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Contents

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Event and Comment.

Supplementary Feeding of Stock.

WHEN supplementary feeding of stock becomes necessary, the use of concentrated foodstuffs—such as grain or compressed meals—rather than bulky fodders, unless they can be grown on the property, is sound practice. While it may not be practicable to provide for the supplementary feeding of whole herds or flocks, it is certainly advisable to provide for a sufficient reserve of concentrates to cover the maintenance of at least the best of the breeding stock.

In the dairying branch of animal industry, circumstances are somewhat different, for it is practicable for dairy farmers to overcome, in some degree, seasonal influences by the cultivation of a balanced acreage in relation to the number of stock carried to enable enough farm-grown feeds to be conserved in the form of silage, hay, and grain to meet supplementary feeding requirements. Overmuch reliance is often placed on pastures alone with little thought to the conservation of surplus growth, with the inevitable result of serious seasonal fluctuations in production.

While the need of conserving fodder is widely recognized, unfortunately it has not yet become a general practice. An ideal system is one which combines fodder conservation with pasture management and the cultivation of fodder crops. A general aim should be the growth and storage of enough feed to maintain the milking herd in production for at least six months. This is really necessary if the recurring annual decline in output during the winter and spring months, when pastures are either dormant or dried out, is to be checked.

In Queensland, climatic conditions are generally conducive to the growth of a summer range of useful fodder crops, particularly maize and sorghum. With silage making on a sound basis, the storage of hay or grain for use with it to provide a correct balance should be regarded as a regular farm routine.

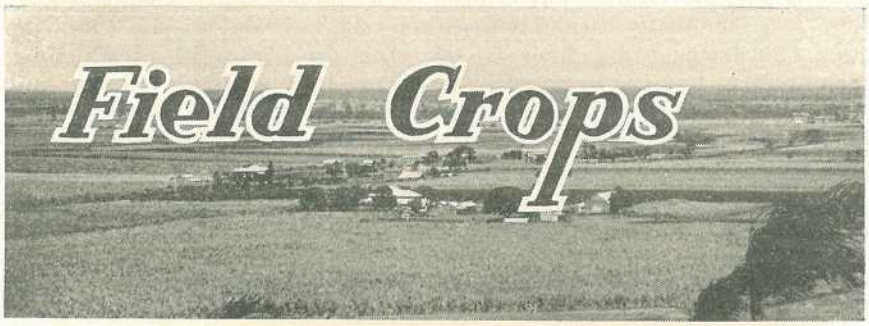
New Harvesting Machinery.

Something more than elementary knowledge is needed for the essential requirements of the dairy cow. While there is a spreading interest in the growing of greens and grains and in the better feeding of milking herds, the number of dairy farmers who systematically conserve silage for use with hay and grain during the dry period of the year is not large. There are, of course, limiting factors in respect of fodder conservation. Labour shortage, not lack of finance is, perhaps, the major factor. The answer is mechanization, the use of complete harvesting equipment of high capacity designed to deal with bulky crops at a cost much below that of ordinary methods. This particular factor has engaged the attention of agricultural engineers in Britain and America, who have evolved "one man harvesting units" designed specifically for the purpose of solving the labour problem. Two such types of machines have been brought to Queensland and are now in operation. One is the Ensilage Harvester, which harvests standing row crops, such as maize and sorghum, chaffs them in one go at an hourly rate of 8 to 10 tons; the other is the Automatic Pick-up Hay Baler, which is capable of turning out from 250 to 300 bales of hay an hour. The possibilities of such machines in fodder conservation practice will be readily appreciated. Obviously, their purchase and operation would be beyond the means of many farmers with average-sized dairying properties, but group purchase and usage on a co-operative or contract basis might get over that difficulty. There is evidence of the practicability of that idea in some localities in the State in which co-operatively owned harvesting outfits are already working successfully.

Storage of Home-grown Fodder.

It is generally agreed that equipment and storage for home-grown fodders should be regarded as an ordinary dairy farm necessity. For the storage of green fodder as silage, several types of silos, ranging from the inexpensive trench to the permanent and more costly concrete-lined pit or tower structure, are well known. For the trench type, only labour cost is involved, plus a small amount for maintenance; while with other types the first outlay is the only cost incurred and the silo, therefore, should not be regarded as an expensive farm improvement when its permanence and usefulness are taken into account. A trench silo can be constructed for an outlay of less than 5s. a ton capacity; the costs of concrete pit and tower silos may range from 20s. to 40s. a ton capacity. In the construction of silos, practical and advisory assistance is available from the Department of Agriculture and Stock.

The conservation of fodder and the balanced feeding of stock are absorbing subjects of which there is always something fresh to learn and through which all engaged in stock raising, dairy farmers particularly, may directly benefit. Farmers interested may obtain any information desired from the district adviser in agriculture, or by communicating with the Department of Agriculture and Stock, Brisbane.



Progress in Wheat Breeding, 1946-47.

R. E. SOUTTER, Plant Breeder, Agriculture Branch.

THE drought conditions of the 1946 season in Queensland drastically reduced the State's wheat production and seriously curtailed the winter cereal breeding programme of the Department. It was possible eventually to plant only two observation plots, one at Hermitage Regional Experiment Station, near Warwick, and the other at the Queensland Agricultural High School and College, Lawes.

The first sowing at Hermitage was made in August, but because of poor and irregular germination the plot was ploughed out and replanted during the first week in October. Notwithstanding the fact that this sowing was made unseasonably late, giving little promise of success, the more disease-resistant strains succeeded in producing useful yields of good quality grain.

The site at the College was chosen because of the availability of water for irrigation. This enabled the plot to be sown without rain, and to be watered judiciously during the growth of the crop. Planting was carried out in early August and harvesting occurred during November. The outbreak of stem rust at this centre during the warm ripening period was more severe than at Hermitage, though at both sites the older rust-susceptible varieties were very seriously affected. As the College plot was the more seasonal in growing period, in addition to being the more heavily rust infected, it has been used to provide the data and illustrative material which follow.

Material Tested.

The observation plots are representative of a series which are normally replicated at some four or five centres throughout the State. They each comprised approximately 200 rows, 30 to 40 of which represented named varieties and the remainder fixed crossbred selections from the current Queensland wheat breeding programme. The named varieties included all the standard Queensland varieties, in addition to a number of recent introductions from the southern Australian States.

The majority of the local varieties were Queensland bred, and while they have in the past shown their ability to withstand adverse

weather conditions they have never been claimed to be rust-resistant; they have frequently been able to escape rust, however, when sown at the main planting period. Others in this group represent old introductions such as Pusa 4 and Gluyas, which have for many years played a prominent part in Queensland's wheat culture. A number of the new introductions, particularly those from New South Wales, have been specifically bred for resistance to stem rust and have maintained their resistance under local conditions during the past few years of trial. The great majority of the newer Queensland hybrids have also been bred for rust resistance, in addition to yield and milling quality, and have proved highly resistant in field tests during recent seasons.

In the following tables, a comparison is made between 14 introduced varieties (including the rust-resistant Celebration, Charter, Gabo, Kendee, Yalta and Hofed) and 14 Queensland productions, comprising three older named varieties and 11 new crossbreds.

Stem rust and leaf rust reaction have been computed on the basis of a scale from 0-6. A reading of 0 indicates a complete absence of rust pustules, whlie 6 represents the maximum possible coverage of rust.

As yields have been based on single rows 33 ft. in length and 1 ft. 6 in. apart, from the plot at Lawes, no great weight should be attached to the figures. It is considered, however, that these yields do indicate very marked differences in the reaction of the varieties and hybrid samples to the searching conditions of the season experienced. Bushel weights were determined by chondrometer test, but in the case of the lower-yielding varieties this figure was unobtainable on account of insufficiency of grain.

In the accompanying illustrations (Plates 28 to 34) grain samples of the 28 varieties and strains included in Tables 1 and 2 are depicted. In each plate the top samples represent introduced varieties (cf. Table 1), and the lower two are from Queensland-bred varieties and strains (cf. Table 2).

TABLE 1.

DATA ON INTRODUCED VARIETIES. WHEAT OBSERVATION PLOT. LAWES, 1946.

Variety or Strain.	Stem Rust.	Leaf Rust.	Computed Yield per Acre.	Appearance of Grain.	Bushel Weight.
			Bushels		Lb.
Charter	0	2	27·5	Good	61
Gabo	0	1	21·5	Pinched	58½
Kendee	1	2	21·0	"	59
Pusa 4	5	4	13·7	Very pinched	..
Warigo	3	2	12·8	" "	..
Gular	4	3	11·9	" "	..
Celebration	0	2	11·0	Pinched	..
Yalta	Trace	3	11·0	"	..
Eureka	4	3	10·0	Very pinched	..
Hofed	2	1	10·0	Pinched	..
Insignia	5	4	9·1	Very pinched	..
Gluyas	4	3	7·3	" "	..
Currawa	4	2	2·7	" "	..
Ford	5	4	2·7	" "	..

TABLE 2.

Data on Queensland-bred Varieties and Hybrid Selections. Wheat Observation Plot. Lawes, 1946.

Variety or Strain.	Stem Rust.	Leaf Rust.	Computed Yield per Acre.	Appearance of Grain.	Bushel Weight.
			Bushels		Lb.
K54P4–4608	0	4	32·0	Very Good	64¼
K54P4–4625	0	4	31·1	,, ,, ...	64¼
KGPF–4613	0	3	31·1	Good	65¼
PHarv–4607	0	3	30·2	,, ...	64½
KGPF–4521	0	3	28·4	,, ...	65¼
KGPF–4676	0	2	28·4	,, ...	65
SFPFHS.4607	0	1	28·4	Fairly good (*Red*) ..	60¼
KGPF–4655	0	3	27·5	Good	64¾
Wheat Rye 4601 ..	2	1	26·5	,, ...	61¾
KGPF–4672	0	3	25·6	,, ...	63
KGPF–4508	0	2	24·7	,, ...	64¾
Seafoam	5	4	18·3	Slightly pinched ..	..
Puglu	4	3	14·6	Pinched	..
Flora	3	4	7·3	Very pinched	..

Rust observations made by Mr. R. B. Morwood and Mr. D. Rosser.

Discussion.

Comparisons of the varieties and strains within the two tables show some startling differences in the calculated yield per acre. While it is reiterated here that these figures cannot be accepted as representing accurate comparative yields under field conditions, it is still held that they do indicate marked differences in the ability of these strains to produce grain under seasonal conditions, which have been mainly dry and yet conducive to rust.

A study of the illustrations depicting grain samples from the 28 strains reveals differences in kernel plumpness which are no less startling than those in yield. One of the most extreme contrasts is afforded in Plate 32, where Currawa and Eureka are shown alongside two new crossbreds of the parentage Kenya Governor x (Pusa Flora).

It is obvious from inspection of the tables and illustrations that certain general relationships hold; and one of the most important of these is that, in both groups, the strains which were immune or highly resistant to stem rust have also proved highest in yield and highest in bushel weight. Moreover, they have provided the plumpest and most attractive grain samples. This relationship is to be expected in a season in which stem rust is prevalent, and shows the importance of breeding rust-resistant varieties for districts in which such seasons are likely to be often encountered. Those varieties showing apparent immunity to stem rust were Charter, Gabo, and Celebration, amongst the introductions from the South, and all the new Queensland crossbreds except Wheat x Rye-4601. Others showing but a trace of stem rust were Kendee and Yalta from New South Wales, while Hofed (N.S.W.) and the wheat-rye cross showed moderately low readings also. All other varieties, whether introduced or local, gave values ranging from 3 (intermediate) to 5 (bad).

Leaf rust infestations, ranging from 1 to 4, indicate a fair degree of resistance in some of the new varieties and strains. This disease, however, appears to have little effect in Queensland upon either yield or kernel plumpness (as can be seen from the previous tables) and, therefore, has not been viewed with great concern.

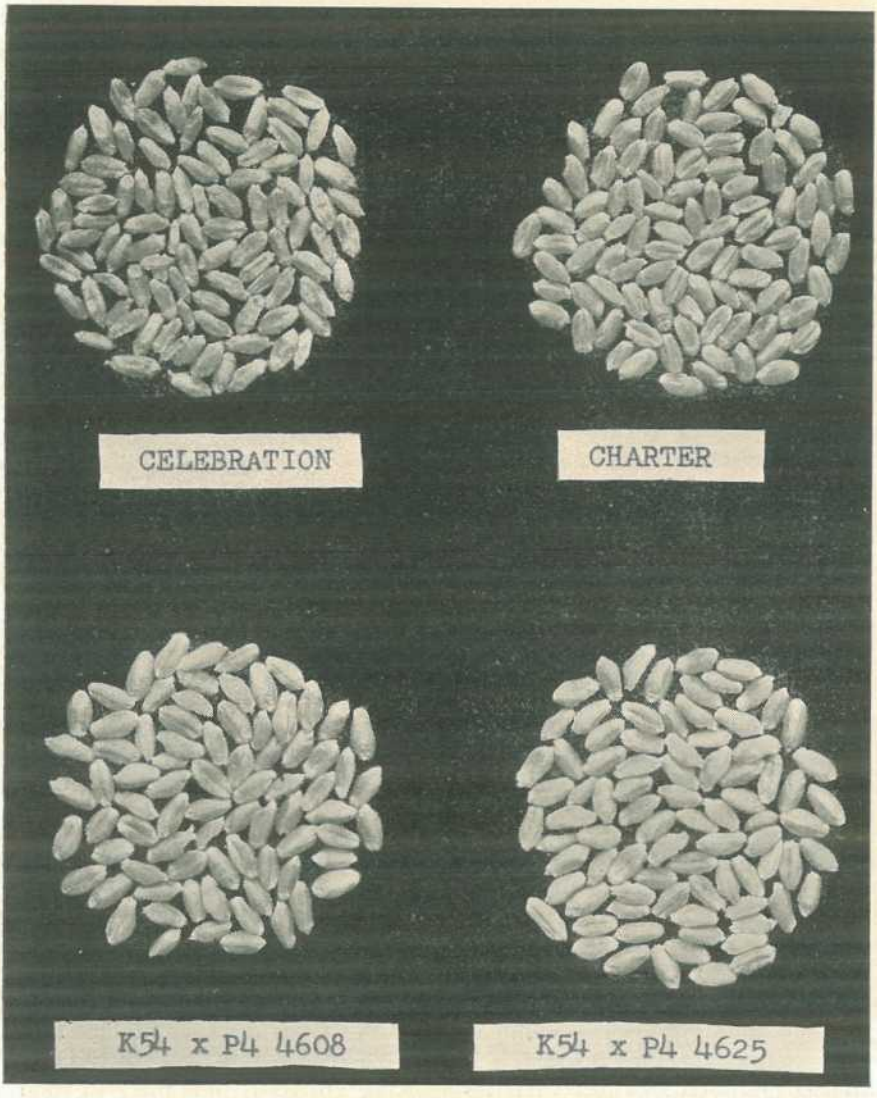


Plate 28.

One other important feature which does emerge from the tables and illustrations is that although all plump grain samples came from rust-resistant plants, not all rust-resistant plants have produced plump grain (or for that matter, high yields). Among the strains which are rust resistant and at the same time plump-kernelled, may be classed the two

K54 x P4 selections and Charter, illustrated in Plate 28. The other variety shown in this plate, Celebration, is equally rust resistant, but has produced pinched kernels and a considerably lower yield. Other varieties which, in spite of their rust resistance, have yielded pinched grain are Gabo, Kendee and Yalta. Conversely, Puglu (Plate 31), though

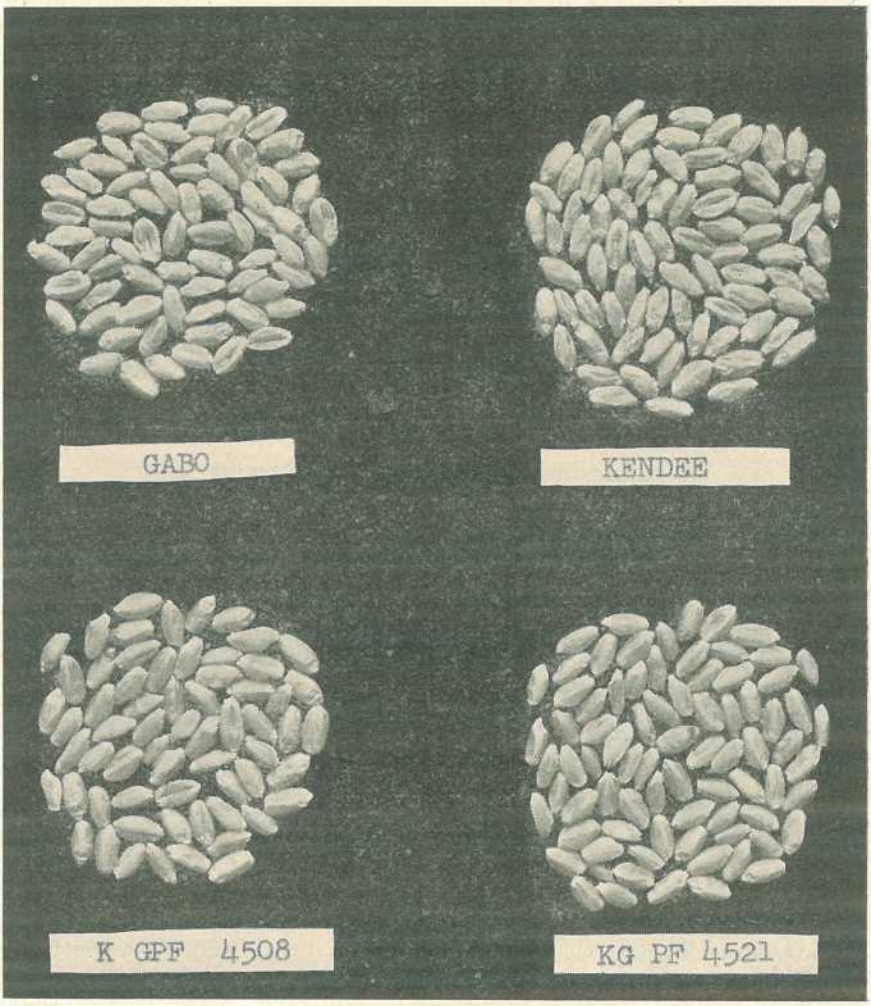


Plate 29

fairly heavily rusted in the field, yielded a grain sample which is no more pinched than that of Kendee, Celebration or some of the other highly resistant varieties from New South Wales. Incidentally, its appearance in this respect is rather better than that of either parent, Pusa 4 or Gluyas, and provides a reason for this variety's popularity in Queensland.

These comparisons suggest that the locally bred wheats possess something, undoubtedly associated with drought resistance, which renders them better adapted to extremes of seasonal conditions likely to be encountered in Queensland. Such a result is, of course, only to be expected, as it is a well-known plant breeder's maxim that breeding work is always best carried out in the particular district which it is intended to benefit. The only southern variety which approached the best of the Queensland crossbreds in yield, bushel weight, and appearance of the grain was the New South Wales variety, Charter. This test confirms the good opinion held of this variety as the result of previous trials over a three- or four-year period. The other rust-resistant introductions may yield very well in Queensland during a milder season, but appear to have been somewhat out of their environment in the hot dry spring weather experienced.

A number of the new hybrid selections, particularly those from the crosses K54 x P4, and KG x PF, have shown real promise and will go into replicated plot tests in the 1947-48 season. Under the admittedly artificial conditions of this test they have combined immunity to stem rust with good yields, high bushel weight, and attractive grain appearance. Critical tests for yield and bread-making quality are necessary before such strains can be named and liberated to farmers as improved varieties.

Description of Varieties and Strains.

Following are brief descriptions of the varieties and crossbred strains included in the test:—

Celebration (Plate 28).

(Double cross x Dundee) x Dundee, made at Glen Innes in New South Wales by Dr. S. L. Macindoe. It is a very recent liberation of about the same season as "Ford" and has been recommended for replacing that variety in localities where rust infestation is likely. It is claimed to be highly resistant to stem rust. In the tests under observation it proved to be definitely less susceptible than the varieties in general cultivation, producing a grain similar to though not equal to that of Charter.

Charter (Plate 28).

Derived from a Kenya x Gular cross made by Dr. S. L. Macindoe at Glen Innes. This is the most promising general purpose variety for Queensland conditions that has so far been introduced from any of the southern States. It is a medium-tall, mid-early wheat, which tends to lodge when yields are heavy. It is highly resistant to stem rust but moderately susceptible to leaf rust. The grain of this attractive variety finishes well and does not mottle as readily as Eureka.

Gabo (Plate 29).

One of the outstanding rust-resisting wheats produced by Drs. W. L. Waterhouse and I. A. Watson of Sydney University, resulting from a cross (Bobin sel. x Gaza) x Bobin sel. In New South Wales it is an early variety, particularly suited for later sowing. It is claimed

to be highly resistant to the known races of stem and leaf rust and this claim is borne out by limited experience in Queensland. Straw is short and of good strength and stooling is stated to be good for an early variety.

In the 1946 trials this variety did not compare favourably with either "Charter" or the best of the local crossbreds in yield and kernel plumpness.

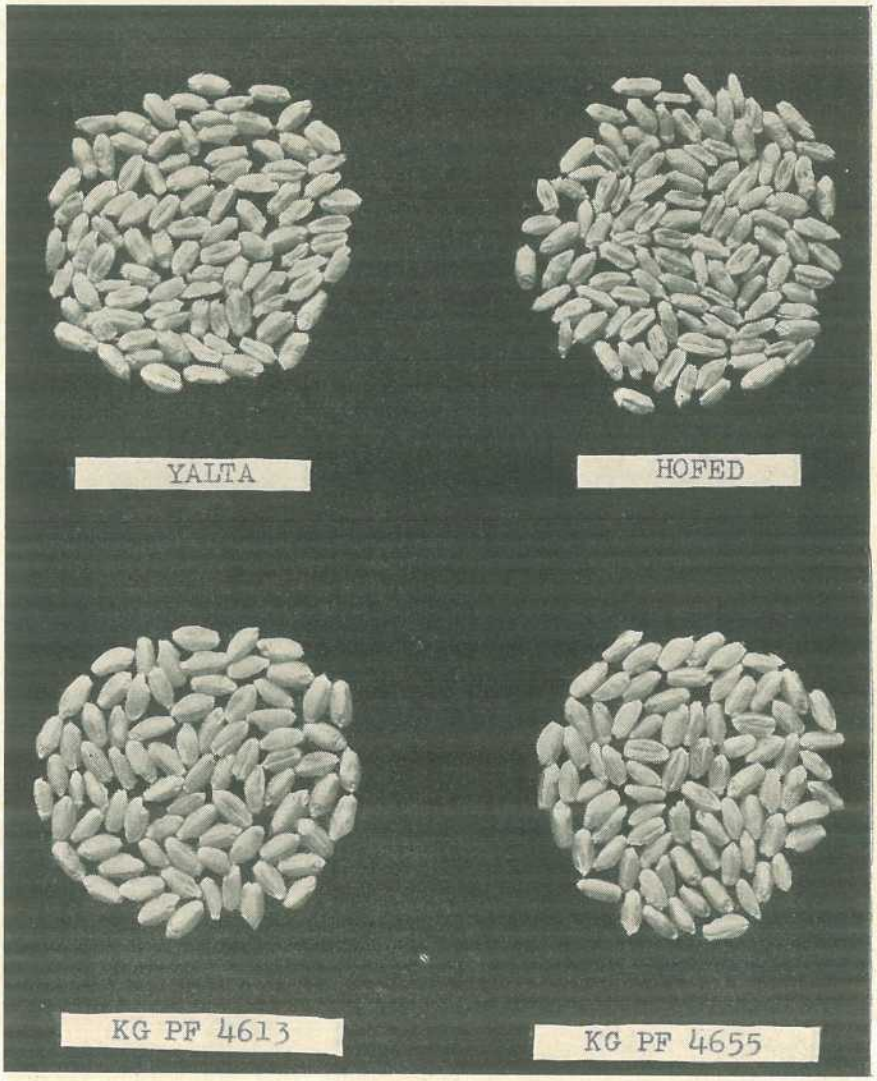


Plate 30.

Kendee (Plate 29).

Parentage Dundee x Kenya (U.A., No. 745). Evolved by Drs. W. L. Waterhouse and I. A. Watson at Sydney University. A mid-season variety suitable for sowing as a main crop in New South

Wales. Straw medium-tall, strong. Does not shatter. Yielding capacity high. It is reputed to be highly resistant to the Australian forms of stem rust but is susceptible to leaf rust. Grain obtained was slightly pinched but with a higher bushel weight than "Gabo."

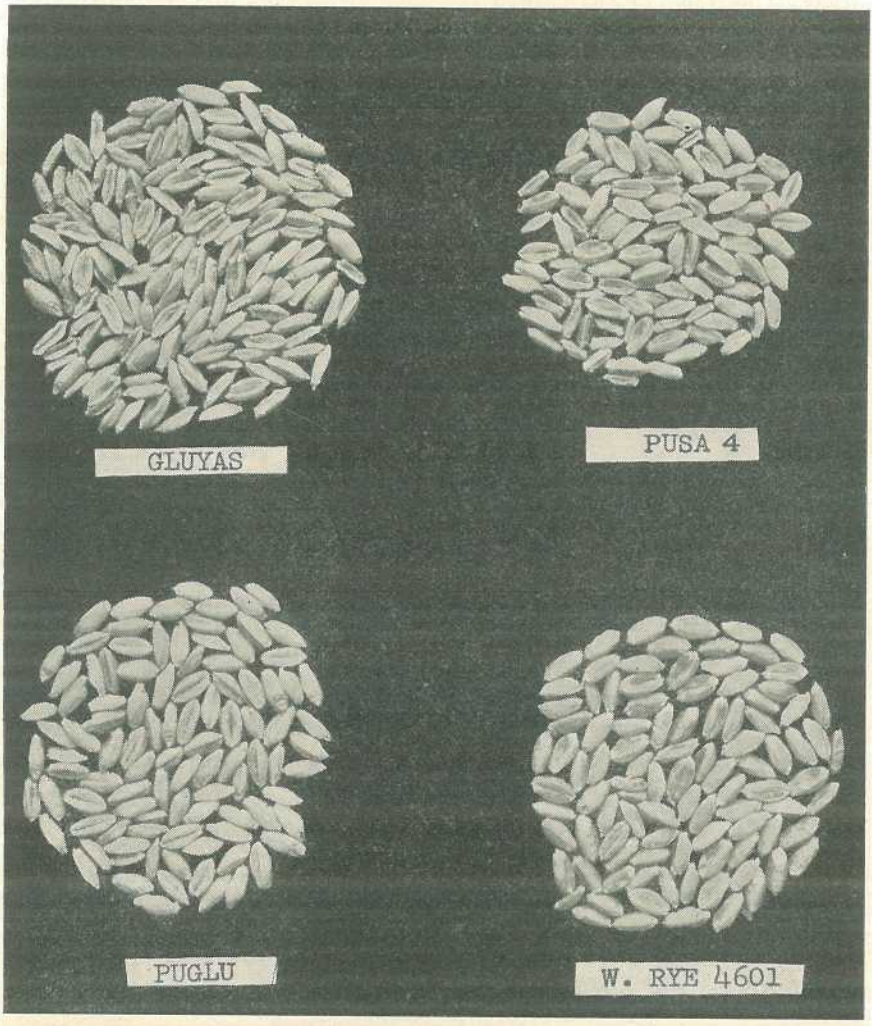


Plate 31.

Yalta (Plate 30).

Evolved at Glen Innes from the cross Kenya x Pusa 4 x Dundee. Another recent introduction to Queensland, this mid-season variety might prove suitable for main crop sowing. Straw medium-tall, strong, with pubescent chaff; grain rather small, dark amber colour, and under favourable conditions plump. It is classed in New South Wales as highly resistant to stem rust but susceptible to leaf rust. These reactions were maintained in the test under review, only a slight trace of stem rust being evident late in the season. Yield was mediocre and the grain pinched.

Hofed (Plate 30).

Produced at Sydney University by Dr. W. L. Waterhouse as a result of crossing Hope and Federation. Medium-late maturing variety, with fine straw which tillers well. This variety has been in general cultivation for a considerable time, and has proved resistant (though not immune) to stem rust, but it has never come into favour with Queensland growers.

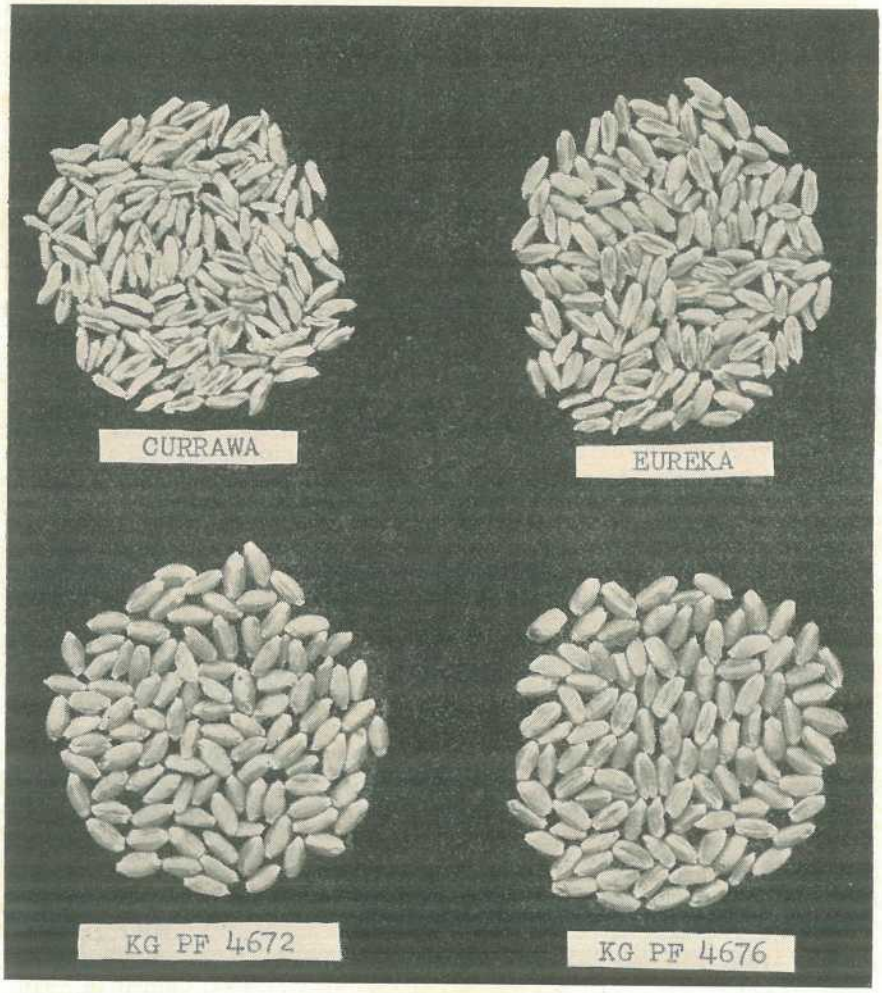


Plate 32.

Gluyas (Plate 31).

Selected in 1894 by Mr. H. J. Gluyas at Port Germain in South Australia, this ultimately became one of the most important wheats in Australia. An old favourite with Queensland growers because of its capacity to give high yields on all types of soil under adverse weather conditions. It is practically the only variety of thirty-five years ago still

being grown. Had it not been for the development of the reaper-harvester it would have gone out of cultivation because of its tendency to lodge. The acreage under this wheat has steadily decreased with the introduction of more suitable varieties. Gluyas blood enters into the breeding of many wheats which have been and are still being grown successfully in Australia, included amongst which are Nabawa, Bencubbin, Gluclub, and Puglu, the last being the second best favoured variety in this State. Because of its susceptibility to rust and the poor quality of the flour, Gluyas is not now recommended.

Pusa 4 (Plate 31).

Parentage unknown. Discovered at the Imperial Economic Botanical Quarters, Pusa, India.

Introduced to Queensland about 1920 and was the leading variety in 1929-30 but has now receded to twelfth place. Because of its exceptionally high quality it has entered largely into the breeding programme of this State, the varieties Puglu, Puno, Puora, Puseas, and Warput having it for a parent.

Currawa (Plate 32).

Resulting from a cross made by Mr. H. Pye at Dookie Agricultural College and named in 1910. At one period it was the second leading variety in Victoria and occupied fourth position in New South Wales. Has been for a very considerable period the best favoured variety for early sowing for grazing purposes in this State, as it is a late variety which, when sown early, produces a large amount of foliage very palatable to stock. Grain is normally soft white, producing a flour of weak quality. It is fairly drought resistant, and although reputed to possess some resistance to stem rust it succumbed to the disease in this trial, producing a poor yield of very pinched grain.

Eureka (Plate 32).

A selection from material obtained as a result of crossing Kenya x Florence x Dundee made by Dr. S. L. Macindoe in 1932 and named in 1938. It is an early mid-season variety, susceptible in Queensland to stem and leaf rust but resistant to bunt.

Straw of good strength. Capable of producing high yields on most wheat soils but because of its susceptibility to local forms of stem rust, and its tendency to produce mottled grain, it is going out of favour in Queensland.

Ford (Plate 33).

Parentage (Fan x Comeback) x (Zealand x Tardent's Blue). Cross made at Roseworthy Agricultural College by Mr. W. J. Spafford and selected from the resulting progeny by Mr. R. C. Scott, named in 1916. It is a medium-late maturing, medium-strong, tall-strawed variety, with long, lax, tapering ear. Grain soft, white, opaque, and plump; gluten medium strong. It is susceptible to stem rust, as the illustration of grain of this variety indicates.

Ford was the third leading variety in Australia in 1935. It is sown for grain and grazing purposes in this State but is not as drought-resistant as some of the earlier maturing varieties from Queensland and New South Wales.

Gular (Plate 33).

Resulting from a cross made in 1911 at Cowra Experiment Farm, New South Wales, and named in 1927.

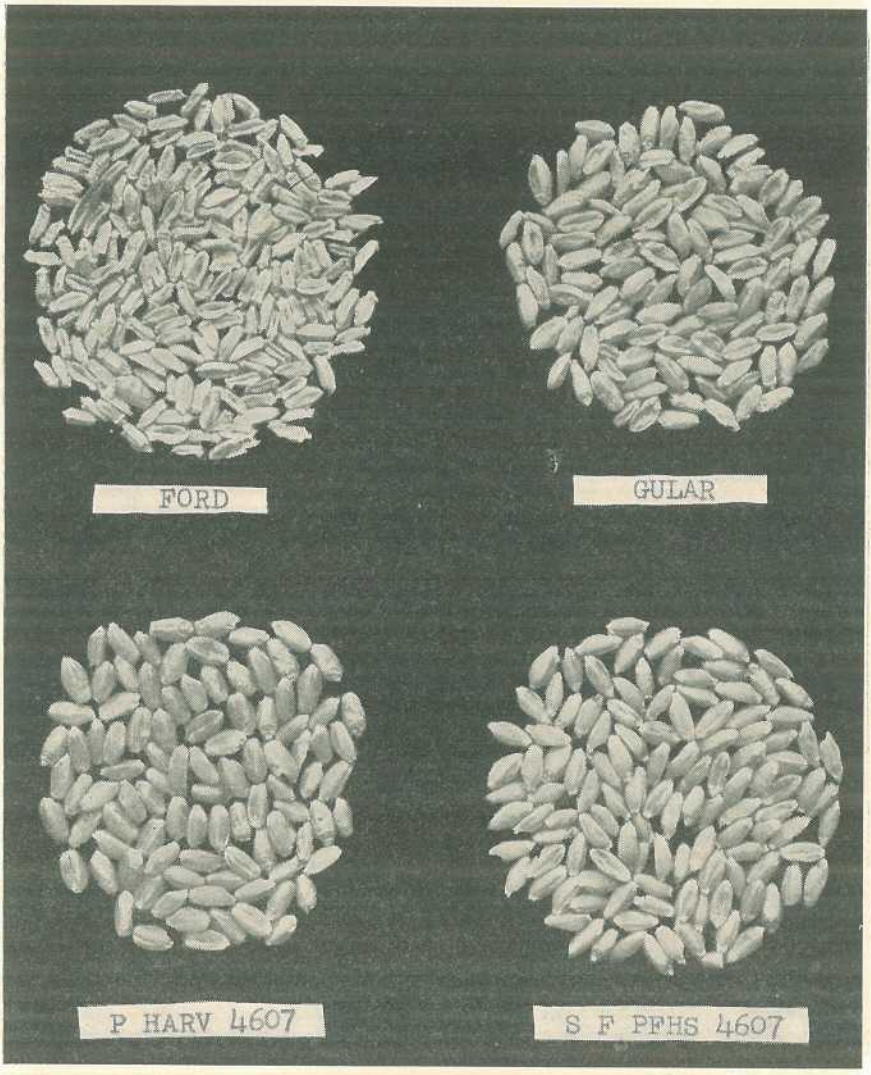


Plate 33.

Early maturing; erect habit of growth; straw medium-tall, medium-strong; tillering poor. Grain white, translucent, producing a flour of very good baking quality. Early, drought-resistant, but is susceptible to stem rust. Gular is one of the parents of the promising recent introduction, Charter.

Insignia (Plate 34).

Selected at Mallee Research Station, Victoria, from material resulting from crossing Ghurka x Ranee. An early maturing variety with characters of both parents. It is not recommended for growing in this State, chiefly because of its susceptibility to injury by stem rust.

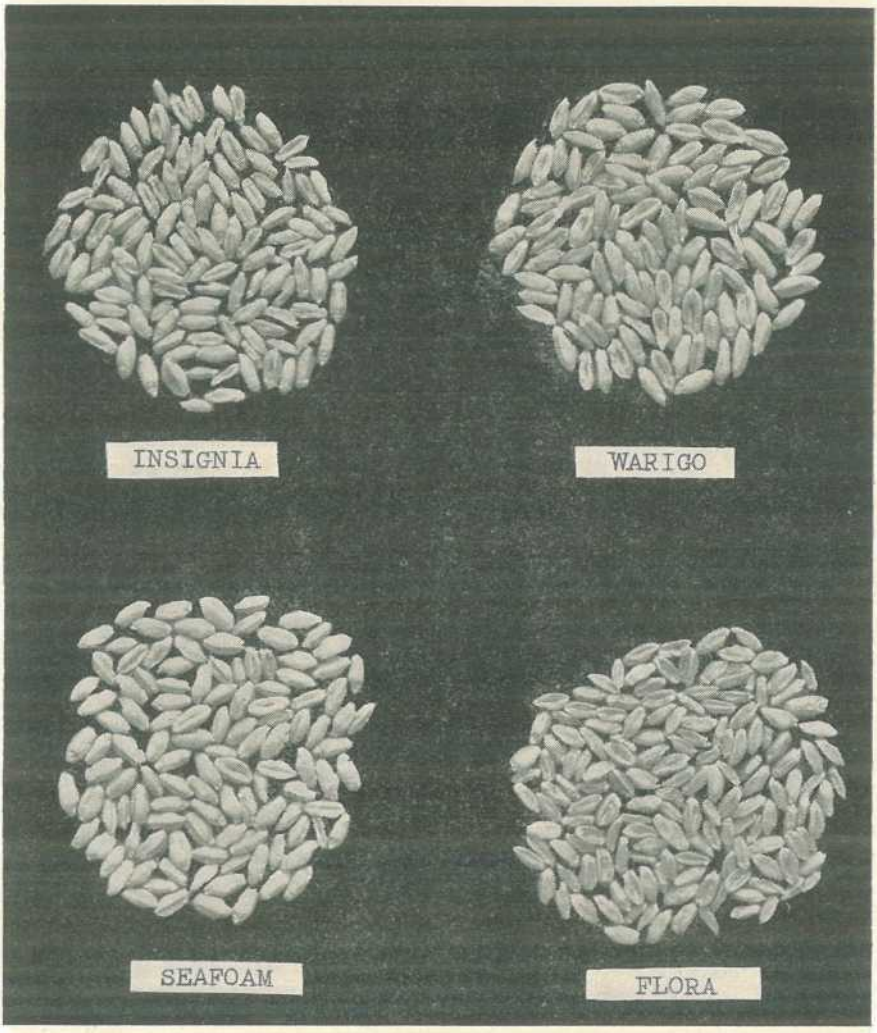


Plate 34.

Warigo (Plate 34).

Selected at Waite Institute, South Australia, by Dr. I. F. Phipps and Mr. S. R. Hockley from segregates from a Nabawa x Hope cross made in 1931. A mid-season variety with medium-fine, tall, strong straw. Grain of medium size, producing strong flour of exceptional dough stability. Some resistance to leaf and stem rust. Because of this and the fact that the variety has high resistance to mildew it has been used

in crossing operations. This variety does not appear to be well adapted to local conditions and it is unlikely that it will ever be extensively grown in Queensland.

K54 P4-4608 and 4625 (Plate 28).

Two promising new selections from the cross Kenya 10854 x Pusa 4 which have so far appeared immune to stem rust though moderately susceptible to leaf rust. These selections, in addition to two others from the same cross, have proved early maturing and prolific both at Hermitage and Lawes, producing plump samples of grain of somewhat better appearance than that produced by Charter. All have pubescent glumes like their Pusa 4 parent.

KG. PF-4613, -4521, -4676, -4655, -4672, and 4508 (Plates 29, 30, and 32).

These selections, placed in order of their yield in the trial, are all segregates from a cross between Kenya Governor and Pusa x Flora —3202. None of them has shown any trace of stem rust in the season's trials but appear to be moderately susceptible to leaf rust; all are bearded. These selections collectively yielded better under nursery-row conditions than all the named varieties except Charter and provided higher bushel weight than any such variety. In grain appearance they were the equal in every case of Charter.

Puglu (Plate 31).

A selection from Pusa 4 x Gluyas made about 1928. Although this variety was never liberated officially it is now second favourite with growers in this State on account of its appearance in the field and its proven ability to yield. Because of the relatively poor quality of its gluten it is not favoured by millers.

Wheat x Rye 4601 (Plate 31).

Resulting from a cross between Kenya Governor wheat and an unknown rye, made in 1935. One seed was obtained from the resulting plant. The probability is that it was the result of cross-pollination. The cross was made originally with the object of ascertaining whether the frost resistance of the rye plant could be incorporated in a segregate having desirable wheat characters as well. Because of the closure of the Roma State Farm in 1935 the facilities for completing this line of research have not been available.

Evidently, some of the rust resistance of the Kenya parent enters into its composition as well as that of two other segregates under observation for, as will be observed, it has produced a good yield of grain of pleasing appearance under conditions which sadly impaired the appearance of the grain of the susceptible varieties of wheat in general cultivation. Next season it is intended to have the grain submitted to a milling test to ascertain if it varies in any respect from the flour obtained from ordinary wheat.

P. Harv. 4607 (Post Harvest) (Plate 33).

This is one of a number of selections made in 1940 of plants which still remained standing in the breeding plots subsequent to a heavy storm which followed the period of general harvesting. From its appearance,

its stem-rust resistance, and the fact that it has pubescent glumes, it is evidently a segregate with Kenya and Pusa 4 blood in its make-up. The grain it produced this season, as will be seen by the table, was of high bushel weight and yield.

SF. PFHS.-4607 (Plate 33).

A selection from a multiple cross involving Seafoam (twice), Pusa 4, Flora, and Hope. This strain is not as promising as some of the others illustrated but has been included because its rust resistance is based upon Hope, as opposed to one of the Kenya varieties. From this parent it has apparently inherited its immunity to stem rust and considerable resistance to leaf rust.

Seafoam (Plate 34).

This variety has the same parentage as Three Seas, being derived from the back-cross Comeback x Cretan x Comeback, and is very similar to Three Seas in all respects. Named in 1930 it is a very early, bearded wheat, which has found favour with growers both on the Darling Downs and elsewhere in the State. It produces a medium strong flour of good baking quality. Though it has in the past been considered to possess some rust resistance, recent tests do not support this view; it has, however, generally proved to be rust escaping and productive of a well-finished grain sample. It has suffered rather severely in this test and does not bear comparison with Charter or the new Queensland hybrids.

Flora (Plate 34).

An older Queensland variety derived from the cross Bobs x Florence, made in 1911. Selection was made in 1919 and the name given later. It is a bald, early variety, and was the leading variety in this State in 1937, 1938, 1939, and 1940, but had receded to sixth position by 1945. It has always proved susceptible to stem rust, though frequently rust-escaping. Under better conditions this variety produces a shotty grain of attractive appearance, which yields a flour of medium-strong to strong class. Flora is one of the parents of Puora, which is now the leading Queensland variety.

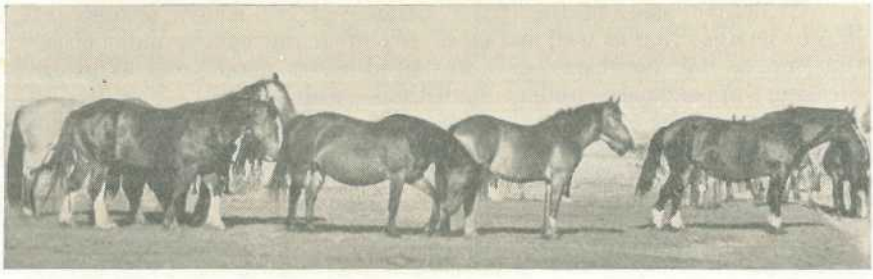


Plate 35.

SHOWING THE METTLE OF THEIR PASTURES.—Brood Draught Mares and Foals on Paradise Downs, Blackall, Western Queensland.

Notes on Weed Control.

C. W. WINDERS, Agrostologist.

"HORMONE" WEEDKILLERS.

IN 1946 a new type of weedkiller which was developed overseas during the war years became available in Australia. Tests carried out over the past year or so have shown that this new type of weedkiller is effective against quite a number of the weeds commonly encountered in Queensland and that it is very likely to be useful in controlling some of our worst weed pests.

Effects on Plants.

Hormones occur naturally in very small quantities in plants, where they have the effect of regulating the growth processes. When the amount of hormone is increased considerably by spraying or dusting on a synthetic hormone, the growth processes are upset and in many cases the plant dies. However, the effect on the plant varies with growing conditions and stage of growth, and a plant which is killed at one period may not be permanently affected if treated at a different time. For this reason a good deal of investigational work will be necessary before definite recommendations can be made for the eradication or control of many of our weeds.

Grasses and cereal crops are highly resistant to damage by hormone weedkillers at all stages of growth. While this rules out these weedkillers for use against weedy grasses such as Johnson grass and crowsfoot, it enables them to be used in growing cereal crops against broadleaved weeds such as wild turnips, star burr, and convolvulus.

Method of Application.

The hormone weedkillers marketed in Australia are intended for application as sprays and any type of spraying equipment can be used. The important thing in spraying is to put on a particular amount of the hormone. For some weeds this will be as low as 1 lb. of the hormone per acre; a good many are killed by 2 lb. per acre; and some will require 3 lb. per acre. Repeat sprayings will be necessary for certain weeds.

It is desirable that the weeds be well covered with the spray solution. Depending on the amount of leaf surface, this will take from 80 gallons to 200 gallons of spray per acre, but in most cases 100-130 gallons should be ample. Since spraying when the weed is young and growing vigorously gives best results, there should be no need for the use of large quantities of spray solution.

Precautions to be Taken.

As the hormones and the liquids or other carriers in which they are normally made up are not harmful to humans or stock, there is no hazard to health in using these weedkillers. There is, however, some danger to crop plants and ornamentals, other than cereals, sugar cane, and grasses, and for this reason the direct application of the weedkillers to such plants, and even the drifting of the spray in the wind, should be avoided. Further, the spray equipment after use should

be thoroughly cleansed with washing soda or as recommended by the manufacturers of the weedicides, since any hormone left in the equipment may harm economic plants sprayed subsequently with an insecticide or fungicide.

Tentative Recommendations.

Pending further testing of the various hormone products, the following recommendations are made for the use of those available in Queensland. It must be borne in mind by users that, as already stated, results vary somewhat from time to time. The weeds listed here have, however, been shown to be susceptible to damage and many have been killed quite readily. In many cases, there is no obvious immediate effect shown by the weed, but within a few weeks it shows abnormal growth and eventually dies.

Star Burr:

This serious pest of northern areas is now spreading into southern Queensland. It is readily killed at all stages by 2 lb. of hormone per acre, and in some instances 1 lb. has proved effective.

Blue-top, Billy-goat Weed or Ageratum:

In some sprayings this widespread weed has been readily killed by 1-2 lb. of hormone per acre, but sometimes when late-sprayed it has developed adventitious roots on the stems and persisted for a time.

Khaki Weed:

This is readily killed by 2 lb. of hormone per acre.

Needle Burr:

If sprayed at the rate of 2 lb. of hormone per acre while still carrying its leaves, this plant is killed, though somewhat slowly. If sprayed after shedding its leaves the weed persists.

Cobbler's Pegs:

This widespread annual is usually killed by 1-2 lb. of hormone per acre.

Bindweeds:

The troublesome bindweeds of the Darling Downs, which have in the past been extremely difficult to control, are readily injured by hormone weedkillers. A high proportion of some infestations has been killed by an application of 1 lb. per acre, but with a weed of the nature of bindweed more than one spraying must be expected for a complete kill. Experience to date is that the bindweeds can be controlled and probably eradicated by fairly light applications.

Thornapple, Stramonium or False Castor Oil:

The thornapple which was abundant on the western Darling Downs in 1936-37 was, in the one experiment so far carried out in Queensland, readily killed in all stages by 2 lb. of hormone per acre.

Water Hyacinth:

This aquatic plant is easily killed by hormone weedkillers at 1-2 lb. of hormone per acre.

Pigweed:

This cosmopolitan weed is usually killed by 1-2 lb. of hormone per acre, but at times it is quite persistent.

Turnip Weeds:

The various turnip weeds are especially susceptible to hormone weedkillers, and if attacked in the rosette stage can probably be controlled in the wheat crop with 1 lb. of hormone per acre.

Wild Mint:

Applications as low as 1 lb. of hormone per acre are effective against wild mint.

Noogoora Burr and Bathurst Burr:

Both of these important burrs are easily killed by 2 lb. of hormone per acre, and at times by as little as 1 lb. per acre.

Miscellaneous Weeds:

The weeds listed above are the main pests for which recommendations can be made with some degree of confidence. There are quite a number of minor pests which are readily controlled by hormone weedkillers. These include swinecress, various thistles, Shepherd's purse, rattlepods, cudweeds and ragweeds, bellvine, lambstongue, wireweed, true castor-oil plant, Devil's needles, and stinking Roger. Promising results have also been obtained on lantana, weir vine, wild sunflower, groundsel bush, and nut grass.

Intermediate and Resistant Weeds.

Quite a number of the weeds against which the hormone weedkillers have been tested were killed or severely damaged in their early stages of growth, but were resistant when old. The various wild cottons are in this class, also verbenas, sidas, docks, and oxalis. Possibly an effective method of treatment for these weeds will be determined in time, but at the moment no suggestions for farm treatment will be given.

As already stated, the various weedy grasses are not obviously affected by hormone weedkillers, nor have these weedkillers shown promise against bracken fern, native lime, boxthorn, cacti, or the perennial ground cherry known as potato weed.

Availability and Cost.

Three weedicidal hormone preparations are available in Queensland. These are "Methoxone," "Weedone," and "2, 4 Diweed." The lastnamed is marketed in powder form for mixing with water on the farm; the other two are concentrated solutions which have to be further diluted on the farm. They are all different forms of the hormone 2, 4 dichlorophenoxyactic acid and apparently differ little from one another in their effects on most plants, though critical tests might show one more suitable than the others for a specific purpose.

The cheapest rate at which the hormones are likely to be available in weedkiller form for some time yet is about £1 per lb., representing an outlay for spray material of at least £1 per acre in the case of the most susceptible weeds and considerably more for weeds of higher resistance.

NUT GRASS CONTROL.

The control of nut grass on cultivated land remains a very difficult problem and in many circumstances it is impossible to do more than hold the weed from spreading. Experimental work now in progress suggests that both a new type of weedkiller (the hormone type) and certain soil fumigants may be effective in destroying nut grass, but at the moment no definite recommendations for their use can be made. With a weed such as nut grass, whose tubers may lie dormant in the ground for a long period, it is impossible to finalize control trials in a single season, and probably a further year or two years' investigation will be necessary to work out an economical treatment.

The following measures have been used with some degree of success against nut grass, and individual farmers may find that one or more of them may be applied to their particular conditions. It might be mentioned here that the parasitic insects of nut grass in Australia do not appear to exercise any great degree of control of the pest and entomologists do not consider it worthwhile introducing them to new districts.

Chemical Methods.

The common weedkillers such as arsenicals and chlorates effect some "kill" of nut grass when applied as sprays, but movement of the poison throughout the underground system of tubers is usually not sufficiently thorough to thin the weed out to very small proportions.

Chemicals which sterilize the soil will, of course, destroy nut grass if they are applied in quantities sufficiently large to ensure sterilization to a depth of 18 inches or more. Thorough sterilization will throw the treated land out of cultivation for upwards of a year, the period depending on the chemical used, the soil type, and the rainfall experienced. Soil structure may be adversely affected. Consequently, it may be inadvisable to use soil sterilants except where only small patches are infested. Sodium chlorate at the rate of at least 4 cwt. per acre and ordinary salt (such as coarse butcher's salt or waste salt from hide stores) at the rate of at least 5 tons per acre can be used as soil sterilants.

The hormone type of weedkiller mentioned above is on the market in Queensland under the trade names of "Methoxone," "2, 4-Diweed," and "Weedone." The basis of weedkillers of this type is 2, 4-dichlorophenoxyacetic acid. Farmers wishing to test this type of weedkiller should at each spraying apply the equivalent of at least 2 lb. of the active constituent per acre. This represents a minimum cost of £2 per acre per spraying. The weed should be sprayed when in the young and actively growing condition and not during the winter months.

Some farmers are under the impression that hormone-type weedkillers can be used against nut grass in growing vegetable crops. This is incorrect. So far as is known, only true grasses and cereal crops are not seriously affected by amounts of the hormone-type of weedkiller necessary to harm nut grass.

Cultural Methods.

One method of tackling nut grass is to cultivate at frequent intervals in order to destroy the young leaves before they can manufacture foodstuffs and supply them to the underground storage organs—the tubers. The success of this method depends on regular cultivation. If, owing to a long period of wet weather, cultivation is long delayed, the tubers will have a chance to recover from the effects of any previous regular cultivations. Cultivation seldom eradicates nut grass from a paddock, but if it can be carried out thoroughly—say at fortnightly intervals over a year or two—it will probably enable crops to be grown for three or four years without severe competition from the weed.

Care must be taken to avoid spreading nut grass from paddock to paddock on the cultivating implements.

Infested paddocks on which it is costly to grow row crops because of the large amount of tillage necessary would in many instances be better devoted to a strongly competitive semi-permanent crop such as lucerne or pasture. Such crops if properly managed tend to weaken the stand of nut grass and may permit a rotation of annual row crops and semi-permanent crops to be operated.

Use of Livestock.

Pigs are fond of the tubers of nut grass, and if they are confined on an infested patch for a reasonable length of time and permitted to root in the soil they will reduce the infestation considerably.

Poultry can also be used to reduce nut grass infestations If run on a restricted area, so that all shoots are plucked as soon as they appear above ground, fowls will very largely clean an area within a couple of years.

Flaming.

It is claimed by some American authorities that frequent flamings will destroy nut grass. This method of treatment is now under test in Queensland. Farmers with a flamethrower or a weed burner attachment may find it worth while to carry out tests on their properties.

CONTROL OF JOHNSON GRASS.

During recent years a very encouraging degree of success has been achieved in the destruction of Johnson grass by means of weedkillers. Treatment is rather expensive and in some cases does not give a complete kill. Factors such as stage of growth, season, amount of moisture in the soil, and even the time of day at which spraying is carried out, all appear to influence the results of spraying weeds with underground stems. Consequently, a considerable amount of investigational work is necessary before the best set of conditions for spraying can be determined.

Until definite recommendations can be made, the following procedure is suggested. It is a somewhat tighter procedure than that adopted by some farmers, who are apparently getting satisfactory results with a wide range of treatment, but new users can deviate from the procedure outlined if they desire to experimnt.

Weedkiller to Use.

The weedkillers which have proved satisfactory against Johnson grass have sodium chlorate or a mixture of sodium chlorate and calcium chlorate as their poisonous base. For a heavy infestation carrying a bulky topgrowth the amount of chlorate necessary per acre is about 400 lb. Straight sodium chlorate may be made up at 1 lb. per gallon of water and the solution applied at 400 gallons to the acre. An equivalent amount of chlorate would be contained in about 160 gallons of "Atlacide Solution" diluted with 240 gallons of water. These are 10 per cent. strengths—that is, 1 lb. of chlorate in 1 gallon of spray solution. In some cases probably a 7½ per cent. strength—that is, ¾ lb. of chlorate in 1 gallon of spray solution—would suffice, but farmers starting off on spraying are advised to use the stronger solution.

Chlorate for weedkilling purposes costs roughly one shilling per pound, so the cost of material for a dense acre would be about £20, with additional expense for follow-up applications on a smaller scale.

The efficiency of the weedkiller may be increased by adding a wetting and spreading agent—such as Agral 2 at the rate of 1 lb. to 100 gallons of spray solution.

Stage of Growth.

Though some farmers claim to have had good results from spraying young growth of Johnson grass, experimental work suggests that the flowering stage is the best stage in which to attack the weed. It is generally accepted that a fairly large amount of chlorate must be carried down into the underground stems in order to ensure their death. A large topgrowth, such as is present in the early flowering stage, would be more likely to absorb the requisite amount of chlorate than a less prolific growth. It is quite likely, however, that if a heavy application of spray is made, the fairly large proportion which runs to the ground would in due course be absorbed by the underground runners and assist in their destruction.

Soil Conditions.

Little information is available as to the best soil conditions for the action of chlorates on plants with rootstocks. As already pointed out, in order to kill the vigorous underground creeping stems, movement of the chlorate in the sap from the leaves downwards is necessary. Theoretically, this movement is greater when soil moisture is low than when the soil is wet. Consequently, spraying may possibly be most effective if carried out in early autumn when the soil is drying out after summer rains, or in a dry period following early spring rains.

Time of Day to Spray.

Here again there is little information available for Johnson grass. Downward movement of chlorates absorbed by leaves is usually more rapid if the plants are sprayed after sundown, but in Queensland satisfactory kills have been obtained by ordinary daytime spraying.

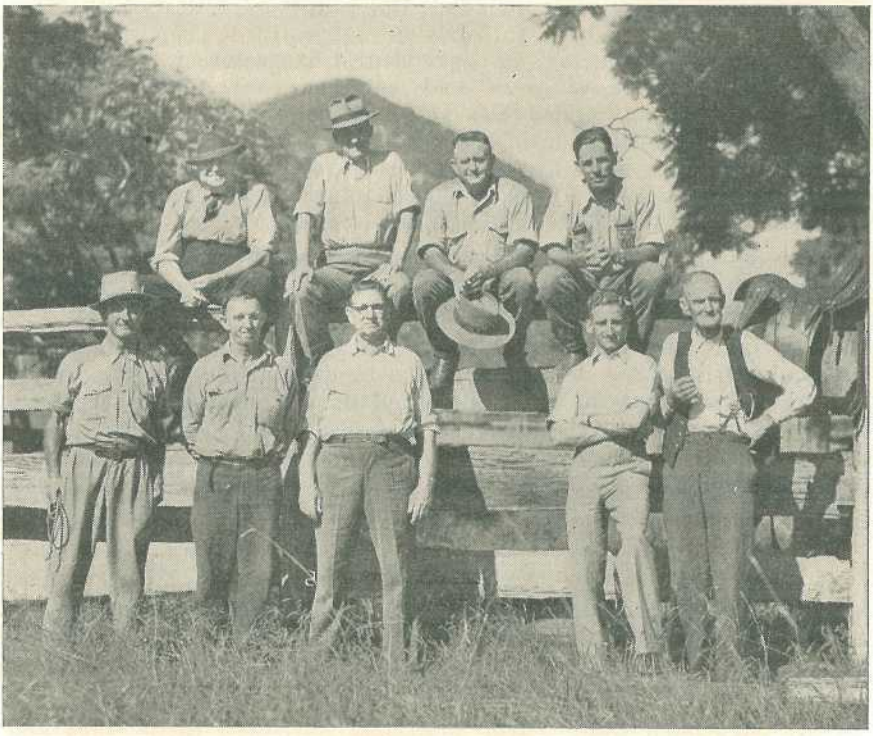
Equipment.

The chlorates are non-corrosive and can be used in any spraying equipment. Knapsack spraying appears to be less effective than using a power spray outfit of the orchard type. The latter is, of course, much faster and spray booms up to 40 ft. in width can be used.

Precautions.

Though chlorates are much less dangerous to use than are arsenicals, they present some special hazards. In the first place, plants sprayed with chlorates are rendered specially attractive to stock, and though the amount of chlorate eaten may not be sufficient to kill the animals, possibly the prussic acid normally present in Johnson grass would lead to death.

Sodium chlorate when it dries out on inflammable material, such as clothing, is very easily ignited. Clothes and boots should therefore be thoroughly washed after being wetted with chlorate solution. "Atlacide" is comparatively safe to use because it contains chemicals which absorb moisture from the air and prevent the chlorate from drying out on the clothes.



[*Photograph, Department of Agriculture and Stock.*

Plate 36.

After the Muster—Group at the delivery of 102 Prime Bullocks at Kingpah, the property of Mr. J. Faulkner, near Moogra, West Moreton.

Left to Right (*Standing*)—Leo O'Brien, Gus. Hohenhouse, Jack Faulkner, Don. Faulkner, Bob Corcoran; (*Top Rail*)—John Reid, Col. Joyner, Harry Head, and R. J. Price (Wilson Meats Ltd.).

Half a Century in Queensland Agriculture.

STORY OF THE DEPARTMENT OF AGRICULTURE AND STOCK.

PART 2.

J. F. F. REID.

AFTER the inauguration of the Australian Commonwealth, departmental activities expanded widely. From an official summary (undated, but probably of 1905) of new legislation and events of departmental importance since 1st January, 1904, the following notes are taken:—

Administration of central sugar mills was transferred to the Treasury.

The Meat and Dairy Board administration was merged with that of the Department, instead of, as formerly, by a secretary and staff.

The care of gardens around public buildings became a departmental responsibility.

New staff appointments included: Dairy instructor, dairy inspectors, cream and grading inspectors; assistant agricultural chemist and five cadets; poultry instructor; an agricultural inspector in place of an agricultural adviser; shearers and sugar workers' accommodation inspectors; a cadet under the Government Botanist; slaughtering inspectors; the substitution of a Queensland fruit and plant inspector at Wallangarra in place of a New South Wales official; manager and staff of the Roma State Farm; a tobacco expert (re-appointment); and additional fruit inspectors in North Queensland.

Appointments allowed to lapse (as no longer required) included: Assistant instructor in fruit culture, viticulturist, and agricultural adviser.

For the Queensland Agricultural College additional breeding stock were imported, as the demand for pure-bred animals greatly exceeded the supply; additions to water supply plant and farm machinery were obtained; two silos were built; roads fenced; 100 acres cleared and 25 acres planted with paspalum grass.

At Westbrook State Farm, a small irrigation plant was installed, and pure-bred poultry stock acquired.

At Hermitage State Farm, sheep, cattle, pigs and poultry were included in the breeding stock; a system of farm apprenticeship was instituted; introduced pasture plots were established; and grain experiments were continued. It was reported that as a result of several years' experiments crossbred wheats which, that year, had withstood rust attack in the Maranoa district had been evolved.

At Biggenden State Farm additional pure-bred cattle, pigs and poultry had been obtained; a system of farm apprenticeship instituted; a silo had been built; and pasture experiment plots laid down. It was designed to work this property as a model dairy farm of 80 acres intensively cultivated.

At the Gindie State Farm there was an entire change of policy from agriculture to grazing. The farm was redesigned as a grazing

homestead area stocked with beef and dairy cattle, sheep (Shropshire-Merino crosses), pigs and poultry. Conservation of fodder (using native grasses) also was to be practised.

At the Roma State Farm (then a new establishment), of 730 acres 100 acres were put under wheat in the first year for experimental purposes, and dry farming experiments were initiated. Some crossbred wheats had proved drought-resistant. A silo also was built.

At the Kamerunga State Nursery, a water service by gravitation from Rocky Creek was completed. The preparation of growers' coffee for market and for sale on owners' account gave "very satisfactory results." Coffee machinery and a cotton gin were installed.

Stud cattle and pigs were imported from England "for the Department and for private persons, the selections being made by an officer of the Department sent to England for that purpose."

The Agricultural Chemist initiated analyses of dairy products for export in order to improve manufacture, fodders and grasses, wheats and other grains for which a special mill was imported, and of sugar cane to prove value. The testing and marking of dairy glassware to ensure correctness also were included among additional services of the chemical laboratory.

There was an organised effort to improve grain cultivation before the establishment of the Roma State Farm by the laying down of farm plots in the Maranoa, by the introduction of hard and other drought-resisting wheats, and the making known to millers and others the values of wheats grown, as determined by analyses.

The Department ginned cotton for growers at Ipswich and sold it on growers' account. The result was so encouraging that a private firm installed plant for the treatment of future crops.

A profitable market was "established in England for *Backhousia citriodora,*" an essential oil.

A trial shipment of citrus fruits to the Philippines was successful as an experiment in transport.

Machinery was installed "for treating manufactures of fibre (sisal hemp) and sale of it at a price that proves it to be of great value to Queensland." Apparently, sisal hemp production did not come up to expectation, for interest in its cultivation subsequently faded out.

New legislation relating to the land industries of the State and passed during that period included: *The Dairy Acts; Agricultural Bank Act Amendment Act; Native Animals Protection Act*—providing for a close season for the opossum and native bear (koala), and for the total protection of platypus and squirrel, and for the prohibition of the use of cyanide or other poison; *Shearers' and Sugar Workers' Amendment Act*—providing for better accommodation; *Marsupials Act; Fertilizers Act; Weights and Measures Act;* and the *Special Agricultural Lands Selection Act.*

The lastnamed measure provided for "establishment of persons as farmers who are willing and desirous of following that occupation, but have not the means to do so. The Gayndah Group was established under it."

Plate 37.

STAFF OF THE DEPARTMENT OF AGRICULTURE AND STOCK, 1910.

FROM 1907 TO 1917.

In the first ten years of the present century the migration tide of southern settlers was at its top. The slogan "Landless Men for a Manless Land" had penetrated to the apple orchards of the Huon Valley, to the tall timber lands of Gippsland, to the Wimmera, the Mallee and the treeless country below the Goyder Line. Dairy farmers of the Illawarra and of the "Big Scrub," too, had heard of the dense softwood jungles of Queensland covering rich virgin volcanic soil to a depth of 70 feet in places, rain forest country that, they had been told, could be had for next to nothing in comparison with the sky limit values of their own environment. Queensland land laws were said to be the most liberal in the world. Agricultural farm selection was based on the easiest of terms—low valuation, one-fortieth of the purchase money down with one-fifth of the survey fee, and 40 years to pay it, and the right to make it freehold at any time. Had radio propaganda been the rage at that time nothing would have stopped the rush of settlers to rural Queensland.

GROUP SETTLEMENTS.

Under the conditions of agricultural farm selection, group settlements with priority occupation could be formed—priority conditional on personal residence and the making of improvements equal to the cost of erecting a ring fence during the first five years. The idea of migrating as a group looked good to many southern farmers who contemplated pulling up their tent pegs and going to Queensland. In the new settlement areas they would know their own neighbours with whom they could co-operate in the work of pioneering. Like the Israelites of old, they sent out spies to view the Promised Land. Shrewd fellows they were. No starry-eyed romanticists ready to "tackle anything," and so accomplish nothing, among them. They came purposefully over the Border to appraise, estimate and bargain with the Government of the day. From Brisbane they went forth with Lands Office lithos in hip pockets to drop off a train somewhere, spread maps along a log to get their bearings, hire saddle horses and disappear into the bush—to return after a cruise along survey lines, snigging tracks and wallaby pads, with eyes agleam with the joy of discovery and as monosyllabic in speech as a gold digger who has struck it rich and is on his way to the bank with a bag full of welcome nuggets.

Before long, newly selected "scrub" lands were ringing from dawn to dusk with the sound of axes biting into sappy softwoods and, more metallically, into harder brigalow and belah. Down went the scrub in "drives" to dry for the "burn." After the fire, clearings studded with scorched stumps, scarred with charred logs and flecked with grey ash looked anything but promising in their blackened desolation. Soon, however, up through the sooty surface of the soil were to come long, wobbly emerald pencil lines of germinated maize, hand-planted amidst the debris; to be followed later by the green shoots of paspalum or Rhodes grass from seed broadcast along the rows. A crop and a paddock of pasture in a single season—could it be beaten? The untrodden jungle lands of yesteryear are the richly productive farm lands of to-day. The new settlers soon realised the value of the dirt beneath their feet.

The annual report of 1907 stated: "The influx of experienced farmers and their families from the Southern States and elsewhere

is having a marked effect on the agronomy of the districts in which they have settled, and the gain to Queensland agriculture through their advent will be considerable. On the other hand, skilled and reliable farm labour has been scarce and at periods, particularly during harvest time, practically unobtainable for general agriculture as separate from the sugar industry."

Special Group Selection System.

Ordinary group selection by farmers of experience and capital should not be confused, however, with groups of more or less inexperienced settlers formed under the provisions of the *Special Agricultural Selections Act of* 1905. That measure was introduced by Hon. Digby F. Denham, then Secretary for Agriculture. Its purpose was to assist married men of good repute, but without means, to settle on the land. Mr. Denham said in Parliament that the measure marked a departure in methods of dealing with the unemployment problem. The land was to be selected by the Departments of Agriculture and Lands conjointly and necessary financial assistance was to be given to the settlers in the form of loans covering rent, survey fee, sustenance, and necessary buildings, fencing, stock, and equipment, to be repaid as the land was brought into production. Amount of advances was limited to a modest sum, £140. A supervisor was to be appointed for the first two years and his salary was to be chargeable to the group.

There was, however, a marked contrast between the *Special Agricultural Selections Act of* 1905 and the *Co-operative Communities Land Settlement Act of* 1893, which provided that no member of a settlement group could have any individual interests in the improvements he effected. The new measure gave the individual selector the right of entire interest in the improvements he made on his holding. Other provisions of the measure of 1905 included balloting for blocks which were to be acquired on a fee-simple basis at an agreed price. In all things, each settler was to get the benefit of his own individual efforts. The Act was an attempt to put "the waste labour on to the waste land by means of waste capital, and thus convert this trinity of waste into a unity of production." It was designed as "a special form of assistance to needy men." Good land and good management were regarded as essentials, plus, of course, capital assistance in the form of a loan on easy terms.

Some idea as to how this special group settlement scheme worked out in practice may be gained from the following comments of the Under Secretary of the Department of Agriculture and Stock in his 1907 report:

"It is probable that no body of men in Queensland, with their families, have started farming with the advantages that those who were selected as members of this group commenced their life on the land allotted to them. The rent of the land has been paid on their account; money has been advanced for rations, clothing, tools, and other necessaries; and an overseer has been appointed to direct and guide them through the difficulties that must inevitably be met" in the pioneering stage of farm life in virgin country.

The first contingent left Brisbane in July, 1906; but, notwithstanding the advantages offered, and the many claimants for those advantages, it was not until June, 1907, that all the selections, 23 in number, were occupied.

As soon as the land was ready for occupation, 75 families were selected from the applicants at that time, from whom, after due inquiry, the members of the group were chosen. Difficulty in finally filling the selection list will be more readily appreciated from the following extract from the report:—"Families invited to join the group numbered 61; families who refused after making application, 22; applicants who declined after acceptance, 9; families who left the group after joining, 7." Apparently applicants on investigating the conditions of the agreement they were asked to sign did not view work on the promised land as easy a job as they had expected.

"At one time," the report continues, "there were signs that some of the members residing on the area appeared to think that there was no need to work hard, and as the result of an inquiry, two members were required to withdraw and a third was cautioned as to his future conduct. The warning had an effect upon the man, but as his family abandoned the selection he was forced to retire also, because the essence of this Act being the settlement of families, single men or men living apart from their families are debarred.

"The experience of the year has shown that the difference between those who have received the advantages of this Act and the ordinary selector . . . is very wide indeed. The man who has to fight his own way makes the best of what he has or what he can fashion or produce without murmuring, in the hope that by hard and continuous labour fortune will smile on him and his home will be secured for himself and his family. With some of those who have received assistance from the Government, on the other hand, it would seem that they consider themselves badly treated if anything they ask for is refused. Meetings to raise agitation to secure certain ends that were desired, but would not be allowed, were held for attaining the objects desired. If that which was asked for were not granted, a meeting would be held denouncing the overseer for his refusal." This caustic comment was not applied to the whole settlement, but only to the few who did not fit in.

The report goes on: "Under the Regulations, a settler is allowed to borrow £80 towards the purchase of clothing, rations, and the means of living generally; and £60 for stock and implements; but he is not allowed, unless in exceptional circumstances, to disburse the money. . . . Experience has shown that it has been impossible to work to the exact limit of the Regulations. Families differ in number and are of various ages . . . therefore it has been necessary to somewhat exceed the limit in some cases.

"The provision of facilities for sending cream to the factory at Maryborough has been another reason for increasing the individual indebtedness with the view of shortening the time when the members of the group will be self-supporting. Bulls and cows have been purchased and sold at cost price, and members receiving them have to sign an agreement that as soon as five cows are in milk they will cease to receive rations and clothing. The efforts in this direction have been somewhat hindered by a disastrous outbreak of redwater among 100 heifers bought for the group. Unfortunately, the mob arrived at Wetheron just at the time when the river (the Burnett) and creeks were in high flood, and the cattle could not cross. They were placed in a paddock, but very soon developed tick fever and many died. In July, 1906, the group entered into the possession of

an area of 4,391 acres that was in a virgin state and was formerly part of a cattle run. In July, 1907, the land was occupied by 23 families consisting of 23 men, 23 women, and 128 children."

From the foregoing excerpts from an official source, it may be fairly deduced that farming on community lines under a system of paternalism may not be as successful as the advocates of community farming may believe. The history of other "managed" group settlements in Queensland, before and since, is equally interesting and illuminating, as examples of the primary importance of the personal equation as a factor in successful land settlement.

DEVELOPMENT OF THE DAIRY INDUSTRY.

Apart, perhaps, from the pastoral and sugar industries, no other primary industry had made such progress in the previous ten years as the dairy industry. The coming of the cream separator into general use and the resultant change over from farm to factory butter manufacture and the opening of new dairying country were among the main factors in its remarkable development. It was not so very long before that Queensland farmers could not make enough butter for home requirements. When the exporting stage was reached, many handicaps had to be overcome, including the difficulties connected with refrigerated space and freight rates. Regular shipments and rapid transport to British markets involved transhipment at Sydney from coastal steamers, increased expense and risk of deterioration. A State subsidy induced one and then another shipping company to make Brisbane its terminal point in Australia and to provide refrigerated chambers for butter at reduced charges. Some years had to pass before Queensland was on the same footing as the other States.

On its appearance in London, Queensland butter had to be sold for lower prices than were paid for other butters with an established reputation and buyers were often dissatisfied because of variations in quality. To remedy this, legislation providing for Government inspection and grading had to be passed. After that system had been initiated, the Queensland product soon attained parity with the butter of the Southern States and New Zealand and the general standard was undoubtedly higher than in pre-grading days.

Coincident with the improvement in the quality of butter was the progressive improvement of dairy herds. Good milking strains had been introduced and more attention was paid to feeding of dairy cows. To the Department is justly due much credit for these changes, by both educational effort and consistent administration of dairy legislation. "The continued influx of experienced farmers from the South," said the departmental chief in 1908, "will go far to advance the industry, but, generally, greater attention is needed towards providing fodder for cows during dry periods and shelter during the winter months."

The year before, experiments in silo construction and filling were commenced on the State farms. Various types of silos and materials for their construction were then under consideration. Silos of iron, fibro-cement and of iron and malthoid were erected. At Hermitage, an octagonal 130-ton fibro-cement structure was built and partly filled with sorghum from a field which yielded 14 tons to the acre. The manager stated: "This silo was filled early in April (1907) and the result is that

we now have a fine supply of good, nutritious feed available at any moment, which otherwise would not have been preserved. The older and smaller silo was filled at the same time with about 30 tons of red kaffir corn and a few tons of lucerne."

Because of the lightness of the material, the use of fibro-cement in silo building was not generally successful. Many farm silos were erected that year, but then, as now, the problem was to keep them filled. "There is no State in Australia that offers such opportunities for successful dairying, and the country only awaits those who will take advantage of the benefits offered," was the departmental dictum in 1908. Since then the output and value of the industry has increased tenfold and great as are its present dimensions they are small in comparison with the possibilities of expansion.

DEVELOPMENT OF TROPICAL AGRICULTURE.

Of the development of tropical agriculture, it was reported: "There is evidence that farmers are inclined to cultivate main crops other than maize and sugar, which have so long dominated the agronomy of the tropical regions. Plantings of rubber have been made which, though small at present, indicate a commencement and it is hoped will be the forerunners of Queensland rubber in the market. The success attending the experiments in cigar tobacco on the Northern Coast, and the good prices realized for the product, have encouraged several farmers at Bowen and Cardwell to undertake the cultivation of this plant, and it is but a matter of time before the area under cigar tobacco in this State will be considerable.

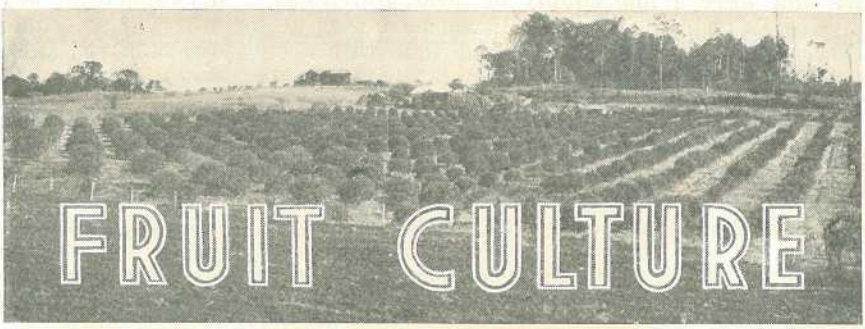
"Agriculture is so extensive in its application and so variable in its circumstances, including as it does all relations of man with the soil, that it is impossible to include every branch of so wide a subject within the pages of a report.

"Diversity of products is to be expected, of course, in a country stretching through 18½ degrees of latitude, possessing an extraordinary variety of soils and climate. There is probably no other country with so wide an agricultural range. To mention crops which can be grown successfully would mean listing nearly every crop of economic value found in the torrid or the temperate zone."

In annual reports of the first decade of the century there were repeated references to the possibilities of rubber production in the tropical parts of the State. The report for 1907-1908 states: "Mr. Newport, the Instructor in Tropical Agriculture, by writings and lectures, has been assiduous in trying to induce farmers in the North to plant rubber . . . and these efforts have been, to a certain extent, successful. There is a slight indication on the Johnstone River . . . that attention is being given to this product, and by arrangement made by this Department some thousands of plants and a quantity of seed have been imported on growers' account."

At the close of 1908 the number of people in the State, scattered over its 670,500 square miles of territory, was only 558,000. The population has doubled since, but is still less than that of either Sydney or Melbourne.

[TO BE CONTINUED.]



Strawberry Culture.

C. N. MORGAN, Senior Adviser in Horticulture.

THE production areas of strawberries in Queensland are situated along the coastal strip from the New South Wales border to the far north, with the main producing districts within 150 miles north and 50 miles south of Brisbane. The mild winter of this area lends itself to commercial production of this fruit for a considerable portion of the year, giving, in many seasons, a long picking period frequently extending from early June to the end of November. Owing to the shorter winter, crops in the northern portion of the State have a much shorter season.

During the early part of the season, the berries sell readily on the open market in Queensland, and many of the bigger growers send interstate. A recent development is the despatch by air of considerable quantities of berries to various markets. Later in the season, when the market price does not warrant the extra expense of packing, the berries are sent to local canneries for jam making. During the war years the fresh fruit market was able to absorb practically the entire crop, but formerly up to 200 tons of berries were processed in a season. Since the war, the requirements of the processing trade have increased and large plantings have been made especially to satisfy this demand.

Strawberry growing has features which make it attractive to many farmers. Much of the work involved is light. The cost of establishing a patch is not excessive and the returns are quick. The crop is thus a useful one for a new farmer who is anxious to get some early cash return from his land. However, careful attention must be given to the selection of a suitable site and unremitting care taken with cultural details if success is to be assured.

Location and Soils.

The location of a property for strawberry growing should be in a district with ready access to market, enjoying suitable climatic conditions, and, in many cases, a reliable irrigation supply. The latter condition depends usually on the type of soil to be used. Some of the sandy and volcanic types of soils dry out quickly during the fairly dry winters usually experienced in Queensland. Such drying out results in a rapid drop in production.

Strawberries appear to do well on almost any type of soil, provided climatic conditions are satisfactory, but the most popular are the well-drained, sandy loams, with good water-holding capacity, or, where irrigation is possible, red volcanic types rather than the heavier loams. The latter, however, have the advantage of retaining moisture well; and where the drainage is good may be profitably employed, especially if irrigation water is unprocurable, or in light supply. Badly drained soil is never satisfactory as it remains too cold and weed growth is most difficult to control; and, furthermore, root rots are very apt to develop under wet conditions.

Plate 38.
A Well Grown Strawberry Crop.

Normally, in the main areas, frosts are light and do not appear to affect the strawberry adversely. Thus, portions of many farms which, during the winter are unsuitable for many other crops, are quite satisfactory for strawberries. New land has many advantages for strawberries, not the least of these being freedom from weeds, but old land, well prepared, will grow good crops provided it is well supplied with humus, and fertilized correctly.

Preparation of Land.

As planting is done in the autumn, preparation should begin some months before, in order to get the soil into as good a condition as possible. For this reason, preparation of either new or old ground should begin in the early spring. Although the strawberry is not a deeply rooted plant, ploughing of the soil to a depth of eight inches is recommended, as a good depth of well-tilled ground improves the water-holding capacity. In the case of new ground, it will be necessary to allow it to fallow for two to three months before a second ploughing is carried out. With old ground, a cover crop of Poona pea or corn should be sown during the spring or early summer and ploughed under at least two months before planting. After it has rotted a further ploughing

and subsequent harrowing and cultivation should be carried out until the land is in good condition. Constant cultivation following the final ploughing does much to firm and level the ground as well as control weed growth.

Some growers find that strawberries do well on ground following a late spring crop of tomatoes, cabbage, beans, &c., crops which have usually been well fertilized and which leave the land in a good state of tilth. Preparation of this ground is comparatively easy.

Fertilizing.

Fertilizing practices vary to some extent, depending largely on variations in soil conditions. For instance, on a soil rich in organic matter, or following a crop that had received heavy fertilizer dressings, the necessity for heavy dressings is not as great as on a piece of old ground which has not been used for some time.

For pre-planting applications, farmyard manure, if procurable, is recommended, and this should be applied to the soil during the final preparation, a few weeks prior to planting. Commercial fertilizers have also proved satisfactory for this purpose, particularly on well-prepared ground containing a reasonable amount of organic matter. As strawberries are planted close and must be kept growing quickly, the base dressings of fertilizer should be fairly heavy, and amounts of from 15 cwt. to 1 ton per acre are not excessive. A complete mixture high in phosphoric acid, and containing a medium proportion of nitrogen, is recommended; as many of the soils, particularly the red volcanic, readily "fix" a large part of the phosphoric acid and thus make it unavailable, it is advisable to spread the fertilizer in a narrow band about one foot wide along the ground, where the rows will be, rather than broadcast it over the whole area. The fertilizer should be cultivated in about 7-10 days prior to planting. Heavy dressings of nitrogenous fertilizers at planting often cause the plants to produce excessive leaf growth.

Top dressings of fertilizer will probably be necessary during cropping; the extent of these will best be judged by the appearance of the plants and crop. Usually the first top dressing is done at first flowering, and then further dressings applied as required. Each top dressing should take approximately 1-1½ cwt. of a water soluble fertilizer, fairly high in nitrogen. Top dressings may be applied alongside the plants, or in between the plants in the row, and should be made carefully to avoid dropping the fertilizer on the fruit or leaves, thereby causing burning. After top dressing, if irrigation is available the plants should be watered to dissolve the fertilizer and wash off any that may have fallen on the leaves.

Planting Material.

Strawberries are grown in Queensland as an annual crop and it is only on rare occasions that the parent plant is allowed to remain in the ground to produce fruit for the second season. The reasons for this are that it is most difficult to keep a big area free from disease, weeds and runners during the hot summer months. Whilst it is usually possible to obtain a few early berries from a second season's crop, these do not compare either in size or quality with the first fruits of the new season's plants. Annual planting is, therefore, strongly recommended.

Most growers use their own runners, leaving only enough old plants to provide sufficient planting material for the following season. From 1,000 to 1,500 plants should yield enough runners for an acre, providing they are well tended. It is particularly important to keep plants that are of good quality, true to type and free from disease, as a few undesirable "mother" plants provide the nucleus for a most unsatisfactory patch of berries after a few years of indiscriminate plantings. Severe "rogueing" should, therefore, be carried out in the prospective runner bed. Diseased and weakly plants should be eliminated as soon as they are detected; others, which for any other reason are undesirable as "mother" plants, but which are bearing a good crop, should be clearly marked and then cut out as soon as picking is finished.

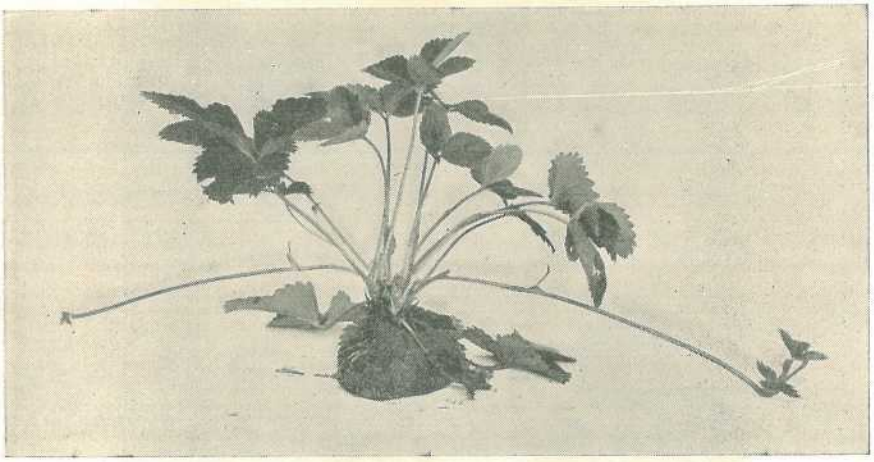


Plate 39.
Strawberry Plant Commencing to Send Out Runners.

Every effort should be made to encourage production of sturdy, well-rooted runners. Cultivation of the ground between the rows, watering of the old plants, plus a light top dressing of fertilizer as the runners appear, will help considerably to ensure an adequate supply of good material. Suitable types are shown in Plates 39-41.

Runners usually appear about December. Complete weed control is difficult at this time of the year, but should be carried out as well as practicable before the runners spread out between the rows. Where the runners grow in competition with weeds and are shaded by them, they tend to produce long, weak leaves, which wilt badly after being transplanted. Furthermore, such runners commonly carry numerous weed seeds to the new area.

Prior to removing the runners for planting, the beds should be well watered, to facilitate digging. In order to avoid injuring plants, it is best to dig the runners by starting at some given point, and not to walk through the area indiscriminately. Lifting the runners should be done as carefully as possible, and for this purpose a small trowel or a

strong-bladed knife will be found most suitable. When free, the roots are trimmed to about three inches and all broken and dead leaves removed. A few of the older leaves also may be removed, if necessary, to lessen transpiration after planting out. After trimming, the runners should be placed in a bucket containing a little water, or between wet bags. The plants should not be exposed to the wind and sun any more than is necessary. No more should be dug than can be replanted on the same day.

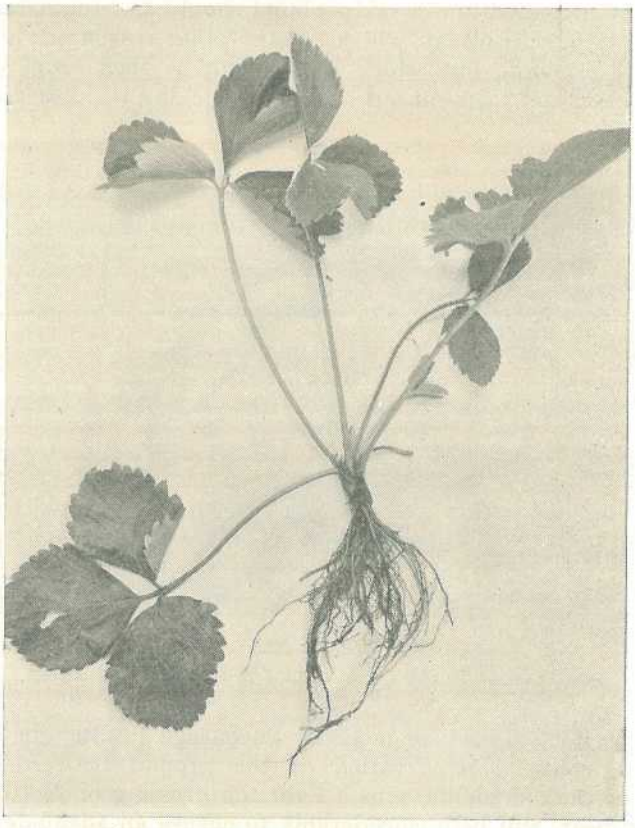


Plate 40.
A STRONG, HEALTHY RUNNER SUITABLE FOR PLANTING.

Only healthy runners with a good root system and a well developed crown should be used for planting. Growers have often been advised to use only first or second runners as planting material, but when the runners are massed together it is a difficult and tedious job to do this. Furthermore, it has been found that very little difference is apparent between the times of cropping, if care is taken to select sturdy plants.

Planting.

The main month for planting is March, but the operation may be carried through to early April without affecting the earliness of the crop to any great extent. Some growers plant in February, contending

that the plants will crop earlier. This is, however, not always the case, and February plantings cannot be recommended as a general practice. The hot weather during this month often results in losses, particularly where irrigation is lacking or inadequate.

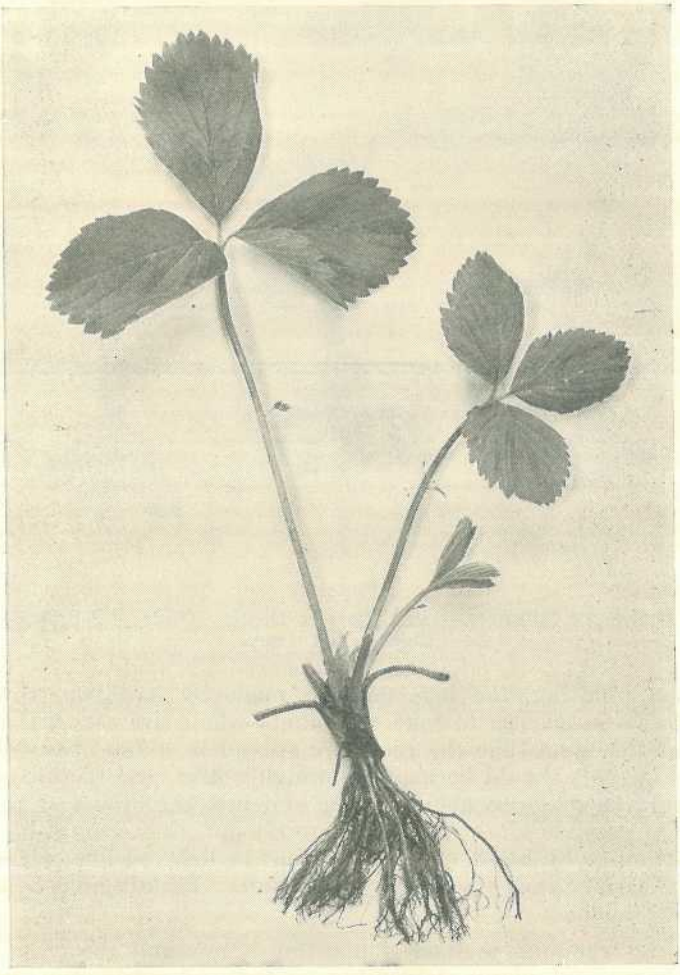


Plate 41.
The Runner Shown in Plate 40 Pruned Ready for Planting.

Care in transplanting is essential, and much of the early loss and ultimate unsatisfactory growth of the plants can be traced to carelessness at this time. The runners must be set at the correct depth, i.e., with the crown just above ground level (Plate 42). Should the crowns be below ground level they often die or make unsatisfactory growth. If they are too high there is a risk of the roots drying out. It is only possible to set plants correctly if the rows have been well prepared and levelled by raking or some other means. Before planting, a wire should

be stretched along the row and the plants set along it, in order to keep a straight line. This assists in cultivation, whether horse or hand implements are used.

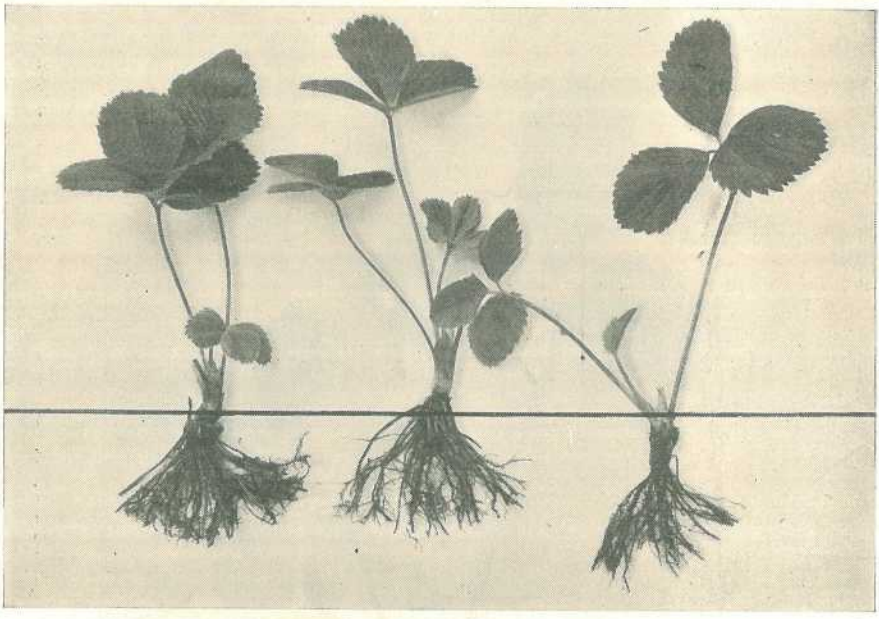


Plate 42.
PLANTING OF RUNNERS—Left: Correct Depth. Centre: Too Shallow. Right: Too Deep.

When planting, the hole may be made by hand or trowel, and should be large enough to take the plants which are set at the correct depth; at the same time the roots are spread in a fan shape. The soil around the roots should be made thoroughly firm, and in this operation care should be taken to avoid getting soil into the crown of the plant. As soon as possible after the plants are set out, they should be watered by irrigation or by hand. This should not be delayed longer than after the completion of each row of, say, five chains. Planting out is best done in the afternoon.

The most popular method of planting is in single rows, the distance between rows and plants depending on type of cultivation, irrigation and disease control to be employed. For horse cultivation, up to 2 ft. 6 in. between rows and 12 in. to 15 in. between plants is allowed, while for hand cultivation, 2 ft. by 12 in. to 15 in. is satisfactory.

Numbers of plants per acre are as follows:—

Distance Between Rows.	Distance Between Plants.	Number of Plants.
2 feet	12 inches	21,780
2 feet 6 inches	12 inches	17,424
2 feet	15 inches	17,424
2 feet 6 inches	15 inches	13,939

Cultivation.

Cultivation between the rows and plants should be carried out to control weed growth. As the strawberry is not deeply rooted, cultivation should be shallow. A dutch or flat hoe is usually used for close work between the plants and small hand cultivators, fitted with hoeing attachments, are used between the rows (Plates 43 and 44). If a horse cultivator is used it may be fitted with "duck-foot" type of tynes to ensure shallow working. When chipping, care must be taken not to pull the soil away from the plants, thus exposing the roots. At the same time, it is essential to avoid any soil lodging in the crowns.

Plate 43.
Hand Cultivator Showing Hoeing Attachments.

Plate 44.
Method of Using Hand Cultivator.

Irrigation.

Irrigation for strawberry growing is highly desirable, as the plants, being shallow-rooted, quickly show the effects of dry weather.

On the red volcanic loams it would be difficult to grow a crop through the season successfully without irrigation, except in the high rainfall belt. Some of the other types of soils do not dry out nearly as quickly, and, with reasonably good rains in the spring, will crop well to the end of the season. Most irrigation is done by the overhead system, which appears to be most suitable for strawberries. Watering should be done after picking and should not be excessive but sufficient to keep the plants growing and cropping satisfactorily. Over-watering should be avoided and splashing should be guarded against as far as practicable.

Mulching.

Mulching is not done to any extent, but where it has been tried, has usually proved of great advantage. Apart from the aid in controlling weed growth, it helps to prevent evaporation of moisture from the soil and keeps the berries free from dirt splashed up by rain or irrigation water. On the other hand, damage to the fruit from certain ground-frequenting insect pests may be aggravated to some extent when a mulch is used. Materials for mulching, which are easily obtained, are oak-leaves or blady grass, and these, if spread around the plants to a depth of an inch, about six to eight inches on either side, soon settle down to a good, firm mulch. The presence of such a soil covering does not interfere with fertilizer top dressings as the soluble chemicals used for this purpose quickly pass into the soil. Sawdust is most unsuitable as a mulch, as it sticks to the ripe berries when picking and is difficult to remove without injuring the fruit.

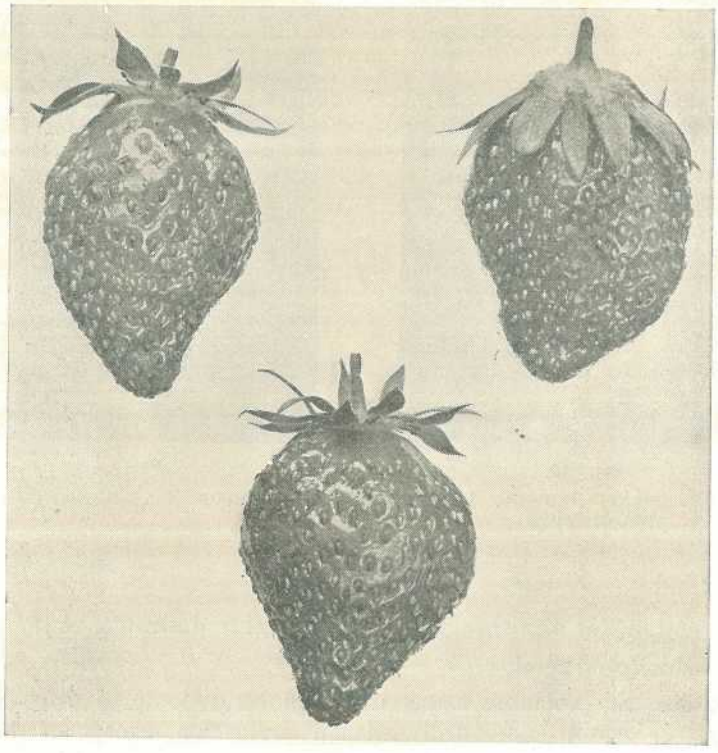


Plate 45.
FRUIT OF THE PHENOMENAL VARIETY.

Harvesting.

Berries should be picked when they are mature, i.e., when they are about three-quarters coloured. To handle the crop successfully, daily picking during the main part of the season is often necessary, and rarely is it possible to allow picking to extend further than every

second day. A pamphlet on the picking and packing of strawberries for market may be obtained on application to the Department of Agriculture and Stock, Brisbane.

Varieties.

Numerous varieties of strawberries are available but two local selections have so far proved the most satisfactory for Queensland conditions. These are the well-known Phenomenal and Aurie varieties. They are both vigorous growers, producing medium-sized, highly coloured berries of firm texture which are good carriers and suitable for the fresh fruit market and for processing. Both varieties bear flowers which are self-fertile, i.e., they will pollinate and produce crops without having to be interplanted with another variety.

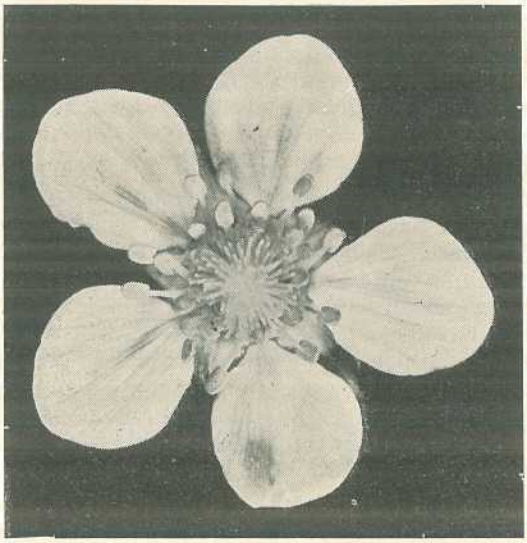


Plate 46.
TYPE OF FLOWER CONTAINING BOTH MALE AND FEMALE PARTS.

Phenomenal is grown more extensively than Aurie. The latter fruits a little earlier and may stand up to dry conditions a little better than Phenomenal. However, the plants suffer rather severely at times from leaf diseases and the quality of the berry is somewhat inferior to that of the Phenomenal.

New growers sometimes purchase varieties from outside the State, but there is nothing to commend this practice, particularly as serious diseases may be introduced in this way.

PLANT PROTECTION

Diseases of Sorghum.

R. B. MORWOOD, Plant Pathologist.

SORGHUM is playing an increasing part in the farming economy of this State. The grain varieties are being used extensively in Queensland to replace maize on account of the drought-resisting qualities of sorghum. These are referred to by many growers by their varietal names—such as Milo, Kalo, and Hegari. A number of varieties of sweet sorghum, including Saccaline, Italian, Leoti, &c., are important summer fodder crops. In addition, broom-millet, and Sudan grass are botanically sorghums, as is also Johnson grass. All these are liable to be affected by the same set of plant diseases but, apart from adopting a simple seed treatment, the grower need pay little further attention to the control of these diseases.

This position is not due to the absence of parasites, as quite a number of fungi and bacteria have been reported to be pathogenic to sorghum. That these pathogens do so little harm is largely due to the work of plant breeders. They have produced and tested a large number of varieties of sorghum and have been ever on the alert for disease. As a result, those strains which have been shown to be susceptible to diseases difficult to control have been largely eliminated. There are now available a number of varieties which can be sown with a high degree of confidence that plant disease will not be a serious factor in production. Unfortunately, this statement cannot be extended to include those disorders caused by the presence of insect pests. Aphids, corn ear worm, and particularly midge, all constitute hazards which have to be considered.

These notes do not deal with these or other insect pests, on which information can be found in various Departmental publications. It is, however, important to distinguish the troubles due to insects from those due to diseases. This is simple enough in the case of the larger insects, which are readily seen. Midges, however, are small enough to be overlooked and the grower may see only the result of their activities. This consists of a head without grain or with only part of the head carrying grain. To those not familiar with the condition, this is easily confused with frost damage or ascribed to some disease.

Smut.

The principal disease affecting sorghums in Queensland is covered kernel smut. This is caused by a fungus* whose spores may be found on seed. When present the spores germinate with the sorghum seed and infect the seedling. The fungus develops inside the plant and may stunt it slightly, but otherwise cannot be detected at this stage. When the plant matures the fungus develops in place of the seed and what should have been a sorghum kernel becomes a black mass of fungous spores. Affected heads can be readily seen in the crop and as many as 25 per cent.

* *Sphacelotheca sorghi.*

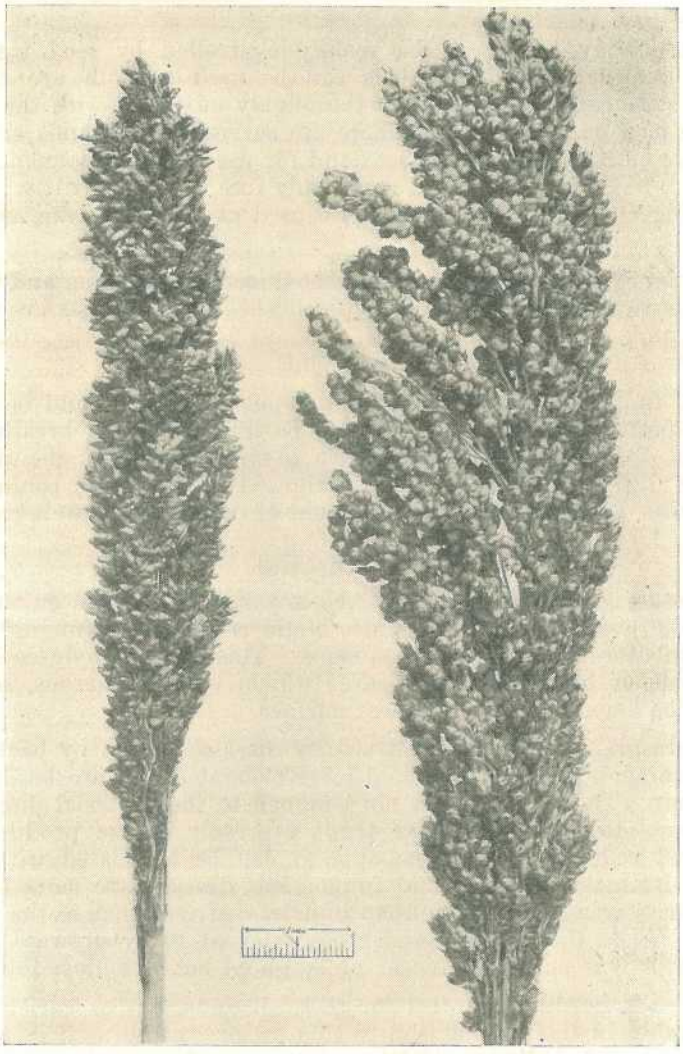


Plate 47.
Covered Kernel Smut of Sorghum.—Left: Diseased head; Right: Healthy head.

of the heads have been found carrying smut balls in place of grain. The smut balls are elongate, somewhat conical, covered with a membrane which is at first purple then grey. Usually the whole of the head is affected but occasionally some grain is formed in the same head as the smut. In addition to the direct loss of heads, the remainder of the grain is contaminated with spores on harvesting. Fortunately, smut is not in any way poisonous and such contaminated grain can safely be used for feeding purposes. However, even if only a small percentage of smut is present in grain used for seed it can produce a badly diseased crop.

Sorghum smut is more serious on the varieties grown for grain than on those grown for fodder purposes, as in the latter case the stalk is of equal importance to the seed. Some varieties are much more susceptible to smut than others and, of those grown locally, Kalo is particularly subject to that disease.

Control.

Fortunately, smut can be readily controlled by seed treatment. Either copper or mercury dusts can be used as both are effective. Copper carbonate can be used by thoroughly mixing it with the seed at the rate of 2 oz. per bushel. There are several good brands of copper carbonate on the market in Queensland for use in seed treatment. They require to be finely ground and reasonably free from impurities. Smutol containing copper oxychloride can be used at the same rate as copper carbonate.

Either of the mercury dusts marketed locally—Agrosan and Ceresan—can be used at the rate of ½ oz. per bushel. These dusts are slightly volatile and, as a result, their effectiveness is increased by storing the grain for a day or more after treatment.

The fungicidal dusts are somewhat poisonous so should be treated with respect. Reasonable care should be taken to avoid breathing the dust and a dust mask should be worn if much dust is in the air. The mercury dusts will cause blisters if allowed to remain in contact with moist skin. Dusts should be handled out of doors or in a well-ventilated barn.

Leaf Diseases.

Another group of diseases, which are more noticeable on the sweet sorghum grown for fodder, includes blight caused by a fungus* that is responsible for a similar disease on maize. This fungus produces elongate grey spots or blotches on the leaves which, when numerous, seriously reduce the amount of effective leaf surface.

There are several somewhat similar diseases caused by bacteria, in which the spots are narrower and more elongated and are bordered by red colour. The red colour is not confined to the bacterial diseases, as any injury to a sorghum leaf tends to result in the production of bright-red coloration. For example, it can be associated with aphid attack. Both the bacterial and fungus leaf diseases are more frequent in the scrub areas of the State than in drier districts, such as the Darling Downs. These diseases are sometimes referred to by growers as rust. Actually, a true rust† does occur on sorghum but is seldom found.

There is no direct control for these diseases, but as varieties vary considerably in their susceptibility this factor can be used in avoiding loss. In plant breeding and plant selection work, varieties particularly susceptible to leaf diseases have been, and are still being, eliminated so that the more recent recommendations will be comparatively free from such troubles.

Diseases Not Found in Queensland.

Of diseases not found in Queensland there are a number of fungus leaf spots which are of only minor importance. Another disease, crown rot, caused by a fungus, has been quite serious in the past in the United States. It is recognised by the presence of rotted roots and a reddish-brown discoloration seen on splitting the base of the plant. The rotting of this area results in stunting and premature death of the aboveground parts of the plant. It is being brought under control by crop rotation and the use of resistant varieties.

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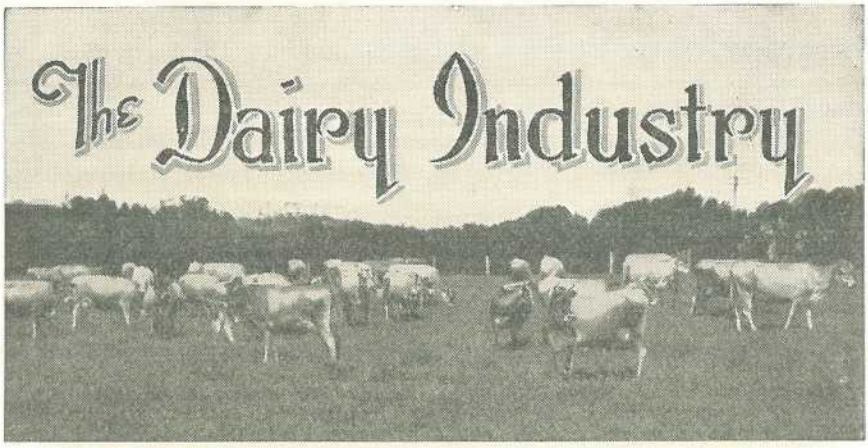
* *Helminthosporium turcicum.*

† *Puccina purpurea.*



Cream Vacreation.

A SIMPLE EXPLANATION OF THE "INTENSITY FACTOR."

T. W. SMITH, Division of Dairying.

IN the evolution of pasteurization, the Murray Vacreator is regarded as the latest method of processing cream for butter manufacture. As is usually the case when the most up-to-date machinery is introduced into industry, there is a shortage of skilled operatives and this is particularly so in regard to the vacreator. Sometimes the person who is to operate the machine is shown how to start it and stop it; but from then onwards he spends some time groping his way along until he becomes thoroughly conversant with the vagaries of the machine. At the present time, there are some vacreator operatives in this predicament. They are operating machines (and in many instances doing a good job) without actually knowing why they are doing certain things.

The following will elucidate some of these points of cream vacreation.

The Value of Cream Processing Records.

As the processing of cream in a Murray Vacreator consists of a washing or cleansing process, in combination with pasteurization, it should be obvious that the vacreator operative should thoroughly understand his machine and be able to determine the intensity of treatment to which the various grades of cream should be submitted so as to maintain uniformity in the grade notes of the resulting butter.

As every cream grader knows, the standard of the cream delivered to a butter factory on a Monday is much below that of cream delivered on a Wednesday and a Friday of the same week, often because of the length of time that the cream must be stored on the farm, where cooling facilities are usually inefficient. The cream grader's effort to maintain a maximum percentage of choice and first-grade cream thus results in an inferior bulk grade being produced.

Where no records are kept, the operative is definitely working in the dark. Where processing records are kept, the treatment applied to the cream can be compared with the grade notes of the resulting butter and the intensity of treatment varied accordingly.

A certain amount of standardization occurs under the vacreation process and where the butter-maker can refer to the records of the treatment being given the cream, moisture control in the manufacture of butter is greatly facilitated.

Function of the Water through Condenser Cones.

Apart from being instrumental in maintaining the vacuum in the machine, the flow of water through the condenser cones performs two other major duties, i.e.—

1. It carries away the volatile impurities of the cream;
2. It is the source from which the intensity factor is determined.

By the water-pressure gauge it is possible to know the number of gallons of water per hour which is passing through each unit of the vacreator.

By noting the rise in temperature which occurs between the incoming water and the outgoing water it is possible to judge the amount of treatment the cream is receiving.

The Intensity Factor.

This can be claimed as one of the most important features of efficient vacreation. The intensity factor is the amount of heat (expressed in B.T.U.) expended per lb. of cream treated. As this heat is applied in the form of steam which mingles directly with the cream, a greater quantity of steam is required than would be the case for merely pasteurizing. In the pasteurizing chamber, heating of the cream and condensation of the steam occurs. The mixture, drawn into the separating chamber, which is maintained at a lower vacuum by the equilibrium valve, boils freely, eliminating the volatile odours. These volatile flavours are then carried up through the gooseneck and away with the condenser water.

This fusion of the steam with the cream and the subsequent evaporation of the steam is referred to as a washing or cleansing process. It should, therefore, be apparent that a bare first-grade cream would require more washing than a good first-grade cream, just as a dirty article takes more washing than a soiled one. In a like manner every vacreator operative should know when he has an inferior quality cream to wash and how thorough the washing must be.

To determine this the following details must be noted:—

1. Gallons of water per hour passing through each condenser.
2. The gallons per hour of the cream being treated.
3. The difference in the temperature of the water entering and leaving the condensers.

The gallons of water passing through the condenser cones are as follows:—

Pressure Gauge Reading. lb. pressure per sq. in.	Single Unit. Gallons per hour.	Tandem Unit. Gallons per hour.
60	1,760	3,520
65	1,800	3,600
70	1,890	3,780
75	1,940	3,880
80	1,980	3,960
85	2,025	4,050
90	2,070	4,140
95	2,115	4,230
100	2,160	4,320

There are various methods of working out the intensity factor, but for rapid factory practice the following will be found suitable:—

Single Unit.

$$\frac{\text{Gallons of water per hour x Temperature rise}}{\text{Gallons of cream per hour}} = \text{Intensity Factor.}$$

Example.

Water pressure per sq. in .. .. = 65 lb.
Gallons of water per hour .. .. = 1,800
Gallons of cream per hour .. .. = 600
Incoming water temperature .. = 80° Fahr.
Outgoing water temperature .. = 140° Fahr.

$$\therefore \text{Intensity Factor} = \frac{1,800 \times 60}{600} \ldots = 180 \text{ B.T.U. per lb. cream treated.}$$

When a Tandem Unit is installed the gallons of water per hour is multiplied by the MEAN temperature rise and divided by the cream flow.

Tandem Unit.

$$\frac{\text{Gallons of water per hour x MEAN temp. per hour}}{\text{Gallons of cream per hour.}} = \text{Intensity factor.}$$

Example.

Water pressure per sq. in. .. .. = 65 lb.
Gallons of water per hour .. .. = 3,600
Incoming water temperature .. .. = 80° Fahr.
Outgoing water temperature of 1st Unit = 130° Fahr.
Outgoing water temperature of 2nd Unit = 90° Fahr.
∴ Total temperature rise = rise in temp. of 1st Unit plus rise in temp. of 2nd Unit
Total temperature rise = (130° F. − 80° F.) + (90° F. − 80° F.)
= (50° F. + 10° F.) = 60°F.
MEAN temperature rise = 30° F.
Gallons of cream per hour = 600

$$\therefore \text{Intensity Factor} = \frac{3,600 \times 30°\text{F.}}{600} = 180 \text{ B.T.U. per lb. cream treated.}$$

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the A.I.S. and Jersey Societies' Herd Books, production records for which have been compiled during the month of June, 1947. (273 days unless otherwise stated.)

Animal.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Mature (Standard 350 lb.).				
Alfa Vale Star 10th (365 days)	W. H. Thompson, Nanango	15,618·4	679·879	Penrhos Pansy's Pride
College Rapture 2nd	Q.A.H.S. and College, Lawes	9,803·55	357·728	Dulciman Disraeli
Senior, 3 Years (Standard 290 lb.).				
Navillus Charm 17th	C. O'Sullivan, Greenmount	10,291·45	408·722	Greyleigh Eros
Jamberoo Dignity 5th	A. F. Ezzy, Millmerran	8,445·2	363·38	Murray Bridge Florrie's Prince
Trevor Hill Iris 6th	G. Gwynne, Umbiram	6,960·99	309·368	Balater Czar
Junior, 3 Years (Standard 270 lb.).				
Alfa Vale Pet 3rd	W. H. Thompson, Nanango	10,535·05	417·984	Reward of Fairfield
Junior, 2 Years (Standard 230 lb.).				
Evermoor Fay	W. A. Freeman, Rosewood	10,779·8	408·321	Frenchview Park Lad
Trevlac Vision	W. A. Freeman, Rosewood	10,399·95	392·419	Trevlac Rosette's Combination
Trevlac Biddy	R. Tweed, Kandanga	5,536·2	239·19	Trevlac Rosette's Combination
JERSEY.				
Mature (Standard 350 lb.).				
Palmridges Sylvina	H. Sigley, Jaggan	9,618·1	513·413	Overlook Financier
Palmridges Brown Shore	H. Sigley, Jaggan	7,037·1	459·966	Overlook Financier
Boree Pridette	A. Visini, Gympie	7,884·15	388·059	Maurfield Larkspur's Gift
Kathleigh Doreen	F. W. Kath, Moffatt, *via* Dalby	6,286·55	383·987	Oxford Daffodil's Victor
Trecarne Chimes 5th	T. A. Petherick, Lockyer	8,997·65	371·056	Jerseylea Golden Duke
Kathleigh Bud	F. W. Kath, Moffatt, *via* Dalby	6,139·58	360·392	Kathleigh Jersey King II.

Junior, 3 Years (Standard 270 lb.).					
Glenrandle Lucy	P. Kerlin, Killarney	7,320·0	391·779	Bellgarth Glory King
Westwood Locket	F. Porter, Cambroon	5,544·55	362·889	Westwood Combination
Carnation Designer's Orange	W. Spresser and Son, Ipswich	5,662·3	287·003	Bellgarth Designer
Senior, 2 Years (Standard 250 lb.).				
Westbrook Tulip 134th	Farm Home for Boys, Westbrook	6,655·0	326·777	Mornmoot Clementine's Valour
Trecarne Golden Tot 4th	T. A. Petherick, Lockyer	4,991·65	257·748	Trecarne Some Duke
Junior, 2 Years (Standard 230 lb.).				
Kathleigh Peggy	F. W. Kath, Dalby	6,963·3	395·819	Kathleigh Silver Victory
Westwood Kelos	F. Porter, Cambroon	5,534·35	357·684	Trecarne Golden King 2nd
Lermont Myrtle 2nd	J. Schull and Sons, Oakey	6,624·9	321·33	Lermont Ambassador 2nd
Lermont Mischief	J. Schull and Sons, Oakey	5,978·85	316·307	Trinity Noble Effort
Lermont Golden Lily	J. Schull and Sons, Oakey	5,462·55	302·063	Trinity Noble Effort
Grasmere Victory's Carina	F. Eager, Petrie	6,672·95	289·697	Oxford Brown Victory
Westbrook Sultane 9th	Farm Home, Westbrook	6,180·25	285·187	Westbrook Ambassador 52nd
Nairfale Mayday	R. J. Browne, Yangan	5,154·8	274·306	Nairfale Count Paymaster
Linden Grove Laura	F. McGrath, Kin Kin	4,767·6	255·488	Linden Grove Laddie
Romsey Peach Bud	J. Wilton, Killarney	4,779·2	254·916	Oxford Pixie's Victor
Linden Grove Petal	F. McGrath, Kin Kin	4,537·3	241·291	Linden Grove Laddie
Trecarne Dairy Queen 3rd	T. A. Petherick, Lockyer	4,807·55	238·272	Trecarne Some Duke

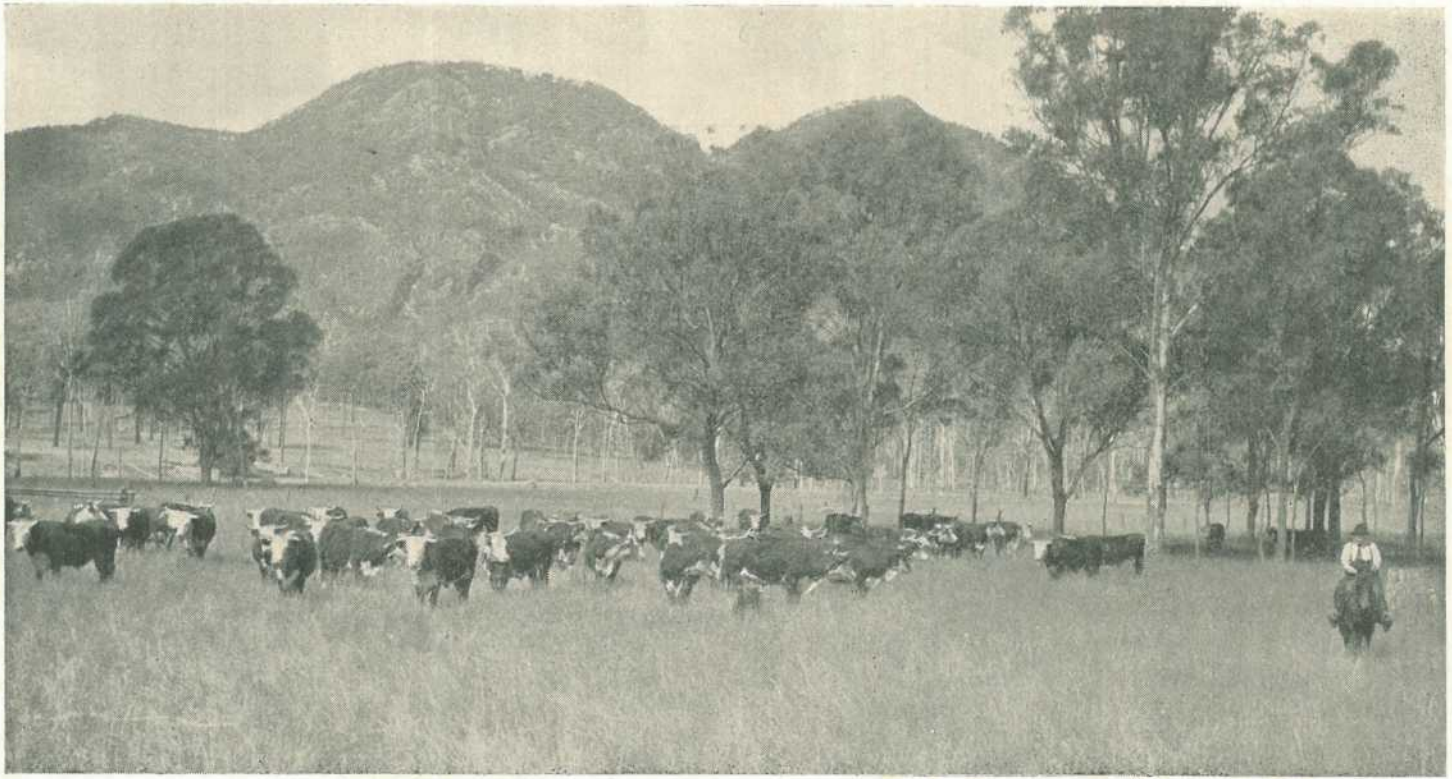


Plate 48. [*Photograph, Department of Agriculture and Stock.*

FAT CATTLE ON KINGPAH PASTURES.—The property of Mr. J. Faulkner.

Sheath Rot (Posthitis) of Sheep.

G. R. MOULE, Officer in Charge, Sheep and Wool Branch.

SHEATH rot is a disease of wethers and rams with which most sheep men are familiar. It is often referred to as pizzle rot or balanitis, although these names are not really correct as the disease commences on the sheath and the other organs may become involved secondarily.

The disease can cause serious economic loss, for up to 40 per cent. of a flock of wethers have been affected. Animals suffering from the disease lose weight rapidly and are often attacked by blow flies. Few deaths result directly from the disease, but, if a heavy wave of blow-flies occurs concurrently with an outbreak of sheath rot, severe losses may ensue. The disease can cause considerable inconvenience and expense, as it may mean extra handling of sheep. In addition, rams as well as wethers may be affected.

Sheath rot occurs extensively in Queensland. It is particularly prevalent in the so-called "desert" country south-east of Hughenden and east of Barcaldine, and in other areas where "dry" sheep are run.

The cause of the disease is not known despite considerable work done in Australia and in other parts of the world. Practical means of controlling the disease are, however, available.

Course of the Disease.

Most woolgrowers become aware that the disease is occurring amongst their sheep when they find sick animals. By this time the condition is usually well advanced.

If careful observations are made it will be seen that the disease commences as a small scab-like ulcer which may be located on or near the opening of the sheath. This scab may remain more or less "dormant" for some time or may extend fairly rapidly. When this occurs, the whole of the sheath becomes enlarged and red. The animal may experience difficulty in urinating and a close examination will reveal that in many cases the sheath contains pus and the penis itself may be involved. When this happens to rams it is particularly serious.

Because of the irritation and pain the affected sheep become uneasy and may kick at its belly, or attempt to bite at the affected part.

Treatment.

A considerable amount of research work has been done by the C.S.I.R. on the cause and treatment of sheath rot. During these investigations it was considered desirable to send affected sheep from

Western Queensland to the McMaster Laboratory in Sydney by train. Almost without exception these animals recovered within about ten days of their arrival in Sydney. The factors in the rapid recovery were examined and it was found that fasting affected animals, as would occur in a long train journey from western Queensland to Sydney, brought about rapid return to health in the majority of cases.

Under field conditions the sheep should be starved by being confined in a small bare holding paddock for about a week or ten days. Ample water should be available during the whole of this period. The exact technique used may be varied somewhat by allowing restricted grazing just to keep the sheep going during the last two or three days. It was found in the experimental work that it was possible to starve the sheep for ninteen days without any untoward results, except of course a loss of weight. Accordingly, animals which do not respond to the initial treatment may be drafted off and their period of starvation extended.

It has been found that a few cases may not respond to starvation, and with these it is necessary to resort to medical and surgical treatment. This consists of slitting the sheath, for which a long pair of scissors with one blunt (or ball) pointed blade may be used. The affected area is then irrigated with a solution of 2 per cent. (1 in 50) copper sulphate or 10 per cent. copper sulphate ointment may be applied after the pus has been removed from the affected parts.

THE MILCH GOAT—HINTS ON MILKING.

Goats should be milked twice a day, or as near twelve-hour intervals as practicable; heavy producers may require three milkings. Regularity of milking is a big factor in keeping up the milk flow. The manner of milking is also important if the milk supply is to be maintained and that very delicate organ, the udder, kept in good shape. Cleanliness of the udder and milking utensils is necessary to obtain milk that will keep.

Goats should be taught to stand quietly whilst being milked. To facilitate the milking, a stand 18 inches off the ground, upon which the goat soon learns to stand, is useful. If the goat will not stand quietly on the platform during milking, her head should be secured either by strap and short chain, or in a miniature cow bail.

The udder should be washed with clean, tepid water before milking, as should the milker's hands, which should be dried. Milking with wet hands is undesirable and unhygienic. The goat may be milked either from the rear or on the side, but whatever method is adopted should be adhered to as a routine. Both teats should be grasped gently but firmly with the hands and all the fingers closed and opened without pulling down at all. Some milkers advocate a slight upward push before each flow. Stretching the teats each time is bad milking. This method is suitable when the teats are large, but if the teats be small, the milking has to be done by stripping. In this method, the teat is grasped between the first finger and the thumb, close to the udder. The hand is drawn down the teat to cause the milk to flow with the motion of the hand.

Whatever method is used, it is very important to strip the udder of all milk. To do this, imitate the kid, which pushes and rubs the udder. Then with finger and thumb, strip the last few ounces from the udder. Milk the animal as quickly as possible. To get the best results, practice quickness, quietness, and gentleness.

Lanolin spread on the teats before milking often helps to allay any tenderness, and aids the milking of small-teated young goats. Should goats kick when being milked, examine the udder for long hairs, which should be cut off. Also see that the milker's fingernails are well trimmed, otherwise sore udders may result.

MARKETING

Production Trend Reports.

Monthly reports on production trends of important primary commodities instituted by the Minister for Agriculture and Stock early in the year have been well received.

The reports which are in the form of a stencilled pamphlet containing nine or ten pages are obtainable free upon application to the Department. They contain much information of value to organisations and firms supplying products or services to farmers as well as to farmers themselves.

The service will be extended from time to time and eventually detailed forecasts of the production of different crops will be included.

The report is widely distributed, copies being sent as far afield as London, and from the continuous inquiry it is apparent that there has long been a demand for this kind of information, which it is only possible to obtain through a service such as that now being conducted by the Marketing Division of the Department.

Throughout the farming areas of the State, with the exception of the Far North, where some substantial falls were recorded, the rainfall during July was considerably under average. Most of the southern districts, including the Darling Downs, received less than half an inch for the month.

Dairy cattle were in fair to good condition. There had been a marked drying off of herbage and pastures, and growth of winter fodder crops had slowed; but, because of the low winter rainfall, weed taints, usually prevalent and the cause of much down-grading of cream at that time of the year, were causing little trouble.

On the Darling Downs, the sowing of wheat for grain was completed. Germination was excellent and on most lands subsoil moisture had been sufficient for satisfactory early growth. Early rains were needed for adequate further development.

Planting of sugar virtually ceased during the month and young crops made little progress. Further deterioration in the crop occurred at Mackay, and prospects in the Bundaberg mill areas were less promising. All mills north and inclusive of the Lower Burdekin had commenced crushing and early ccs and condition of the cane were fairly good.

Harvesting of cotton was still in progress during July in the Callide Valley, where the weather conditions had been conducive to the production of good grades.

Intake of eggs by the South Queensland Egg Marketing Board for July was 635,473 dozen, which compares very favourably with 494,384 dozen for July, 1946.

Comparative Prices, Australian and Cuban Sugar—A Correction.

In the article on Empire Preference on Rural Products in the June issue of the Journal, the last paragraph of the section dealing with sugar, page 370, contained the following statement:—

> "even with the present general shortage of sugar, the current Cuban export quotation is about the same as the wholesale home consumption price in Australian capital cities, £33 4s. per ton."

The General Secretary of the Queensland Cane Growers' Council has since drawn our attention to the fact that the present export price of *raw* sugar from Cuba is approximately £9 per ton in excess of the price for Australian *raw* sugar. The comparison as made in the article referred to was, therefore, not between the value of raw sugar in Cuba and the value of raw sugar in Australia, but between the price of *raw* sugar in Cuba and the wholesale price of *refined* sugar used for home consumption in Australia, viz., £33 4s.

Latest overseas reports record that odd parcels of Cuban raw sugar recently sold at up to £47 per ton, which figure is well over £20 in advance of the price received by the Australian sugar industry for that portion of the raw sugar produced and refined for home consumption.

GENERAL NOTES

Staff Changes and Appointments.

Mr. G. R. Moule, B.V.Sc., Veterinary Officer attached to the Sheep and Wool Branch of the Department of Agriculture and Stock, has been appointed Officer in Charge of the Sheep and Wool Branch, Division of Animal Industry.

Mr. V. R. Smythe, Assistant Dairy Technologist, has been appointed Dairy Technologist in the Division of Dairying, Department of Agriculture and Stock, Toowoomba.

Central Queensland Egg Marketing Board.

Regulations have been issued under the *Primary Producers' Organisation and Marketing Acts* authorizing The Central Queensland Egg Marketing Board, in certain cases, to exempt egg producers in its area from the requirement to deliver eggs to the Board. The Board may, in its discretion, grant exemptions in respect of eggs required as food for a grower's family and for the hatching of his own flocks and in respect of sales to retail vendors. It will be a matter for the Board, within the framework of the Regulations, to determine its own policy in respect of exemptions.

Sir John and Lady Higgins Research Scholarship.

Applications are invited by the University of Melbourne from graduates in science, agricultural science, and veterinary science for the Sir John and Lady Higgins Research Scholarship. Intending candidates must have had at least one year's experience in research work, or one year's advanced training after qualifying for the first degree. Candidates who will have completed one year's post-graduate studies in research by December, 1947, are eligible to apply.

The scholar will be required to carry out research work in industrial chemistry and biochemistry as related directly to the study and the development of the pastoral and agricultural industries of Australia. Preference will be given to graduates in agricultural science and veterinary science provided that after graduation their work has been in chemistry or biochemistry.

The scholarship is valued at £400-£500 and is awarded for two years. Travelling or other expenses may also be paid at the discretion of the Professorial Board, under whose direction the work will be carried out. The selected scholar will be expected to take up the tenure of his scholarship in March, 1948.

Applications should reach the Registrar, University of Melbourne, Carlton, N.3, not later than 15th August.

Central Queensland Egg Board.

Egg producers in Central Queensland, with the assistance of the Marketing Division of the Department of Agriculture and Stock, have established a producer-controlled marketing board for eggs in the region extending from Bundaberg to Mackay. In this area, there are approximately half a million head of poultry. The Board has assumed control as from the 1st July and has arranged with the Central Queensland Meat Export Company at Lakes Creek, Rockhampton, to act as its agent in the receiving, handling, and marketing of eggs. Producers in this area now control their own industry in their own interests and thus will be in a position to assist in placing their industry on a firmer footing.

Banana Levy.

The Executive Council has approved of the issue of an Order in Council under the *Banana Industry Protection Acts* providing for a levy on banana growers, the proceeds from which will be used for the maintenance of the Banana Industry Protection Board. The levy, which will operate from the 26th August, is at the rate of 1½d. per case containing 1½ bushels or less for bananas marketed in the case; and 2d. in the £1 or part thereof on the gross proceeds of sales of bananas marketed in the bunch. In respect of bananas marketed elsewhere than in Queensland, the sum of 2s. 10d. a ton is added to the freight charges.

Rural Topics

Feed for Pigs.

Because the pig will eat classes of food which otherwise would be of no economic value on the farm, it is looked upon as a scavenger, and many articles of food are fed to it in a putrefying or mouldy condition. Not only are foods in such a state a fruitful source of disease, but the flesh of the animals so fed will be of poor quality. The quality of the bacon depends upon the food given, and first-class flesh cannot be expected from pigs not suitably fed.

Skim milk and butter-milk are excellent foods if fed while fresh and sweet, but to store them in insanitary tanks, casks or other containers until they are semi-putrid is merely to invite trouble. Where swill and hotel refuse is collected for food it should be fed before it becomes soured, since there is great danger of poisoning from soured swill. In addition, it should always be boiled before use. Fruit, vegetables, and root crops when rotting are also a common source of digestive derangements, while maize fed in a mouldy condition may cause poisoning and nervous disorders. The danger of sickness may be lessened in all these cases by boiling the food before giving it to the pigs.

Signs of Good Lucerne Seed.

Indications of Freshness.—Lucerne seed should be bright, fresh to the smell, and of a yellowish-green colour, these characteristics indicating that it is not old seed; the latter can nearly always be picked by the absence of a good smell, and a brown, "aged looking" colour. Provided it is properly stored, lucerne seed retains its viability for a considerable time; seed two or three years old may germinate nearly as well as new seed, but it may not have the vigorous and rapid germinating ability of the latter.

When purchasing lucerne seed, examine it closely for shrivelled and cracked grains if it has been produced in a dry climate, whilst samples containing weed seed should be looked at askance, especially if the lucerne is to be grown under irrigation.

Maintenance of Quality in Cream.

Ability to maintain quality in cream during the summer months depends primarily upon:

1. General dairy cleanliness.
2. Removal of the animal heat from milk or cream by means of water cooling as soon as possible after it is produced.
3. Maintenance of the fat test of cream at about 40 to 42 per cent., in order that a minimum amount of skim milk is present in the cream.
4. Blending of cream from different milkings only after it has been cooled.

A Warm-Hearted Country.

"England is a country of warm-hearted people always eager to help. The little apparent coolness at the start arose out of good manners—not wanting to interfere with someone else's business." Mr. A. E. Hyland said that at a recent meeting of the Australian Dairy Board when he was telling of his experiences in the United Kingdom during twelve years as Director of Australian Overseas Publicity. "Apart from any sentimental feelings," he added, "it would be a wise thing to preserve our attachment to this great and powerful family spread over all the world. Whilst we remained part of this powerful band of big brothers, the rest of the world would have to take notice of us."

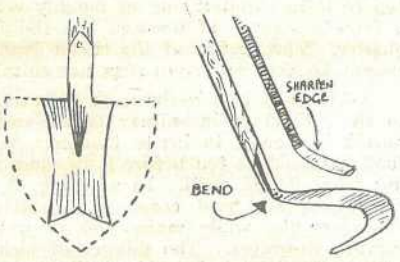
Taking a Rise Out of the Cow.

Sometimes when driving a cow, or attempting to lead her, she will lie down and refuse to get up, and the same thing may happen when you try to lead her into a truck. She will get up quickly, however, when the palms of the hands are placed over her nostrils, with the fingers under the jaw tightly enough to stop her breathing.

GADGETS AND WRINKLES

IDEAS FOR ERADICATING BRACKEN.

There are various useful ideas in operation such as stock trampling and eating; top-dressing and sowing pastures is also of value. There is also, of course, the Gippsland hook, which is very effective, and in this connection, some find it an advantage to bend same over as shown in this sketch.



A good implement can also be made from an old shovel—the illustration showing how it should be cut—the dotted lines showing the original shape and the firm lines the finished shape of the "slasher." The fish-tail end will also be noted. It should, of course, be sharpened, and, if necessary, the handle can be altered to suit.

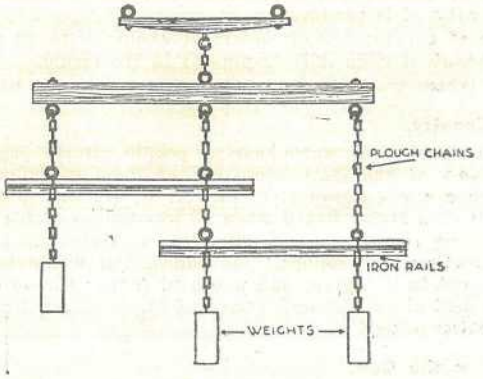
Another idea is to always carry a bent stick whenever walking through bracken infested country and, if a collection of these sticks is kept in a handy place, they will be found of very great use. A sample stick is shown in the sketch.

ANOTHER METHOD.

This also comes from Scotland, and experience has shown it to be very effective—good results being obtained by bruising, which can be done with this home-made implement in preference to cutting.

It can be cheaply made but the drag bars must be heavy and, if possible, with concave facing or edges. The sketch shows two drags attached but three or four could be used if the ground is not too rough or hilly.

The scientific idea behind bruising seems to be that bleeding of the underground rhizomes continues over a long period, causing impoverishment at the roots, whilst the damaged fronds allow disease and parasites to interfere with the root system.



—From "Handy Farm and Home Devices and How to Make Them."
(J. V. Bartlett for War Blinded Association, Adelaide, S.A.), 1946.

Care of Mother and Child.

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

DIARRHOEA IN BABIES AND CHILDREN.

WE will assume that a diagnosis of diarrhoea in an infant or child has been made and the baby has been taken off all milk and other foods for the necessary period.

It is most important that baby has plenty of fluid during this period—boiled water at the rate of 2½ to 3 oz. for every pound of body weight should be given in 24 hours, so that if baby weighs 10 lb. he will need 25 to 30 oz. of boiled water each day given as often as he will take it. Barley water may be used instead—the older baby may take this better, and after the first day sugar of milk or a glucose preparation at the rate of one tablespoon of sugar to every 12 tablespoons of boiled water or barley water should be added. When baby shows signs of improvement—his temperature is normal again, his motions are not offensive, and he looks better, he must be carefully graded back on to food. *And this is the time when most mistakes are made and serious relapses may be caused.* If at all possible mothers should seek the guidance of the sister at their nearest Child Welfare Centre at this period and not try to manage alone. If baby is under a doctor's care he will of course continue to supervise the feeding and general management until baby is well, but mothers often visit their doctor or a centre once or twice only and then go their own way. In a severe case of diarrhoea this may have grave consequences. *The important part of the treatment of diarrhoea, and particularly infective diarrhoea is that the baby shall be under skilled supervision until he is back on to his usual diet and is digesting it well.* For the benefit of mothers who are beyond the reach of medical help a few general rules may be laid down.

Breast Fed Babies.

In the first place it is most unusual for breast fed babies to contract infective diarrhoea, and so the mother who is feeding her own baby has little to worry about in an epidemic, provided she does not give her baby a dummy or is careless in personal hygiene. If through some mischance baby does become infected it is ever so much easier to grade him back on to food. After the initial period of starvation, which may only need to be 8 or 12 hours, he may have a breast feed for say two minutes every 4 hours followed by a drink of barley water. Increase the feeds by one or two minutes every day or alternate day depending on the speed with which baby recovers until he is back on his full feeds. Keep up the supply of water.

Artificially Fed Babies.

To grade these babies back on to food the greatest care must be taken. The experience of this service is *that the majority of relapses occur from introducing milk and milk foods too soon and increasing the strength of the milk mixture before baby's digestion can deal with it.* A rapid increase in the feeds, even when baby appears to be much better, will very often result in a relapse.

If baby is under 9 months it is advisable to add one or two teaspoons of milk to each 3 or 4 hourly feeding of sweetened barley water to see how baby re-acts. Make an increase every *alternate* day to give baby's digestion time to adjust itself to each change and watch the motions carefully. The amount may be doubled every alternate day. If, as the milk is increased, it is not well tolerated, the addition of a pancreatising agent, such as Benger's Food, is often useful particularly for older babies. Dried milks may be Bengerized if these are used. Baby should in this manner be graded carefully back to the food he was having before he became ill, provided he was doing well on it.

Toddlers.

After the initial starvation the child may have water food, sago, or arrowroot well cooked and flavoured with a little syrup, sugar, meat extract, or orange juice, or grated raw apple or baked apple may be given 2-hourly as much as the child will take. In a day or two give a rusk or crisp baked bread without butter once or twice a day. Marmite or Vegemite broth may be added next, and later this can be thickened with potato baked or boiled in its skin (no butter). Milk should be introduced later and with care, and can with advantage be diluted and Bengerized for a few days. Remember unless baby can digest a food it is no use to him, and merely overtaxes his already weakened digestion, so go carefully always, and if possible have expert guidance.

Further advice on this and other matters can be obtained by communicating personally with the *Maternal and Child Welfare Information Bureau,* 184 *St. Paul's Terrace, Brisbane,* or by addressing letters *"Baby Clinic, Brisbane."* These letters need not be stamped.

THE FARM GARDEN.

If animal manure in quantity is not available, an efficient system of soil management in the garden will include the growth of green manures for digging under. Green manures serve the purpose of conserving the mineral matter of the soil, increasing the amount of combined nitrogen, and counterbalancing the continuous diminution in organic matter due to bacterial action.

The more immature the green crop and the lighter textured and better aerated the soil, the more rapidly is the material decomposed. The period that elapses between the digging under of the green crop and the planting of a new crop should not be so great that the nutrients, which are rapidly liberated once decomposition begins in the soil, are lost. In gardening practice where sandy or heavy soils require organic matter in quantity for the improvement of their texture, the practice of green manuring alone is insufficient to ensure this effect, though its value in providing rapidly available nutrients is considerable.

Succulence and the nitrogen content of green manures determine the rate of release in usable form of nitrogen from its compounds present in the growing plant. Fibrous legumes, or legumes poor in nitrogen as occur when grown on poor acid soils lacking the appropriate organisms for nodule production, may deplete the soil of nitrogen suited to plant nutrition for several weeks or months. When legumes of correct maturity and nitrogen content are turned under, an ample release of nitrogen may be in evidence in moist soil in two weeks' time. Where favourable results are expected of green manure crops, nitrogenous fertilisers should be applied to non-legumes, and ample minerals, a favourable degree of acidity and the correct organisms for inoculating must be provided for legumes.

With the enthusiasm of spring, most of the space is utilised in the majority of gardens, but any areas which are not used in autumn or winter can be put under a green crop. A hardy and useful crop for the garden is a mixture of wheat and vetches, broadcast with superphosphate over the prepared ground, and then raked in or turned under to a depth of 1 or 2 inches with a spade, taking a shallow horizontal slice and inverting. Other quick-growing and useful crops are New Zealand blue lupins, field peas and tick beans, which may be grown alone or mixed with a cereal. The rapidity of growth of these crops, under good conditions, makes them useful for growing in the interval between crops.

QUEENSLAND WEATHER IN JULY.

Except for slightly over average rain totals at a few places on the far North Coast fringe and over average showers of 53 points at Hungerford, marked deficiencies were general in all districts with Nil reports in the Carpentaria, Central and Lower West, Central Lowlands and Highlands to the Central and Coast sections. A few light showers were received in parts of the far South-West, Warrego and Maranoa and in the Downs and South Coast districts; the only light to moderate showers with isolated thunder and hail were reported on the morning of the 23rd. Rainfall distribution throughout most of the State has steadily deteriorated since May, though in parts of the South-West 1 to 2 inches were recorded in June. In the farming and dairying areas of the South-East Divisions the promising outlook at the end of May has not been consolidated by any useful rain in June and July, and an early general soaking distribution is required. Frosty night conditions have also assisted in the drying up of pastures and caused local vegetable and cane crop damage. Crops and pastures in the Central Coast East also require more rain and many pastoral areas in the Central West, Central Interior, Lowlands and Highlands to the Central Coast West are experiencing hard wintering conditions as they missed the March rains which benefited most of the Carpentaria and southern inland divisions.

Pressure.—As in June the continental high pressure belt continued as the chief control with a series of fairly substantial centres moving from west to east across the centre of the Continent. Movement of the front of these "highs" brought fresh south-east winds at times along the tropical Queensland coast. Considerable activity was maintained in the low pressure belt to the south of the Continent, but there was little inland penetration of the fronts and centres. Only very weak trough formations were shown in Queensland and there was a complete absence of any out of season inflow of air from the north. A combination of inland trough, cold front and southern "low" on the 21st produced the light to moderate rain in the south-east districts, but the next similar distribution on the 26th moved too quickly for rain production in southern Queensland.

Temperatures.—Mean maximum temperatures were above average from approximately 0.3 deg. at Cairns and Thargomindah to 2.7 deg. at Georgetown and Mitchell. Minimum temperatures were slightly above normal at Cairns and Longreach but otherwise below 4.3 deg. at Rockhampton and 2.9 deg. at Mitchell.

Frosts.—There were many sharp frosts in the south-east quarter with cold night temperatures penetrating well northward into the Central Coast and Tropical Interior. Many stations in the Maranoa and Downs recorded 30 deg. and under grass minimum readings on over 20 nights, Stanthorpe 25 (13 deg. on 20th), Bybera 24 (11 deg. on 20th), Mitchell 20 (15 deg. on 20th), Tambo 18 (15 deg. on 30th), and Winton 29 deg. on 18th.

Brisbane.—Mean pressure $\frac{9+3}{2}$ 30.095 inches (normal 30.078 inches).

Temperatures.—Mean maximum 70.1 deg. (normal 68.5 deg.); mean minimum 46.4 deg. (normal 48.8 deg.); mean temperature 58.3 deg. (normal 58.7 deg.). Highest daily reading 74.9 deg. on 5th, lowest daily reading 40.0 deg. on 13th.

Rainfall.—34 points on 1 day (average 216 on 8 days). Lowest number of days rain in July since Nil in 1841. *Sunshine.*—266.5 hours (52.2 above normal). *Frosts* (suburbs) 17 nights (record highest). 25 deg. on grass at Archerfield on 18th. *Fogs* (3, general). *Mist patches* 9.

The rainfall position is summarised below—

Division.	Normal Mean.	Mean July, 1947.	Departure from Normal.
	Points.	Points.	Per. Cent.
Peninsula North	42	21	50 below
Peninsula South	24	Nil	100 ,,
Lower Carpentaria	20	Nil	100 ,,
Upper Carpentaria	42	Nil	100 ,,
North Coast Barron	114	118	4 above
North Coast Herbert	179	93	48 below
Central Coast East	111	4	96 ,,
Central Coast West	65	Nil	100 ,,
Central Highlands	116	7	94 ,,
Central Lowlands	82	Nil	100 ,,
Upper Western	41	Nil	100 ,,
Lower Western	51	1	98 ,,
South Coast, Port Curtis	178	24	87 ,,
South Coast, Moreton	227	24	89 ,,
Darling Downs, East	181	49	73 ,,
Darling Downs, West	141	30	79 ,,
Maranoa	147	17	88 ,,
Warrego	107	26	76 ,,
Far South-West	69	18	74 ,,

Commonwealth of Australia, Meteorological Bureau, Brisbane.

ASTRONOMICAL DATA FOR QUEENSLAND.

SEPTEMBER.

Supplied by W. J. NEWELL, Hon. Secretary of the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Day.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.03	5.33	Cairns	27	31	Longreach	34	36
6	5.58	5.36	Charleville ..	27	27	Quilpie	35	35
11	5.52	5.38	Cloncurry	48	52	Rockhampton ..	9	11
16	5.46	5.40	Cunnamulla ..	29	29	Roma	17	17
21	5.40	5.42	Dirranbandi ..	19	19	Townsville ..	22	27
26	5.35	5.45	Emerald	18	20	Winton	38	42
30	5.30	5.46	Hughenden ..	33	37	Warwick	3	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	p.m.	a.m.
1	6.02	6.29
2	6.57	7.00
3	7.52	7.31
4	8.49	8.01
5	9.48	8.34
6	10.49	9.08
7	11·53	9.48
8	..	10.34
	a.m.	
9	12.59	11.27
	p.m.	
10	2.04	12.28
11	3.05	1.35
12	4·00	2.44
13	4.48	3.54
14	5.30	5.01
15	6.08	6.06
16	6.44	7.09
17	7.17	8.10
18	7.51	9.10
19	8.27	11.09
20	9.05	11.07
21	9.46	..
		a.m.
22	10.31	12.04
23	11.20	12.59
	p.m.	
24	12.12	1.49
25	1.06	2.35
26	2.02	3.17
27	2.58	3.55
28	3.53	4.29
29	4.49	5.01
30	5.45	5.32

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

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

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Day.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	23	14	39	30	14	5	45	34
6	13	25	28	41	3	16	31	47
11	10	29	25	44	0	20	27	52
16	19	19	35	34	10	10	39	39
21	29	10	44	25	19	0	52	28
26	27	12	43	26	18	1	51	29
30	19	18	35	33	10	9	41	38

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Day.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	38	17	56	42	41	27	32	16
3	28	28	50	49	34	34	24	24
5	18	38	42	56	27	41	16	33
7	9	47	37	62	21	47	8	39
9	6	53	35	66	20	51	6	44
11	5	52	35	65	19	50	5	44
13	12	44	38	60	23	46	11	37
15	22	32	45	53	30	38	19	28
17	34	22	53	45	38	30	28	19
19	43	11	60	38	45	23	36	11
21	52	5	66	34	50	20	43	6
23	55	3	68	32	51	18	45	4
25	52	5	66	34	50	20	43	6
27	48	11	63	38	48	23	40	11
30	30	25	51	47	35	32	25	22

Phases of the Moon.—Full Moon, September 1st, 2.34 a.m.; Last Quarter, September 8th, 1.57 p.m.; New Moon, September 15th, 5.28 a.m.; First Quarter, September 22nd, 3.42 p.m.; Full Moon, September 30th, 4.41 p.m.

On September 24th, at 7 a.m., the Sun will cross the Equator on its apparent journey from north to south. On this day it will rise and set at true east and true west respectively. On September 3rd and 16th the Moon will rise and set approximately at true east and true west.

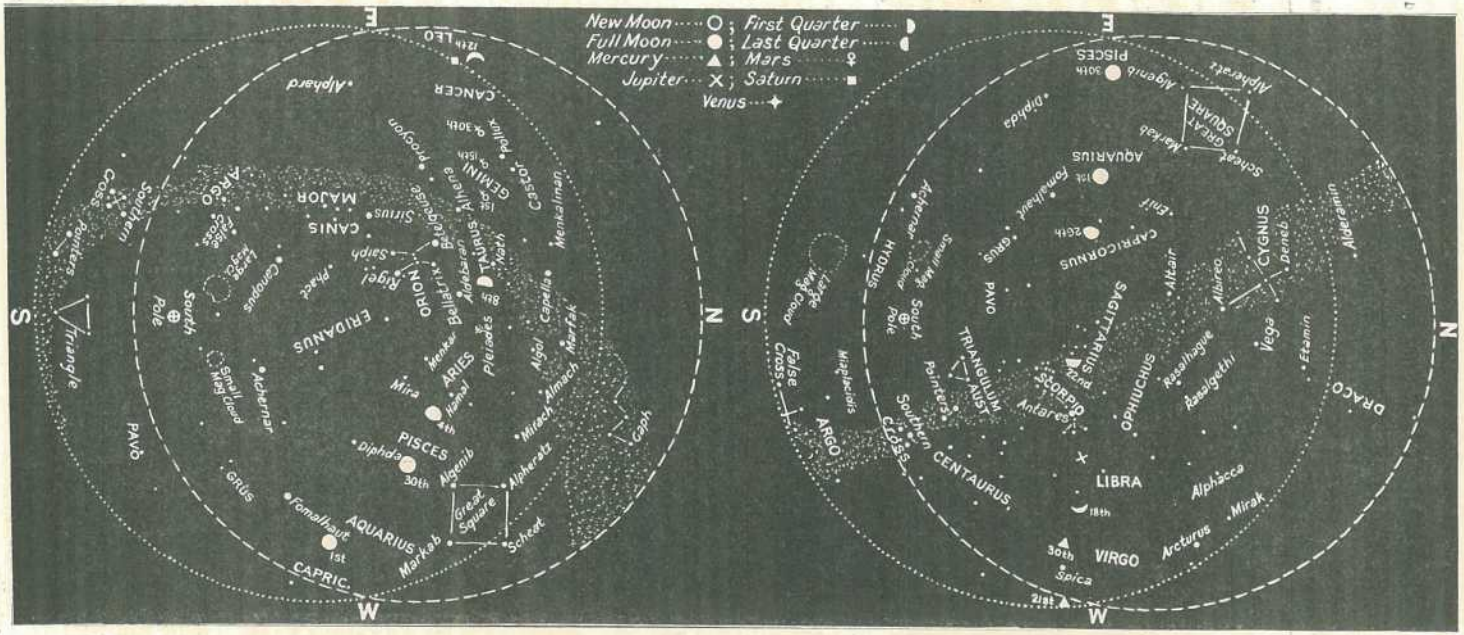
Mercury.—An evening object all this month. On the 1st, in the constellation of Leo, it will set 10 minutes after the Sun and by the 30th, in the constellation of Virgo, will set 1 hour 40 minutes after sunset. On the 26th it will pass 1 degree to the north of Spica.

Venus.—Too close in line with the Sun for observation, being in conjunction with the Sun on the 3rd.

Mars.—In the constellation of Gemini, at the beginning of the month will rise between 2.45 a.m. and 4 a.m. and at the end of the month will rise between 2 a.m. and 3.15 a.m. It will pass 6 degrees south of Pollux on the 20th and by the end of the month will be in line with Castor and Pollux.

Jupiter.—Well up in the sky at nightfall. At the beginning of September will set just before midnight and at the end of the month will set between 9.30 p.m. and 10.30 p.m.

Saturn.—May now be seen low in the east during morning twilight. In the constellation of Leo, at the beginning of the month it will rise about 1 hour before the Sun and at the end of the month it will rise 2 hours 15 minutes before the Sun.



Star Charts.—The chart on the right is for 7.15 p.m. in the south-east corner of Queensland to 8.15 p.m. along the Northern Territory border on the 15th September. (For every degree of longitude we go west the time increases 4 minutes.) The chart on the left is for 9 hours later. On each chart the dashed circle is the horizon as viewed from Cape York and the dotted circle is the horizon for places along the New South Wales border. When facing north hold N at the bottom; when facing south hold S at the bottom, and similarly for the other directions. Only the brightest stars are included and the more conspicuous constellations named. The stars which do not change their relation to one another moving east to west arrive at any selected position about 4 minutes earlier each night. Thus, at the beginning of the month the stars will be in the positions shown about one hour later than the time stated for the 15th and at the end of the month about one hour earlier than that time. The positions of the Moon and planets which are continually changing in relation to the stars are shown for certain marked days. When no date is marked the position is for the middle of the month.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

JULY RAINFALL.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July,	No. of years' records.	July, 1946.	July, 1947.		July,	No. of years' records.	July, 1946.	July, 1947.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	1·12	42	0·50	0·79	Gatton College ..	1·37	74	0·26	..
Cairns	1·53	61	0·98	1·40	Gayndah	1·47	72	0·46	0·09
Cardwell	1·38	71	0 06	1·00	Gympie	2·07	73	0·34	..
Cooktown	0·98	67	1·26	1·74	Kilkivan	1·50	62	0·31	0·15
Herberton	0·89	57	0·54	0·40	Maryborough ..	1·93	72	0·09	0·02
Ingham	1·69	51	0·12	0 79	Nambour	2·67	47	0 60	0·87
Innisfail	4·75	62	1·37	2·84	Nanango	1·65	61	0·74	0·20
Mossman	1·19	19	1·01	1·73	Rockhampton ..	1·73	72	0·11	0·11
Townsville	0·67	72	0·01	..	Woodford	2·28	55	0·18	0·15
Central Coast.					*Darling Downs.*				
Ayr	0·73	56	..	..	Dalby	1·71	73	0·32	0·08
Bowen	0·93	72	0·16	0.08	Emu Vale	1·57	47	0·10	0·42
Charters Towers ..	0·67	61	0·10	..	Jimbour	1·48	64	0·28	0·18
Mackay	1·64	72	0·24	0·18	Miles	1·62	58	0·36	0·05
Proserpine	1·58	40	0·24	0·63	Stanthorpe	2 00	70	0·35	1·16
St. Lawrence ..	1·36	72	0·07	..	Toowoomba	2·06	71	0·43	0·16
South Coast.					Warwick	1·80	78	0·05	0·55
Biggenden	1·41	44	0·10	0·37	*Central Highlands.*				
Bundaberg	1·83	60	0·17	0·22	Clermont	1·06	72	..	..
Brisbane Bureau ..	2·16	95	0·19	0·34	Springsure	1·18	74	..	..
Caboolture	2 37	67	0·13	1·22					
Childers	1·70	48	0·18	0·22	*Maranoa.*				
Crohamhurst	2·90	50	0·52	0·17	Roma	1·43	69	0·05	..
Esk	1·90	56	0·30	0·08	St. George	1·21	62	0·03	0·41

CLIMATOLOGICAL DATA FOR JULY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Pts.	
Cairns	..	79	63	81	5. 6, 7, 11, 15, 17, 23, 28	56	11	140	8
Herberton	..	73	49	82	14	37	18	40	6
Townsville	..	78	57	82	16, 17	51	24	..	..
Brisbane	30·14	70	46	75	5	40	13	34	1
Rockhampton	30·14	76	46	83	15	36	30	11	1
Darling Downs.									
Dalby	..	67	35	76	4	26	21	8	2
Stanthorpe	..	59	30	68	4	19	20	116	2
Toowoomba	..	62	38	71	4, 26	29	20	16	2
Mid-Interior.									
Georgetown	30·04	85	53	90	10	44	23	..	..
Longreach	30·17	76	45	87	13	34	18	..	..
Mitchell	30·20	69	35	78	4, 13, 14	25	20, 21	..	..
Western.									
Burketown	..	84	56	92	10	47	19	..	..
Boulia	30·12	75	..	87	4, 13	..	..	..	..
Thargomindah	30·13	66	41	80	13	35	18, 20 30	30	3

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