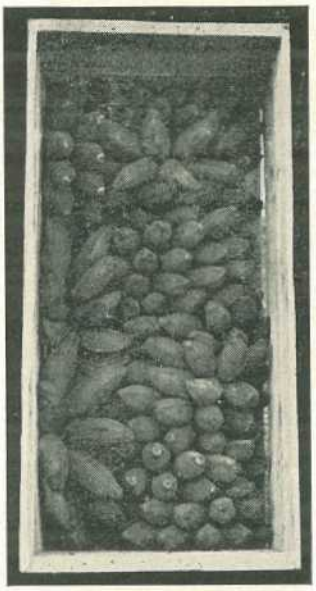


Plate 289.
BOTTOM LAYER, SHOWING PLACING OF HANDS WITH SHANK END DOWN.

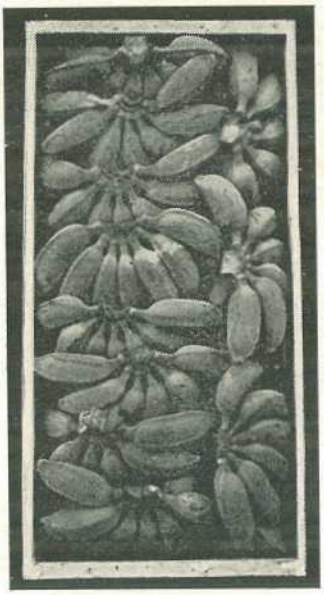


Plate 290.
FINISHED CASE, SHOWING SHANK END PLACED UPWARDS.

Plate 291.
"SMALL" FRUIT PACKED, SHOWING A LAYER OF HANDS PLACED FLAT TO HEIGHTEN THE TOP LAYER, AS REQUIRED.

Plate 292.
FINISHED CASE OF SMALL FRUIT.

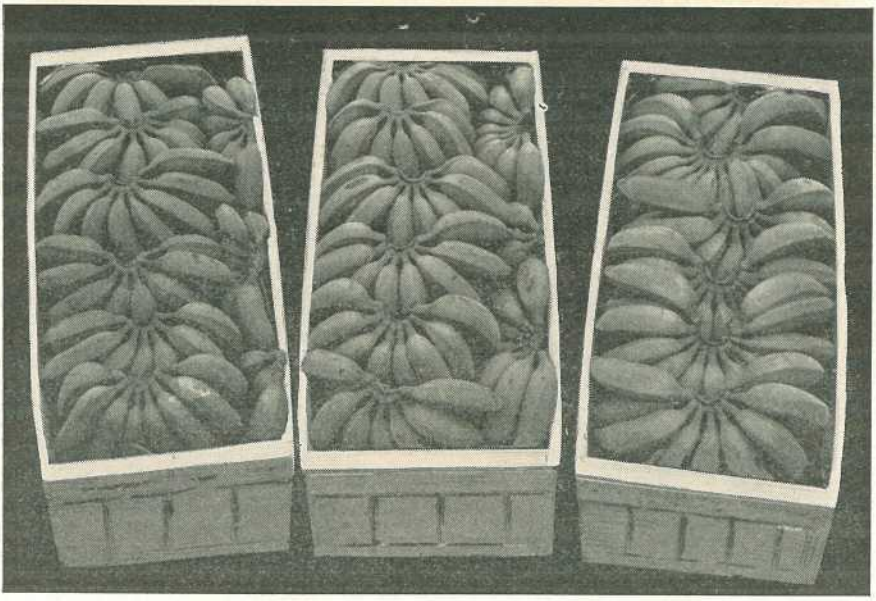


Plate 293.
FINISHED CASES OF LARGE AND MEDIUM FRUIT.

Acknowledgment.

Thanks are due to Mr. A. Want, of Yandina, for making available fruit and facilities for demonstrational purposes.

QUEENSLAND SHOW DATES FOR 1940.

The Queensland Chamber of Agricultural Societies has issued the following list of show dates for 1940:—

JANUARY.

Pittsworth Bushman's Carnival	29th

FEBRUARY.

Stanthorpe	1st to 3rd
Killarney	9th and 10th
Warwick	13th to 15th
Clifton	21st and 22nd
Allora	28th and 29th

MARCH.

Amiens	3rd
Goombungee	8th
Boonah Bushman's Carnival	25th
Oakey	27th and 28th

APRIL.

Pittsworth	2nd and 3rd
Toowoomba	15th to 18th
Dalby	22nd and 23rd
Kingaroy	30th April and 1st and 2nd May
Tara	30th April and 1st May

MAY.

Yarraman	3rd, 4th, and 6th
Longreach	6th to 8th
Nanango	9th to 11th
Murgon	16th to 18th
Ipswich	21st to 24th
Kalbar	25th
Gympie	30th and 31st and 1st June

JUNE.

Bundaberg	6th to 8th
Blackbutt	7th and 8th
Boonah	12th and 13th
Toogoolawah	28th and 29th

JULY.

Cleveland	12th and 13th

AUGUST.

Pine Rivers	2nd and 3rd
Caboolture	8th and 9th
Royal National, Brisbane	12th to 17th

OCTOBER.

Warwick Rodeo	5th and 7th

Queensland Butter Production.

G. B. GALLWEY, Inspector of Accounts.

THE accompanying tables cover the operations of all butter factories in Queensland for the year ended the 30th June, 1939.

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.

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

The particulars also show that butter is graded in three grades at the factory and the percentages published indicate the quality of this butter which is true to grade when officially graded. The remainder is degraded, or in other words is not in the opinion of the graders correctly graded by the factory.

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.

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED, 30TH JUNE, 1939.

Factory.	Make and Pay in Lb.					Official Gradings.			
	Total.	Choice.	First.	Second.	Pastry.	——	Choice.	First.	Second.
							%	%	%
Caboolture	Made 3,383,298	3,126,202	256,368	728	..	True to grade ..	78·9	47·7	100
	Paid 3,381,995	3,192,073	187,854	2,068	..	..	..	..	..
Eumundi	Made 2,676,63	2,526,142	138,392	12,105	..	True to grade ..	83·3	56·4	91·9
	Paid 2,675,912	2,539,338	129,307	7,267	..	..	..	..	..
Pomona	Made 2,956,020	2,695,107	255,603	5,310	..	True to grade ..	25·9	70·6	100
	Paid 2,955,151	2,822,448	130,724	1,979	..	..	..	..	..
Esk	Made 2,849,072	1,476,185	1,140,817	232,070	..	True to grade ..	80·5	98	95·6
	Paid 2,848,996	1,524,447	1,149,903	174,646	..	..	..	..	..
Beaudesert	Made 4,600,358	3,981,492	618,866	..	..	True to grade ..	80·3	90·1	100
	Paid 4,600,428	4,071,512	523,992	4,924	..	..	..	..	..
Dayboro'	Made 456,717	21,301	410,664	24,752	..	True to grade ..	..	76·4	65·2
	Paid 456,884	304,166	137,071	15,647	..	..	..	..	..
Lowood	Made 796,105	542,778	230,057	23,270	..	True to grade ..	91·6	95·9	96·8
	Paid 796,531	637,262	142,369	16,900	..	..	..	..	..
Maleny	Made 2,614,505	2,530,617	41,496	42,392	..	True to grade ..	91·9	66·9	100
	Paid 2,613,389	2,538,716	55,848	18,825	..	..	..	..	..
Booval	Made 5,016,010	3,896,942	734,941	383,655	472	True to grade ..	84·3	95·5	100
	Paid 5,017,345	3,890,149	900,272	226,924	..	..	..	..	..
Boonah	Made 4,750,681	2,532,239	1,929,268	289,174	..	True to grade ..	62·9	97·8	98·6
	Paid 4,750,520	2,742,476	1,805,952	202,092	..	..	..	..	..

Grantham	Made	3,008,395	2,232,840	527,228	248,327	..	True to grade ..	69·6	85·7	98·2
	Paid	3,009,296	2,388,631	453,317	167,348	..	..	..	..	..
Laidley	Made	2,145,168	1,931,231	105,392	108,545	..	True to grade ..	85·2	94·6	96·7
	Paid	2,145,034	1,950,924	102,747	91,363	..	..	..	..	..
Kingston	Made	7,029,400	6,595,064	..	434,336	..	True to grade ..	87·1	..	100
	Paid	7,029,417	6,659,689	..	369,728	..	..	..	..	..
Woodford	Made	2,367,569	2,212,281	152,137	2,141	..	True to grade ..	70·5	93·8	100
	Paid	2,367,167	2,204,533	159,351	3,283	..	..	..	..	..
College	Made	105,070	98,518	5,096	1,456	..	True to grade ..	45·1	39·4	100
	Paid	105,082	89,638	13,615	1,829	..	..	..	..	..
Chinchilla	Made	3,091,588	1,543,132	1,074,360	474,096	..	True to grade ..	28	85·5	98·8
	Paid	3,094,539	1,790,982	971,804	331,753	..	..	..	..	..
Toowoomba	Made	6,038,606	4,794,454	918,064	326,088	..	True to grade ..	97·9	98·7	99·3
	Paid	6,046,691	4,804,333	917,236	325,122	..	..	..	..	..
Clifton	Made	1,610,172	1,118,436	439,712	52,024	..	True to grade ..	72·9	95·4	95·6
	Paid	1,610,176	1,126,871	437,564	45,741	..	..	..	..	..
Crow's Nest	Made	2,298,914	1,436,458	818,496	43,960	..	True to grade ..	67·7	95·1	96·6
	Paid	2,298,914	1,435,889	819,093	43,932	..	..	..	..	..
Dalby	Made	4,316,481	2,923,714	1,155,943	236,040	784	True to grade ..	93·9	95·2	98·8
	Paid	4,317,739	2,921,042	1,173,232	222,875	590	..	..	..	..
Goombungee	Made	2,325,284	1,586,532	602,336	136,416	..	True to grade ..	68·2	97·3	100
	Paid	2,325,284	1,593,721	603,561	127,999	..	..	..	..	..
Jandowae	Made	3,408,666	2,817,306	470,736	120,624	..	True to grade ..	76·11	85·2	97·5
	Paid	3,408,690	2,838,520	459,771	110,399	..	..	..	..	..
Miles	Made	1,772,289	556,193	1,107,792	108,304	..	True to grade ..	19·7	87·1	86·3
	Paid	1,772,972	556,362	1,108,260	108,350	..	..	..	..	..

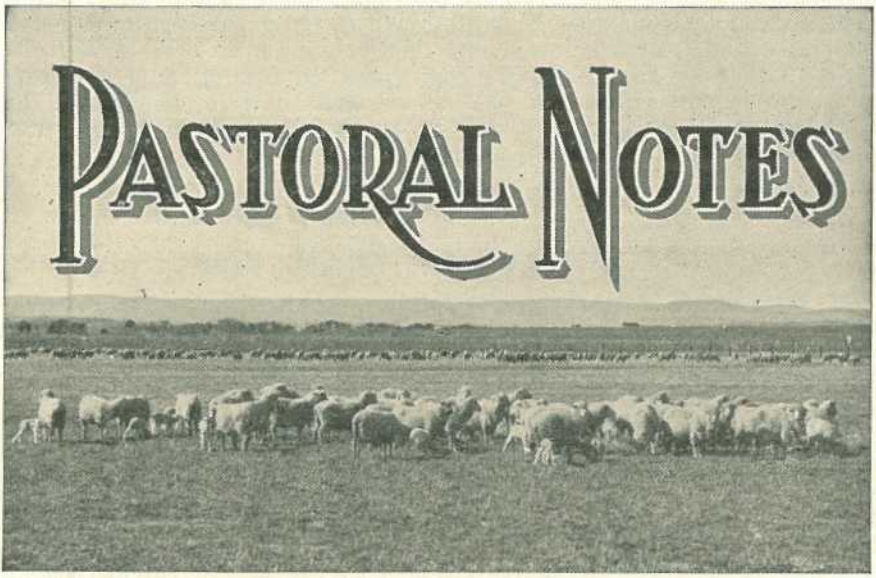
PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED, 30TH JUNE, 1939—*continued.*

Factory.		Make and Pay in Lb.					Official Gradings.			
		Total.	Choice.	First.	Second.	Pastry.	——	Choice.	First.	Second.
								%	%	%
Killarney	Made	1,633,988	1,066,354	444,602	123,032	..	True to grade ..	76·8	97	100
	Paid	1,633,931	1,091,974	449,193	92,764	..	..	..	..	..
Milmerran	Made	1,694,277	400,223	982,604	358,707	42,734	True to grade ..	75·9	95·1	88·2
	Paid	1,694,196	513,766	826,524	353,906	..	..	..	..	..
Oakey	Made	5,895,397	5,049,685	299,376	368,928	177,408	True to grade ..	70·2	87·4	69·6
	Paid	5,896,683	5,253,786	360,397	282,500	..	..	..	..	..
Roma	Made	1,284,101	..	804,237	479,864	..	True to grade ..	100	97·7	100
	Paid	1,283,847	155,597	729,411	398,541	298	..	..	..	..
Warwick	Made	3,481,023	2,507,583	587,768	385,672	..	True to grade ..	84·2	90·7	94·1
	Paid	3,478,773	2,507,340	619,803	351,630	..	..	..	..	..
Allora	Made	1,556,371	1,236,420	288,357	31,594	..	True to grade ..	93·4	93·7	98·9
	Paid	1,555,446	1,245,092	279,627	30,727	..	..	..	..	..
Texas	Made	281,076	11,944	215,596	53,536	..	True to grade ..	..	94	99·3
	Paid	280,838	92,993	139,234	48,611	..	..	..	..	..
Gayndah	Made	2,597,876	1,780,388	684,824	133,114	..	True to grade ..	82·2	87·2	98·9
	Paid	2,598,902	1,815,919	683,919	109,154	..	..	..	..	..
Biggenden	Made	3,152,841	2,599,449	521,696	31,696	..	True to grade ..	85·5	94·4	100
	Paid	3,152,271	2,678,740	459,831	13,700	..	..	..	..	..
Kingaroy	Made	5,819,631	5,230,936	353,208	235,487	..	True to grade ..	92·4	68·1	98·9
	Paid	5,823,732	5,342,701	315,818	165,213	..	..	..	..	..

Maryborough	Made	1,404,742	798,002	487,236	119,504	..	True to grade ..	72·6	98·6	94·2
	Paid	1,403,203	812,553	497,041	93,609	..	..	..	..	..
Mundubbera	Made	4,242,092	3,889,516	249,872	102,704	..	True to grade ..	58·7	44·1	97·9
	Paid	4,243,869	3,942,772	257,844	43,253	..	..	..	..	..
Wondai	Made	4,206,386	3,752,168	422,634	31,584	..	True to grade ..	84·9	69·5	93
	Paid	4,207,138	3,812,695	373,777	20,666	..	..	..	..	..
Nanango	Made	3,668,740	2,381,972	1,150,800	135,968	..	True to grade ..	43·9	94·1	95·3
	Paid	3,669,681	3,253,742	386,142	29,797	..	..	..	..	..
Murgon	Made	4,802,186	3,643,658	1,124,032	34,496	..	True to grade ..	86·7	98·1	100
	Paid	4,801,808	4,486,303	306,694	8,811	..	..	..	..	..
Proston	Made	2,167,198	1,790,150	340,592	36,456	..	True to grade ..	84·7	89·3	99·1
	Paid	2,165,343	1,892,139	258,188	15,016	..	..	..	..	..
Gympie	Made	8,765,788	8,160,596	499,520	105,672	..	True to grade ..	97·84	83·1	86·6
	Paid	8,767,124	8,274,507	414,069	78,548	..	..	..	..	..
Cooroy	Made	2,080,787	1,575,779	465,304	39,704	..	True to grade ..	93·3	98·7	98·2
	Paid	2,078,837	1,757,314	296,465	25,058	..	..	..	..	..
Gladstone	Made	3,522,333	550,225	1,804,721	1,167,387	..	True to grade ..	34·6	91·4	97·2
	Paid	3,548,292	448,123	2,091,053	1,009,116	..	..	..	..	..
Biloela	Made	3,325,707	318,813	2,368,550	638,344	..	True to grade ..	64·2	92·8	95·7
	Paid	3,326,980	442,149	2,290,381	594,450	..	..	..	..	..
Bundaberg	Made	2,510,497	456,603	1, 39,173	514,721	..	True to grade ..	..	97·8	91·8
	Paid	2,529,184	753,091	1,298,816	476,875	402	..	..	..	..
Mackay	Made	794,958	794,958	..	..	..	..	..	..	..
	Paid	787,274	682,516	64,224	40,514	20	..	..	..	..
Monto	Made	4,802,105	2,005,341	2,557,856	238,908	..	True to grade ..	75	91·9	84·3
	Paid	4,811,969	1,674,153	2,929,426	208,283	107	..	..	..	..

PRODUCTION AND PAYMENT FOR BUTTER IN GRADES AND OFFICIAL GRADINGS FOR THE 12 MONTHS ENDED, 30TH JUNE, 1939—*continued.*

Factory.		Make and Pay in Lb.					Official Gradings.			
		Total.	Choice.	First.	Second.	Pastry.	——	Choice.	First.	Second.
								%	%	%
Rockhampton ..	Made	2,718,606	1,892,790	432,656	380,784	12,376	True to grade ..	..	76·7	88·1
	Paid	2,735,071	638,564	1,721,667	363,104	11,736	..	..	..	..
Wowan	Made	3,162,523	209,130	2,144,240	809,153	..	True to grade ..	..	94·5	98·8
	Paid	3,139,462	693,256	1,718,532	727,674	..	..	..	..	..
Atherton	Made	3,202,390	3,195,340	..	7,050	..	True to grade ..	99·6	100	100
	Paid	3,202,896	3,187,757	..	15,139	..	..	..	..	..
Bushy Creek	Made	95,396	..	95,396	..	..	..	..	..	..
	Paid	95,411	..	95,411	..	..	..	..	..	..
Daintree	Made	171,380	..	170,441	..	939	..	..	..	..
	Paid	171,380	..	170,441	..	939	..	..	..	..
Ingham	Made	17,015	..	17,015	..	..	..	..	..	..
	Paid	19,065	..	19,065	..	..	..	..	..	..
Millaa Millaa	Made	1,087,036	1,064,938	..	22,098	..	True to grade ..	45·2	100	100
	Paid	1,086,325	1,065,801	..	20,524	..	..	..	..	..
Ravenshoe	Made	560,002	554,234	..	5,768	..	True to grade ..	100	76·9	100
	Paid	558,417	553,389	..	5,028	..	..	..	..	..
Silkwood	Made	56,080	7,087	42,206	..	6,787	True to grade ..	..	..	..
	Paid	56,483	7,132	42,517	..	6,834	..	..	..	..



Wounds in Horses—Simple Treatment.

The fundamental principle underlying all wound treatment is the provision of suitable downward drainage for the discharges from the wound. If such drainage is provided, then most wounds tend to heal well, but deep wounds penetrating downwards and which form pockets do not progress satisfactorily, for the reason that pus and discharges collect within them and cannot get away. Wounds which penetrate in an upward direction need little treatment, beyond ensuring that they remain open while healing from their deepest part and that they are reasonably clean on the surface. In the case, however, of downward penetrating wounds, it is necessary to use a knife judiciously in order to allow the discharge a free outflow.

Before any wound treatment is attempted, the injured edges of the wound should be clipped with scissors to remove the hair and reveal the true nature of the wound. The next thing to do is to wash the wound thoroughly with a warm, weak disinfectant solution. Then, if necessary, the depth of the wound can be explored with a blunt probe which has been boiled, or with the fingers after the hands have been thoroughly washed and scrubbed. Punctured wounds—such as nail or stake wounds—are always difficult to drain and often have to be opened up. Microbes are carried in when the foot is punctured, pus of a black liquid and foul smelling nature may gather in the foot, and may continue to accumulate because it cannot drain away. If that happens, acute lameness is certain to follow. If unattended, these corrupt fluids rise slowly above the level of the horn and eventually break out through the soft skin over the coronet; but by that time the structures within the foot are in a nasty mess and the case has become very serious.

To treat hoof punctures, the whole foot is cleaned and, if possible, it is held in a bucket of warm disinfectant solution to still further cleanse

it and also soften the horn. The sole of the foot is then pared away by making a cone-shaped hole at the point where pain is most acute. The apex of the cone must be carried right through the horn until blood or pus is revealed. The pus should then be allowed to drain away. To prevent the hole from closing, a pad soaked in a solution of iron perchloride should be placed in the wound, and the treatment should be repeated daily while necessary. If treated thoroughly in the way described little further attention is necessary.

THE MENACE OF GRASS FIRES.

After the great growing season we have had, it would be wise to give some thought to the menace of grass fires in nearly every district. The late winter, with its succession of hard frosts, helped in the drying out of paddocks.

In any case, strong growths of grass will soon dry out with the advance of summer, and unless fire outbreaks are prevented or properly controlled serious losses of stock and property are likely to happen. And these losses are not individual, they are felt throughout a community.

So it would be wise to look out for fires and form breaks where possible or necessary, as well as check up on all cases of careless use of fire. Campers and picnickers should also see that every fire they light is completely put out—that is just plain commonsense.

THE CORRIEDALE.

There is a bright future for the Corriedale in Queensland. Judged from any point of view this breed has, as in the other States, come to stay.

The Corriedale proper was evolved about sixty-five years ago by crossing the Lincoln with the merino. The breed is now regarded as purebred. A breed is said to be pure when it will reproduce its type with certainty.

The Corriedale will go further in Queensland than a general utility farmer's sheep. The time is fast approaching when this breed will be run extensively on marginal areas of the Darling Downs, and especially on much of the brigalow and belah country reclaimed from prickly-pear.

Some breeders in Queensland show a tendency to breed the Corriedale too fine. This is a mistake and, to some extent, nullifies the reasons for which the breed was evolved. Loss of size and constitution follow too fine a fleece.

The covering should be strong, somewhere about 54's-56's quality, and with strength must go length. A strong short wool is common, but is not desirable. The fleece should be bright. Scientific culling in a Corriedale flock should proceed from both ends as it were. Anything tending to too much Lincoln is undesirable, and anything showing too much of the merino type also should be rejected.

Conformation and size, too, are of great importance with this fast-improving breed.

Plate 294.

HOCK DEEP IN LUXURIOUS PASTURE.—Blood horses grazing, Rodney Downs, Western Queensland.

CARE OF SHEEP SKINS.

Want of care of the skins from sheep killed for mutton on the property is the cause of a loss, which if taken in the aggregate, is considerable.

Skins should be carefully removed from the carcase, using the knife as little as possible in the process, and dried in the shade.

There are three methods of treating sheep skins. A frame may be made with hooks in suitable places for stretching the skins; the skins may be stretched on a rail, placing neck and tail on the rail; or the floor of the shearing shed may be utilised, in which case the skin should be laid on the floor woolly side down. In all cases, the skins should be treated with an insecticide, a solution of one of the power dips being suitable.

When packing for market, skins should be packed wool to wool and skin to skin.

Be careful to keep valuable sheep dogs away from poisoned skins. Many a good dog when hungry has been lost by having free access to treated sheep skins.

PROFIT FOR THE SHEEP MAN.

It is admitted by those in a position to know that one of the more important retarding factors in the fat lamb industry is the meagre supply of cross-bred ewes. This applies not only in Queensland, but all over Australia.

Excellent crossbred ewe lambs, bred the right way, are regularly slaughtered as fat lambs. This is wrong in principle, although easily understood. Farmers generally are not in a position to refuse the remunerative figure offered. The opportunity exists, therefore, for the man further out, especially on some of that excellent country reclaimed from pear infestation, to join long-woolled rams with the robust type of merino, with the object of retaining the ewes of the drop for sale to fat lamb raisers nearer in and on the dearer country. The wethers of the drop should be disposed of as fat lambs.

The profits to a grazier adopting this policy are undoubted.

FARMERS' WOOL SCHEME.

Farmers consigning wool to the Department of Agriculture and Stock for classification and sale under the Farmers' Wool Scheme are advised to use good wool packs in preference to fadges and bags—if the quantity of wool consigned makes it practicable.

Notwithstanding the cost of purchase, the use of packs will actually result in a reduction of marketing costs. Firstly, bales weighing 200 lb. or over are charged at a lower railage rate than bales, fadges, or bags weighing less than 200 lb. Secondly, the cost of cartage of the wool from rail to the Department's store will also be reduced. Thirdly, if the wool is forwarded in good new packs, provided they are branded on the top only, they can be used by the Department in rebaling, and the

farmer is credited with their full value. If the condition of the packs does not permit of this being done, they can, if desired, be returned at a small cost (approximately 1s. a pack) to the farmer for use again in forwarding wool to the Department.

The object of the Farmers' Wool Scheme is to assist small growers, and any means whereby marketing costs can be reduced will, no doubt, be appreciated.

THE WOOL APPRAISEMENT SCHEME.

Woolgrowers of Queensland are by now aware of the fact that the British Government has purchased the whole of the clip for the duration of the war and one clip after the war at a standard price of 13·4d. per lb. Appraisement conditions make it particularly important that clips should receive expert treatment in the matter of correct classing before going to the show floors.

A badly classed clip will bring only the value of the lowest-priced wools in the line. On the other hand, a well-got-up clip will sell to advantage.

Greater care should be taken in the matter of yield, type, length, and colour in the fleece lines. With the possible shortage of wool packs in the future, growers are urged to make their bales heavier, thus effecting a saving in packs. Payment for wool will, as usual, be made a fortnight after appraisement.

Ten per cent. of the total purchase money is to be withheld until the completion of the season. Should the British Government sell wools to neutral countries or anyone else at a profit, the grower will benefit to the extent of 50 per cent. of such profit. Should a loss be sustained, Australia will not participate in that loss.

ROTATIONAL GRAZING.

The practice of grazing paddocks throughout the year according to a pre-arranged 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.

WATER SUPPLY PLAN.

On many grazing properties in Queensland there is sufficient surface water to last until June or July in a normal year, and possibly until August in a good year, when there has been a heavy wet season. There is a period between the time that the surface water dries up and the first storms fall in which it is necessary to provide water, either by well or bore.

When selecting a site for a well or a bore, the grazier should first make a survey of his country. A site should, if possible, be selected on a part of the property where cattle do not feed intensively when surface water is available. On a number of grazing properties the mistake has been made of putting down a bore in close proximity to surface water. As the surface water dries up, the grass in the immediate vicinity is also eaten out, and when it is necessary to pump water for stock there is often no grass anywhere near the bore or well. As a result, the stock are forced to walk long distances to grass.

When bores and wells are put down in places away from surface water, there will probably be grass near at hand in a dry time, and cattle will do better, drink oftener, and retain condition that they would otherwise lose through excessive walking.

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.

BLIGHT IN CATTLE.

Blight in cattle may again become prevalent in the coastal areas of the State during the wet season.

This is a highly contagious disorder, and, apart from losing condition, many animals become blind. Treatment should be applied as soon as the trouble is noticed.

The following solution is very useful in treating the complaint:—

Nitrate of silver	3 grains
Sulphate of morphia	1 grain
Soft water	1 ounce

An alternative and less expensive remedy is a mixture of 2 per cent. zinc sulphate and 2 per cent. boracic acid in water that has been boiled.

All eye discharges should be washed from the face of the beast and vaseline applied to the area covered. The discharges attract flies; while flies continue to irritate the animal a cure will be long delayed, if not prevented entirely.

The affected eyes should be syringed in the early morning and late afternoon. A small bulb syringe is quite suitable for applying the solution.

SHEEP ON COASTAL COUNTRY.

Coastal farmers who are desirous of stocking sheep usually ask the question how to start to the best advantage. Conditions and circumstances along the coast vary so greatly that no hard and fast rules can be laid down.

It is usually considered that where dairying, pig raising, and mixed farming can be successfully combined in coastal areas the conditions are favourable for fat lamb raising. There is one chief guiding point, and that is, where the rainfall can be considered as excessive for the combination mentioned, it will be decidedly against the wellbeing of sheep.

For fat lamb raising the British breeds should be used. The most suitable of them is the Romney Marsh, and the wetter the conditions the nearer to the pure Romney Marsh the breeding flock should be. If crossbred or Corriedale ewes are not available, then strong-woolled, plain-bodied merino ewes should be introduced, to which should be mated pure Romney Marsh rams. Of the progeny, ewes should be retained for breeding and the wethers used for home consumption or sold as fat lambs. Merino ewes should not be retained on the coast for longer than two seasons.

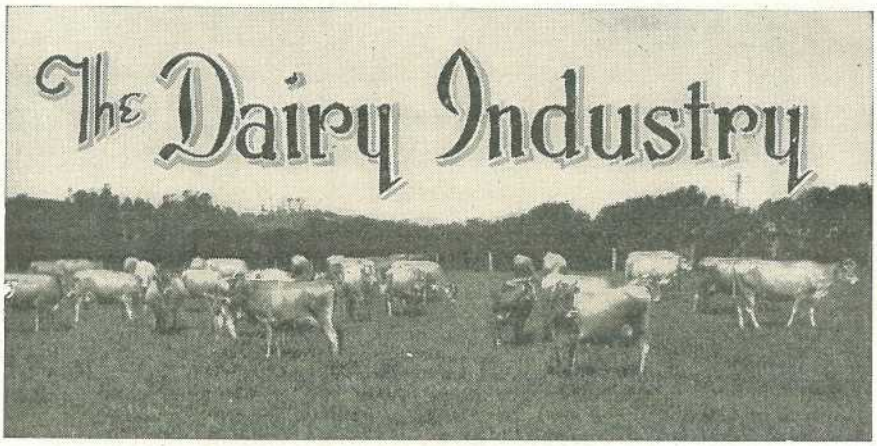
All lambs should be marked during August, and the ewes shorn in September. If the ewes are healthy and well fed from the time the lambs are dropped, all lambs that are to be sold should be fit before or during December. A month after the lambs are disposed of, the ewes that are to be sold should be fat and sold as such to secure best results. Healthy merino ewes with good teeth and carrying not more than four or five months' wool should fatten on good feed in three or four weeks.

"PEA STRUCK" SHEEP.

When the Darling pea is in pod, its effects on animals are most noticeable. There is no medicinal treatment, but sheep noticed as affected should be removed immediately to a paddock in which the plant is not growing. Recovery is then certain and rapid, unless, of course, the animals are too far gone.

If practicable, the plants should be hoed out and destroyed. If very thick a flame thrower may be profitable to use.

One thing is certain, however, once sheep have acquired a taste for Darling pea they will always look for it—hence the necessity of grazing these particular sheep on country where the plant does not exist.



Effect of Disease on Composition and Yield of Milk.

The effect of disease on milk from cows is variable. Usually there is an alteration in composition, accompanied by a decrease in yield. Generally speaking, the milk-sugar (lactose) is considerably decreased and the chloride and ash content increased. Fat is more likely to be increased than diminished. Casein is likely to be lowered and albumen increased, whilst the total protein may remain constant. A consideration of one or two important diseases will illustrate the changes that may occur.

Mastitis is one of the commonest diseases in this country, and analyses show that the casein, fat, and lactose are markedly reduced and the cholrides increased in milk from cows suffering from this malady. Casein and fat are the all-important substances in the manufacture of cheese, and a deficiency in these constituents in milk means a lowered chese yield at the factory. The importance of this disease in relation to cheese-making is, therefore, very evident, and only serves to emphasise the need for greater care and vigilance on the part of all concerned in the dairying industry.

Foot and mouth disease is not known in Australia, but analyses of milk in countries where it occurs show that drastic changes are wrought in the composition and yield of milk. One of the most noticeable effects of the onset of this disease is a very marked reduction in the volume of the milk secreted—often to one-quarter of its original quantity. The changes in composition depend very much on whether the udder is inflamed or not. If the udder is inflamed, then the changes in composition are very similar to those that occur in cases of mastitis. When the udder is not inflamed the fat, protein, and ash are increased and the lactose diminished. The fat may rise to as high as 10 to 15 per cent., the protein to 5 per cent. (normally 3), and the lactose diminish to 3 or 4 per cent. (normally 5).

It is rather curious and interesting to find that the composition of milk when a cow dries off is very similar to that from a cow with foot

and mouth disease, without inflammation of the udder. Drying a cow off usually involves a considerable reduction in her feed, together with less frequent milking, and it is suggested that there is a similarity between these conditions and those that occur in severe disease. In cases of disease there is a marked decrease in the food intake, and the milkings are apt to become less frequent. The abnormality of milk and the decrease in yield brought about by these two diseases alone indicate the economic importance of disease in regard to the dairying industry. Anything that the individual farmer may do towards improving the health of his herd will not only be of benefit to himself, but to the industry at large.

PALATABILITY OF STOCK FOODS.

While the cost of the ration fed to dairy cows is likely to influence its composition, consideration should also be given to the palatability of the feeds selected. Nothing should be fed to the animals which will affect the quality of the product yielded. What is suitable for one animal may not be suitable for another, and the method of using stock foods governs their value. For producing animals—i.e., animals converting the food eaten into some product such as milk—it is essential that they should eat enough. In order to guarantee this sufficiency, care should be taken to ensure that the ration fed is wholesome and palatable.

Unless the ration is palatable, cows and fattening pigs will not consume sufficient food for the efficient production of milk and cream, and bacon. Unpalatable foods which have to be fed to milking cows should be used sparingly and mixed with some other well-liked feed. In this way the bulk of the ration can be increased, the more palatable ingredients inducing the animal to consume the whole of the mixture. Roughage can be chopped and mixed with concentrates. The roughage often becomes softer and the mixture more wholesome and appetising by mixing it with a dilution of molasses.

It is only by feeding rations of a palatable nature that the maximum production can be obtained from live stock. At the same time, it must be remembered that an important function of farm animals is to convert into useful products material which would otherwise be wasted. By keeping a watch on the materials at hand, it should be possible to dispose of practically all the feed available in a way which will ensure the best return.

CARE OF CREAM IN TRANSIT.

A contributing factor in the low grading of some cream at the butter factory is often lack of thought and care for it while in transit. Some farmers blame cream carriers or railway officials for any deterioration which occurs while it is on the road; but, presumably, if the carriers and the railwaymen do neglect to give the extra care which cream needs, particularly in hot weather, they may be merely following the example of indifference displayed by the owner of the cream.

For example, cream may be brought in by a farmer and left at the station overnight to be consigned by a train timed to leave, say, at 7.20 next morning. Mostly such cream comes from farms only 2 or 3 miles distant. Surely, any dairyman who takes a pride in turning out choice cream can arrange such a short journey in the three hours of daylight before train time. The owner should realise the deterioration which must develop in cream in cans which may be left to stand at the station for twelve hours lidded down and unstirred through a warm night; but let the train be an hour late and hear the complaints about the neglect of the Railway Department!

A less frequent fault in delivering cream too early at the railway siding or roadside is the neglect to make allowance for the alteration of the sun's position as the day advances. A shady spot selected at 10 o'clock in the morning may be no longer shady at noon, and by the time the cream can is lifted by the railway man or the cream carrier it may have been exposed to the direct heat of the sun for an hour or longer.

In many parts of Queensland extra attention to details is demanded by the exigencies of the climate and, in this, the efforts and care of each individual handling cream in transit becomes all important.

CLEAN MILK IN HOT WEATHER.

At this season of the year, the problem of keeping milk from souring requires a little extra attention. Bacteria thrive at midsummer temperatures and cause milk to sour and lower the butter-making qualities of the cream. Chief among the measures of defence against the souring of milk are cleanliness and cooling—i.e., low temperature. It is not enough to draw the milk in a clean way; utensils must be clean to the point of being practically free from souring bacteria. In addition, milk must be cooled immediately, if its quality is to be preserved long enough to permit its delivery to the consumer in an acceptable condition.

Milk sours very quickly at high temperatures. This, however, is not the only cause of the souring of a lot of summer milk. Mudholes, manure heaps, swamps, and the muddy banks of streams in the grazing paddocks help to deposit a considerable number of bacteria on the teats, udders, and adjacent parts of the cows. The bacteria which gain entrance to the milk at the time it is drawn and in course of conveyance to the cans for temporary storage, or for immediate delivery, have a lot to do with the time required for souring.

If the customer should complain of sour milk in the warm weather, and should the cooling of the milk fail to remedy this defect, then all possible sources of contamination should be investigated. In some cases, this will be found coming from the filth of muddy places, or the dust, or dry manure.

With sterile utensils and rapid cooling, a low bacterial count may reasonably be expected; likewise the complete elimination of rejected supplies, higher quality milk, and, consequently, greater profits.

POINTS IN DAIRY PRACTICE.

Maximum results on the dairy farm can only be obtained by the successful combination of three factors—the farmer, the pasture, and the stock. The farmer must efficiently manage and improve his pastures, while the stock must give the highest possible amount of milk fat from the quantity of food consumed.

The farmer may claim that he has good cows and produce factory returns as evidence thereof. That evidence, however, is merely proof that the herd is good, not that each individual member is good. Until he submits his herd to regular testing, he has no definite proof that his herd contains no unprofitable cows, that his herd sire is at least maintaining the production in the younger stock, or that he is breeding from the right cows. A record of any drop in factory returns is an open book to the regular testing farmer, but a sealed book to the farmer working solely on factory returns.

If the position is to be improved by herd testing, the responsibility is on the farmer to consider the individual results and carry out the necessary remedies. Failure to act on the part of the farmer cannot be held against herd testing.

The fertility of the land must be maintained if the pastures are to carry the stock economically. Each cow returns to the soil a proportion of the plant food it consumes in the form of manure, which should be regularly broken up and distributed by harrows. The plant foods which are not returned to the pastures are those which make the milk and those used to produce and maintain the body of the animals. A cow which produces 500 gallons of milk in a lactation period, equivalent to approximately 200 lb. of fat, removes from the pasture at least 7 lb. of lime and 11 lb. of phosphoric acid in the milk alone. This is equivalent to approximately a ½ cwt. of bonedust or superphosphate. Thus a herd of forty such cows would remove yearly the equivalent of 1 ton of those fertilizers from the pasture. As a large proportion of Queensland soils are deficient in phosphorus, particularly in coastal areas, a loss such as this is a very serious matter, and if not returned to the soil in some form, pastures will deteriorate, and conditions conducive to the occurrence of stock diseases peculiar to phosphorus deficiency may develop.

There are various ways in which these plant foods can be returned to the pastures. The obvious method is to distribute the phosphatic fertilizer over the pastures; a less obvious but efficient method is to administer at least 2 oz. of bone meal to each cow daily. This weight only makes good the calcium and phosphorus removed in the milk and is distributed over the pastures in the droppings.

The introduction of improved pasture grasses and the adoption of rotational grazing would also assist materially in obtaining the maximum efficiency on the dairy farm.

NAVEL INFECTION.

In newly-born animals the navel is a prolific source of infection. Under farm conditions, it pays to treat the umbilical cord as soon as possible after birth. First, tie it with a string in a 5 per cent. carbolic solution, then paint the cord and surrounding area with a 5 per cent. iodine solution or dettol.

PASTURES AND BUTTER-FAT.

Efficient production is the only form of economic production, and this, perhaps, applies more to dairying than to any other primary industry.

Efficiency is achieved by ensuring that cows receive the right food in the right quantities. The cheapest means of filling the first requirement is by herd testing and culling, since by this method only high-producing cows are maintained on the farm.

Nowadays, the value of dairy land is judged, not by the number of cows it will carry, but by the butter-fat production per acre. Once this idea is fixed in mind, it becomes obvious that the higher the cow yields the more economic a producing unit she becomes. Low producers means reduced output and reduced efficiency in the working of the farm.

As the dairy cow is required to produce large quantities of milk which is rich in protein, it follows that it must be given foods which are likewise rich in protein. There is little difference between the food values of the various popular cultivated grasses, which in the early stages of growth are equal in protein content to many valued concentrates. The young shoots are very rich in this respect, and this accounts for rapid recovery of cattle grazing on pastures after rain following spells of dry weather, or after a burn.

Here, then, is a natural food for the dairy cow readily available. It is economic, too, because with a little care it can be produced in large quantities, and it requires no labour in feeding. The dairy pastures then deserve special attention to maintain them at an efficient standard. There are several ways of maintaining and improving pastures, namely:—

(1) The growing of grasses which have a high-feeding value.

(2) Top dressing pasture land.

(3) Rotational grazing, or, in other words, feeding the grass while in its young stage of growth.

(4) Renovation of pastures.

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.

Body Length in Pigs.

Now that carcase appraisal has provided a definite measure of carcase quality in pigs, there is indisputable evidence of a general lack of body length in Australian pigs.

For a long time leaders in the pig industry have stressed the necessity to select for body length, and breeders have attempted to secure this desirable features in their pigs; in fact, most breeders thought their pigs had sufficient body length. However, since pigs have been measured under the carcase appraisal system during the past few years, it has been found that Australian pigs generally are too short.

Body length is not only an important characteristic from the bacon curer's point of view, but the producer also wants long pigs because they are usually more productive—long-bodied sows are usually better milkers, and that extra inch in the middle helps the weight when pigs are being sold.

Investigators have shown that pigs with bodies long in proportion to their weight also have the desirable light covering of back fat.

Body length in proportion to weight can be increased by growing the pigs slowly, but this practice is usually uneconomical, and as body length is an hereditary characteristic and is associated with the number of ribs in the pig, it is important that breeding stock should be selected for length of body, either judged by appearance or by records of pigs of similar breeding whose carcases have been appraised.

The number of ribs in pigs varies from thirteen pairs to seventeen pairs, while most pigs have fourteen pairs or fifteen pairs. Such knowledge enables the breeder to have a wide field for selection of stock.

There has been a tendency to select stock with good hams and good heads. These are valuable features in the pig, but not nearly so important

as body length, and in obtaining goods heads and hams body length is usually lost. Breeders and judges of pigs might, therefore, with advantage place a lot more importance on selection for body length, even if something is lost in ham and head quality.

The best pig for the grower or the trade is a pig well balanced in all features, but if body length has been lost, it should be retrieved quickly. It is difficult to place too much importance on body length of pigs, particularly when it is remembered that a light covering of back fat and light shoulders are usually associated with good body length.

Pig-raisers may obtain an appraisal of their pigs through various carcase competitions, or by arrangement with the firms slaughtering their pigs. Full information on these services can be obtained from the Department of Agriculture and Stock.

Pig breeders who fear that the pig which suits the meat trade will not suit the farmer may find solace in the knowledge that in Denmark, where pig improvement has been based on the results of careful testing for many years, there has been marked increase in body length, decrease in back fat, increase in streak thickness, decrease in food consumption per lb. of pork, and increase in rate of growth. These statements are based on the analysis of complete records on many thousands of Danish pigs of the Large White and Landrace breeds, and therefore indicate that similar improvement might be anticipated with other breeds of pigs, provided similar methods are adopted.

Pig-recording is costly work, and involves the use of testing stations, but some useful work can be done at very little cost by growers recording the prolificacy of their sows, the rate of growth of their pigs, and the carcase quality of their porkers and baconers.

PIGGERY PESTS.

At this season of the year pigs are frequently tormented by house flies, mosquitoes, and lice. This irritation can be allayed to a large extent by giving the pigs a daily dressing (only a very small quantity at each application) of oil to which a small quantity of disinfectant has been added.

The pig has a tough skin and often carries a coarse coat of hair, but despite that his health may suffer through parasitic infestation. Where the skin is lacerated or badly sunburnt and cracked, blowflies and house flies swarm around, becoming a source of risk to the animal's general health. Wounds resultant from castration and other operations are favourable places for attack by blowflies. Where there is considerable inflammation, painting the affected areas with a dilute solution of iodine will be helpful. Carbolised glycerine—or boro-glycerine—is an excellent dressing once the wounds have been thoroughly cleansed by washing and/or syringing out. Any treatment for reduction of irritation and inflammation and assistance in healing will be beneficial.

Prevention of attack is often difficult, but something might be attempted along these lines by eradicating breeding grounds like manure heaps where flies breed freely. Swampy areas encourage mosquitoes and sandflies, and neglected sties and pens and rubbish lying about harbour fleas and lice. A general clean-up along the lines of a spring cleaning is worth while.

WHEN SELLING PIGS.

Porkers should be marketed at an age and weight to suit export market conditions, as well as the local trade. Best trade weights, for prime conditioned pigs, range between 60 lb. and 90 lb. dressed (approximately 95 lb. to 139 lb. live weight). For local markets, the best range is 60 lb. to 80 lb. dressed weight (95 lb. to 130 lb. live weight). Porkers should be in good condition, free from bruises, whip marks, or other faults, and be protected from the effects of severe heat; otherwise, they will not dress out to advantage on slaughter. Lighter weights and very thin pigs are not profitable as porkers, and at factories and meatworks will only be paid for at valuation.

Bacon pigs for local markets should be 90 lb. to 130 lb. dressed weight (approximately 140 lb. to 185 lb. live weight), with added range to 160 lb. dressed weight (220 lb. live weight) at slightly lower rate per lb. dressed. For export, the range of weights varies from 120 lb. dressed weight (175 lb. live weight) to 160 lb. dressed weight (220 lb. live weight), but the heavier pigs should not carry too much fat; otherwise, they are subject to reduction in price or to rejection. For local markets also, there is a strict limitation to the percentage of fat, and factories prefer pigs in meaty condition with only a slight covering of fat.

Sows for small goods trade should be in good condition, and should have weaned their litters two months or more before marketing; also, they should not be in pig any more than one month, if in pig at all. Sows close to farrowing and those farrowed recently are liable to condemnation at the factories. Poor brood sows and poor stags are useless and will not be accepted, while boar pigs are useless for meat purposes until castrated, and then well fed for approximately two months, the time depending on the progress made after the operation.

In every instance the greatest care should be taken to avoid bruising and damaging the pigs in transit, especially when loading and unloading. Pigs carted to country sidings for trucking or sale should not be fed immediately before despatch, as such feeding is conducive to heavier shrinkage and to digestive disorders in transit.

It is again emphasised that under the Queensland Pig Industry Act all pigs must be branded by the vendor before sale, barter, or exchange. Full information on any of these points is obtainable from the Department of Agriculture and Stock, Brisbane.

THE BREEDING SOW.

Experience has shown that sows having the benefit of succulent and nutritious pasture and plenty of daily exercise in the sunshine in clean paddocks, where they are undisturbed by other stock, are more likely to have big litters than sows which are continuously housed or confined to a small pen.

Keeping pigs in paddocks is satisfactory only where clean, warm, dry shelter sheds are available, in which the pigs may camp at night.

As the farrowing stage approaches, it is advisable to place each sow in her own individual yard or pen. The best time to do this is about three weeks before the sow farrows.

Sows housed together at farrowing time are likely to become quarrelsome, and any disturbance, particularly at feeding time, may result in abnormal births, if not in abortion.

Under open-air conditions and with succulent grazing, there should be little or no necessity for purgative medicines before farrowing. However, as individual animals differ in habits, and some are lethargic at this stage, a warm bran mash in which is mixed three fluid ounces of castor oil and just enough table salt to disguise the flavour of the oil will be beneficial, if given two or three days before the farrowing date.

Use of drastic purgatives should be strictly avoided, as the after effects are liable to bring on irregularities in the digestive organs. Careful control will do more than medicine or force in assuring satisfactory results. The food should be of a laxative, nourishing nature, and quantity should be strictly regulated according to the condition of the sow and litter.

MONEY IN PIGS.

That there is good money in pigs if they are properly bred, fed, and controlled is again evidenced in the bacon factory returns of a farmer on the Evelyn Tableland, North Queensland. Sales over twelve months totalled 107 bacon pigs, all of which were bred on the farm, plus 45 store pigs, which were sold because of continued dry weather.

The bacon pigs were sent to the North Queensland Co-operative Bacon Association factory at Mareeba, which has a regulation requiring farmers to notify the number of all pigs being consigned at least three days before trucking. The farmer's practice is to weigh his pigs on Thursday to decide the number to be sent on the following Monday, so that the factory may be advised. The weight put on by the pigs in the meantime is invariably reflected in factory weights.

The sales table for the period indicates that this farmer has found that there is money in pigs.

Date.	Sales.	Realisations.
1938—	Pigs.	£ s. d.
July 9th	6	16 11 9
July 31st	16	43 14 0
August 20th	9	26 1 9
September 10th	9	24 12 2
September 24th	15	41 13 1
September 30th	7	17 12 3
October 22nd	5	13 0 8
November 26th	4	6 14 6
December 17th	10	21 11 1
1939—		
January 21st	19	37 13 2
February 25th	2	3 19 5
June 17th	4	8 3 8
June 30th	1	2 4 2
	107	
Deferred pay at ½d. a lb.		18 2 0
		£283 13 6
45 pigs sold as stores at £1 5s. each		56 5 0
Total sales		£339 18 6

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire ..	White Leghorns, Australorps, Rhode Island Reds, and Langshans
F. J. Akers, Eight Mile Plains	Elmsdale ..	White Leghorns and Australorps
E. J. Blake, Rosewood ..	Sunnyville ..	White Leghorns, Australorps, White Wyandottes and Rhode Island Reds
R. H. & W. J. Bowles, North Rockhampton	Glenmore Poultry Farm and Hatchery	White Leghorns and Australorps
J. Cameron, Oxley Central ..	Cameron's ..	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps
J. L. Carrick & Son, Manly road, Tingalpa	Craigard ..	White Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
T. G. Crawford, Stratford ..	Rho-Isled ..	Rhode Island Reds
Dr. W. Crosse, Musgrave road, Sunnybank	Brundholme ..	White Leghorns, Australorps, and Rhode Island Reds
Dixon Bros., Wondecla	Dixon Bros. ..	White Leghorns
Rev. E. Eckert, Head street, Laidley	Laidley ..	Australorps, White Leghorns, and Langshans
Elks & Sudlow, Beerwah ..	Woodlands ..	Australorps and White Leghorns
W. H. Gibson, Manly road, Tingalpa	Gibson's ..	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros. ..	White Leghorns
G. Grice, Loch Lomond ..	Kiama	White Leghorns
J. W. Grice, Loch Lomond ..	Quarrington ..	White Leghorns
Mrs. M. Grillmeier, Mount View, Milman	Mountain View	Australorps, Minorcas, and Rhode Island Reds
C. & C. E. Gustafson, Tannymorel	Bellevue ..	Australorps, White Leghorns, and Rhode Island Reds
P. Haseman, Stanley terrace, Taringa	Black and White	Australorps and White Leghorns
C. Hodges, Kuraby	Kuraby ..	Anconas and White Leghorns
J McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Australorps. and Brown Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
A. Malvine, junr., The Gap, Ashgrove	Alva ..	White Leghorns and Australorps
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Langshans
J. A. Miller, Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, Brown Leghorns, and White Leghorns
Mrs. H. I. Mottram, Ibis avenue, Deagon	Kenwood Electric Hatcheries	White Leghorns
J. W. Moule, Kureen	Kureen ..	White Leghorns and Australorps
D. J. Murphy, Marmor ..	Ferndale ..	White Leghorns, Brown Leghorns, Australorps, Silver Campines, and Light Sussex
S. V. Norup, Beaudesert Road, Cooper's Plains	Norup's ..	White Leghorns and Australorps
H. W. & C. E. E. Olsen, Marmor	Squaredeal Poultry Farm	White Leghorns, Australorps, Black Leghorns, Brown Leghorns, and Anconas
A. C. Pearce, Marlborough ..	Marlborough Stud Poultry Farm	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, Langshans, Khaki Campbell and Indian Runner Ducks, and Bronze Turkeys
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshans, Rhode Island Reds, and Brown Leghorns
G. R. Rawson, Mains Road, Sunnybank	Rawson's ..	Australorps
J. Richards, Atherton	Mount View Poultry Farm	White Leghorns and Australorps
H. K. Roach, Wyandra	Lum Burra ..	White Leghorns and Australorps
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
A. Smith, Beerwah	Endcliffe ..	White Leghorns and Australorps
A. T. Smith, The Gap, Ashgrove	Smith's ..	White Leghorns and Australorps
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
A. J. Teitzel, West street, Aitkenville, Townsville	Teitzel's ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's Poultry Farm	White Leghorns and Australorps
W. A. Watson, Box 365, P.O., Cairns	Hillview ..	White Leghorns
G. A. C. Weaver, Herberton road, Atherton	Weaver's Stud Poultry Farm	Wyandottes, Indian Game, Barred Rocks, Australorps, White Leghorns, Anconas, Rhode Island Reds, Buff Orpingtons, Black Orpingtons, and Buff Leghorns.
T. Westerman, Handford road, Zillmere	Zillmere ..	Australorps and White Leghorns
H. M. Witty, Kuraby	..	White Leghorns and Australorps
P. A. Wright, Laidley ..	Chillowdeane ..	Brown Leghorns, White Leghorns and Australorps
R. H. Young, Box 18, P.O., Babinda	Reg. Young's ..	White Leghorns, Brown Leghorns and Australorps

POINTS IN POULTRY KEEPING.

The maintenance of the flocks in a condition of good health largely depends on two factors:—(1) stock of sound constitutional vigour, and (2) sanitary surroundings.

Only healthy laying and breeding stock possessing an abundance of constitutional vigour should be kept. The removal of birds from the flock at the first sign of debility or sickness is a necessary precaution against loss.

Since the welfare of the healthy members of the flock is of far greater importance than that of a few sick birds, it is important to look after the healthy birds first. Sick birds should be culled out of the flock. The poultry house can then be cleaned and disinfected. All feeding and drinking utensils should be thoroughly washed.

If treatment of sick birds is advisable they should be kept confined while under treatment. Birds suffering from a contagious disease should be quarantined until all danger of contaminating the rest of the flock is over. In many cases of disease it is better to kill the affected birds at once, and burn or bury them deeply. In no case should diseased birds be sold.

Sanitation is a very important factor in keeping down disease in poultry flocks. The land used for poultry should be kept free from contamination by regular cultivation and the growing of grass, or some other kind of crop. Some poultrymen lime their soil annually. It is, of course, necessary to keep poultry houses clean and well littered with clean, dry straw. Houses to be kept free from dampness need good ventilation, draughts should be avoided. Overcrowding tends to weaken the vitality of the stock, and careful poultrymen allow three or four square feet of floor space to each bird. Poultry houses should be disinfected thoroughly at frequent intervals. If disinfectants are used, the fowls should not be marketed until the odour of the disinfectant has completely gone. If poultry are to be marketed shortly after disinfecting the premises, the house may be best disinfected with a 4 per cent. solution of formaldehyde. Disinfection will be most effective if the floors, walls, and roosts are first cleaned thoroughly.

The culling of laying flocks has been practised for a number of years in practically all parts of the country, and, as a result, the laying qualities of the flocks have greatly improved. Culling has also led to a better distribution of the marketing of surplus hens. While the practice of culling the laying stock is designed to eliminate the poor layers, sometimes there is a tendency to market hens in unthrifty condition or in poor health, a practice which cannot be too emphatically condemned. Only the slip-shod farmer will market hens in poor flesh, and it obviously pays to select stock carefully before marketing.

MILK AS A FOOD FOR FOWLS.

Skim milk is an excellent poultry food, and if fowls are given all the skim milk they can drink, and even if fed on nothing else but grain, they will continue to lay well.

Farmers generally appreciate the necessity of efficient feeding and, to give their fowls the necessary amount of protein, use one or other of the prepared mashes. These mashes are usually fed with grain, the

birds being given an equal quantity of each. In these circumstances a sufficient amount of protein is made available to the birds.

The farmer who has skim milk to give his birds may therefore depart somewhat from his ordinary practice, for skim milk is a protein-rich food; but how far he may do so depends on the quantity of skim milk available. If the birds are given only, say, half the skim milk they will consume, half the quantity of mash that is usually fed should be supplied and the grain increased by about 50 per cent.

It will generally be found a sound policy when milk mash and grain are being fed to the flock to give the birds all the grain that they will consume, and not force them to eat given quantities of mash. This practice will largely enable the birds to balance their own ration.

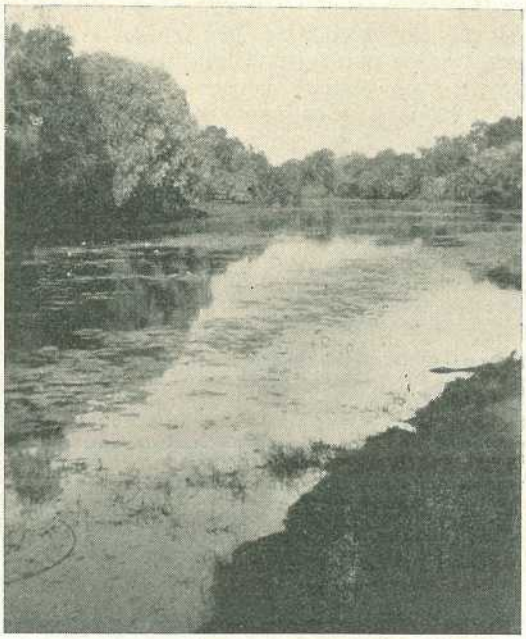
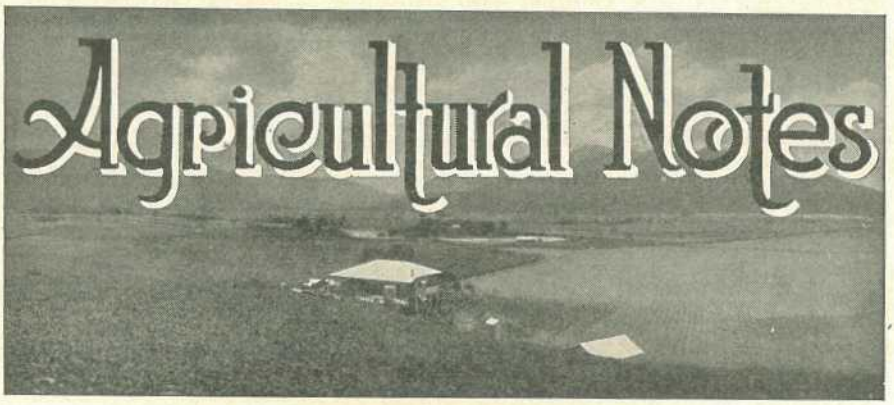


Plate 295.

ON THE SMITHBURNE RIVER, NORTH OF NORMANTON, IN THE GULF COUNTRY, NORTH QUEENSLAND.



Pasture Renovation in the Central District—Cotton a Factor.

In the Central district, on both scrub and forest land of the various coastal areas, the older stands of Rhodes grass are gradually dying out. Paddocks which at one time would safely carry a beast to three acres have been reduced to less than half that carrying capacity. On some farms the Rhodes grass has almost disappeared, and its place has been taken by numerous varieties of weeds and herbage. The loss of grass has not only markedly reduced the production of cream by the dairy herd, but the grazing of the cows on the resultant weed growth has frequently caused serious tainting of the milk produced. Instances of farmers receiving as high a return as 80 per cent. of weed-tainted cream during a twelve months' supply are not uncommon, and show the extent to which the pastures have deteriorated. The farmer is thus a heavy loser because of both decreased production and the lower price paid for weed-tainted cream.

The two problems mentioned above go hand in hand, and will have to be faced by a greater number of farmers as the Rhodes grass pastures grow older.

The major cause of the depletion of these pastures is injudicious stocking and a lowered supply of nitrate nitrogen in the soil. The heavy yields produced by this excellent grass drain the soil of the plant food nitrate nitrogen to a great depth until eventually there is not enough nitrate to promote sufficient grass to suppress weed growth. It is necessary, therefore, to grow Rhodes grass in a crop rotation which will allow of the restoration of ample supplies of nitrate nitrogen before the grass is resown.

It has been found in investigations conducted at the Biloela Research Station that the ploughing of the old grassland for three years' growth of cotton and then replanting Rhodes grass is a very suitable way of bringing the depleted grass paddocks back to normal production. Yields of 3½ tons of air-dried Rhodes grass hay have been produced at this station in the second year of establishment of the grass on forest alluvial soils following cotton. There is not only a restoration in yield of the grass obtained through the use of this rotation, but the quality of the grass also is very much improved for a considerable period.

The use of this rotation also definitely improves the yields of cotton, as compared with cotton crops grown on old cultivations. Gains ranging from 20 to 60 and even 100 per cent. have been obtained, both in experiments and commercial crops. Cotton-growing should, therefore, have a very definite place in the renovation of wornout pasture lands—whether Rhodes gross or native grasses have been the dominant growth—especially as there is an increasing demand for cotton in Australia.

Further information on the grassland-cotton rotation and the growing of cotton may be had on application to the Department of Agriculture and Stock, Rockhampton.

A SIMPLE METHOD OF WATER-PROOFING FARM SHEETS.

A simple and cheap method of water-proofing closely woven fabrics —such as old tarpaulins or calico sheets,—is to rub into them a solution of approximately 2 lb. of paraffin wax to 1 gallon petrol.

To save time in preparing the solution, the wax may be flaked with a knife and gently heated until it melts. It may then be poured into the petrol and stirred well.

If the sheet to be dressed is hung over a rail the solution may be applied with a cloth pad. When the petrol evaporates a thin film of wax is left on and between the threads of the fabric. This prevents mildewing and forms a permanent water-proof coating.

"CARROT FERN"—A POISONOUS PLANT.

Specimens have been received by the Department of a plant cultivated in gardens under the name of "carrot fern." The specimens were sent with a report that a child had died from accidentally eating some part of the plant. The plant proved to be hemlock (*Conium maculatum*), common in Europe, and in early times was used for poisoning criminals condemned to death. The poisonous principle is due to an alkaloid, coniin, which tends to disappear as the plant is dried. The plant is moderately common in cultivations, and is grown primarily because of its ornamental fern-like foliage. It grows several feet in height, and has small white flowers.

In Europe, accidental cases of poisoning are on record where the seeds have been mistaken for aniseed, the leaves for parsley, and the roots for parsnips.

A general warning about the plant is given, and this is the first case in Queensland so far as we know of anybody having been poisoned by the plant. The plant apparently is not often touched by stock, although cases of poisoning by it in Europe are on record.

PROPAGATION OF GRASSES.

Frequently enquiries are received by the Department of Agriculture and Stock as to where seed of blue couch, Kikuyu, Panicum muticum (Para), and Guinea grass can be obtained. Kikuyu grass fails to set seed in Queensland, and little or no seed of commercial value is collected from stands of the other grasses.

Propagation is usually carried out with roots, runners, or plants, except in the case of Guinea grass, which is reproduced from roots or plants only, as it does not send out runners. Supplies of the roots may best be obtained direct from the grower.

It is sometimes the practice to pass the runners of Kikuyu grass or Para grass through a chaffcutter set wide so that the resultant "chaff" can be broadcasted and harrowed in.

Blue couch should not be confused with the ordinary couch of Queensland, which can be grown from seed.

USE OF SODIUM SILICATE.

Sodium silicate, under the name of waterglass, is well known on farms as an egg preserver. In its different forms it has a variety of uses.

A hot 1 per cent. solution (1 lb. to 10 gallons) of alkaline sodium silicate is a powerful detergent, and is consequently used widely in cleansing floors, utensils, cream cans, and bottles. It is also used to remove grease and dirt from clothes.

Colloidal sodium silicate is used in proofing casks and rendering concrete floors, feeding troughs, and holding tanks, resistant to the acids that arise from bacterial action on fats, molasses, and other fermentable substances.

Timber and fabrics may be impregnated with sodium silicate to make them fire proof. The solution can be used as a vehicle for pigments and fillers, so that two jobs may be done at once.

THE PREVENTION OF SORGHUM POISONING.

In view of the numerous enquiries from farmers regarding the poisonous properties of various members of the sorghum family when immature, attention is called to the characteristics of the chief types in general cultivation.

All plants of the sorghum family, which includes Soudan grass, Johnson grass, the sweet or saccharine sorghums, such as saccaline, and the grain sorghums represented by feterita, contain quantities of a prussic-acid-yielding glucoside, which often causes fatalities among stock where reasonable precautions are not taken.

The poison is chiefly concentrated in the young stalks, but decreases in amount as the plants grow, the danger, normally, becoming progressively less.

Stock should, therefore, never be allowed access to immature feed (sweet) sorghum, especially if wilted through dry weather. Second growth and immature frosted material is also dangerous. The sweet sorghums are most palatable and nutritious when the grain is in the milky stage, and this is obviously the most opportune time to cut for silage or fodder purposes. Once the heads are well out, stock can, normally, be grazed or fed with safety.

Sudan grass is largely grown as a grazing crop, and many Downs farmers have successfully fed this grass to stock during all stages of growth over a series of years. It is much less toxic than other cultivated members of the sorghum family at corresponding periods of growth, but farmers should exercise caution, particularly during hot dry weather, and should never at any stage in the plants' growth turn in hungry stock to graze. It is also important to obtain pure seed, as all sorghums hybridise readily, and fatalities have been reported, as a result, possibly, of using hybrid seed.

Immature Johnson grass is distinctly more poisonous than any of the cultivated members of the sorghum family. This grass should, therefore, be eradicated wherever possible, as it spreads rapidly from roots and seed. The seed is difficult to distinguish apart from Sudan grass seed, but the plant can always be identified by its deep-rooting habit, whereas Sudan grass has shallow fibrous roots.

Farmers should not allow the poisonous properties of sweet sorghum or Sudan grass to deter them in the cultivation of these valuable crops for both fodder and silage purposes, as, with the adoption of reasonable precautions, fatalities need not occur.

In the coastal areas where only mild frosts are experienced, varieties such as "Saccaline" can be sown as late as February.

THE pH SCALE.

The term pH is now so commonly heard or read that it is to the farmer's advantage to understand, not merely that a pH value indicates in some way the acid, neutral or alkaline condition of his soil, but to have also some knowledge of the meaning of the value and the theory on which it is based. The following explanation, it is hoped, will assist in this direction:—

Acids contain hydrogen combined in their molecules. In solution (as in the soil) the molecules or acids, alkalis, and salts break up (or dissociate) to a certain degree to form ions. The ion common to all acids and on which acid properties depend is the hydrogen ion. Now, different acids containing *similar amounts of hydrogen in combination* dissociate to different extents to give *different amounts of hydrogen ions in solution.*

Take two acids, for instance—acetic acid and hydrochloric acid. The amounts of acid present may be the same, and may be neutralised by the same amount of alkali, such as caustic soda, and yet the actual degree of acidity or intensity of acidity would be far greater in the case of the hydrochloric acid, because, at the same concentration, it is dissociated into ions to a far greater extent, and make "available" far more hydrogen than the acetic acid.

These hydrogen ions may be considered as "free" or "active" hydrogen, and are termed potential hydrogen—from which the term pH is derived.

The figures used to denote pH are based on the volumes of different solutions that would contain a set weight of hydrogen ions. The scale ranges from 0 to 14, and, as the greater the volume required, the lower the concentration of hydrogen ions; acid solutions are indicated by low figures and alkaline solutions by the high figures.

pH 7 is neutral,—the pH of distilled water. On account of the system used in obtaining the pH, a decrease in 1 unit on the scale indicates an increase of ten times, and a decrease of 2 units indicates an increase of 100 times the acidity. Conversely, rises in pH indicate decreases in acidity to the same extent.

From the foregoing, it will be appreciated that the pH (potential hydrogen) of a soil is an indication of the concentration of hydrogen present in ion form in the soil solution. It should not be confused with the amount of acids present in the soil—as indicated by titration against an alkali—as only portion of these acids are dissociated into ions and, consequently, they may be said to have much of their power not available.

The following guide to the interpretation of values is given:—

pH 4·0 to 4·7—Very strong acidity.
pH 4·7 to 5·2—Strong acidity.
pH 5·2 to 5·8—Medium acidity.
pH 5·8 to 6·4—Moderate acidity.
pH 6·4 to 7·0—Slight acidity.
pH 7·0 —Neutral (pure water).
pH 7·0 to 7·5—Slight alkalinity.
pH 7·5 to 8·2—Medium alkalinity.
pH 8·2 to 8·5—Strong alkalinity.

Beyond these limits, cultivation is not normally possible.

From the foregoing is will be seen that only a small portion of the pH scale is used in actual practice.

A RUBBER "SLAPPER."

For driving livestock (especially pigs), I use a rubber slapper made as shown in illustration. I take a piece of old tyre inner tube about 3 feet long and cut several

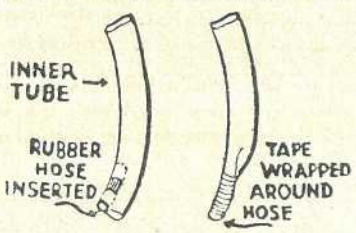


Plate 296.

slits in one side, through which I insert the rubber hose handle. When the hose is worked through the slits I wrap the tube tightly around it and bind with tape to make a firm and very satisfactory hand grip.—S.S.H. in *The New Zealand Farmer.*

Preparation of Land for Deciduous Fruit Trees.

If a man about to plant an orchard were asked for how long he expected it to be a profitable investment, he would probably reply, "For the rest of my life." This being so—and an orchard can and should last a lifetime—it is obvious that too much care cannot be bestowed on the preparation of the land for the reception of the trees; but it is surprising to find that in some cases the land actually receives less preparation than it would for a quickly-planted row of cabbages.

Trees badly planted in ill-prepared ground cannot thrive, and to attempt to establish an orchard under such conditions is really a waste of time and money. There have been cases in which growers have planted the trees, and then tried to finish "the preparation" of the land afterwards. This cannot be done satisfactorily, and the grower would have been better off in the long run had he deferred his planting for a year.

There is nothing so unsatisfactory as working an unthrifty orchard. On the other hand, nothing in the working life of the orchardist gives more pleasure and satisfaction, or is so interesting, as caring for and harvesting the profit of trees that do well, and respond to good treatment.

In the preparation of the land subsoiling is desirable, although not absolutely necessary, provided the land can be, and is, ploughed to a sufficient depth. Should there, however, be a hard pan under the surface soil then subsoiling is necessary; for, if it is not done, the trees may suffer severely from "wet feet."

A disc plough is, generally, the most satisfactory implement to use; and, if it is not set to cut too wide a furrow, it can be made to plough 18 inches deep.

When preparing land for fruit trees, care should be taken to remove, as far as possible, all roots and stumps, even though they be below plough

depth, in order to prevent, or at least to reduce to a minimum, the risk of attack by the root fungus *armillaria mellea* which, although primarily one of nature's scavengers and feeds on dead roots, yet it can—and so often does—leave the decaying roots and fasten on to the live roots of fruit trees with disastrous results. It is almost impossible to save the tree once the fungus has become firmly established.

VALUE OF BIRD LIFE.

The economic value of bird life is not generally realised, and often little appreciated by orchardists, who may adopt an indifferent or careless attitude towards its preservation.

It has been said that about 5 per cent. of the birds known to the fruitgrower as common visitants to his orchard are destructive in some way; but even these may be among the useful species, being insectivorous as well as fruit-eating. Some birds, while being more or less destructive during the fruit season, may do useful work in pest control the whole year round.

Because of their insectivorous habit, birds are Nature's agents in preserving balance by keeping insect pests from attaining plague proportions. Every orchardist should, therefore, assist in their protection, prevent as far as possible their indiscriminate slaughter for food or "sport," and preserve, where practicable, their breeding grounds.

SAVING OUR SOIL.

Surface drainage should be studied before laying out an orchard. In established orchards where it is found that surface wash and scouring is occurring, much can be done to prevent it. All surface water from above the orchard may be diverted by making a wide, shallow contour drain on the top side of the orchard, where the ground may be grassed. With a plough and scoop, this drain can be made usually at a very small cost. Depth and width will be determined by the volume of water to be diverted, but a drain about 4 feet wide and 18 inches deep, with the soil scooped on to the lower side, will do in most cases. This type of drain will not scour nor silt up readily, and if well grassed will need very little attention.

It should be remembered that a fall of 18 inches in every 100 feet is the correct grade for surface contour drains in a cultivated area.

To reduce loss of soil by the action of heavy rains on the cultivated areas, the planting of suitable cover crops should receive attention.

If it is not intended or desired to plant cover crops, it should be remembered that badly cultivated land with a hard pan near the surface will wash more severely than if good cultivation has been the rule.

Where the ploughing has been left in the rough it will be found that each furrow will carry its own water, whereas a final cross-ploughing tends to back the water up until it forcibly breaks through at a low point, generally causing a big run and considerable damage.

TRANSPLANTING TOMATOES.

When tomatoes are transplanted during summer, considerable loss is often caused by the young plants "burning off" at ground level. This is particularly noticeable where the soil is fine or sandy.

A dull day should be chosen for transplanting, but if the area is large and transplanting cannot be postponed, it should be done late in the day. Roll the stem of each plant in paper just before planting. This is best done by having a sufficient supply of papers cut to a suitable size—for the average size plant, about 4 inches by 1½ inches. The papers may be threaded on a string and suspended from the belt of the field worker for convenience in use. On taking a plant from the carrying-box or basket, the paper is snapped off the string and rolled round the stem of the plant—like rolling a cigarette—leaving only the top leaves and the root exposed. The plant may then be placed in the ground in the usual way. It will be found that after a little practice very little extra time will be required for this method of planting. Other advantages of this method are that the young plant does not readily droop, and soon becomes established. Where cutworms are troublesome, it also will give a good measure of control during the early stages of growth.

PROPPING BANANAS.

Loss of promising and superior fruit as the result of uprooting and breaking down caused during cyclonic weather in the Mons Marie variety shows the necessity for a system of propping that will reduce loss to an absolute minimum.

The method giving the best results is double propping, and it is carried out as follows:—Two stakes, 2 inches by 2 inches and approximately 12 feet long, are tied together about 1 foot from the end, and the tie wire left about 2 feet in length.

The two stakes are opened and the small fork or crotch formed by the union of the two stakes is placed at the correct height on the plant, and the length of wire is drawn round the stem and joined on the props.

When the two legs are firmly placed, and with the aid of the wire tie, it will be apparent that the plant will withstand a great amount of buffeting from the weather.

It is wise to place the props in position as soon as the plants have bunched, as it is noted that at this stage quite a large number are affected.

Another advantage of this method is that the bunch hangs between the two props, thus practically eliminating damage through rubbing.

For Cavendish bananas this method is just as practical, as the one-take system causes an appreciable loss through rubbing, but for this variety the length may be reduced to 9 feet.

GLADIOLUS THRIPS.

The gladiolus thrips is again active in southern districts, and in some gardens and nurseries the present crop of blooms will be of little value while subsequent crops will require protection from the pest.

The insect is a typical fringe-winged thrips about one-fifteenth of an inch in length and dark brown, sometimes almost black, in colour. Normally, both the adults and the small yellowish larvæ are confined to the more sheltered parts of the flower spike or the growing point, and the bulk of the injury is produced before the leaf or flower spike is unfurled. Colonies of larvæ may often be found in the small spaces between the closely-folded leaves of the plant and in the as yet unopened flower buds. The distinctive injury consequently often follows feeding on these younger parts of the plant prior to their emergence. Typically, symptoms are an uneven silvering on the surface of the leaves, malformations in and discolorations of the flower spike, and a general bedraggled appearance of the plant. Though the damage to the plant is obvious, a secondary effect is lack of vigour in the corms which is frequently not appreciated. Any set-back to the plant has an adverse effect on corms taken from it, and thrip injury is no exception to the rule. Control measures are, therefore, necessary not only for the current season's crop but also for that of the following year.

As with most species of thrips, reproduction is very rapid and populations may build up quickly to injurious levels. Continuous attention is therefore necessary, for it is much easier to retain control if treatment is applied before the plants are more or less "alive" with the insects. Similarly, corm protection is desirable to ensure freedom from infestation when planted out in the field. The essentials in control are therefore three—

(*a*) Corms should be fumigated in paper bags at the rate of 1 oz. naphthalene per 100 corms for a period of one week before being stored during the off season. A second treatment should be given just prior to planting out in the following season. If corrosive sublimate (1-1,000 for one hour) treatment is given before planting out, the second fumigation may be omitted.

(*b*) When planted out suitable sprays should be applied as soon as the thrips appear and at weekly intervals thereafter. If an outbreak was experienced in the previous season, it is better not to wait for the appearance of the thrips but to apply an initial treatment when the plants are about 6 inches high. The most efficient spray contains Paris green 1 oz., brown sugar 2 lb., and water 3 gallons. A mist spray is desirable, and it is important to agitate the contents of the pump frequently to ensure an even discharge of the toxic ingredient, Paris green. The cost of this spray is not excessive, but it has the disadvantage of occasionally burning the leaves. A more expensive spray, suitable perhaps for garden purposes, is said to be equally effective and at the same time less harmful to the plants. It contains tartar emetic 2 oz., brown sugar ½ lb., and water 3 gallons.

The derris wet sprays provide a further alternative method of dealing with the thrips, and, although they do not offer maximum efficiency, they are relatively inexpensive and convenient. Derris sprays should be mixed to the normal strength as recommended by the manufacturers and applied to the plants weekly.

(c) Where possible plantings should be arranged to allow a break of some months between seasonal operations, volunteer growth being suppressed throughout. In the absence of field hosts, the pest population will thus be at a minimum when corms are planted.

PINEAPPLE MARKETING.

When the summer smooth leaf pineapple crop in South Queensland is ready for market, the necessity of packing only good class, matured fruit will demand renewed emphasis.

There is always the tendency with some growers to pick the first shipments of pineapples too closely, with the result that these consignments lag on the Southern markets, waiting for the necessary colour to develop. Subsequent consignments arrive on top of an already loaded market, and have the effect of reducing prices. Complaints that pineapples are arriving far too green and are consequently very hard to move on the market are very common. Such fruit never ripens into an attractive condition.

Pineapples for the Southern markets should not be picked until there is a distinct sign of colour at the base of the fruit. Only fruit left until this stage will develop into a good eatable commodity.

None but good quality fruits free from sunburn, mechanical injury, or insect damage, and which are reasonably assured of being free from water blister, should be packed. Packing with woodwool is much preferable to grass; the pack always opens up cleaner and drier when the former is used.

Packing fruit to a nice grade is also a further factor in favour of a consignment. Any malformed fruit, or that which may have had the tops destroyed by frost, should not be packed. Cleanliness in the packing shed will keep the fruit free from most of the troubles which influence market values.

NEW CODLING MOTH ADVISORY SERVICE.

The Department of Agriculture and Stock recently announced the inauguration of a new codling moth advisory service which should make the control of this pest a simpler and more efficient job than previously.

For some time past it has been quite clear that there was little prospect of discovering sprays more toxic to the insect than those now in more or less general use, such as lead arsenate, white oil, and white oil combined with nicotine sulphate. Research has therefore aimed at improving the method of applying the sprays. The weakness in the past has been the difficulty experienced by the fruitgrower in deciding when cover sprays—that is, the sprays applied to the developing fruit—should be given to his trees. Recent work has brought to light two important facts about the insect which have a bearing on this problem. They are—

(1) That moth activity occurs in "bursts" during the season; and

(2) That eggs are laid mainly when these "bursts" of activity are in progress.

To determine when the moths are active, traps containing a cheap wine and water are hung in the orchard, and the activity of the moth can be estimated from the number caught. The new advisory service is based on the principle that continuous records of the number of moths in flight show when they are most active and thus when most of the eggs are being laid. From these observations it is possible for the expert to say definitely when sprays must be applied to give the best results. Timing sprays in this way is a marked advance in codling moth control methods, and during the current season the department is servicing a number of traps placed in various districts, and full publicity will, from time to time, be given to the spray dates during which growers in the Stanthorpe district ought to man their pumps and get to work spraying their apple trees.

The information as to spray dates will be broadcast over various wireless stations when received. Notices will also be posted up at railway stations and post offices in the Granite Belt and announcements will be issued through the Press.

Growers who apply their codling moth sprays as suggested in this service will find their spray costs reduced because the number of treatments will be the lowest possible without losing efficiency. In addition, doubt as to when to spray and when not to spray will no longer be a source of worry. There is therefore much to gain and nothing to lose by following the departmental recommendations in this matter, for the facts on which they are based are just as sound as science can make them.

A HORSE "COME BACK."

"If farmers will only go back to a greater use of horses in place of the mechanical power, which is taking so much out of their industry without giving compensating returns, they will help to win the war by conserving their resources and making agriculture a self-contained industry."

That is the opinion of a prominent Southern horse breeder who specialises in Clydesdales, and it is a point well taken. For, after all, if the war lasts very long there is sure to be a shortage of oil fuel for farming purposes and the position of farmers who have sold all their horses will not be easy.

The relative value of horses and tractors is still a topical subject at farmers' gatherings. It is a subject worth while studying from all angles. It is possible—no, probable—that one day we shall have an economic research institute which will settle this and many other questions bearing on farm management, supplies, and so forth. Such research would be of great value to the man on the land, because it would analyse questions of costs and expenditure, profit and loss, which are often outside the calculations of the average farmer.

The advice is now given to the rank and file farmer to breed from every good mare he possesses. Horse prices are high and are likly to remain so. Even when the war is over there will always be a demand for good farm sorts.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

EARLY summer storms enhanced seasonal prospects for the stone fruit grower, although some of the fruit already on the market show evidence of the effects of an adverse spring in some localities.

The market for tomatoes has been up and down alternately. Opening at a high price level the market was spoilt badly by a revival of the practice of consigning immature fruit by growers who ought to know better.

Most other fruits continued at payable margins throughout November.

Prices at the end of the month were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Sixes, 11s. to 12s. 6d.; sevens, 10s. to 14s. 6d.; eights and nines, 12s. 6d. to 16s.

Sydney.—Sixes, 10s. to 14s.; sevens, 14s. to 17s.; eights and nines, 17s. to 20s.

Melbourne.—Sixes, 13s. to 16s.; sevens, 15s. to 18s.; eights and nines, 17s. to 21s.

Adelaide.—To 22s. for choice fruit.

Newcastle.—Sixes, 13s. to 15s.; sevens, 16s. to 18s.; eights and nines, 17s. to 20s.

Pineapples.

Brisbane.—Smoothleaf, 5s. to 7s.; loose, 2s. to 7s. dozen; Ripleys, 8s. to 10s. case; loose, 1s. 6d. to 6s. 6d.

Sydney.—Smoothleaf, 8s. to 13s.

Melbourne.—Smoothleaf, 9s. to 15s.

Newcastle.—Smoothleaf, 9s. to 12s.

Water blister prevalent in Southern consignments. Careful handling is required during wet, hot periods.

Papaws.

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

Sydney.—2s. to 9s. tropical case.

Melbourne.—5s. to 10s. tropical case.

Newcastle.—8s. to 10s. tropical case.

Mangoes.

Brisbane.—4s. to 8s., specials higher.

Sydney.—15s. to 20s.; special varieties only wanted.

Melbourne.—18s. to 22s.; special varieties only wanted.

CITRUS FRUITS.

Oranges.

Brisbane.—13s. to 15s. bushel.

Lemons.

Brisbane.—Locals, 11s. to 15s.; Gayndah, 15s. to 20s.

STONE FRUITS.

Cherries.

Brisbane.—5s. to 10s.; choice to 13s.

Apricots.

Brisbane.—9s. to 13s. half bushel; small lower.

Plums.

Brisbane.—New South Wales Wilson, 5s. to 10s. half bushel.

Peaches.

Brisbane.—Stanthorpe Mayflower, 7s. to 9s. half bushel; China Flats, 1s. to 4s. tray.

OTHER FRUITS.

Passion Fruit.

Brisbane.—8s. to 12s. half bushel.

Sydney.—10s. to 15s. half bushel.

Melbourne.—10s. to 18s. half bushel.

Tomatoes.

Brisbane.—Ripe, 1s. to 3s.; coloured, 1s. 6d. to 5s.; green, 1s. 6d. to 4s.

Sydney.—Cleveland, 4s. to 6s. half bushel.

Newcastle.—5s. to 6s. half bushel.

VEGETABLES.

(Brisbane unless otherwise stated.)

Cabbages.—2s. to 7s. dozen. Good Stanthorpe higher to 10s.

Beans.—7s. to 10s.

Peas.—6s. to 8s.

Parsnips.—3d. to 1s. 6d.

Carrots.—3d. to 6s. *Sydney:* 2s. to 4s. a quarter.

Lettuce.—6d. to 1s. dozen.

Pumpkins.—4s. to 8s.

Marrows.—6s. to 2s. 6d. dozen.

Cucumbers.—3s. to 3s. 6d. bushel. *Sydney*: 5s. to 8s. bushel.

Rhubarb.—6d. to 9d. bundle.

Beetroot.—3d. to 8d. bundle.

Rockmelons.—*Brisbane*: 3s. to 10s. dozen. *Sydney*: 12s. to 16s. bushel.

Watermelons.—7s. to 24s. dozen.

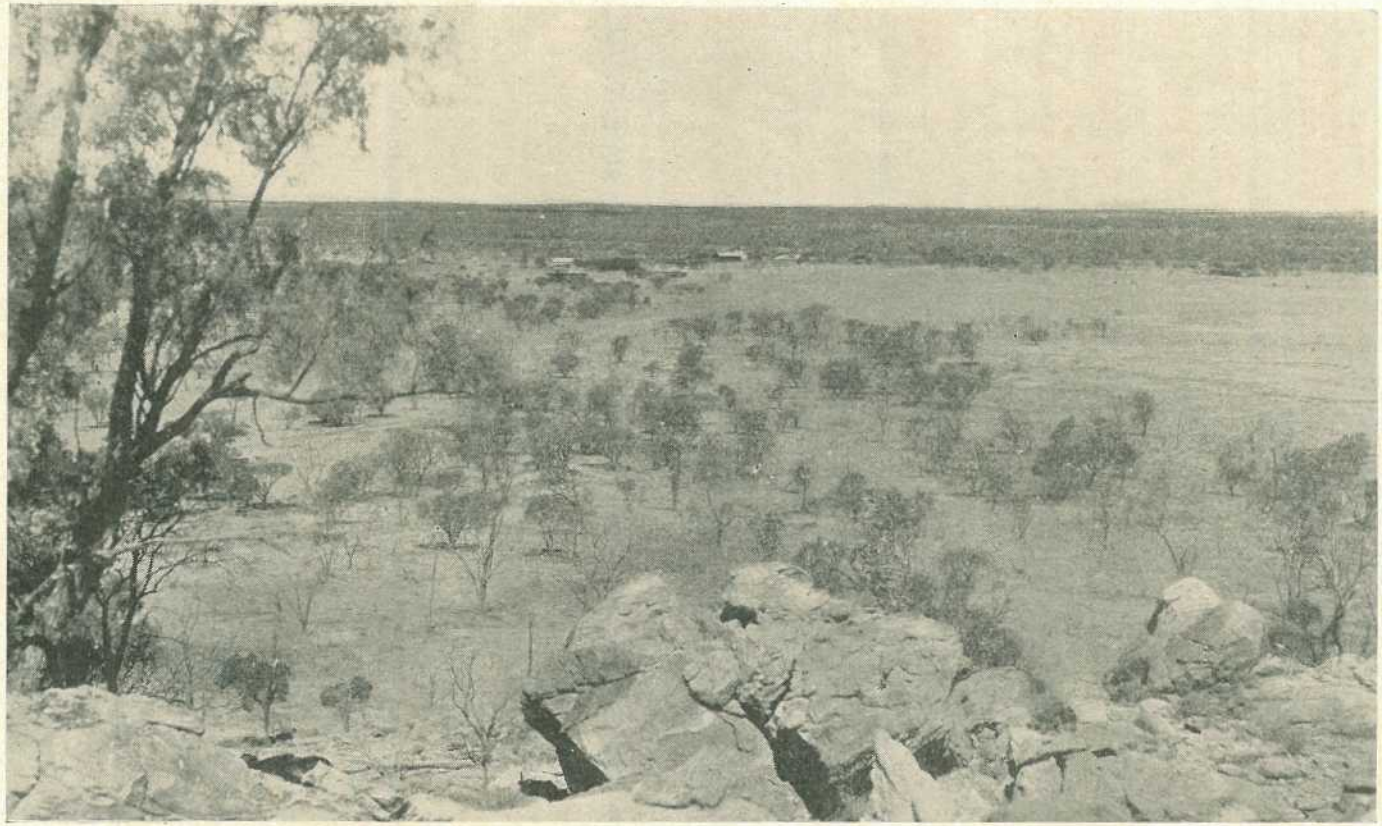


Plate 297.
A WESTERN QUEENSLAND LANDSCAPE.—Outlook from Solomon's Temple, over the Strathdarr country, near Longreach, the homestead and station buildings in the mid-distance.

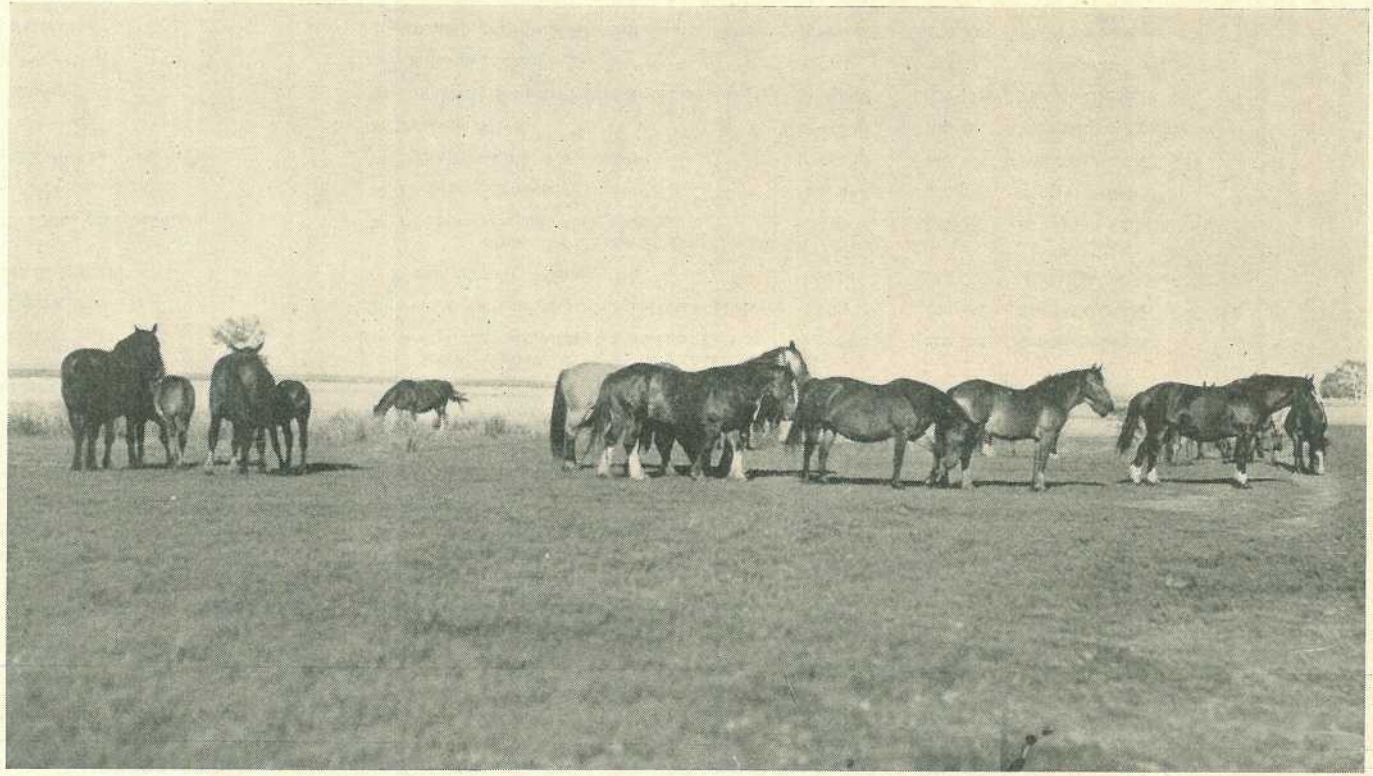


Plate 298.

On the Home Pasture.—Brood draught mares and foals, showing bone and quality, on Paradise Downs, Blackall, Western Queensland.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Friesian Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled during the month of October, 1939 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
JUNIOR, 4 YEARS (STANDARD, 310 LB.).				
Alfa Vale Gwen 5th	W. Hinrichsen, Clifton	7,908·25	332·442	Reward of Fairfield
SENIOR, 3 YEARS (STANDARD, 290 LB.).				
Jamberoo Broady II.	N. Bidstrup, Warra	10,251·66	412·955	Brookland Terrace Banker
Valera Sheila 3rd	Sullivan Bros., Pittsworth	8,089·5	332·369	Rosenthal Lord Bine
Jamberoo Rosie III.	N. Bidstrup, Warra	8,582·77	331·303	Banker of Brookland Terrace
JUNIOR, 3 YEARS (STANDARD, 270 LB.).				
Ardilea Flower	W. Hinrichsen, Clifton	7,195·75	313·135	Midget Sheik of Westbrook
SENIOR, 2 YEARS (STANDARD, 250 LB.).				
College Stately Lady	Queensland Agricultural High School and College, Lawes	8,235·13	299·452	College Sergeant
College Grandeur	Queensland Agricultural High School and College, Lawes	7,192·78	298·861	Trevlac General
Dulcie 3rd of Lynfield	F. E. Birt, Box 31, Gympie	6,821·9	287·515	Springdale Surprise
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Star 5th of Alfa Vale (365 days)	W. H. Thompson, Alfa Vale, Nanango	12,635·45	539·583	Reward of Fairfield
Glenroy Betty (365 days)	W. F. Kajewski, Glenroy, Glencoe	12,855·95	518·592	Parkview Glider
Glenroy Bluebell 2nd (365 days)	W. F. Kajewski, Glenroy, Glencoe	12,064·25	507·103	Blue Boy of Glenthorn
Ehlma Park Gentle	N. Bidstrup, Warra	8,415·84	319·161	Mount Blow Monash
College Rapture	Queensland Agricultural High School and College, Lawes	7,983·68	317·112	Trevlac General
Navillus Princess 5th	C. O'Sullivan, Navillus, Ascot	7,703	294·91	Alfa Vale Re Nell
College Rascal 8th	Queensland Agricultural High School and College, Lawes	6,016·15	270·336	Fussy's Kitchener of Hillview

College Wendie 2nd	Queensland Agricultural High School and College, Lawes	6,491·24	269·203	College Sergeant
Happy Valley Dolly	R. R. Radel, Coalstoun Lakes	6,011·7	263·345	Sunnyview Artist
Glen Idol Muriel	Estate of P. Doherty, Box 31, Gympie	6,000·65	260·757	Excellency of Blacklands
Valera Roseleaf	Sullivan Bros., Pittsworth	6,054·21	247·649	Rosenthal Lord Bine.

JERSEY.

Senior, 3 Years (Standard, 290 lb.).

Bellgarth Vera Belle	P. Kerlin, Killarney	5,799·5	313·049	Bellgarth Golden King
College Floss 2nd	Queensland Agricultural High School and College, Lawes	6,846·29	309·203	Bellgonia Peggy 9th Duke

Junior, 3 Years (Standard, 270 lb.).

Trinity Chiming Princess	G. Champney, East Wooroolin	6,290·4	357·307	Trinity Nobly Born
Windyway Nightshade	Wakefield Bros., Upper Barron, Atherton	5,320·55	285·82	Royal Emblem 2nd of Rosedale

Senior, 2 Years (Standard, 250 lb.).

Ellerdale Wonder's Golden 3rd	Farm Home for Boys, Westbrook	6,109·55	298·710	Mildred's Wonder
Peeramon Princess Rose	A. H. O. Koppen, Perramon	5,941·1	297·041	Trinity Popcorn 2nd Pioneer
College Starbright 7th	Queensland Agricultural High School and College, Lawes	4,993·35	258·843	Belgonia's Peggy 9th Duke

Junior, 2 Years (Standard, 230 lb.).

Grangevale Memo	T. Gillespie, Ravenshoe	6,257·7	333·026	Banyule Supremacy
Glenview Twinkle	F. P. Fowler and Sons, Coalstoun Lakes	6,764·25	316·006	Trinity Governor's Hope
College Fleur 2nd	Queensland Agricultural High School and College, Lawes	5,173·84	278·293	Belgonia's Peggy 9th Duke
Trinity Heiress	G. Champney, East Wooroolin	5,097·97	273·767	Trinity Nobly Born
Westbrook Safety 17th	Farm Home for Boys, Westbrook	4,999·6	270·68	Oxford Gem's Ambassador
Windyway Maiden	Wakefield Bros., Upper Barron, Atherton	4,880·5	254·218	Royal Emblem 2nd of Rosedale
Grangevale Gloria (251 days)	T. Gillespie, Ravenshoe	5,002·25	232·325	Banyule Supremacy

FRIESIAN.

Junior, 3 Years (Standard, 270 lb.).

St. Athan's Piebe Nolly	F. C. Noller, Kumbia	11,813·41	436·12	Greenvale Segis Piebe 3rd

GUERNSEY.

Junior, 2 Years (Standard, 230 lb.).

Laureldale Olga 3rd	W. A. Cooke, Laureldale, Witta	5,324·9	246·492	Laureldale Peer

General Notes

Staff Changes and Appointments.

Mr. A. F. S. Ohman, Government Veterinary Surgeon, Toowoomba, will be transferred to Brisbane.

Mr. F. Stanfield, the Poultry Farmers' Co-operative Society, has been appointed an honorary inspector under *The Diseases in Poultry Acts.*

Mr. D. C. Colyer, Lowmead, has been appointed an honorary protector of fauna.

Mr. E. A. Crosser, a member of the Rural Development Board, has been appointed acting deputy chairman of the board, and Mr. W. Bell, Department of Public Lands, has been appointed deputy member of the board, during the absence of Mr. J. L. Callaghan, deputy chairman, on official business.

Mr. E. B. Rice, Dairy Technologist, Department of Agriculture and Stock, Toowoomba, has been appointed Acting Director of Dairying.

Mr. P. P. Comiskey, District Inspector of Stock, Department of Agriculture and Stock, will be transferred from Emerald to Rockhampton.

Mr. J. P. H. Clark, Inspector of Stock, will be transferred from Gladstone to Emerald.

Mr. H. N. Whitaker, Gordonvale, has been appointed millowners' representative on the Mulgrave local sugar cane prices board, in place of the late Mr. W. F. S. Howe.

Mr. P. Volp, Mulgrave Cane Disease Control Board, Gordonvale, has been appointed an honorary inspector under *The Sugar Experiment Stations Acts.*

Mr. O. B. Farrelly, Lagoons, Mackay, has been appointed an honorary protector under *The Fauna Protection Act.*

Mossman and Hambledon Cane Diseases Control Boards.

An Order in Council has been issued under "*The Sugar Experiment Stations Acts, 1900 to 1938,*" constituting the Mossman and Hambledon Cane Diseases Control Boards in and for the cane disease infested areas comprising the Mossman and Hambledon mill areas.

Honorary protectors appointed under "*The Fauna Protection Act of 1937,*" include Messrs. R. G. Hollis, of Mandalay, Fig-tree Pocket; C. H. Westcott, Sunnyside, via Sarina; and V. O'Neill, Springcliffe, via Mackay; and C. Patrick, Mount Glorious.

Following is a list of new appointments as honorary fauna protector and honorary ranger under "*The Native Plants Protection Act of 1930*":—Messrs. S. A. Best, L. Harden, W. Nicklin, H. Cuff, R. Dobson, Charles Patrick, R. Moss, J. Batterham, K. E. H. Webber, and C. Morrison.

Tully Cane Growers' Levy.

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts empowering the Tully River District Cane Growers' Executive to make a further levy for administrative purposes at the rate of ½d. a ton on local canegrowers. This is additional to the levy of 1¾d. approved in July last.

Wild Life Preservation.

An Order in Council has been issued under "*The Fauna Protection Act of 1937,*" declaring the town of Redcliffe and portion of the shire of Pine to be a sanctuary under the abovementioned Act.

In 1909 the Redcliffe Shire was declared a sanctuary under "*The Native Birds Protection Acts, 1877 to 1884,*" and the Order in Council redefines the boundaries of the original sanctuary.

Milk Board.

An Order in Council has been issued under *The Milk Supply Act of 1938,* declaring that the number of representatives of producers on the second Brisbane milk board shall be three, and the number of representatives of wholesale vendors on the board shall also be three.

Packing of Apples.

A Regulation issued under *The Fruit and Vegetables Acts* provides that every case or package in which apples may be sold shall be a wooden case, as prescribed, and that no person shall sell any apples unless the same are so packed.

Sulphate of Ammonia an Essential Agricultural Requirement.

An Order in Council approved under *The Agricultural Requirements Control and Conservation Act of* 1939, declares that sulphate of ammonia and any fertilizer mixture containing any of such substance shall be essential agricultural requirements for the purposes of the Act.

Assistance to Wheatgrowers.

An Order in Council has been issued under *The Wheat Stabilisation Act of* 1938,'' determining that the basis on which moneys granted to the State by the Commonwealth by way of financial assistance shall be distributed to wheatgrowers shall be a payment to each wheatgrowers of one penny and nine-sixteenths of a penny for each bushel of wheat grown in Queensland, and harvested on or after 1st October, 1938, which has been sold or delivered for sale during the year in respect of which the payment is made to the State.

An Order in Council issued in May last provided for a payment of twopence a bushel.

Essential Agricultural Requirements.

The Agricultural Requirements Control and Conservation Act of 1939 came into operation on 16th November, 1939.

An Order in Council also has been approved under this Act, declaring the following to be essential agricultural requirements for the purposes of the Act:—

Sulphate of potash (potassium sulphate),

Muriate of potash (potassium muriate) chloride of potash (potassium chloride),

Plant ash containing potash,

Any other substance containing potash, which substance is capable of being used for fertilizing purposes, and

Any fertilizer mixture containing any of such substances.

Papaw and Tomato Levy.

Executive approval has been given to the extension of the Papaw and Tomato Levy Regulations issued under *The Fruit Marketing Organisation Acts,* 1923 *to* 1934, and enforced by the Committee of Direction of Fruit Marketing, the former levy for a further twelve months from 9th December, 1939, and the latter for two years, from 31st December, 1939.

Central Sugar Cane Prices Board.

The Central Sugar Cane Prices Board has been constituted from the 13th November, 1939, to consist of the following members:—

His Honour, Mr. Justice W. F. Webb, Messrs. T. A. Powell (canegrowers' representative), E. S. Smith (millowners' representative), J. McC. MacGibbon (qualified sugar chemist), and A. R. Henry (a person experienced in accountancy and audit; also to act as secretary to the Board).

It has been approved that Mr. Justice Webb shall act as chairman of the board.

Good Litter Records.

''Port Curtis Bonetta I,'' a large white sow, owned by Mr. W. C. Paroz, Biloela, has recently completed her second litter record under the litter recording plan of the Department of Agriculture and Stock, with results which should interest pig breeders. On the 9th March, 1939, she farrowed her first litter, 12 pigs, and reared them all so well that the litter weighed 659¾ lb. at 56 days of age, an average of 54.98 lb. per pig. On the 6th September, the sow farrowed her second litter, 13 pigs; one was killed when a month old, and the remainder weighed 514 lb. at 56 days of age, an average of 42.83 lb. per pig.

As heavy weights at weaning are important in marketing stock early, all pig breeders will appreciate the value of this sow's prolificacy and ability to give her pigs a good start.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of Mr. W. D. Francis, Botanist.

Native Tobacco.

A.W.J. (Brisbane)—

The specimen (*Nicotiana suaveolens*) is the common native tobacco of western parts of the State. It is found as well in some of the drier areas nearer the coast, such as on the western parts of the Darling Downs. It should not be confounded with the common wild tobacco, which is common in the cleared rain forests and scrub areas of coastal parts of the State.

The native tobacco contains the alkaloid nicotine. It has been proved by feeding tests to be poisonous to stock. Apparently, its poisoning properties are due to its nicotine content. In feeding tests in New South Wales, conducted by Seddon and McGrath, it was found that 12 oz. of the dried leaves of the plant were repeatedly poisonous to sheep, but that small doses less than 12 oz. were not poisonous. The results of these feeding tests explain why it is that graziers and others have noticed sheep eating it to a limited extent without any ill-effects following. In such cases, it is evident that sufficient quantities of the plant were not consumed.

"Tumbling Mustard."

S.G.W. (Mulgeldie)—

The weed is tumbling mustard or oriental rocket (*Sisymbrium orientale*). It is a native of Europe, the Orient, and the Himalayan region, and is fairly common in cultivations in Eastern Australia during the winter and early spring months. It is an annual plant which belongs to the Crucifer family (*Cruciferæ*). If plentiful in a pasture, it would most likely taint the milk of cows which eat it. It is not poisonous.

Rockhampton Grass Specimens Named.

Inquirer (Rockhampton)—

The specimens have been determined as under. None of them could be classed as good dairying grasses, and only a few are of any use for fattening.

1. Common vervain (*Verbena officinalis*). This is not a grass, but belongs to the same plant family as the lantana. It is sometimes very common in the pasture, and occurs also as a weed on farm headlands, fallow land, and similar places. It is rarely touched by stock.
2. Paddock love grass (*Eragrostis leptostachya*). This makes quite a useful addition to the average native pasture, and at times is fairly plentiful. It can scarcely be classed as a good grass, however.
3. Bunch spear grass (*Heteropogon contortus*). In its younger stages, this is quite a good fattening grass, but as it matures it becomes rather coarse, and the "spears" are developed. These "spears" at times cause severe mechanical injury to grazing animals.
4. Barbed wire grass (*Cymbopogon refractus*). This species has a poor reputation as a fodder, and tends to replace the better class kangaroo grass in the coastal open-forest country as the kangaroo grass becomes eaten out.
5. A three-pronged spear grass (*Aristida* sp.). Probably this is the same as No. 7, but in the absence of "spears" it is impossible to be sure.
6. A Star grass (*Chloris* sp. (?). This specimen is too fragmentary for identification, but appears to be one of the star grasses, most of which are of a limited value in the native pastures.
7. A three-pronged spear grass (*Aristida latifolia*). This is rather a coarse, robust species which is of little value as a fodder.

"Wild Flax" or "Broom Bush."

H.R.S. (Yeerongpilly)—

The plant specimen is *Pimelea trichostachya*. It is observed that the specimen has been referred to as "broom bush." Several years ago when in the Quilpie district, we heard it referred to as "wild flax." In that district it is reputed to be poisonous to stock. The plant has a peculiar and rather objectionable smell in the field. Even when some distance away from it, when the wind is blowing over it towards one, this unpleasant smell is noticeable. At the time of our visit to the Quilpie district, it was very dry, and some of the sheep were being shifted farther east. There was a considerable quantity of this plant growing in patches, and often in flower. It had the property in some way of remaining green and healthy-looking when the rest of the vegetation was suffering from the effects of the drought. We saw no indications anywhere of the plant being eaten by stock.

White Cedar—Poisonous to Pigs.

J.H. (Rosevale)—

The fruit of the White Cedar is poisonous to pigs. The poisonous principle of this fruit is not known. Some chemical work carried out at the Technological Museum in Sydney yielded a resinous material from the fruit, and it is thought that this resinous material may contain the poisonous principle. We have had no experience which suggests that the fruit of the White Cedar is not poisonous in August and September.

A Rib Grass.

T.A.F. (Brisbane)—

The plant is one of the rib grasses. It is a Queensland native, and is generally regarded as a good fodder. The seeds should be suitable for feeding to birds. The botanical name of the plant is *Plantago varia*.

Prickly Milk Thistle. Prickly Lettuce.

W.R.S. (Gympie)—

1. Prickly milk thistle (*Sonchus asper*). It is widely spread in different parts of the world, and is very closely allied to the common milk thistle (*Sonchus oleraceus*). As a matter of fact, it is often placed merely as a variety of *Sonchus oleraceus*.

2. Prickly lettuce (*Lactuca Scariola*). At times this plant has been suspected of being poisonous, but nothing definite has been proved against it. So far as we are aware, it is a useful fodder when eaten with grass and other herbage.

A Barley Grass.

H.A.L. (Nanango)—

The specimen is *Hordeum leporinum*, a barley grass, sometimes known as wall or mouse barley. It is a native of Europe, but has been naturalised for many years in Australia, more particularly in the Southern States. In its earlier stages, it is said to be quite a useful fodder, being a winter-growing species. Towards maturity, however, it loses its nutritive value rapidly, and by summer, consists of dried stalks, a field of it somewhat resembling wheat after harvesting. Further, the seed-heads cause trouble to sheep, particularly becoming caught in the wool and piercing the skin and eyes. The hard, pointed seeds also pierce the mouth and cause at times bad sores, even in severe cases decay of the facial and jaw bones have been attributed to this cause. In the circumstances, it cannot be recommended as a fodder species.

Variegated or Lady Mary Thistle.

A.G.S. (Goondiwindi)—

Your specimen is the variegated thistle or Lady Mary thistle (*Silybum marianum*). It is a native of Europe and Western Asia, and is fairly common in parts of the Darling Downs. It has been declared a noxious weed for the State. At times it has caused poisoning in stock, as sometimes it developes a prussic-acid-yielding substance. Because of the prickly nature of the plant, and the fact that it is sometimes poisonous, it would be as well to eradicate it.

Broom Bush or Wild Flax. Tobacco Plant. Bottle Brush.

J.L. (Yeerongpilly)—

The broom bush (*Pimelea trichostachya*) is reputed to be poisonous in the Quilpie district; where it is known as wild flax. It is a drought-resisting plant, and we have noticed it quite green and flowering when the grass and herbage had disappeared. Even in dry times, the plant is avoided by stock. The wind, when blowing towards one from these plants, even when they are some distance away, is charged with the peculiar disagreeable odour of them.

The tobacco plant is *Nicotiana suaveolens*. This plant was experimented with in New South Wales by Seddon and McGrath, who found that 12 oz. of the dried leaves was poisonous to sheep, but that doses less than 12 oz were not fatal. However, animals have been observed to eat the plant without ill-effects. This is probably explained by the fact that the lethal quantity was not consumed.

The bottlebrush weeds are various species of *Trichinium*. These are ornamental plants, which belong to the Amaranth family, and which are not known to be poisonous to stock.

Climbing Buckwheat.

C.H.L. (Gayndah)—

The weed is the climbing buckwheat (*Polygonum convolvulus*). It is not known to be poisonous to stock, and so far has not become a serious pest. In eradicating the plant and checking its spread, the treatment should aim at preventing seed developing. If practicable, the plants should be hoed out before they seed.

Scarlet Pimpernel.

W.A.T.S. (Nambour)—

The specimen is the scarlet pimpernel (*Anagallis arvensis*). It is a native of Europe and temperate Asia. It is reported to be poisonous to sheep, 22 oz. in two days being found to produce death. However, it is considered that larger animals, such as cattle, do not eat sufficient quantities to cause poisoning. Because of that, it has been decided not to proceed with investigations by the Poison Plants Committee of this department. There is a blue-flowered variety of this species.

Creeping Knapweed.

L.N.D. (Cambooya)—

The specimen is the creeping knapweed (*Centaurea repens*). It is a native of the Eastern Mediterranean region, and has been established in Queensland for some time, particularly on the Darling Downs. It is a serious weed pest, and is difficult to get rid of. The best mechanical means of eradicating it is by repeated cutting of the plants below the surface of the ground, thus preventing the green parts growing and supplying the underground parts with nutrients. If stock can be kept off the area infested with the weed, spraying with arsenic pentoxide could be done, although it is not likely that only one spraying would effectively kill the weed. "Weedex" is not so poisonous as arsenic pentoxide. It is quite likely that several sprayings with "Weedex" would be necessary. It is not the skeleton weed.

Prairie Grass.

R.W.L. (Moolboolaman)—

The specimen is *Bromus unioloides*, commonly known as prairie grass. It is native to America, and was introduced many years ago as a fodder. Since then it has become naturalised in many parts of Central and Southern Queensland, frequently occurring as a weed of waste or cultivated ground and in gardens. It is a winter-growing annual which reaches maturity in the spring and early summer, and is cultivated to some extent as a fodder in southern areas, where the autumn-spring rainfall is sufficient. The grass thrives on a good loamy soil, but sandy soils are unsuitable. It is both palatable and nutritious, the chief limiting factor to its use being the unsuitability of the rainfall in most districts, except in southern portions of the State. A perennial form does occur, but has not yet been exploited to any great extent. Although the annual form dies off in the summer if allowed to seed, it reseeds fairly well.

Rural Topics

Industry and Progress.

"Your refusal to be satisfied is industry's hope for progress. It is your desire for new comforts and new services that stimulates the imagination of industry and spurs its action. Industry knows that the novelty of yesterday becomes the necessity of to-day.

". . . . And so it is that from your 'divine discontent' by your refusal to be satisfied with things as they are, industry pushes forward. The scientist in his laboratory feels the urge of your desires. The inventor in his shop knows that you are waiting. The worker in the factory is conscious that the labour of his hand and brain brings things worthwhile into your life. . . . . The merchant and distributor bring these products within your ready reach. These are the means industry uses to meet your demands. Industry must continue to hope that you are not satisfied."—R. J. Hamilton in "*Stories of American Industry.*"

Variety in Stock Feeding.

The flesh-forming materials in foods (proteins) are composed of units termed amino acids. These amino acids are synthesised by plants, but it is very doubtful whether they can be "manufactured" by vertebrates.

The most useful proteins are those which contain the greatest variety of amino acids. For this reason, animal by-products—milk, eggs, flesh, &c.—stand alone. If a vegetarian diet is to be persisted with, it must be selected from a wide range of foods so that the missing amino acids in one material way may be made up from another. This explains the benefits of variety in live stock feeding.

Risk of Feeding Raw Offal to Pigs.

On many farms a fat beast is killed occasionally for domestic use. Portions of the carcase and viscera are sometimes fed raw to pigs. These form a valuable pig food if cooked; but, if fed raw, the health of animals may be endangered. For example, when an animal is affected with tuberculosis, the primary lesions in the organs, being small, may escape detection. Although the carcase may not be grossly affected, there is a real danger to pigs—especially young ones—if fed with uncooked material from a diseased beast.

Under the Cattle Slaughtering Act, the Diseases in Stock Act, and the Pig Industry Act, the feeding of any meat offal or blood to pigs, unless it is thoroughly cooked, is a serious offence.

Shade for Pigs.

During the summer adequate shade for pigs should be provided. The ordinary sty, particularly if it has an iron roof, is very hot, and some other shade is necessary in the heat of the day. If there are no trees nearby, a wooden shed will answer the purpose.

Another important aid to the health and comfort of pigs is a bath in which they can lie in hot weather. To wallow in the mud is the pig's natural method of cooling itself. Unfortunately, the wallow sometimes seen on the pig farm is a filthy puddle-hole. If there is infection of any kind in the yard, it is to be found in just such a place. Dirty wallows should be drained and filled in, and a concrete or similar bath provided. This can then be kept clean, and the liability to infection will be diminished.

Comfortable and hygienic conditions are most important in maintaining the health and wellbeing of pigs.

An Important Point in Calf Feeding.

It is very important that calves should be fed separately. The practice of feeding the whole mob out of tubs or troughs must be condemned strongly, because it allows the fast drinkers to get too much milk at the expense of the others. It also tends to the formation of a bad habit. The young calves drink faster than they should, which causes a variety of digestive troubles. Slow drinkers grow best when they get their full ration of milk.

Proper pens or bails for calf feeding are well worth the time or money entailed. Too often there is a complete lack of conveniences for this important routine job.

Corn Cob Charcoal for Pigs.

A good use for the corn cobs (cores) that accumulate on most farms, and around piggeries, is to make charcoal of them. The cores are of little value as a food for pigs because of their coarse, dry fibre content, and even if the whole cob (grain and core) were ground, it is doubtful whether it would be worth the trouble.

After the pigs have chewed all the corn from the cob, the waste cores and husks may be raked together into a pile and burned. When the heap is a mass of red hot coals water may be poured over the pile. The partially charred cores, when cold, may be gathered for the pigs. Bones should also be gathered and burned, and added to the charcoal made from the cores. This cleaning-up serves a double purpose; it gets rid of matter that would otherwise accumulate and become a nuisance, and provides charcoal and mineral matter for the pigs.

Valuable Pig Foods.

Skim milk and buttermilk—they should not be mixed with wash water—are of equal feeding value. These dairy products supply all the protein necessary to balance the carbohydrate content of the grain portion of the pig's ration. Together with lucerne, rape, barley, or other green feed—which may be either grazed or fed in the pig pen—they form an excellent ration.

Dairy Farm Layout.

There are two necessary adjuncts to a dairy farm which are often looked for in vain—a crush and an isolation paddock.

A crush is necessary for the handling of bulls and young stock, but few dairy farms are equipped with one.

An isolation paddock is very necessary, but is rarely provided.

How many diseases could be checked if a farmer had a good isolation paddock in which he could place and watch a suspected animal, without any danger of the animal coming into contact with the rest of his herd?

Heredity in Sheep.

None of the domestic animals respond 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.

Marketing Passion Fruit.

With the coming of warmer weather, passion fruit growers should exercise greater care in the harvesting of their fruit. Fruit should not be allowed to fall from the vines, as fallen fruit quickly become crinkled, reducing its size and value to the retailer. By picking the fruit when it is showing half colour its marketing life will be greatly increased, and its selling value raised. Where a grower has a percentage of crinkled fruit, it should be included with marked and blemished fruit and packed separately from the uncrinkled fruit. While most retailers have no outlet for crinkled fruit, there is, however, a good market otherwise for fruit of this description.

All fruit should be carefully handled and packed on the diagonal system, which gives the fruit the maximum of protection and display value, thereby enhancing its general appearance.

Sea Gulls in Insect Control.

Seagulls are useful allies of the farmer in destroying pests—that has been found out in England where gulls have done very good service for farmers by devouring myriads of grass grubs. Accurate observers of the habits of seagulls have a very large credit balance in their favour as friends of humanity.

Saving Wool Scour Wastes.

There seems to be no reason why much of the wool to be shipped from Australia under the Imperial wool purchase scheme should not be scoured here, instead of being sent away in the grease.

In sending greasy wool abroad huge quantities of dirt as well as grease—seldom less than 50 per cent.—are actually shipped, and thus take up much space which could be filled with other export commodities.

In war time, when every ton of freight space counts, it does seem absurd to go on sending hundreds of thousands of tons of "waste" to the Old Country, when by extracting it from the wool here, we would not only save freight, but would provide more work in our own wool scouring industry and, what may be of equal importance, retain all the by-products of the wool scour.

Of course, it is known that British manufacturers always like to get the bulk of our wool in grease and scour it to suit their own requirements, but there seems to be no good reason why that practice should be continued at a time of national emergency. Scoured wool may be difficult to sort—and that is why, no doubt, British top makers prefer to get it in the greasy state. But it should not be impossible to do the sorting here before scouring.

Another point of particular interest at the present time is that the chemicals contained in the yolk of sheeps' wool—potash, for instance—could be saved. The value of this, as well as of lanoline and other fats, is recognised, but in the past most of these have been run off with the dirt of the scour. To-day, we obviously cannot afford to waste any product which might be of value. During the last war it was found profitable to recover potash from the wool in the wash, but only in a small way. With an extension of the scouring industry—which would naturally follow if we decided to ship our wool as scoured instead of greasy—the possibilities would become very much greater, and it might pay to build special plants at various centres to extract at least some of the valuable by-products of the scour.

A start might be made with the low-grade wools, the dirt and grease content of which is frequently as high as 75 per cent. To scour these would reduce their bulk by probably three-fourths, thus economising on shipping space to the benefit of other exports.

The Uses of Milk.

Many things are being made from milk, quite apart from the usual dairy products. In Canada there are several factories for making casein from milk and from casein other factories make buttons, imitation ivory, furniture glue, binder for paints, sizings, and many other commodities. One factory buys whole milk, skims it, and makes butter from the cream. The skim milk is used in casein; the lactose, or milk sugar, is used as a supplement in baby foods; the albumen is separated out and, being rich in protein and vitamin C, is used as an animal concentrate. In fact, all that is left of the milk when the factory is done with it is water.

Fodder Values.

The Danes were the first farmers to speak in terms of fodder units, and, as the result of experiments in Denmark, every intelligent Scandinavian farmer knows the relative feeding value of nearly every stock food used in his country. For convenience, they take a pound of barley, the food with which they are most familiar, as the unit, and compare the relative values of all foods with that pound of barley. This fodder unit of a pound of barley equals 6 lb. of separated milk, 12 lb. of whey, 10 lb. of mangels, 12½ lb. of turnips, 2½ lb. of meadow hay, 4 lb. of oat straw, and so on.

War Time Farming.

Victory in the war will rest very largely with the farmers of the Empire, but especially those of Great Britain who are so close to scenes of naval and military action. This fact is recognised by all concerned. A very interesting development is the number of women and girls who are joining the Women's Land Army. Volunteers include shop assistants, typists, hairdressers, waitresses, farmers' daughters, and others who live at home. Landlords are working in the field alongside their tenants and farm workers, getting in the harvest.

The Women's Land Army is proving one of the most popular of the auxilliary services. In addition to the volunteers so trained in peace time, a large number of women have started their training since the outbreak of war, and before long there should be an immense body of trained or partially-trained and efficient women to assist with the Old Country's most vital industry—agriculture.

The Place of Wool in the Textile Trade.

The question often arises as to whether wool can hold its place in the textile world. At present there does not seem much doubt about it, but we can't measure yet the extent to which substitutes may be used as a war time necessity, especially in countries dependent largely on outside supplies. We have to admit, too, that wool substitutes have increased greatly in recent years, even to the extent of overthrowing old customs. Still it would be unwise to overemphasise the threat of these new materials to natural wool, but it would be equally unwise to underestimate it. Wool continues a long way in the lead of competing fibres. But to keep that lead we certainly have to increase our knowledge of wool, and apply any useful information or experience as soon as possible.

It seems a fair prophecy that, within ten years, substitutes will be produced not as cheaply as wool, but with virtues similar to those of the natural product. It is for this reason that intense scientific effort is necessary to keep wool ahead of all other textiles, and pastoralists and sheep men generally are showing their foresight in supporting much scientific work on all phases of wool production and use.

It also has to be admitted that like some other commodities, wool cannot hold its place in competition with artificial fibres by relying on its own traditional virtues. The position of wool in the commercial world has been attacked with some success by the chemist, but there is plenty of scope, and even plenty of time for it to fight back, although every day is valuable.

So it is a fair answer to the fair question: "Can wool hold its place in the textile world?" that it can, but to do so it must enlist the resources of all branches of science. And so the veterinary workers are wanted to prevent stock diseases, and the men of science on the breeding side must be called on to improve the quality and quantity of wool produced. That means, too, a reduction of costs, which also is of immense importance to the industry. On the technical side, the chemist and his co-workers in science must remove any disadvantages which are inherent in wool, and they may even improve it so well in other respects that wool may be able to compete even more strongly as a textile fibre.

Rough Riders and Rough Horses.

With the Light Horse, Field Artillery, and other mounted units in camp, arguments about buckjump riding and "outlaws" are continually cropping up, especially among "boys from the bush."

We have all seen rough riders in action, and, some of us anyhow, have had more than a passing acquaintance with horses that can "root a bit." Even a passing acquaintance may have been on such occasions when a knowing horse has decided to "turn us down and go alone."

From the days of Dargan's Grey—and that is between thirty and forty years ago—great show ring buckjumpers like Snips, Queensland, and Carrandotta, and many others, have earned wide reputations for the number of first-rate riders each has thrown. Old timers will, of course, argue that "horses don't buck like they used to," but something outstanding is always turning up that can "screw buck" just as fiercely and for as long a time as anything ever foaled. And no matter how good a buckjumper may be, someone will always be found to master it—even though many reputations may become tarnished in the attempt. Horses like Dargan's Grey, which earned their reputation in the ring could, and would, have been ridden to a standstill under ordinary station conditions. In fact, we have seen some of the toughest of young-uns tamed when horses were being selected for a mustering outfit. Someone will always be found to master the wildest outlaw. But, of course, horses would not be buckjumpers if they didn't have a victory now and then.

Roughriders may come and go, but we don't suppose there has ever been many better riders than "Boomerang" Jack Brady. From Bourke through Western Queensland to Wyndham, in North-western Australia, he was known wherever cattle were mustered. Riding a bad horse was, to him, like having breakfast. With perfect hands he would measure up to our idea of a finished, balanced rough rider. The reputed outlaws "Boomerang" Brady mastered were legion, but it was when on a young colt that he showed his best ability, his light hands and perfect balance making his riding a sheer delight to watch. It is doubted if he was ever thrown in a fair go. Many a drover and old admirer recall his exploits when they read of the breaking-in of Light Horse and Artillery remounts for war service these days out at Enoggera or wherever the horses for the new A.I.F. are broken in.

Farm Notes

JANUARY.

THE heaviest rains of the year occur usually during the January-March period, and, weather conditions permitting, the main field activity for the month will be the preparation of land for autumn and winter crops, together with the scarifying and chipping required for existing row crops.

In all districts where wheat, barley, canary seed, and oats have been harvested, ploughing should be continued in order to conserve moisture for the succeeding crop, and to eradicate troublesome summer weeds.

Early ploughing permits the accumulation of subsoil moisture, which is invaluable in promoting the growth of winter cereals at a time when seasonal rainfall is often deficient. The practice of early ploughing is recommended, especially to dairymen outside the wheat areas who normally sow oats, barley, and wheat for green feed.

Land intended for the February potato planting will now be in an advanced stage of preparation. The selection of whole seed from disease-free crops is recommended for autumn planting, as losses may occur from rotting if hot, wet conditions prevail after the planting of cut sets. Very small whole potatoes, less than 2 inches in diameter, are not likely to give the same results as more robust potatoes.

Succession sowings of summer fodder crops—such as sorghum (saccaline, white African, and imphee), Sudan grass, white panicum, Japanese millet, and cowpea may be continued where land is available. Maize sowing may also be completed in districts where early frosts are not the usual experience, but preference should be given to early-maturing or mid-season varieties.

Full advantage should be taken of the opportunity to arrange for the adequate conservation of fodder during the summer growing season, when the production of bulky, green crops presents no great difficulty.

Well-grown crops of maize and the sweet sorghums cut at the right stage of growth and before full maturity will make excellent silage which may be economically conserved in pit, trench, stack, or overhead silo. Surplus green grass, and many other green crops also, will make satisfactory silage for winter feed, and as a reserve for dry periods. Many dairymen prefer to rely on a continuity of green fodder crops throughout the year, but provision also should be made for conservation, for if pastures are scarce because of dry conditions, crop growth is then also at a minimum.

January is usually a favourable month for the sowing of paspalum, Rhodes, and other summer grasses in districts suitable for their growth. Recently burnt scrub land or thoroughly cultivated areas provide a good seed-bed, given sufficient moisture, but care should be taken to ensure that the germination standard of the seed is sufficiently high, as a good cover and rapid early growth is the principal factor in keeping weeds and undergrowth in check.

All harvesting machinery should be placed under cover. Repairs and adjustments may be regarded as wet-day jobs.

DISTILLED WISDOM.

Blessed is he who has found his work; let him ask no other blessedness. He has a work, a life purpose; he has found it, and will follow it!—*Thomas Carlyle.*

Don't do anything till you do it, and when you've done it, stop doing it.—*William Gillette.*

Noah was six hundred years old before he knew how to build an ark—don't lose your grip.—*Elbert Hubbard.*

When the outlook is not good, try the uplook.

Orchard Notes

JANUARY.

THE COASTAL DISTRICTS.

ORCHARDS and plantations should now be carrying a good cover crop, which will help to check erosion during the wet season and, when cut and turned under, maintain the soil in good physical condition.

Pineapple plantations should be kept well worked.

Bananas and pineapples may still be planted, although it is somewhat late for the former in the southern parts of the State. It would be wise to keep a good lookout for pests of all kinds, including Maori on citrus trees, scale insects, leaf-eating insects, borers, and fungus pests generally, using the remedies recommended by the Department of Agriculture and Stock.

Care is advised in handling and marketing of all kinds of fruit.

Grapes are in full season, and in order that they may be sold to advantage they should be very carefully handled, graded, and packed, as their value depends on the condition in which they reach the market. Well-coloured, mature fruit, with the bloom on and without blemish, always sells well. One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe. A maturity standard for grapes is now in force, and immature grapes are liable to condemnation.

Bananas for the interstate trade should be well filled, but showing no sign of ripening. The fruit should be carefully graded and packed and the cases marked in accordance with the prescribed regulations and despatched without delay.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JANUARY is a busy month in the Stanthorpe district, and orchardists will be fully occupied gathering, packing, and marketing the crop of mid-season fruits.

Much of the fruit may not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District; and, if they are carefully selected and properly graded and packed, they should carry as far as Cairns.

Points to remember:—

The fruit should be fully developed, but quite firm when gathered. It should be handled carefully. Bruised fruit is spoilt fruit.

Only one-sized fruit, of an even degree of ripeness and colour, should be packed in a case.

The fruit should be so packed that it will not shift, for if it is packed loosely it will be so bruised when it reaches its destination that it will be of little value. At the same time, it must not be packed so tightly as to crush the fruit.

OVERDOING A JOB.

There's such a thing as carrying an idea too far. The story is told of a farmer so keen on cleanliness about his place that he painted the inside of his concrete silo. The fermenting ensilage dissolved the ingredients in the paint and contaminated the fodder with lead. When a few of his cows died mysteriously he started to investigate. Lead poisoning was the cause, and it was traced to its source—the painted interior walls of his concrete silo. He is not likely to forget the moral of the lesson he got through being TOO fussy.

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.

THE NEWLY BORN BABY.

Health of Mother and Child.

THE health of the baby at birth is closely related to the health of the mother during pregnancy. There are expectant mothers who, because they have had one or two babies without any trouble, are apt to become careless or indifferent regarding the care and supervision of their health. They overlook or are not aware of the fact that the supervision which is recommended and provided for all mothers is necessary not only in their own interest and that of their family, but also in the interest of the expected baby. A large number of babies are born prematurely or in such a debilitated state that many of them are unable to survive the first week. Of every 100 children who die during the first year of life, about sixty-seven die during the first month, and of these most die during the first week. Maternity hospitals and wards have been built throughout the State by the Government, and in connection with these supervision and care are provided for expectant mothers. No mother should neglect to take full advantage of this service which is offered. From the statistics of one large hospital it is learned that of the women admitted to the hospital who had not received adequate supervision and care during pregnancy, almost one-third of them developed some disease associated with pregnancy or child-birth, and that the mothers of nearly one-sixth of the infants born prematurely had suffered from such disease.

Notification.

The maternal and child welfare nurse is able to call upon the mother of the newly-born child of whose birth she receives notification. The case is different in regard to the expectant mother, upon whose co-operation in making her condition known to them, the doctor and nurse are entirely dependent.

The Nature of the Supervision.

What is the nature of this supervision or ante-natal care, some may ask. Actual treatment advised is very little, and the advice given, generally speaking, aims at preventing disease, discomfit, and pain. Many women remain fit and well during pregnancy, but it is important that the expectant mother should receive advice during the early months of pregnancy in order that she may learn how to keep herself fit, and may know what she may safely do. It will give her peace of mind and confidence to feel that someone who understands is guiding her. The mother will be doing the best for herself and for her unborn infant if she follows the advice she receives and reports regularly to the doctor or nurse. While the supervision is in their hands, the hygiene of pregnancy is in the hands of the mother herself.

Diet.

It is most important that the expectant mother should eat food of the right kind. The baby is entirely dependent on her for his nourishment during the nine months before he is born.

Three meals a day are sufficient, and should include milk, egg, cheese, butter, meat, vegetables, fruit, and bread, as follows:—

Milk.—1½ to 2 pints. In districts where cow's milk cannot be obtained, use goat's milk, if possible. If fresh milk cannot be procured, use full cream dried milk. Some of the milk will be taken with porridge, some in junket or milk puddings.

Egg.—One.

Cheese.—1 oz.

Butter.—1½ to 2 oz. If there is a deficiency of butter, fresh beef dripping may be used.

Meat should be taken in moderation, and should include liver and fish. Tinned salmon and herring are valuable.

Vegetables, both raw and cooked, should be eaten. Raw vegetables eaten as salads should include lettuce, tomatoes, celery, scraped carrot, finely-cut raw cabbage, and sweet peppers. These can be grown in most gardens. Potatoes should be cooked in their own jackets and eaten every day. Other wholesome vegetables are spinach, silver beet, Chinese cabbage, French beans, peas, turnip tops, swede turnip, pumpkin, and sweet potatoes.

Fruit should always be eaten and is best uncooked. Tomatoes, oranges, papaws, pineapples, bananas, and mangoes are wholesome, but all fruit is good when taken in reasonable quantities. Canned fruit should be used when fresh fruit cannot be obtained.

Bread and scones should be made of wholemeal.

A liberal supply of water should be taken between meals.

In addition to the right kind of food, the expectant mother needs fresh air and sunshine, and of these there is no shortage in Queensland. She should have adequate sleep in addition to exercise, and recreation stopping short of fatigue.

If they experience any difficulty in receiving advice, expectant mothers are invited to write to the nearest Maternal and Child Welfare Centre (Baby Clinic) or to the Maternal and Child Welfare Training Centre, Alfred street, Fortitude Valley, Brisbane.

IN THE FARM KITCHEN.

CHRISTMAS PUDDINGS.

FOR those who like a Christmas pudding, but at the same time prefer a cold pudding, a recipe for frozen plum pudding is included.

Take 4 oz. suet, ½ lb. seeded raisins, ½ lb. currants, 2 oz. sultanas, 2 oz. candied peel, 1 oz. shelled walnuts, 4 oz. sugar, 3 oz. breadcrumbs, 1½ oz. flour, grating of nutmeg, ¼ flat teaspoonful ground cinnamon, ¼ flat teaspoonful ground cloves, 2 eggs, ½ gill rum.

Wash, pick over, and dry the fruits, and stone the raisins. Shred the candied peel and chop up the walnuts. Sieve the flour with the spices, add the finely-chopped suet and the breadcrumbs, then stir in the sugar, prepared fruits and nuts, and mix all together. Whisk the eggs and add them. Moisten the mixture with the rum and some milk as required. Beat it well and leave it to stand overnight, adding more moisture after that time if necessary. Turn the mixture into six buttered moulds. Cover them securely with buttered papers, and steam them for about an hour and a half to two hours. Unmould the puddings and serve them with half a shelled walnut on each. Sufficient for six persons.

Christmas Pudding.

Take ½ lb. breadcrumbs, ½ lb. seeded raisins, 1 oz. citron peel, 1 grated carrot, ½ lb. brown sugar, ½ lb. muscatel raisins, 6 oz. flour, 1½ gills ale, ½ lb. shredded suet, 2 oz. lemon peel, 6 eggs, 2 nutmegs, ½ lb. currants, ¼ lb. orange peel, 3 oz. almonds, salt.

Mix the breadcrumbs, sugar, grated nutmeg, chopped raisins, cleaned currants, minced peels, and a pinch of salt together in a basin. Stir in suet, then the minced blanched almonds. Add well-beaten eggs and remaining ingredients, without the ale. Beat for two or three minutes with a wooden spoon, then stir in the ale. Cover and leave for several days, stirring once daily. Pack into two buttered pudding basins if small puddings are wanted or into one large pudding basin if a pudding for twelve is wanted. Cover with buttered paper and then a floured cloth. Steam for seven or eight hours in a saucepan with boiling water, coming half-way up the sides. If two puddings are made of the mixture, four or five hours is long enough to cook. Cook either the small puddings or the large pudding for four hours on Christmas Day, then turn out, sprinkle with vanilla sugar, decorate with a sprig of holly, and serve with brandy or rum custard.

Old English Plum Pudding.

Take ¾ cupful sifted flour, 1½ teaspoonfuls salt, ½ nutmeg (grated), ½ teaspoonful cinnamon, ½ teaspoonful of mace, 1 teaspoonful ground cloves, ½ lb. seeded raisins, ½ lb. currants, ½ lb. chopped figs, 2 oz. citron (chopped), 2 oz. candied orange peel (chopped), ½ cupful breadcrumbs, 1 cupful hot milk, 4 eggs (separated), ½ lb. good beef suet (finely chopped), ½ cupful boiled cider.

Mix and sift flour, salt, and spices. Stir in fruits. Soak crumbs in hot milk for ten minutes. Beat sugar into well-beaten egg-yolks, and add suet and soaked crumbs; stir into flour mixture. Add cider and mix well. Fold in stiffly-beaten egg-whites. Turn into greased one and a-half quart mould or basin, cover and steam three and a-half hours. Approximate yield: twelve portions.

Georgia Christmas Pudding.

Take ½ cupful chopped walnuts or pecan nuts, ½ cupful sugar, 6 egg-whites, ½ cupful chopped raisins, ½ cupful sherry, ¼ cupful rum, 1 teaspoonful lemon juice.

Soak the nuts and raisins in the lemon juice for at least six hours—overnight if possible. Beat the egg-whites to a very stiff froth, add the sugar and beat till ropy. Fold in the wine-soaked fruits and nuts. Pour into a buttered baking dish. Set in a pan of hot water. Bake in a moderate oven for one hour. Serve with the following sauce: Make a custard of 6 egg-yolks, ¼ cupful of sugar, and 1½ cupfuls scalded milk. When smoothly thickened, flavour with sherry and serve on the Christmas pudding. This is a famous old Georgia recipe.

Frozen Plum Pudding.

Take ½ cupful currants, ½ cupful seeded raisins, ½ cupful finely-shredded citron, 12 maraschino cherries, 3 tablespoonfuls shredded dates, 3 tablespoonfuls shredded figs, ½ cupful maraschino cordial, 3 tablespoonfuls blanched, chopped almonds, 1 quart chocolate ice cream.

Wash currants, add raisins, and steam or simmer in a small amount of water for five minutes, or until plump; drain and cool. Marinate all other fruits in maraschino cordial for six hours; combine fruits and nuts, and mix it into ice cream. Turn into freezing trays of refrigerator and freeze for two to four hours or until firm.

Hard Times Christmas Pudding.

Take ½ lb. flour, ¼ lb. breadcrumbs, 1 cupful milk, ½ lb. stoned dates, ¼ teaspoonful salt, ¼ lb. currants, 3 oz. shredded suet, 1 apple, 2 tablespoonfuls treacle, ½ teaspoonful mixed spice.

Mix flour and crumbs together in a basin. Chop apple and suet. Quarter dates and add with apple and sugar, suet, currants, spices, and salt to flour, and crumbs. Warm treacle. Add to milk and stir in dry ingredients. Turn into a well-greased basin. Cover with a greased paper and steam for six hours. Turn out and serve with custard sauce.

Nursery Christmas Pudding.

Take 1 oz. ground rice, 6 oz. breadcrumbs, 3 oz. raisins, 4 oz. suet, 2 oz. sugar, 3 eggs, 2 tablespoonfuls plum jam, milk, butter, 1 teaspoonful baking-powder.

Mix together all the dry ingredients except the raisins. Stir in the jam, add the beaten eggs, finely-chopped suet, and a little milk. Butter a mould, seed the raisins, and stick them in even rows in the mould. Pour the pudding in very gently and cover with greased paper. Steam for two hours. Turn out and serve with custard sauce.

Special Diet Christmas Pudding.

Take 8 oz. coconut meal, 16 prunes (soaked and minced), 1 lb. seeded muscats (minced), 4 oz. raisins (2 oz. left whole and 2 oz. chopped), 2 beaten egg-yolks, 4 oz. chopped walnuts and almonds (mixed), a very little grated orange and lemon rind, 3 dessertspoonfuls whisky (or more as desired).

Mix all the ingredients together thoroughly. Add a little prune juice if mixture seems too dry, but mixture should be fairly stiff. This amount is sufficient for two medium-sized puddings. Steam in buttered basins for one hour. If liked, a teacupful of grated carrot can be added to this mixture. For a sweeter pudding, omit prunes.

WHEN THE CHICKEN WON'T GET THE AXE.

Electrocution of poultry is a possibility of the future. A Canadian man of science has been experimenting quite successfully with the slaughter of fowls by electricity. The electric current also relaxes the muscles and so makes the removal of the feathers a very easy job.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1939 AND 1938, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of years' records.	Oct., 1939.	Oct., 1938.
North Coast.	In.		In.	In.
Atherton	0·94	38	1·26	1·77
Cairns	2·14	57	1·10	4·30
Cardwell	2·01	67	2·16	1·38
Cooktown	1·03	63	0·24	1·38
Herberton	0·97	53	0·90	1·10
Ingham	1·86	47	1·55	1·97
Innisfail	3·26	58	0·78	5·31
Mossman Mill	2·93	26	5·52	3·49
Townsville	1·31	68	0·02	0·75
Central Coast.				
Ayr	0·92	52	0·15	1·37
Bowen	1·01	68	0·04	0·92
Charters Towers	0·74	57	0·18	1·77
Mackay P.O.	1·73	68	1·47	2·43
Mackay Sugar Experiment Station	1·48	42	..	2·06
Proserpine	1·62	36	0·72	1·84
St. Lawrence	1·79	68	2·10	1·41
South Coast.				
Biggenden	2·46	40	5·65	2·35
Bundaberg	2·13	56	2·10	2·99
Brisbane	2·56	87	2·31	3·45
Caboolture	2·63	52	2·40	4·61
Childers	2·76	44	3·74	2·66
Crohamhurst	3·38	46	3·94	6·85
Esk	2·64	52	2·66	2·60

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of years' records.	Oct., 1939.	Oct., 1938.
South Coast—contd.	In.		In.	In.
Gatton College	2·06	40	1·71	2·59
Gayndah	2·42	68	1·78	3·10
Gympie	2·74	69	1·87	3·12
Kilkivan	2·68	60	3·64	4·50
Maryborough	2·76	68	2·90	4·25
Nambour	3·23	43	3·05	4·18
Nanango	2·26	57	1·03	2·96
Rockhampton	1·80	68	2·28	3·36
Woodford	2·62	52	1·63	1·91
Central Highlands.				
Clermont	1·31	68	1·45	1·80
Gindie	1·38	40	..	1·62
Springsure	1·65	70	1·20	2·65
Darling Downs.				
Dalby	2·06	69	0·60	2·42
Emu Vale	2·20	43	1·18	2·79
Hermitage	1·92	33	..	3·26
Jimbour	1·88	51	0·45	2·72
Miles	2·06	54	0·33	4·14
Stanthorpe	2·52	66	1·29	2·15
Toowoomba	2·58	67	0·98	3·06
Warwick	2·34	74	1·04	4·26
Maranoa.				
Bungeworgorai	1·44	25	..	0·72
Roma	1·75	65	0·75	1·85

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—OCTOBER, 1939.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure, Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·98	83	70	86	23	57	6	24	2
Herberton	..	80	56	88	17	42	1	90	6
Rockhampton	30·07	82	62	89	6, 16	55	11	228	10
Brisbane	30·12	75	58	82	16	52	8	231	9
Darling Downs.									
Dalby	30·10	80	52	88	15, 16	39	8, 11	60	5
Stanthorpe	..	71	46	81	15	28	10	129	9
Toowoomba	..	75	50	88	7	34	10	98	10
Mid-Interior.									
Georgetown	29·96	93	65	98	6, 17	44	1	110	5
Longreach	30·00	88	60	98	4, 16	45	11	413	7
Mitchell	30·05	81	53	92	15	35	11	50	3
Western.									
Burketown	29·96	90	67	98	8, 25	57	12	55	2
Boulia	29·99	88	61	104	5	46	11	144	3
Thargomindah	30·02	82	58	104	5	43	10	126	6

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	December, 1939.		January, 1940.		MOONRISE. Dec., 1939.	Jan., 1940.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	4·50	6·31	5·0	6·50	10·17	11·9
2	4·50	6·30	5·1	6·50	11·1	11·50
3	4·50	6·30	5·1	6·50	11·45	a.m.
4	4·50	6·33	5·2	6·51	..	12·31
					a.m.	
5	4·50	6·34	5·3	6·51	12·27	1·15
6	4·50	6·34	5·3	6·51	1·8	2·2
7	4·51	6·35	5·4	6·51	1·49	2·51
8	4·51	6·36	5·5	6·52	2·33	3·43
9	4·51	6·37	5·5	6·52	3·19	4·37
10	4·51	6·38	5·6	6·52	4·7	5·41
11	4·51	6·38	5·7	6·52	4·59	6·26
12	4·52	6·39	5·8	6·51	5·52	7·17
13	4·52	6·40	5·9	6·51	6·45	8·9
14	4·52	6·40	5·10	6·51	7·41	9·2
15	4·52	6·41	5·11	6·51	8·34	9·47
16	4·53	6·41	5·12	6·50	9·27	10·37
17	4·53	6·42	5·13	6·50	10·17	11·31
						p.m.
18	4·53	6·42	5·13	6·50	11·8	12·26
19	4·54	6·43	5·14	6·50	11·58	1·18
					p.m.	
20	4·54	6·44	5·15	6·49	12·49	2·14
21	4·54	6·44	5·16	6·49	1·41	3·11
22	4·55	6·45	5·17	6·49	2·35	3·45
23	4·55	6·45	5·18	6·48	3·32	5·2
24	4·56	6·46	5·19	6·48	4·29	5·56
25	4·56	6·47	5·19	6·48	5·27	6·49
26	4·56	6·47	5·20	6·47	6·25	7·36
27	4·57	6·48	5·21	6·47	7·19	8·23
28	4·58	6·48	5·22	6·47	8·11	9·6
29	4·58	6·49	5·23	6·46	8·59	9·49
30	4·59	6·49	5·24	6·46	9·44	10·30
31	5·0	6·50	5·25	6·46	10·26	11·18

Phases of the Moon, Occultations, &c.

4th Dec.	☾	Last Quarter	6 40 a.m.
11th ,,	●	New Moon	7 45 a.m.
19th ,,	☽	First Quarter	7 4 a.m.
26th ,,	○	Full Moon	9 28 p.m.

Perigee, 3rd December, at 5.0 p.m.
Apogee, 18th December, at 2.0 a.m.
Perigee, 29th December, at 9.0 p.m.

Mercury rises at 4.32 a.m., 18 min. before the Sun, and sets at 6.7 p.m., 24 min. before it on the 1st; on the 15th it rises at 3.34 a.m., 1 hr. 18 min. before the Sun, and sets at 6.1 p.m., 40 min. before it.

Venus rises at 6.19 a.m., 1 hr. 29 min. after the Sun, and sets at 8.12 p.m., 1 hr. 41 min. after it on the 1st; on the 15th it rises at 6.40 a.m., 2 hrs. 48 min. after the Sun, and sets at 8.31 p.m., 1 hr. 50 min. after it.

Mars rises at 11.31 a.m. on the 1st, and sets at 12.18 a.m. on the 2nd; on the 15th it rises 11.15 a.m. and sets at 11.50 a.m. on the 16th.

Jupiter rises at 1.8 p.m. on the 1st, and sets at 1.23 a.m. on the 2nd; on the 15th it rises at 12.16 p.m. and sets at 12.27 a.m. on the 16th.

Saturn rises at 3.7 p.m. on the 1st, and sets at 2.40 a.m. on the 2nd; on the 15th it rises at 2.7 p.m. and sets at 1.44 a.m. on the 16th.

During this month four of the five visible planets will be above our horizon: Venus, Mars, Jupiter, and Saturn.

At our Summer Salstice on 23rd December the Sun will reach its furthest limit, 23½ deg. south of the Celestial equator, and all places within that latitude will have the Sun directly overhead at midday, and men and telegraph poles will be without a shadow. Not for long, fortunately for men. When Peter Schlemihl in an unhappy hour had sold his shadow, he left, at his end, to his friend Chamissa, his curious story with the advice: "If thou wouldst live among men then learn above all things to respect thy shadow, and after that thy money. If thou wouldst live for thy better self, O friend, thou wilt need no advice."

At Christmas-time our sky is rich in luminous constellations in and around the Milky Way. Among them Orion is the most conspicuous. The three stars in its belt are called in Scandinavia "de tre visa mannen" (the three wise men) and these point to Sirius, the greatest and most beautiful star in the heavens.

2nd Jan.	☾	Last Quarter	2 56 p.m.
9th ,,	●	New Moon	11 53 p.m.
18th ,,	☽	First Quarter	4 21 a.m.
25th ,,	○	Full Moon	9 22 a.m.

Apogee, 14th January, at 10 p.m.
Perigee, 26th January, at 9 p.m.

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

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.