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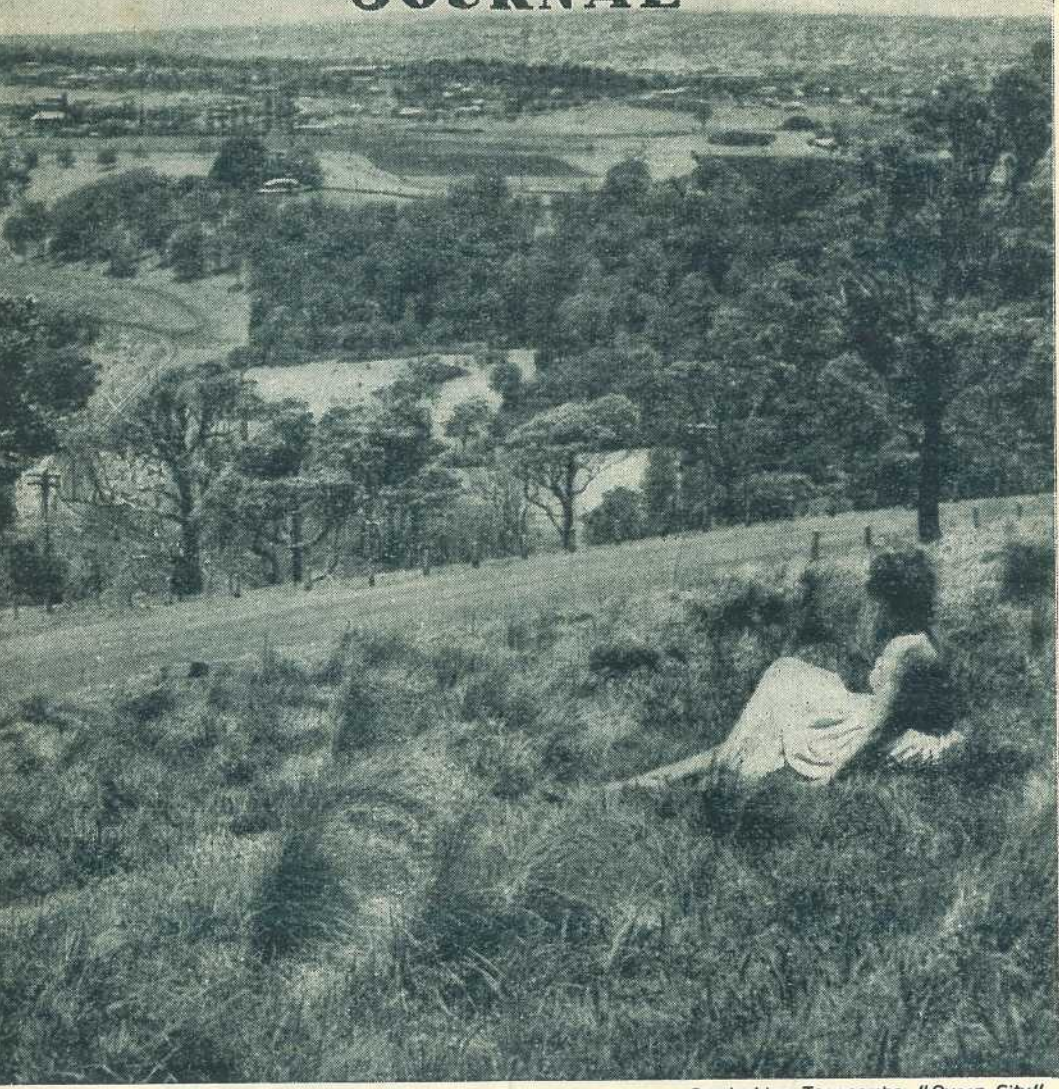
DEPARTMENT OF AGRICULTURE

QUEENSLAND AGRICULTURAL JOURNAL



Overlooking Toowoomba, "Queen City" of the Darling Downs.

LEADING FEATURES

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Queensland AGRICULTURAL JOURNAL

Contents

Tuberculosis-Free Cattle Herds.

TESTED HERDS (As at 11th July, 1955).

The Tuberculosis-free Herd Scheme (which is distinct from the tuberculosis eradication scheme operating in commercial dairy herds) was initiated by the Department of Agriculture and Stock for the purpose of assisting owners of cattle studs to maintain their herds free from tuberculosis and so create a reservoir of tuberculosis-free cattle from which intending purchasers can draw their requirements. The studs listed here have fulfilled the conditions to the date shown above.

Breed.	Owner's Name and Address.
Aberdeen Angus ..	The Scottish Australian Company Ltd., Texas Station, Texas
A.I.S.	M. E. & E. Scott, "Wattlebrae" A.I.S. Stud, Kingaroy
	F. B. Sullivan, "Fermanagh," Pittsworth
	D. Sullivan, "Bantry" Stud, Rossvale, *via* Pittsworth
	W. Henschell, "Yarranvale," Yarranlea
	Con. O'Sullivan, "Navillus" Stud, Greenmount
	H. V. Littleton, "Wongalea" Stud, Hillview, Crow's Nest
	J. Phillips and Sons, "Sunny View," Benair, *via* Kingaroy
	Sullivan Bros., "Valera" Stud, Pittsworth
	Reushle Bros., "Reubydale" Stud, Ravensbourne
	H. F. Marquardt, "Chelmer" Stud, Wondai
	A. C. and C. R. Marquardt, "Cedar Valley," Wondai
	A. H. Sokoll, "Sunny Crest" Stud, Wondai
	W. and A. G. Scott, "Welena" A.I.S. Stud, Blackbutt
	G. Sperling, "Kooravale" Stud, Kooralgin, *via* Cooyar
	C. J. Schloss, "Shady Glen," Rocky Creek, Yarraman
	W. H. Thompson, "Alfa Vale," Nanango
	S. R. Moore, Sunnyside, West Wooroolin
	H.M. State Farm, Numinbah
	D. G. Neale, "Groveley," Greenmount
	Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
	A. W. Wieland, "Milhaven" A.I.S. Stud, Milford, *via* Boonah
	W. D. Davis, "Wamba" Stud, Chinchilla
	Queensland Agricultural High School and College, Lawes
	C. K. Roche, Freestone, Warwick
	Mrs K. Henry, Greenmount
	D. B. Green, Deloraine Stud, Durong, Proston
	E. Evans, Wootha, Maleny
	T. L. and L. M. J. Cox, "Seafield Farm," Wallumbilla
	J. Crookey, "Arolla A.I.S. Stud" Fairview, Allora
	M. F. Power, "Barfield," Kapaldo
Ayrshire	L. Holmes, "Benbecula," Yarranlea
	J. N. Scott, "Auchen Eden," Camp Mountain
	"St. Christopher's" and "Iona" Studs, Brookfield road, Brisbane
	E. Mathie and Son, "Ainslie" Ayrshire Stud, Maleny
	C. E. R. Dudgeon, "Marionville" Ayrshire Stud, Landsborough
	G. F. H. Zerner, "Pineville," Pie Creek, Box 5, P.O., Gympie
	T. F. Dunn, Alanbank, Gleneagle
Friesian	C. H. Naumann, "Yarrabine" Stud, Yarraman
Guernsey	C. D. Holmes, "Springview," Yarraman
	A. B. Fletcher, Cossart Vale, Boonah
	W. H. Doss, Degilbo, *via* Biggenden
	A. C. Swendson, Coolabunia, Box 26, Kingaroy
	C. Scott, "Coralgrae," Din Din road, Nanango
	R. J. Wissemann, "Robnea," Headington Hill, Clifton
Jersey	Queensland Agricultural High School and College, Lawes
	J. S. McCarthy, "Glen Erin" Jersey Stud, Greenmount
	J. F. Lau, "Rosallen" Jersey Stud, Goombungee
	G. Harley, Hopewell, M.S. 189, Kingaroy
	Toowoomba Mental Hospital, Willowburn
	Farm Home for Boys, Westbrook
	F. J. Cox and Sons, "Rosel" Stud, Crawford, Kingaroy Line
	R. J. Browne, Hill 60, Yangan
	P. J. L. Bygrave, "The Craigan Farm," Aspley
	R. J. Crawford, "Inverlaw" Jersey Stud, Inverlaw, Kingaroy
	P. H. F. Gregory, "Carlton," Rosevale, *via* Rosewood
	E. A. Matthews, "Yarradale," Yarraman
	A. L. Semgreen, "Tecoma," Coolabunia
	L. E. Meier, "Ardath" Stud, Boonah
	A. M. and L. J. Noone, "Winbirra" Stud, Mt. Esk Pocket, Esk
	W. S. Conochie and Sons, "Brookland" Stud, Sherwood road, Sherwood
	Estate of J. A. Scott, "Kiaora," Manumbar road, Nanango
	F. W. Verrall, "Coleburn," Walloon
	C. Beckingham, Trouts road, Everton Park
	W. E. O. Meier and Son, "Kingsford" Stud, Alberton, *via* Yatala
	G. H. Ralph, "Ryecombe," Ravensbourne
	Mrs. I. L. M. Borchert, "Willowbank" Jersey Stud, Kingaroy
	W. and C. E. Tudor, "Boree" Jersey Stud, M.S. 498, Gayndah
	Weldon Bros., "Gleneden" Jersey Stud, Upper Yarraman
	D. R. Hutton, "Bellgarth," Cunningham, *via* Warwick
	J. W. Carpenter, Flagstone Creek, Helidon
	H. G. Johnson, "Windsor" Jersey Stud, Beaudesert
	W. S. Kirby, Tinana, Maryborough
	S. A. Crarib, "Trecarne Stud," Lockyer
	G. & V. Beattie, "Beauvern," Antigua, Maryborough
	J. A. & E. E. Smith, "Heatherlea" Jersey Stud, Chinchilla
Polled Hereford ..	W. Maller, "Boreview," Pickanjinnie
	J. H. Anderson, "Inverary," Yandilla
	D. R. and M. E. Hutton, "Bellgarth," Cunningham, *via* Warwick
	E. W. G. McCamley, Eulogie Park, Dululu
	Wilson and McDouall, Calliope Station, Calliope

Maize Growing on the Atherton Tableland.

By W. G. STEELE (Senior Adviser in Agriculture), J. ROSSER (Soil Conservationist), and S. R. WALSH (Adviser in Agriculture).

Maize growing is a major industry on the Atherton Tableland and covers the greater portion of the area around the three towns of Atherton, Kairi and Tolga. In this section of approximately 55 square miles of country, nearly 40 square miles (or 25,000 acres) are sown annually to maize. Some idea of the concentration of the industry can be gauged from the fact that practically all this area lies within a radius of three miles from one or other of the centres mentioned.

Machinery and silos for handling and storage of the crop are situated at each of these towns, which are linked by rail and bitumen roads. The marketing of the crop is the responsibility of the Atherton Tableland Maize Marketing Board, so the industry is entirely self-contained.

This fact, together with the differences in climate in comparison with other maize growing areas in Queensland, results in conditions which are peculiar to this area and which call for methods of production somewhat different from those employed elsewhere. These differences apply more to methods of harvesting and handling the grain than to the actual growing of the crop.

Maize has been grown for up to 50 years on some parts of the Tableland and the following table gives the annual total yields from 1924-25 (the season in which the Board commenced operations) to 1951-52. The table also gives the "return to grower" price each year. This price is the actual return after all Board handling costs and interest and redemption have been deducted.

Year.	Tonnage.	Price per Ton to Grower. £ s. d.	Year.	Tonnage.	Price per Ton to Grower. £ s. d.
1924-25	17,099	4 12 0	1938-39	25,675	6 0 11
1925-26	9,232	8 10 0	1939-40	16,778	6 2 4
1926-27	22,541	12 14 6	1940-41	15,326	6 10 7
1927-28	14,222	5 5 0	1941-42	15,785	6 2 6
1928-29	23,391	5 10 4	1942-43	11,641	9 15 0
1929-30	14,254	7 5 0	1943-44	13,991	10 17 3
1930-31	18,006	6 0 3	1944-45	16,923	11 3 4½
1931-32	14,706	4 11 1½	1945-46	4,333	13 5 0
1932-33	16,918	7 15 6	1946-47	11,536	13 4 3
1933-34	20,968	5 4 0	1947-48	21,193	17 0 11
1934-35	7,270	5 6 0	1948-49	13,082	14 15 11
1935-36	11,431	7 9 3	1949-50	16,278	14 9 0
1936-37	19,826	7 10 3	1950-51	15,974	17 19 9
1937-38	26,558	8 1 9	1951-52	11,558	30 16 4

Over this period the average yield was about 30 bushels, or three-quarters of a ton, per acre.

Statistics supplied by the Government Statistician show that for the 10-year period ending with the 1951-52 season the following yearly average yields were made:

Season.	Average Yield bus. per acre.	Season.	Average Yield bus. per acre
1942-43	.. 24.6	1947-48	.. 37.1
1943-44	.. 34.1	1948-49	.. 31.1
1944-45	.. 36.8	1949-50	.. 32.6
1945-46 (Cyclone year)	13.1	1950-51	.. 33.2
1946-47	.. 23.3	1951-52	.. 25.2

This works out at an average of 29·11 bushels per acre over the 10-year period. Figures for the remainder of the State compiled for the same period show an average of 23·47 bushels. This indicates that conditions for maize yields are more favourable on the Tableland than on the average elsewhere in the State.

Owing to distance from southern markets and high freight costs in recent years, an alternative outlet was sought. Large quantities of maize have been exported to Europe and the United Kingdom over the last three years, and for the period from June 30, 1952 to February 18, 1953, 13,927 tons were shipped at a total value of over £485,000.

CLIMATE.

A brief outline of the main climatic features of the Atherton Tableland may assist in describing the conditions under which the maize crop is grown.

The altitude of the Tableland varies from 2,200 to 3,500 feet above sea level and average rainfall from 40 to over 100 inches per year. The main maize-growing area is in the northern section where the land is comparatively level or slightly sloping, at an altitude of approximately 2,500 feet and with an annual rainfall of about 55 inches. The bulk of this rain falls in the first three months of the year and these are the main growing months for the crop. Storm rains occur in October, November and early December, but the first two months cannot be accepted as a safe time for planting, since follow-up rains cannot be relied on. Planting therefore usually takes place in December and the crop has the benefit of the main wet season from January to March.

In the next three months (April, May and June) the weather usually consists of a succession of dull days with light misty rain falling more or less regularly. Under these conditions the maize cobs may remain wet for many days, making harvest impossible and providing suitable conditions for the development of various cobrots and other diseases.

After this period cool dry weather with occasional frosts is usually experienced until the temperature commences to rise during the spring.

While occasional dry periods are encountered during the wet season, the rains are extremely reliable, and in most seasons more than supply the moisture requirements of the crop.

Temperatures seldom rise above 85°F., so stress conditions are rare, and generally speaking, growing conditions could be described as excellent.

SOILS.

The soils in the main maize area are of basaltic origin and are classified on the basis of the original vegetation into "scrub" and "forest" soils.

Plate 1.

A Crop of Atherton Dent Maize Growing on Scrub Soil near Atherton. This picture illustrates the height and vigour of a well-grown Tableland crop.

The scrub soils originally carried a dense tropical rain forest or jungle vegetation. They consist of deep friable red-brown clays of good structure and high fertility.

The forest soils originally carried eucalypts (mostly bloodwood) and cover the most northerly section of the Tableland where the rainfall is lighter than further south. These soils are somewhat similar to the scrub soils, but are usually not so deep. They are also lighter in colour and of somewhat lower fertility.

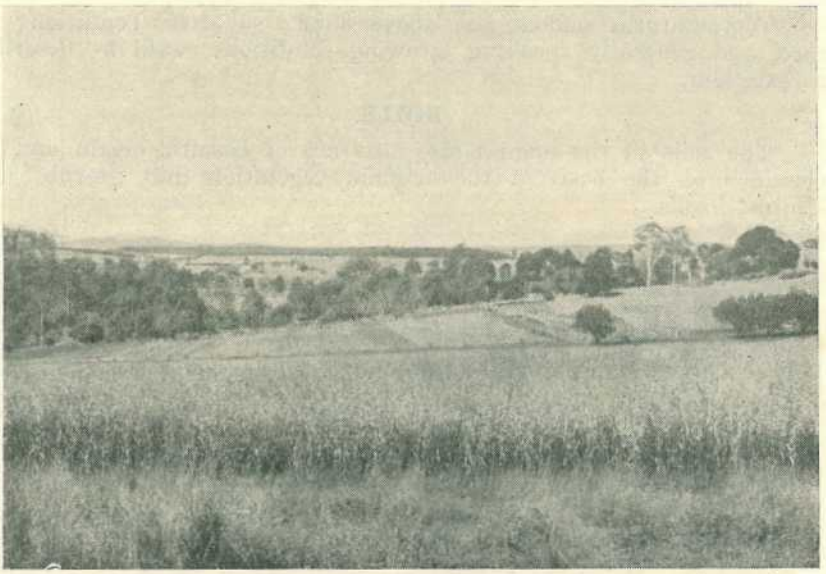


Plate 2.

Maize in a Mixed Farming Area at East Barron. This crop lies between two paddocks which are under dairy pastures.

In their original state the majority of the Tableland soils were highly fertile, but this fertility has steadily declined. This is a natural result of the continuous annual cropping on any soil type, but is particularly evident in such deep, open soils in high rainfall areas. It is therefore essential, from the point of view of both immediate gain and the future agricultural stability of the district, that cropping practices be designed to maintain this fertility.

ROTATIONS.

The value of rotation in a cropping programme has been proved over and over again; the problem is to find a rotation in any particular district which will suit local conditions. The main points to be considered are—

(1) The rotation must fit in with the major agricultural industry of the district—that is, it should be built round the main crop, which in this case is maize.

(2) It must conform to seasonal conditions on the Tableland. The late harvesting (caused by high moisture content of the grain) and the dry period following harvest make it difficult to grow other crops between yearly crops of maize.

(3) It must be economic and not involve a large capital outlay.

On the Tableland, alternative crops which can be successfully grown in rotation with maize include green manure crops such as cowpea and velvet beans. These can be grown without the need for additional machinery and furnish a cash return in addition to improving the supply of nitrogen in the soil. Experiments by the Department of Agriculture and Stock show that in some years maize yields following velvet beans have been double those of crops grown successively for a number of years.

Alternate pairs of rows of cowpeas and maize are sometimes sown; the variety known as Giant is usually favoured for this as it does not climb. Peanuts are also a suitable rotation crop and here again tests have shown favourable increase in yields of maize following this crop.

Both peanuts and green manure crops for seed are good cash crops. Their produce commands a ready market in the area.

While these crops are particularly useful as rotations, one important point which must be borne in mind is that they are annuals which require yearly land preparation and, in the case of peanuts, inter-row cultivation. This constant tilling of the soil year after year breaks down soil structure and eventually results in the upper layers of the soil becoming depleted of organic matter.

This results in the land losing its open friable nature and eventually becoming compacted. Soil in this state does not easily absorb and hold moisture, and tends to restrict the growth of the maize roots. A reduced root system means a smaller feeding area for the roots, a reduction in the uptake of plant foods, and a corresponding reduction in yield.

To correct these faults the inclusion of a short-term pasture in the rotation is essential. Where dairying is combined with maize growing, this combination is ideal and pasture paddocks can be broken up for cultivation as required and old maize paddocks returned to pasture.

Where dairying is not carried out consideration could be given to utilising the pasture by some other form of animal production, or where clean stands of grass are developed, for the production of seed. Lucerne is also an excellent rotation crop and should be grown where soils and conditions permit.

LAND PREPARATION.

As mentioned previously, late harvesting is at times unavoidable owing to a protracted wet season with the consequent high moisture percentage slowing up the intake and storage of grain in the silos.

As a result, land preparation for the next season's crop is frequently held up until September or October. Where possible, however, it is desirable to plough the land about six inches deep and leave it in the rough for several months so that weeds and old maize stalks have a chance to rot down.

Most farmers use a chopper roller to break up the stalks to facilitate turning under with the plough. A chopper roller consists of a log about 10 inches or a foot in diameter, to which are bolted lengthwise four sections of angle-iron. The roller is fitted with axles and towing attachments. On revolving, the roller flattens the stalks and at the same time chops them into short pieces.

Some farmers rake up and burn the trash to make ploughing easier. This practice, however, results in a continued loss of organic matter from the soil. While the effect of this may not be immediate, its yearly repetition will eventually result in depleted soil fertility and decreasing yields of maize.

Following the initial ploughing the land is usually allowed to lie until after storms commence. By leaving the soil in a cloddy state, better penetration of storm rains is made possible. If worked

down to a fine tilth early in the season, the surface of the soil would tend to pack under the storm rainfall. This surface packing reduces the ability of the soil to absorb rain and increases erosion risks.

A tandem-disc cultivator is generally used to break down the clods just prior to the planting season. In some cases a cross ploughing is given, but Tableland soils as a rule break down readily and a second ploughing is not necessary. There is no definite evidence to suggest that a second ploughing is economically sound, but some farmers favour it.

The only other pre-planting cultivation is carried out with the discs immediately prior to planting, and in many cases the practice is to hitch the planters behind the discs and cultivate and plant in one operation.

CONTROL OF EROSION.

Conditions on the Tableland are such that good farming practices, and in many cases special conservation measures, are necessary if loss of soil by erosion is to be avoided. While the soils, especially the scrub soils, have a high natural resistance to erosion, this resistance has been reduced over the years by maize monoculture. Most of the land is undulating, rainfall is high, and some intense falls occur. Add to this that maize is a clean-cultivated row crop, and it is obvious that erosion must occur unless preventive measures are adopted.

Control measures aim at—

(1) Preservation of soil structure so that the absorption of rainwater will be as great as possible and the runoff as light as possible.

(2) Control of runoff.

To preserve soil structure, crop rotation, in particular the introduction of a short-term pasture into the rotation, should be practised. The pasture may consist of grass alone or preferably a grass-legume mixture. While most pasture legumes are difficult to grow on the Tableland, lucerne grows well in at least some parts of the area. Sown with the grass or grown alone, it is a desirable crop to include in the rotation.

Grasses normally used here for short-term pastures are molasses grass and Rhodes grass. Green panic has recently come into favour and promises to be very suitable also. These grasses are all characterised by quick establishment and rapid growth. The usual practice is to sow the grass seed between the maize rows immediately prior to the last cultivation of the crop.

A spell of at least three years, and preferably four years, under pasture is recommended. While the land is under grass the organic matter content of the soil is steadily built up. The effect of implements in destroying soil structure is temporarily removed, and the extensive root development of the grass assists in binding the soil aggregates. In this way soil structure is improved and the liability to erosion is considerably lessened.

The spelling of land under grass is not widely practised in the Tableland maize belt. It has, when practised, given good results both in the prevention of erosion and in the improvement of yields. If the deterioration of maize yields that has undoubtedly occurred is to be halted, crop rotation must be more widely adopted. Rotation

with another clean-cultivated row crop such as peanuts is not sufficient. A complete rest from cultivation is necessary. This can only be attained by the inclusion in the rotation of a period under pasture.

The absorption of rain water into the soil is governed by several factors. One of these is the maintenance of soil structure as discussed above. Another is the influence of crop residues and cover crops in protecting the surface. A third is the tilth of the surface soil; a rough cloddy surface permits of greater penetration and lessens runoff.

It is desirable to protect the surface with crop residues as much as possible. Ideally a system of stubble mulching would be adopted (that is, the ground would be prepared for planting, leaving all the maize stalks on top of the ground). Crops have been grown successfully under stubble mulch at the Regional Experiment Station, Kairi, during the last three seasons. However, mechanical difficulties and the need for special machinery may make stubble mulching unattractive to the average Tableland maize farmer at the present time.

If, however, the stubble cannot be left on top of the ground at least it should be ploughed into the ground. It should not be burnt. Burning of cornstalks, widely practised in the past, and still practised by many farmers, has played a big part in hastening the onset of serious soil erosion.

In preparing the seedbed, the ground should be kept in a rough state as long as possible. Tandem-discs should be used as little as possible, as they chop the soil fine, and leave it highly vulnerable to erosion. Storm rains which usually occur about planting time puddle the surface of the finely disced soil and seal it off. Instead of soaking in, the water runs off, taking the fine loose soil with it.

Plate 3.

Protection of Sloping Maize Land from Soil Erosion by Construction of Contour Banks. These banks are being thrown up by a disc plough on "forest" soil near Mapee.

Plate 4.

Contour Banks on Sloping Scrub Soil near Atherton. Slopes such as these are very subject to erosion after continuous cultivation for a number of years. Contour banks will assist in checking water flow, but rotation of crops with pasture leys is necessary to restore and maintain soil structure.

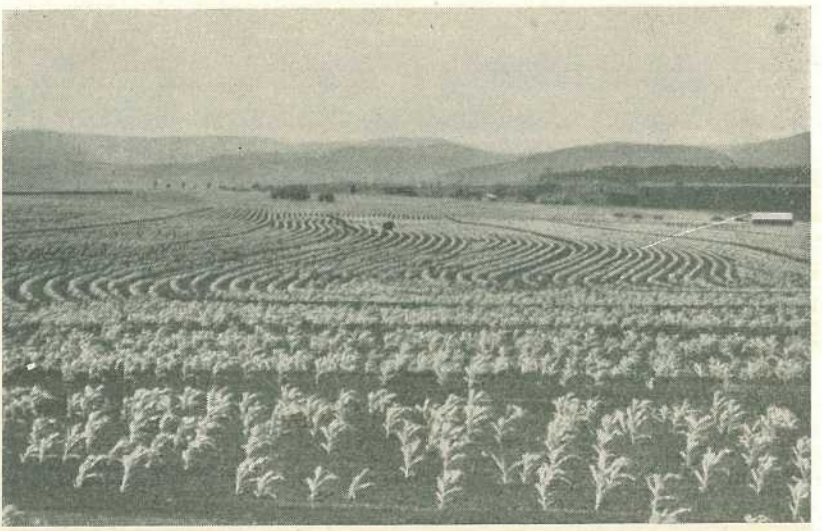


Plate 5.

A Contour-banked Maize Farm near Tolga. The maize rows have been planted parallel with the contour banks. Any short rows necessary are located midway between banks to facilitate mechanical harvesting.

Where tined implements are used for weed control and seedbed preparation, the soil is left with a rougher surface than where discs are used. This rougher, cloddier surface affords the soil considerable protection against erosion. Tandem-disc cultivators do give an excellent weed kill and their use may be unavoidable where weeds have got out of hand. Where, however, a tine implement can be substituted, the discs should not be used.

Another practice which aims at the reduction of runoff is contour planting. Planting of rows across the slope on the contour will result in the ponding of rain water between the rows. This gives the water a chance to soak into the ground and reduces runoff.

On sloping ground it is usually advisable to support contour planting with contour banks (Plates 3-5). Contour banks are used on slopes between 2 per cent. and 8 per cent. to control runoff. Each bank is a low cultivated mound running across the slope. The bank has a slight fall towards one end, so that water reaching it from the land between it and the bank above it is transported slowly around the slope into a safe outlet. A series of banks built in a cultivation prevent the runoff water from concentrating and reaching an erosive velocity. Used in conjunction with other soil conservation measures, contour banks can make a valuable contribution to erosion control. Many farms on the Tableland have already been successfully contour-banked and the practice is spreading.

FERTILIZERS.

Soil tests and fertilizer trials have been carried out in this area for many years. The results indicate that on forest soils an application at planting time of 4 cwt. per acre of a mixed NP fertilizer is payable in most seasons. The same results would apply to scrub soils which have been growing maize continuously for many years or have been partly eroded.

On scrub soils which have received reasonable cultural treatment and have not been subjected to erosion, no fertilizer is necessary at planting time. In a very wet season, however, the application of 1 cwt. per acre of sulphate of ammonia to the young plants as a side-dressing should pay dividends.

VARIETIES.

Atherton Dent or Atherton Main Type.

Since maize growing commenced on the Tableland some fifty years ago many varieties have been introduced. By cross-pollination these varieties have become merged into a more or less uniform variety with the characteristics of a large "Yellow Dent" (Plate 6). The seed is long and broad at the tip. The dent is normally rough, though variations are common and some strains have a very smooth dent. The colour could be described as a light amber with a yellow cap.

The ears are large and the husk covering is very good, extending well over the tip of the ear. The husk is very heavy and while this affords excellent protection to the ear it may cause difficulties in

Plate 6.

Close-up View of a Stalk of Atherton Dent, Showing Size of Stalk and Height of Cob. The cobs are typically well covered with tough husks, and are not easy to wrench from the stalks.

husking, particularly in some mechanical harvesters. Plants are tall, up to 12 feet high in many cases, and stalks are correspondingly heavy.

Durum.

This variety was bred on the Atherton Tableland by crossing a yellow dent variety with a hard flint corn. The object of this cross was to produce a variety with a large flinty grain which should be of better keeping quality and appearance than the Atherton Dent. Another objective in breeding this variety was higher resistance to diseases and insect pests. The variety has been in use now for over twenty years, but though subjected to careful selection in recent years, its yield is not normally the equal of that of the best Dent strains. Durum has in a number of trials shown superior disease resistance to Atherton Dent, and its lighter husk covering permits better husking by mechanical pickers.

In appearance the grain is a deep, translucent amber colour with a rounded top showing either no dent or a smooth dimple dent. The grain is smaller than the Dent types and rather square in shape. The cobs are up to 10 inches long, tapering towards the tip, where the grain tends to become very short and round. This reduction in grain size towards the tip is partly responsible for this variety's tendency to be lower in yield than the Dent strains.

Various combinations of Durum and Dent have been made through natural inter-crossing of the two varieties. It is possible to find all gradations in grain type from the true flint corn with no dent at all to the large soft starchy grain with a large rough dent. Some growers prefer a strain of maize showing a slight indication of Durum but carrying the main characteristics of Atherton Dent. This has been achieved by mixing seed of the two varieties, allowing them to inter-cross, and then selecting seed-ears of the desired type in subsequent years.

Hybrids.

Queensland maize hybrids, bred at Gatton College, have been under trial on the Tableland at various times since 1939, but have never given the outstanding results that they have in other parts of the State. In recent years Grafton Hybrids have also been introduced and tried by farmers.

The results of all these trials have been somewhat contradictory. Under some conditions a hybrid may show promise of higher yields than Atherton Dent or Durum, while on other farms the position is clearly reversed. It appears that a number of the Queensland (Q) and Grafton (GH) hybrids have a higher yielding potential than the local variety, but they are so highly susceptible to cobrots and other diseases that this advantage is generally lost.

At the present time, therefore, no hybrid can be confidently recommended for Tableland conditions. Further tests will be made until all the available southern hybrids have been tried. If this programme fails to bring to light a suitable hybrid, then hybrids will have to be bred from local Tableland seed stocks.

PLANTING.

This operation is carried out with two-row planters attached behind a set of disc harrows so that planting and discing are done in the same operation. Diamond harrows are sometimes attached behind the planters. In some cases two double-row planters are linked side by side, enabling four rows to be planted at the one time.

Row spacing varies from 3 ft. 6 in. to 4 ft., with many growers using a spacing of 3 ft. 10 in. to suit their cultivating machinery. Plant spacing varies, but averages about 20 in. within the row; closer spacing may be used on the more fertile soils. As the Tableland grain is large, planting rates are higher than in the southern districts, the usual rate being 10 lb. per acre.

As was mentioned earlier the planting season extends from November to January. Occasionally plantings are made in October if favourable storms occur, but there is an element of risk involved as follow-up rains may not eventuate. The safest period is from mid-November to early

January, but no hard and fast rules can be laid down in this regard, as seasonal conditions vary greatly. Late January plantings frequently run into a long period of heavy rain soon after germination, and the leaching effect of these rains causes nitrate shortage, resulting in stunting and yellowing of the plants.

CULTIVATION.

Inter-row cultivation is usually carried out by tractor with implements attached, very seldom to-day by horses. This cultivation continues until the crop is too tall for straddling with machinery; usually two, or at the most three, cultivations are given depending on weather conditions and the amount of weed growth.

Up to this stage weed growth can generally be kept in check, but as little inter-row cultivation is carried out from this stage on, fast-growing weeds may then develop. It is often maintained by farmers that these late-growing weeds are not harmful to the crop. While this opinion may or may not be correct, it is certain that the prolific growth of some weeds interferes with harvesting machinery. In particular wild hop (*Nicandra physaloides*) grows to a height of 10 or 12 feet and growth is very robust.

It should be possible to control this growth in most seasons and trials being conducted at the Kairi Regional Experiment Station indicate that late spraying with hormone weedicides may be economical and effective.

PESTS AND DISEASES.

Insect pests such as corn ear worm and aphis are present in varying intensity each year. While causing some damage, they cannot be said to be a limiting factor in yields. Weevils late in the season are sometimes troublesome.

Field mice and marsupials occasionally attack the germinating crop.

The various ear rots are by far the most serious factors limiting yields, and the loss from these in some years assumes serious proportions. It is not appropriate in this article to give a detailed description of these rots, of which the most serious is *Diplodia,* but it is desired to emphasise the need for growers to eliminate affected cobs as far as their harvesting methods permit. While the grower suffers individually if his load of maize as received at the silos contains a high percentage of diseased grain, the inclusion of bad loads in the silos may necessitate more frequent turning of the bulk and this increases handling costs generally.

No direct economic control of ear or cob rots in the field is available but by rejecting diseased cobs when selecting seed, and by rotating other crops with maize, the trouble can be greatly reduced.

HARVESTING.

The time of harvesting is governed by both the time of planting and the nature of the growing season. Weather permitting, the harvest may commence in early May and continue through to September—or even later in some years. During a wet autumn and winter, the moisture percentage of the grain remains comparatively high; this markedly retards the intake at the Board's silos.

The post-war period of labour shortage gave an impetus to mechanical harvesting. Until this labour shortage occurred the maize was almost entirely handpicked.

In hand-harvesting, the cobs are husked on the stalk, snapped off, and thrown into a cart. When hand-harvesting is applied, diseased cobs are readily seen and discarded; this reduces the percentage of "dead grain" in the shelled maize. The present (1954) cost of hand-harvesting is at a daily rate of £2 10s. or higher, rather than on a tonnage basis. The maize is normally stored in a barn on the farm to await delivery to the silos.

Some farmers combine field seed-selection with hand-harvesting, selected cobs being thrown into a portion of the cart which is boarded off, or into a bag hanging on the back of the cart. These selected seed cobs are stored apart, and are later shelled for seed.

By the 1954 season, approximately 95% of the maize on the Atherton Tableland was harvested by mechanical means. During that season 55 mechanical pickers of various makes were operating there.

All these pickers have the same basic principles of operation:—The maize stalk passes between two guides, from which position it is carried back by two chains to the snapping rollers. The snapping rollers, revolving towards each other, draw the maize stalks between them in a downward direction; the cobs, being unable to pass through, are snapped off. The snapping rollers are adjustable to suit the thickness of the maize stalks and the weather conditions at harvest.

From the snapping rollers the cobs are passed back to the husking mechanism. This consists of a series of rollers set in pairs, which also rotate towards each other. The cobs are kept pressed against the husking rollers either by an endless belt or by a series of arms; an arrangement of springs maintains an even pressure on the cobs. In both systems screws enable adjustments to be made for size and moisture content of the cobs.

In some machines alternate steel and rubber rollers are used for husking. Under favourable conditions they have given good results with minimum loss of grain. However, a disadvantage of the rubber rollers is that they become smooth, and have to be replaced after 250 to 300 hours of work.

A moisture content of about 20% gives the most efficient picking and husking, with the least loss of grain. When the moisture content falls much below this figure, it is often the practice to eliminate the husking mechanism because of the loss of grain which would occur through the husking rollers.

From the husking rollers the cobs are dropped to an elevator which delivers them to a trailer drawn behind the picker.

Mechanical pickers in use on the Atherton Tableland may be divided into three classes:—(1) Mounted types, which are mounted on and supported by the tractor; (2) semi-mounted types, which are partly supported by the rear of the tractor and partly by their own land-wheels (Plates 7 and 8); and (3) pull types, which have their own chassis and wheels, and are drawn behind the tractor. The picking rate varies from 8-9 acres per day for the single-row picker to 14-15 acres per day for the double-row picker.

Plate 7.
Mechanical Harvesting of Maize, Using Semi-Mounted Single-Row Picker and Trailer.

Only about five contract picking machines operate on the Tableland; the remainder of the machines serve only the owner's farm, or in some cases, an adjoining farm as well. The cost of mechanical harvesting by contract rates is £3 per ton picked and shelled.

There are two main disadvantages associated with the mechanical harvesting of maize on the Tableland. The first of these is the difficulty in sorting diseased cobs from the bulk of the crop. This presents a real problem when the machines either do not husk the cobs, or only partly husk them. The diseased cobs require to be sorted out from the bulk prior to farm shelling or carting to the silos.

The second drawback is the liability towards loss of crop, particularly in the late season. When the stalks become very dry and brittle they frequently break up in the machine, with consequent loss of cob. In addition, as has been previously mentioned, serious grain loss can occur through the picking and husking rollers. The loss of grain has in some cases been estimated at up to 15%. When the moisture content of the crop has fallen so low as to result in serious harvesting losses, it is advisable to restrict machine-picking to the early morning hours when the crop is damp from dew.

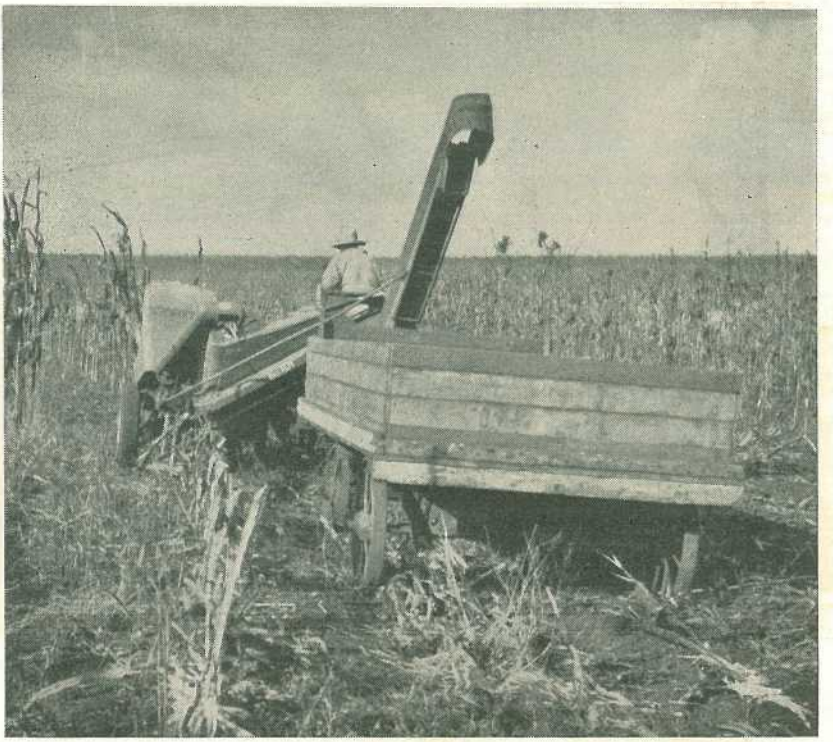


Plate 8.
Rear View of Mechanical Picker in Plate 7.

HANDLING AND MARKETING.

As previously stated all maize except that used for stock on the farm is delivered to the Atherton Tableland Maize Board's silos (Plate 9.) The crop is received either on the cob or as bulk grain. Some farmers have their own shellers, and with the increase in the use of mechanical harvesters more and more individual shellers are being brought into use. Whereas storage in barns on the farm used to be practicable when hand-picking was employed, the greater speed of mechanical harvesting makes it more expedient to shell and deliver immediately to the silos. This eliminates the need for extensive storage facilities on the farm, and, at the silos, time is saved as the grain can go immediately to the scales. Here samples are taken for moisture testing and grading, payment being made on a basis of 14% moisture.

The various operations at the silos have been described in a previous article, (see Q.A.J. June 1949) but improved cleaning machinery now being installed should ensure rapid and more efficient cleaning and grading. This will result in a brighter, more uniform sample of grain which should command a higher price.

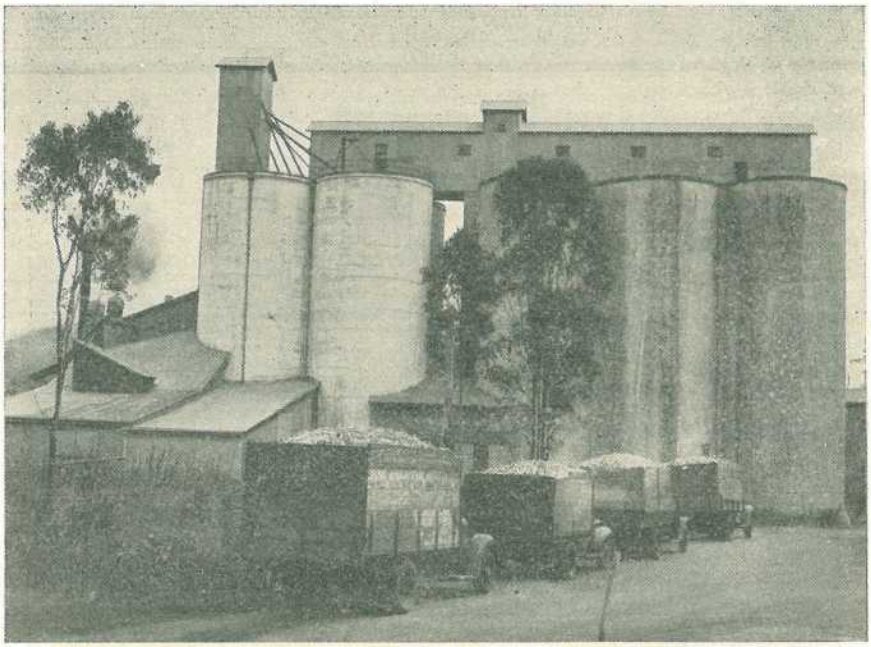


Plate 9.

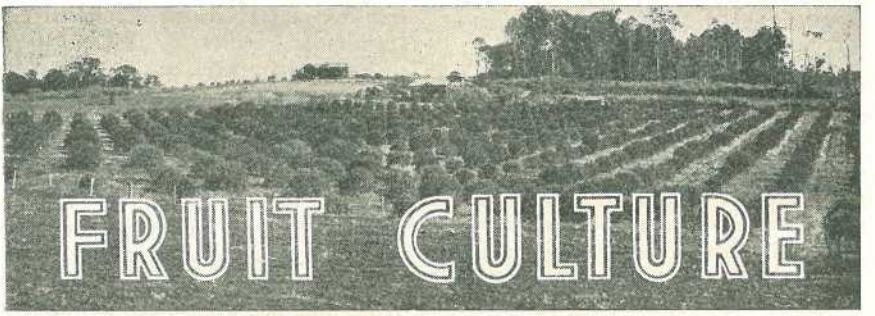
Delivery of Maize to the Silos at Atherton. The motor trucks are ready to empty their loads of cobs on to the scales.

One advantage of the bulk storage and marketing is that a uniformly clean sample of grain is available to buyers, who are able to quote prices knowing that there will be practically no variation in quality. With the new grading machinery the product should be particularly acceptable to southern buyers who process maize for human consumption.

The presentation of a first-class sample of grain is essential if the Atherton Tableland maize industry is to compete successfully with other centres in Queensland closer to the main markets, as local consumption of maize for stock feed is very limited.

QUANTITY OF PLAIN WIRE PER MILE OF FENCING.

Number of Wires.	8 Gauge.			10 Gauge.			12½ g. High-tension.		
	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.
1	3	1	0	2	0	14	1	0	14
2	6	1	14	4	0	14	2	1	14
3	9	2	14	6	1	0	3	2	0
4	12	3	14	8	1	0	4	2	14
5	16	0	14	10	1	14	5	3	14
6	19	1	0	12	1	12	7	0	0



Hybrid Vigour in Horticultural Crops.

By H. M. GROSZMANN, Horticulturist.

In several important horticultural crops, each recognised commercial variety is a mixture of related types. The mixture is not even constant, as it may vary from year to year and from one stock of seed to another.

This variation within a variety is particularly marked in species such as the papaw and the cabbage, which do not normally set seed unless the flowers are fertilised by pollen from another plant.

Variability in the Plant Type.

Whatever the mechanism, the net effect of cross pollination within a variety is to make it a mixture of many strains. Thus in one field of papaws there may be long fruit, round fruit, fruit borne singly on long stalks, fruit on branching stalks, fruit well spaced, fruit crowded, fruit that carries well, fruit that carries poorly, and so on.

This mixture of types in a variety has some advantages, for it is associated with increased vigour and greater adaptability to soil and climatic conditions. It also has some defects. For example, it is not easy to market papaws that differ in shape, carrying quality, palatability and colour, for the variability in the pack confuses the buyer.

Reducing Variability.

It is often desirable to ensure that a variety should breed true at least for a number of important characters. This may involve choosing plants with these characters, inbreeding them for some generations, and selecting in each generation those with the required characters. Inbreeding means pollinating the selected plant with its own pollen (selfing) or with pollen from a closely related plant. Fertilisation with unwanted pollen must be prevented either by growing plants in isolation or by covering the flowers with bags made of cellophane or other suitable material to exclude this pollen.

However, the practice of inbreeding is not without complications. In the first place, it is unlikely that all the desired qualities will be found in any one selected plant. Secondly, inbreeding is often accompanied by loss of vigour. This loss of vigour does not go on indefinitely, but for a few generations there is a progressive weakening of the stock.

Fortunately, both of these difficulties can be overcome. By crossing two inbred lines, the progeny is restored to full vigour and often combines desirable qualities from both parents. It is also more uniform in plant type and more adaptable to varying soil and climatic conditions than either of the parents and may have desirable characteristics not possessed by them.

Hybrid Vigour.

This increased vigour of the first generation hybrids which are produced by crossing inbred lines is known as hybrid vigour. Such hybrids are being listed increasingly in seed catalogues, especially overseas. They include tomatoes, melons, cabbages, cucumbers and sweet corn.

Hybrids between less closely related parental material may also show marked vigour. However, the progeny of very different parents are not likely to meet exacting commercial requirements as well as first generation hybrids of inbred lines or of inbred commercial varieties. Even in these, not all hybrids will be vigorous, and of those that are, only a few will satisfy both the grower and the consumer. Therefore, the breeder must make numerous crosses, retaining only those inbred lines the progeny of which are worth growing commercially.

Defects of Hybrids.

In view of the marked benefits to be gained from the use of first generation hybrids, it might be asked why they have not yet come into general use.

The answer is found partly in the work involved in producing inbred lines and testing numerous crosses between them.

Perhaps more important is the fact that the vigour and uniformity of the crop is at its best only in the first bybrid generation. In the next generation, the type may be anything but uniform. Vigour does not decline so sharply, although it does tend to decrease from generation to generation. In horticultural crops where uniformity of the product is particularly important, it is therefore necessary to maintain the parental inbred lines and to cross them whenever seed is required for commercial plantings.

Horticultural Uses.

In plants like the papaw, the production of inbred lines (Plate 1) and the testing of crosses between them takes considerable time and a substantial amount of space. Selected female trees must be pollinated by hand for several generations with pollen from male trees of the same line and generation until the strain becomes uniform. Material for the development of pure lines may be obtained from commercial crops in different districts. When a number of pure lines have been produced, it still remains to determine which crosses give the best progenies. When this has been done, the selected inbred lines must be maintained either by growing them in isolation or by controlled hand pollination.

However, in those varieties which have distinct male and female trees, the production of hybrid seed is not very difficult. By inter-planting female trees of one line with sufficient males of another, adequate amounts of seed for commercial sowings will be produced by wind pollination.

With the tomato, which is largely self-pollinated, the production of first generation hybrid seed involves cross pollination of the flowers by hand and this adds greatly to the cost. On the other hand, the maintenance of the inbred lines is comparatively easy; actually commercial varieties are really inbred lines owing to the high degree of self pollination which normally occurs. However, it is important to test many crosses, since vigour is only one of the many requirements in a tomato hybrid; it must also bear heavy crops of fruit of good size, appearance and carrying quality.

Of the first generation hybrid tomatoes tested in Queensland, many have proved quite unsatisfactory for commercial purposes. In the autumn, for example, when standard varieties are both vigorous and productive in the Metropolitan area, they do not on the average excel the parents in vigour or productivity. In the winter, however, when growth and fruit setting are generally much poorer, the hybrids have been distinctly more vigorous and prolific than the commercial varieties.

Plate 1.

An Inbred Line of Papaw (Bettina 102). The markings on the fruit indicate the pedigree and the date on which the flowers were pollinated.

This illustrates the greater adaptability of hybrids, which enables them to do better than existing commercial varieties under adverse conditions.

The principle of hybrid vigour could be exploited also in berry, tree and vine fruits which are propagated vegetatively. Once the desired type is obtained, it can be increased by means of runners or cuttings and there would be no need to maintain the parental inbred lines or to make repeated crosses. The difficulty with plants of this kind is in the production of the inbred lines and the hybrids. Where the

life span of the species is short and the plant is small, as with strawberries, the problem is not so acute. However, it becomes more and more difficult in crops where the individual plant takes up a great deal of space and reaches maturity only after a period of several years.

The production of first generation hybrids is a fairly recent development in horticultural crops. It offers increased productivity, uniformity and adaptability. It also frequently permits the combination of desired characteristics from different varieties without the tedious and often uncertain task of fixing them by selection over several generations. It even offers desirable combinations which could not be produced in a fixed or true-breeding strain. On the other hand, the value of the hybrids will be determined in any particular crop only by balancing the cost of the seed against the increased returns from the crops grown from it.

The Bunch Trade in Carrots.

By C. N. MORGAN, Senior Adviser in Horticulture.

The marketing of untopped carrots in bunches is a regular practice both here and overseas. Prior to 1939, practically all carrots from the Metropolitan and surrounding districts were marketed in this form. Small supplies of bagged carrots came from the southern States, but the variety was often unknown here and the roots sold at low prices when locally-grown bunched carrots were available.

During World War II, carrots were produced in large quantities for the Armed Services, and these were delivered in bags, unwashed with the tops removed. This Service demand fluctuated a great deal and substantial amounts of the bagged roots found their way on to the open market and competed with the more attractive bunches. Gradually bagged carrots were accepted on Queensland markets, and since the introduction of grade standards and the adoption of washing and grading prior to bagging, both bunched and bagged carrots have been displayed on market floors (Plate 1).

The marketing of carrots in bunches is particularly attractive to the small grower whose area is not sufficient to justify bulk harvesting. However, few of the larger growers adopt this practice, for although the gross return for a crop marketed in the bunch is greater, the net returns from bagged and bunched roots are much the same when labour costs are taken into consideration.

Why Sell in Bunches?

The tops of carrots are not used by the consumer and the crop is costly to market in bunches. It is therefore difficult to understand why bunched carrots should be popular. Perhaps the only explanation is the housewife's view that healthy green tops are the best available indication that the roots are young, tender and of good quality. Carrots sold in bags cannot be presented as attractively as bunched carrots, even though the quality may be just as good.

Definition of a Bunch.

On Queensland markets, a bunch comprises 12 carrots, untopped and of even grade and bright colour. The roots are uniform in shape, clean and free from blemish, with bright-green, healthy tops.

Different sized roots spoil the bunch and it is therefore better to grade the roots into four grades before they are bunched. Suitable weights for each grade are:—(*a*) large—roots about 12-16 oz. in weight; (*b*) medium—roots about 8-12 oz.; (*c*) medium to small—roots about 4-8 oz.; and (*d*) small—roots less than 4 oz.

Plate 1.
A Bag of Carrots Opened for Display.

The smaller roots must, of course, conform with the minimum size (3 in. long and 1 in. in diameter) permitted by existing grade standards.

If the crop is harvested regularly and only roots of one particular size are pulled, the number of excessively large or very small carrots is reduced to a minimum. This practice of selective pulling is generally sound, for the market shows a distinct preference for a medium-sized root.

Root quality in bunched carrots is judged by the appearance of both the top and the root. The crop must, therefore, be properly looked after until it is harvested; diseases, pests, lack of nutrients and a shortage of water late in the growing period all have adverse effects on the appearance of bunched roots in the market.

Harvesting.

The carrot crop may be harvested either in bulk (that is, part of the area is dug to meet the current market requirement) or selectively, the grower going through the whole area and removing only carrots of the required sizes. Selective pulling is common early in the season, particularly when the total area is small, but bulk harvesting is generally practised late in the season when most of the roots have reached marketable size. After the roots are pulled, they are taken to a washing tank and cleaned.

Carrots grown in a heavy soil should be washed as soon as possible; if the soil dries on the root, it is difficult to remove and washing becomes tedious. Roots should be covered with wet bags between pulling and washing in order to prevent drying out and excessive wilting. Each individual carrot must be thoroughly washed, checked for blemishes, stripped of all discoloured, broken or dead leaves, and placed in its proper grade on wet bags. The roots are then tied in bunches and transferred to the truck for direct delivery to market.

If the consignment is to be delivered by carrier, the bunches are stacked ready for loading in layers with the tops of one row covering the roots of the row below, the whole heap being covered with wet bags. The care taken in covering and keeping the bunches cool and moist is well repaid by the appearance of the roots on the market floor, for they soon become unattractive in a dry atmosphere.

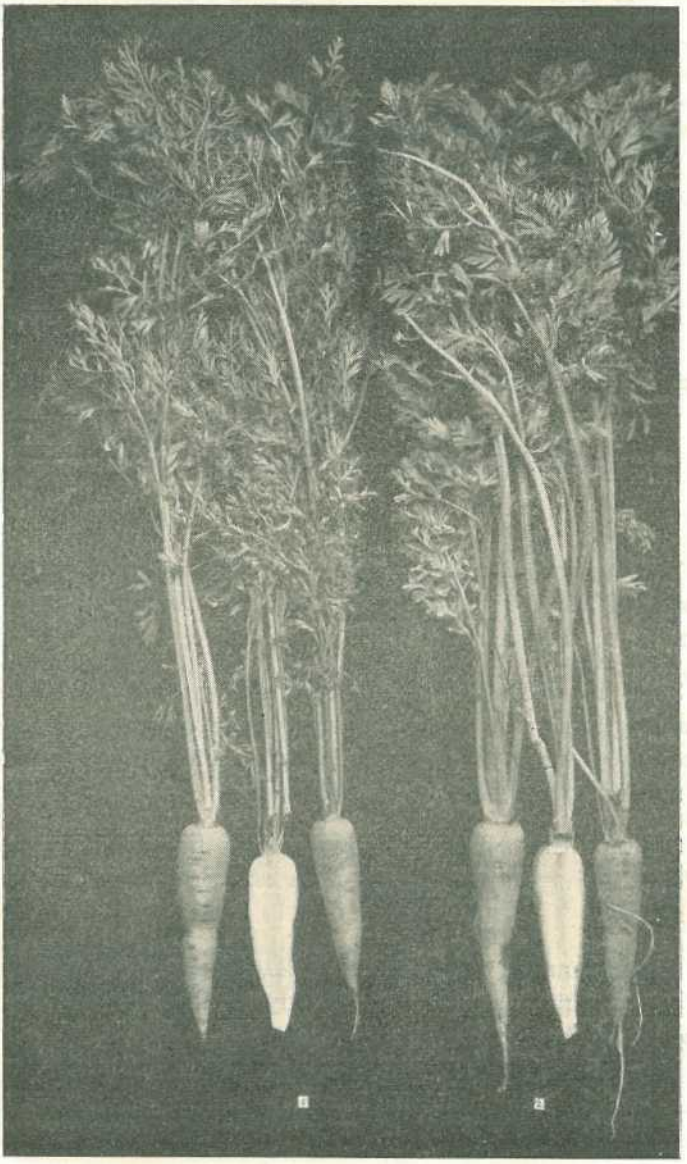


Plate 2.

Red-Cored Chantenay and Danvers Half-Long, Two Varieties of Carrot Suitable for the Bunch Trade. Note the attractive tops.

Harvesting the carrot crop in bunches takes a great deal of time. Washing the roots and tying 200 bunches keeps four men busy for approximately five hours. Two men could easily handle the same number of roots marketed in bags.

Varieties.

The most popular varieties for the bunch trade in carrots are the half-long types such as Osborne Park (or Peerless), Red-cored Chantenay and Danver's Half-Long (Plate 2). They suit the Metropolitan districts, where most of the carrots sold on the Brisbane market are grown, and have an attractive, bright colour. They also reach a marketable size quickly, and provided growing conditions are reasonably good produce a minimum of malformed roots. All these varieties have a strong-growing top which is an indispensable feature in any carrot grown exclusively for the bunch trade. Other varieties may be of comparable root quality but in the absence of suitable tops are of little value for this particular market.

INOCULATION OF LEGUME SEEDS.

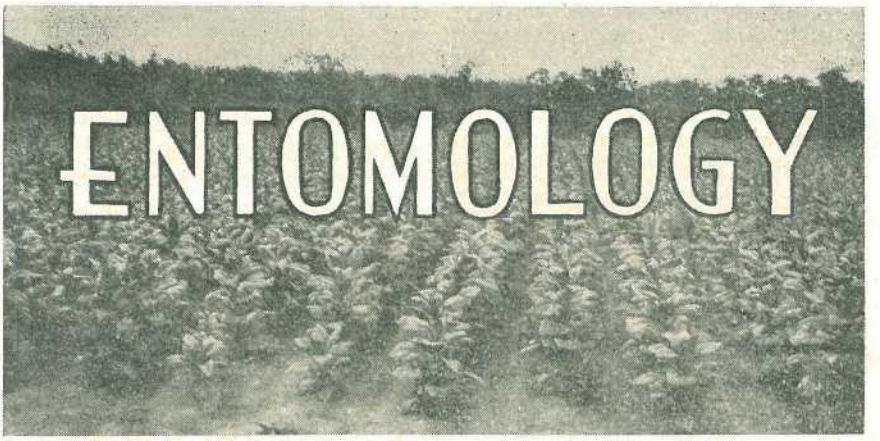
★

The Department of Agriculture and Stock supplies cultures of bacteria for the inoculation of seeds of legumes such as Poona pea, blue lupins, lucerne and clovers.

Seed inoculation is often necessary where the legume intended for planting has not previously been grown successfully, as it provides the plants with bacteria which are necessary for their full development.

Cultures are supplied free and post free. They are in bottles and have to be mixed with skim milk for sprinkling on the seed.

Order from the Under Secretary, Department of Agriculture and Stock, Brisbane, at least 10 days before sowing. State amount and type of seed to be treated.



Control of Tobacco Pests.

By W. A. SMITH, Entomologist.

The tobacco grower has to contend with insects which attack roots, stems and leaves of the growing plants, and the cured leaf in the farm bulk shed. Some of these pests are present on most farms every year, *and even on new farms it is almost impossible to grow a payable crop without the use of insecticides.*

The following schedule covers routine preventive practices associated with seedbeds and early crop growth in the field, and indications are given where observation should be used to regulate the frequency of treatment.

CONTROL SCHEDULE.

In Seedbeds.

Prepare the seedbed site early and eliminate as many weeds as possible.

Sterilize the beds and paths before planting. This may be achieved in varying degrees by firing, steaming or fumigating.

Spread a layer of medium grade river sand to a depth of one-eighth of an inch on the beds after planting as protection against seed-harvesting ants.

Examine the seedbeds closely at the time of seedling emergence for activity of leaf-harvesting ants. If evident, lightly spray the beds and paths with endrin or dieldrin. Give the nests additional spray.

Two weeks after germination, or earlier if necessary, commence light weekly spraying with endrin or dieldrin. The spray should be directed horizontally from each side of the bed and should be applied after the last watering for the day.

Give the seedlings a thorough spraying with endrin or dieldrin a day before pulling for transfer to the field.

In the Field.

Nematodes must be considered early. The history of the land, or of similar neighbouring land, will often indicate whether these pests may limit yields or reduce leaf quality sufficiently to warrant action. If this is likely, fumigate the soil when free from weeds and in good tilth with EDB or DD at least three weeks before planting out. The recommended dosages per acre are 10 gal. of 12½% EDB or 10 gal. of DD. Fumigation depth should be 6 inches, with thorough sealing after application.

Where careful soil working can be achieved during the early life of the

crop, the intended planting line may be treated by a single application along the centre of the row, or one 6 inches each side of it. The double line treatment makes allowance for the lateral movement of soil in and near the planting lines during working. Treatments in rows 1 foot apart over the whole field, requiring 20 gal. of fumigant per acre, permit maximum lateral working of soil, but if reasonable care is taken this more expensive treatment is unnecessary.

Either endrin or dieldrin will control the looper, leaf miner, stem borer and cluster caterpillar, but neither gives sufficient control of budworm when that pest is active. DDT will control budworm and also the other leaf and stem pests except the looper.

A combined spray of endrin and DDT or dieldrin and DDT should, then, be used weekly for the first three weeks after transplanting. Later sprayings should be timed by observations on the presence of young stages of the leaf pests. Applications of endrin at approximately 10-day intervals may prove sufficient for looper control if the spraying is thorough. Complete cover should be the objective—that is, both sides of each leaf should receive a film of the insecticide. When budworm is prevalent, spraying should be carried out *weekly* to protect plant hearts, irrespective of whether DDT alone or a combined spray is used. If only this caterpillar is active, more rapid and economic protection will be obtained by confining the DDT treatment to the upper portions of the plants.

Crops planted for autumn picking should be given the early routine protection. Subsequent insecticide requirements are usually much less than those for fields harvested during summer.

Insecticides and insecticide strengths recommended for use in tobacco fields are as follows:—

(1) *Endrin.*—Strength of spray, 0.05% active ingredient.

(2) *Dieldrin.*—Strength of spray, 0.05% active ingredient.

(3) *DDT.*—Strength of spray, 0.1% active ingredient, preferably in the emulsion form; strength of dust 2%. DDT sprays are more effective than dusts against mixed pest populations.

In a combined spray each insecticide should be used at its recommended strength.

Soil fumigants and detailed dosage rates are:—

(1) *EDB* (12½% *concentration*).

Machine Application.

Treatment in the centre of row position—1 pint to 2$\frac{1}{16}$ chains (136 feet),

or,

Treatment 6 inches each side of row position—1 pint from each outlet to 4$\frac{1}{8}$ chains (272 feet). The same rate applies if 20 gallons are used in rows 1 foot apart across the field.

Hand Injector Application.

Same positions as for machine application but with injections 1 foot apart. Rate: 1 fluid ounce per each 7 injections for centre of row treatment, and 14 injections totalling 1 fluid ounce for the other treatments.

(2) *DD.*

Use the commercial material at the same rates as for 12½% EDB.

A Pest of Cured Leaf.

The tobacco beetle is the most widely distributed and serious pest of cured leaf in farm bulk sheds. It may appear in a new bulk shed from alternative foods in nearby living

quarters. Leaf held over may be riddled and eventually reduced to powder, particularly near the outside of bulks or bales.

Between seasons tobacco debris should be removed by cleaning inside and around the bulk shed. Insecticides used in the empty shed, such as DDT as a dust, spray or swab, or BHC as an "odourless" smoke, help to destroy carry-over beetles. If a dust is used, the surplus should be swept up, and after all treatments the shed should be aired thoroughly.

Any leaf held over should be inspected frequently for tobacco beetle. Infested bulks can be freed from the various stages of the pest only by breaking down for treatment. The most effective method on the farm is to restring the leaf on sticks and expose it in the barn for two hours to temperatures of 140-150°F.

Jassids and Mites.

The pests mentioned in the above schedule occur in all Queensland tobacco districts. Others, such as jassids and mites, however, may appear as serious pests in the south-western districts. The jassids are suppressed by endrin, dieldrin or DDT sprays as used for the more widely distributed pests. Mites can be controlled by spraying with parathion (E605) of 0.015% concentration (active ingredient). It is suggested that the spray be used fortnightly while mites are active.

WARNINGS.

To avoid the risks of undesirable taints and residues, insecticides should be used on tobacco only when necessary. Dieldrin, endrin or parathion (E605) should not be used in excess of the recommended rates, particularly near harvesting.

A health risk is involved if dieldrin, endrin and parathion (E605) are inhaled, ingested or absorbed through the skin. Care should be taken to avoid inhaling these insecticides or being unduly wet by spray. EDB and DD are skin irritants. Fumes from EDB in a poorly ventilated room are dangerous. Splashes of the concentrates should be washed off immediately with soap and water and any clothes which are splashed should be changed immediately and not worn again until they have been washed.

SCIENTIFIC NAMES OF PESTS.

Budworm	*Heliothis armigera* (Hb.).
Cluster caterpillar	*Prodenia litura* (F.).
Leaf miner	*Gnorimoschema operculella* (Zell.).
Stem borer	*Gnorimoschema heliopa* (Low.).
Looper	*Plusia argentifera* Gn.
Seed- and leaf-harvesting ants	*Pheidole anthracina* For.
Nematodes	*Meloidogyne javanica* (Treub) Chitwood.

The Tomato Mite.

By W. A. SMITH, Entomologist.

During the warmer weather the tomato mite (*Vasates lycopersici* (Massee)) is a major pest of tomatoes in Queensland, particularly in districts from Rockhampton north. Severe infestations result in reduced yields and even premature loss of plants.

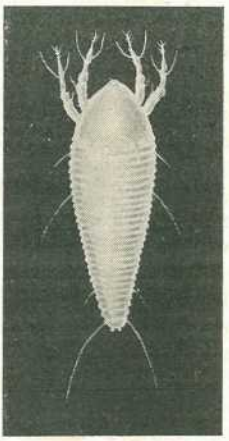


Plate 1.

Tomato Mite, Greatly Magnified.

These sap-sucking pests (Plate 1) attack the leaves, stems and fruit. The first sign of injury as a result of mite feeding is a silvering of the undersurfaces of the lower leaves; later, these leaves become bronze-coloured, wither and die (Plate 2). Before injury is apparent on the upper leaves, the lower part of the stem loses its surface hairs, changes from green to rusty brown, and eventually small superficial cracks appear. Under suitably warm conditions an infestation may spread to the top leaves within a fortnight, thus destroying the foliage and exposing the fruit to the sun.

When fruit suffers direct mite attack typical skin blemishes occur. These, and also sunburn, reduce the market value of the crop.

The tomato mite is extremely small, and though it may occur in large numbers on a plant, it cannot be seen with the naked eye. For most practical purposes growers should be able to recognise the presence of the pests by the signs of early injury.

Under a hand lens the adult mites can be seen as cream, torpedo-shaped specks, moving slowly on the leaves, stems and fruit. The eggs are laid on the plant surfaces, and the newly-hatched young, although somewhat the same shape as the adults, are lighter in colour.

Several weeds, such as wild gooseberry and nightshade, harbour the tomato mite.

CONTROL MEASURES.

Crop Hygiene.

Crop residues should be destroyed soon after harvesting is completed. The risk of infestation is minimised if seedbeds and closely adjacent areas and crop headlands are kept clear of weeds. Complete elimination of outside sources of infestation, however, is seldom possible, and often insecticides must be used for tomato mite control.

Insecticide Treatment.

Correctly timed dusting or spraying with sulphur will adequately control the tomato mite. Dusts should be applied as a light bloom, avoiding clods which may result in leaf burn. When sprays are used, all parts of the plant, particularly the lower leaves and stem, should be thoroughly wetted.

Suitable forms and concentrations of sulphur are as follows.

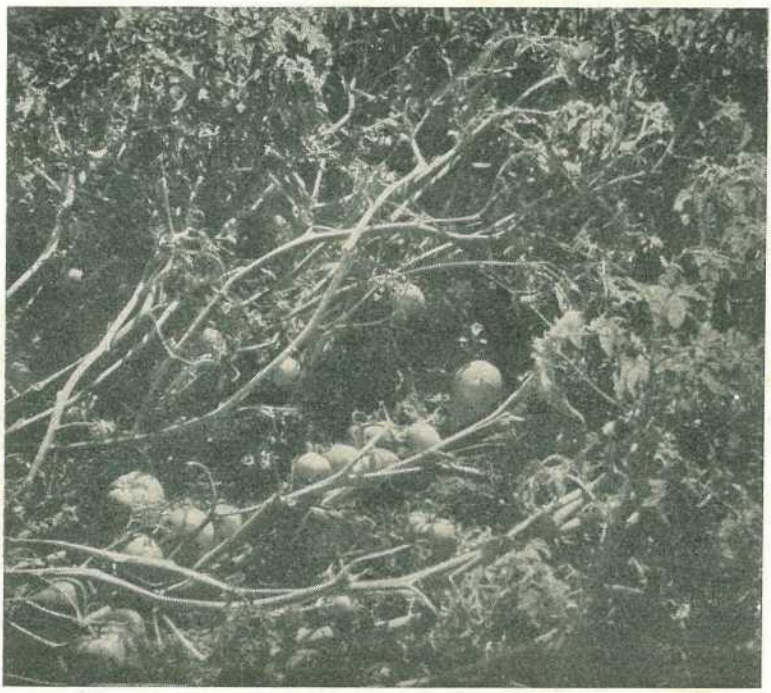


Plate 2.

Tomato Fruit Exposed by Destruction of the Lower Leaves by Tomato Mite.

Method of Use.	Form.	Concentration.
In combined sprays ..	Dispersible, wettable or colloidal sulphur	2-4 lb. in 100 gal. or according to label directions
As a spray	Dispersible, wettable or colloidal sulphur	2-4 lb. in 100 gal. or according to label directions
	Lime sulphur	1 gal. in 100 gal.
As a dust	Any finely ground sulphur	Mixed intimately with an equal quantity of hydrated lime, or used direct
	Commercial mixed dusts for tomatoes containing at least 30% sulphur	Used direct

Parathion (E605) is also effective, but the use of this material may involve a health risk and it is therefore not recommended.

In Districts from Rockhampton North:

Seedbeds require fortnightly treatments. In the field, the interval between normal routine sprayings or dustings may be varied from 2 weeks during warm weather to 4 weeks in winter. When mites are very active the fortnightly application of combined sprays or dusting mixtures containing sulphur may not result in satisfactory control. A treatment with dusting sulphur in the intervening weeks is then required.

In South Queensland:

Mixed dusts are readily available and are generally used in routine schedules for the control of all tomato pests. Additional sulphur treatments for mite control are seldom necessary.

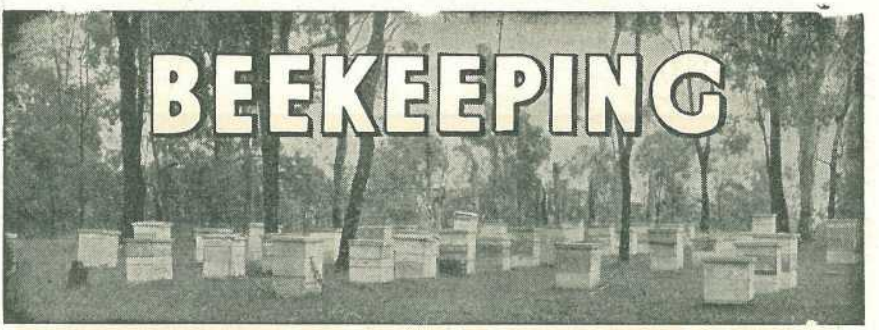
Planting Material of Lady Finger Bananas.

Following the autumn inspection by officers of the Department of Agriculture and Stock of plantations of banana growers who are likely to have Lady Finger planting material for sale during the coming season, a number of plantations which were apparently free from Panama disease have been provisionally approved as sources of supply.

However, the disease is not easy to detect in the early stages, and no guarantee is given that the planting material will be completely free from Panama disease. Nevertheless, the risk of introducing the disease to a new plantation from an approved area is slight. A second inspection by a Horticulture Branch officer will be made before a permit to remove planting material is issued.

Further information may be obtained from the Banana Agent in each district. Names and addresses of the Agents are as follows:—

Maryborough ..	Mr. S. J. Kuskie, Adviser in Horticulture, Department of Agriculture and Stock, Maryborough.
Gympie	Mr. E. J. Anderson, Inspector, Diseases in Plants Acts, Department of Agriculture and Stock, Gympie.
Cooroy	Mr. J. R. Craigie, Inspector, Diseases in Plants Acts, Department of Agriculture and Stock, Cooroy.
Nambour North ..	Mr. J. A. Mobbs, Adviser in Horticulture, Department of Agriculture and Stock, Nambour.
Nambour	Mr. E. Filer, Assistant Adviser in Horticulture, Department of Agriculture and Stock, Nambour.
Palmwoods ..	Mr. R. F. Lovelady, Inspector, Diseases in Plants Acts, Department of Agriculture and Stock, Palmwoods.
Caboolture	Mr. A. E. Smith, Inspector, Diseases in Plants Acts, Department of Agriculture and Stock, Caboolture.
Brisbane	Mr. T. Dennis, Inspector, Diseases in Plants Acts, Department of Agriculture and Stock, Brisbane.
Redlands	Mr. K. B. McRae, Inspector, Diseases in Plants Acts, Redlands Experiment Station, Delancy street, Ormiston.
Beenleigh	Mr. J. J. Tracey, Inspector, Diseases in Plants Acts, Department of Agriculture and Stock, Beenleigh.
Southport	Mr. J. McG. Wills, Senior Adviser in Horticulture, Department of Agriculture and Stock, Southport.
Currumbin ..	Mr. J. Wallace, Inspector, Diseases in Plants Acts, Department of Agriculture and Stock, Railway street, Currumbin.



The Honey Flora of South-Eastern Queensland.

By S. T. BLAKE (Botanist) and C. ROFF (Adviser in Apiculture).

(*Continued from page 62 of the July issue.*)

Flax-leaved Paperbark.

Botanical Name.—Melaleuca linariifolia Sm.

Other Common Name.—Tea-tree.

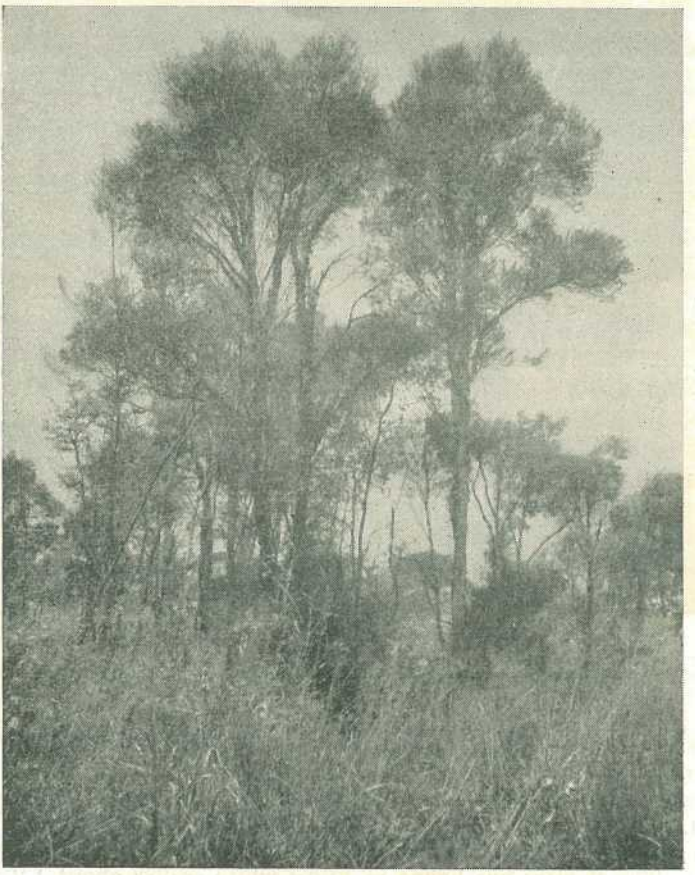


Plate 127.

Flax-leaved Paperbark (Melaleuca linariifolia). Archerfield.

Distinguishing Features.—A paper-barked tree with narrow leaves arranged in pairs and very showy spikes of fluffy white flowers (Plates 127-128).

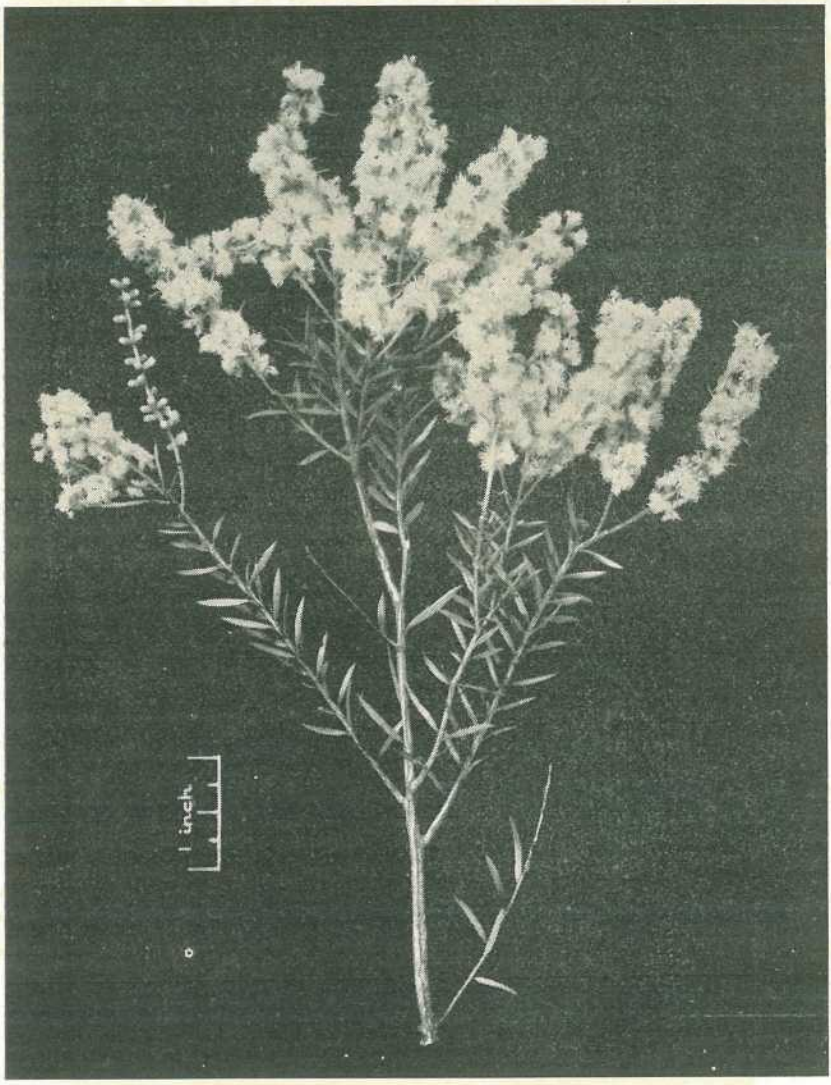


Plate 128.

Flax-leaved Paperbark (Melaleuca linariifolia). Leaves, buds and flowers.

Description.—This is a tree up to 40 ft. high with whitish papery bark and a fairly dense and often rounded crown of dull green leaves. The leaves are arranged in pairs along the branches; they are about 1-1½ in. long, about ⅛ in. wide, tapered at both ends, with a prominent midrib; they give forth a strong odour when crushed, sometimes like melasol. The flowers are borne in fluffy white spikes about 1-2 in. long and 1 in. wide at the ends of the branches. They have five tiny sepals,

five small white petals, five long bunches of stamens and a central style. The branch continues to grow through the spike. The seed-capsules are cup-shaped, about $\frac{1}{8}$ in. long and wide.

Distribution.—Widely spread in south-eastern Queensland. Towards the coast it grows usually on ill-drained sandy soil where it may form small stands, but further inland it tends to be restricted to sandy stream banks. It is found in coastal New South Wales and the same or similar tree is also found on creek banks in other parts of Queensland.

Usual Flowering Time.—November-December.

Colour of Honey.—Dark amber.

Importance as Source of Honey.—Minor.

Importance as Source of Pollen.—Medium.

General Remarks.—This species is useful, as the nectar and pollen are utilised by the bees to build up colony populations.

As the honey is not produced in appreciable quantities its commercial characteristics are unknown.

[TO BE CONTINUED.]

Brucellosis-Tested Swine Herds (As at 11th July, 1955).

Berkshire.

A. P. and N. Beatty, "Deepdene," Barambah road, Nanango
S. Cochrane, "Stanroy" Stud, Felton
G. Handley, "Handleigh" Stud, Murphy's Creek
J. L. Handley, "Meadow Vale" Stud, Lockyer
O'Brien and Hickey, "Kildurham" Stud, Jandowae East
G. C. Traves, "Wynwood" Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
M. K. Collins, "Kennington" Stud, Underwood road, Eight Mile Plains
H.M. State Farm, "Palen" Stud, Palen Creek
A. R. Ludwig and Sons, "Beau View" Stud, Beaudesert
H. H. Sellars, "Tabooba" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
R. H. Crawley, "Rockthorpe" Stud, *via* Pittsworth
F. R. J. Cook, Middle Creek, Pomona
Mrs. I. M. James, "Kenmore" Stud, Cambooya
H. L. Stark, "Florida," Kalbar
J. H. N. Stoodley, "Stoodville," Ormiston
H.M. State Farm, Numinbah
V. G. M. and A. G. Brown, "Burdell," Goovigen
N. F. Cooper, Maidenwell
R. H. Coller, Tallegalla, *via* Rosewood
E. J. Clarke, "Kaloon" Stud, Templin
M. G. and R. H. Atkins, "Diamond Valley" Stud, Mooloolah
L. Puschmann, "Tayfeld" Stud, Taylor
Dr. B. J. Butcher and A. J. Parnwell, "Hartley Grange" Stud, 684 Logan Road, Greenslopes
C. E. Edwards, "Spring Valley" Stud, Kingaroy
G. McLennan, "Murcott" Stud, Willowvale
H. M. Wyatte, "Deepwater" Stud, Rocky Creek, Yarraman
C. F. W. and B. A. Shellback, "Redvilla" Stud, Kingaroy
R. J. Webber, "Webberberry" Stud, 35 Caxton st., Petrie Terrace
J. C. Lees, "Bridge View" Stud, Yandina
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
A. C. Fletcher, "Myola" Stud, Jimbour
Q.A.H.S. and College, Lawes
E. F. Smythe, "Grandmere" Stud, Manyung, Murgon
The Marsden Home for Boys, Kallangur
M. F. Callaghan, Lower Mount Walker, via Rosewood
J. B. Lotz, M.S. 794, Kalbar
G. J. Hutton, Woodford
E. R. Kimber, Coalstoun Lakes
K. B. Jones, "Cefn" Stud, Pilton
A. J. Potter, "Woodlands," Inglewood
Regional Experiment Station, Hermitage
L. Pick, Mulgeldie
J. W. Bukowski, "Secreto" Stud, Oxley

Large White.

H. J. Franke and Sons, "Delvue" Stud, Cawdor
Garrawin Stud Farm Pty. Ltd., 657 Sandgate road, Clayfield
J. A. Heading, "Highfields," Murgon
K. B. Jones, "Cefn" Stud, Pilton
R. Postle, "Yarralla" Stud, Pittsworth
B. J. Jensen, "Bremerside" Stud, Rosevale, *via* Rosewood
E. J. Bell, "Dorne" Stud, Chinchilla
L. C. Lobegeiger, "Bremer Valley" Stud, Moorang, *via* Rosewood
H. R. Gibson, "Thistleton" Stud, Maleny
H.M. State Farm, Numinbah
K. A. Hancock, "Laurestonvale" Stud, Murgon
V. P. McGoldrick, "Fairymeadow" Stud, Cooroy
S. T. Fowler, "Kenstan" Stud, Pittsworth
G. J. Hutton, Woodford
H. L. Larsen, "Oakway," Kingaroy
N. E. Meyers, Halpine Plantation, Kallangur
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes
G. I. Skyring, "Bellwood" Stud, *via* Pomona
O. J. Horton, "Manneum Brae" Stud, Manneum, Kingaroy
F. K. Wright, Narangba, N. C. Line
O. B. Vidler, Manneum, Kingaroy
K. F. Stumer, French's Creek, Boonah
Q.A.H.S. and College, Lawes
R. S. Powell, "Kybong" Stud, Kybong, *via* Gympie
S. and S. Ouglitchinin, "Pinefields," Old Gympie road, Kallangur
C. Wharton, "Central Burnett" Stud, Gayndah
S. Jensen, Rosevale, *via* Rosewood
Kruger and Sons, "Greyhurst," Goombungee
V. V. Radel, Coalstoun Lakes
H. R. Stanton, Tansey, *via* Goomeri

Tamworth.

S. Kanowski, "Miecho" Stud, Pinelands
N. R. Potter, "Actonvale" Stud, Wellcamp
D. F. L. Skerman, "Waverley" Stud, Kaimkillenbun
A. C. Fletcher, "Myola" Stud, Jimbour
Salvation Army Home for Boys, "Canaan" Stud, Riverview
A. J. Surman, "Namrus" Stud, Noble road, Goodna
Department of Agriculture and Stock, Regional Experiment Station, Kairi
E. C. Phillips, "Sunny View," M.S. 90, Kingaroy
F. N. Hales, Kerry road, Beaudesert
T. A. Stephen, "Withcott," Helidon
W. F. Kajewski, "Glenroy" Stud, Glencoe
L. Herbst, "Hillbanside" Stud, Bahr Scrub, *via* Beenleigh
H.M. State Farm, Numinbah more, *via* Murgon
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes
G. H. Sattler, Landsborough
F. Thomas, "Rosevale" Stud, M.S. 373, Beaudesert
H. J. Armstrong, "Alhambra," Crownthorpe, Murgon
Q.A.H.S. and College, Lawes
R. H. Coller, Tallegalla, *via* Rosewood
A. J. Potter, "Woodlands," Inglewood
P. V. Campbell, "Lawn Hill," Lamington

Wessex Saddleback.

W. S. Douglas, "Greylight" Stud, Goombungee
J. Gleeson, "Iona Vale" Stud, Kuraby
C. R. Smith, "Belton Park" Stud, Nara
H. H. Sellars, "Tabooba" Stud, Beaudesert
H. Thomas, "Eurara" Stud, Beaudesert
D. T. Law, "Rossvill" Stud, Trout road, Aspley
J. B. Dunlop, "Kurrawyn" Stud, Acacia road, Kuraby
F. K. Wright, Narangba, N. C. Line
R. A. Collings, "Rutholme" Stud, Waterford
W. R. Dean, "Trelawn," Tandur, *via* Gympie
M. Nielsen, "Cressbrook" Stud, Goomburra
G. J. Cooper, "Cedar Glen" Stud, Yarraman
Mrs. R. A. Melville, "Wattledale Stud," Beenleigh road, Sunnybank
A. J. Stewart, "Springbrook," Pie Creek road, Gympie
S. and S. Ouglitchinin, "Pinefields," Old Gympie road, Kallangur
A. J. Hicks, M.S. 98, Darlington, *via* Beaudesert
Kruger and Sons, "Greyhurst," Goombungee

British Large Black.

H. W. Naumann, "Parkdale" Stud, Kalbar

ANIMAL HEALTH

Botulism in Farm Animals.

By D. N. SUTHERLAND, Divisional Veterinary Officer.

POINTS TO REMEMBER.

Botulism is a form of food poisoning caused by eating food contaminated with botulism germs.

In sheep and cattle the source of poison is usually bones or carrion. The craving to eat this material is associated with lack of phosphorus and/or protein in the diet.

Poultry running under free range conditions are quite commonly poisoned by eating infected material, including rotting poultry carcases.

Poisoning in sheep and cattle may be prevented by correcting deficiencies in the diet which lead to the eating of poisoned material and by vaccination.

Botulism is a highly fatal form of food poisoning which occurs in man and domestic animals. It is caused by consumption of foodstuffs contaminated by the germ *Clostridium botulinum*. In domestic animals the disease may be caused by eating rain-damaged fodder or carrion. For this reason the disease has been known as "forage poisoning" or "carrion poisoning."

The germ concerned is commonly found in the soil and its presence in foodstuffs is due, directly or indirectly, to soil contamination. Under certain conditions the organism will grow in either rotting animal or vegetable matter, producing a highly dangerous poison which is responsible for the disease. The organism cannot grow in living tissues and thus the disease can only be produced by eating food in which the poison is present.

Although all cases of botulism are due to consumption of material in which the poison of *Cl. botulinum* is present, there are a number of different types of the organism, each producing its own specific poison or toxin. The different kinds of domestic animals show a varying susceptibility to the toxins produced by the different types of the organism.

The toxins of all types of the organism produce similar symptoms in susceptible animals. They are readily absorbed from the stomach and intestines, producing characteristic symptoms by their action on the nervous system. The common symptoms are general muscular weakness and depression and interference with the muscles of the tongue and pharynx, leading to inability to swallow. In all animals the mortality rate is high.

Contaminated Materials.

For domestic animals the source of poison is almost invariably either damaged vegetable matter or carrion. In some cases the disease may result from drinking water containing toxin which originated from one of the above sources.

Cereal hay or chaff has been a common cause of the disease. When such material becomes damaged by water, either during harvesting or in the stack, it provides a suitable medium

for the growth of the germ. Conditions favourable for the development of mould growth in fodder are generally suitable for growth of the botulism bacteria. However, fodder which has been proved to be poisonous has not always appeared mouldy. In many cases this may be due to the fact that the toxin is produced in one part of the stack and carried to other parts by water.

Fodder which has been fouled by droppings of mice or other animals may be poisonous. The carcases of mice or other rodents in hay stacks or feed sheds may also be responsible for the disease. Horses are usually affected from this source. The poison may also be produced in uneaten feed which is allowed to remain for long periods in feed boxes.

In cattle and sheep in Australia the great majority of cases of botulism are due to eating carrion. The carcase of any dead animal provides suitable conditions for the growth of the botulism germ, the most common sources of poisoning in Australia being the carcases of dead cattle, sheep or rabbits. Under conditions of good nutrition, cattle and sheep do not eat carrion. However, they often develop a depraved appetite in dry times and then readily eat bones and carcases.

When Botulism Occurs.

In horses the disease occurs almost exclusively in hand-fed animals, the source of the toxin being damaged hay or other forage. Usually, a number of horses from the one stable become affected simultaneously. There is as a rule a lapse of about five days between the eating of the poisonous material and the appearance of symptoms.

In acute cases death may take place less than 12 hours after the first symptoms appear, but some animals may linger for several weeks before death. Some cases may recover.

The symptoms in horses are partial paralysis and loss of co-ordinated movement of the limbs and difficulty or inability to chew and swallow food. The tongue may be paralysed and hang out of the mouth. The disease in cattle may be caused by damaged hay or other forage, but it is much more commonly due to the eating of bones or carrion. As stated above, cattle which are receiving adequate nutrition from the pasture or supplementary feed do not eat bones or carrion. However, under Queensland conditions cattle often develop a depraved appetite, evidenced by a craving for bones. In some cases they will eat the putrid flesh of dead animals. In the great majority of cases this craving is due to a lack of phosphorus in the diet.

Phosphorus deficiency occurs in cattle grazing on country where the soil is deficient in phosphorus. The accompanying map of Queensland (Plate 1) gives some idea of the extensive areas of the State in which phosphorus deficiency has been diagnosed in cattle. In some of these deficiency areas, particularly in the north and north-west, it is strongly suspected that botulism occurs as a herd problem.

As the requirements of phosphorus are highest in young growing cattle and lactating cows, these animals are generally the first in a herd to show evidence of deficiency. For this reason the incidence of botulism in a herd is usually highest in these groups. In phosphate-deficient areas, symptoms of deficiency and depraved appetite are generally more pronounced when pastoral conditions are dry and feed is scarce. It is at this time that cases of botulism are most likely to occur.

In cattle, as in horses, there is generally a lapse of some days between eating the poisonous material and the appearance of symptoms. The symptoms are also similar to those seen in horses, but the progress of the disease is usually more prolonged. Death does not as a rule occur until some days after the first appearance of symptoms.

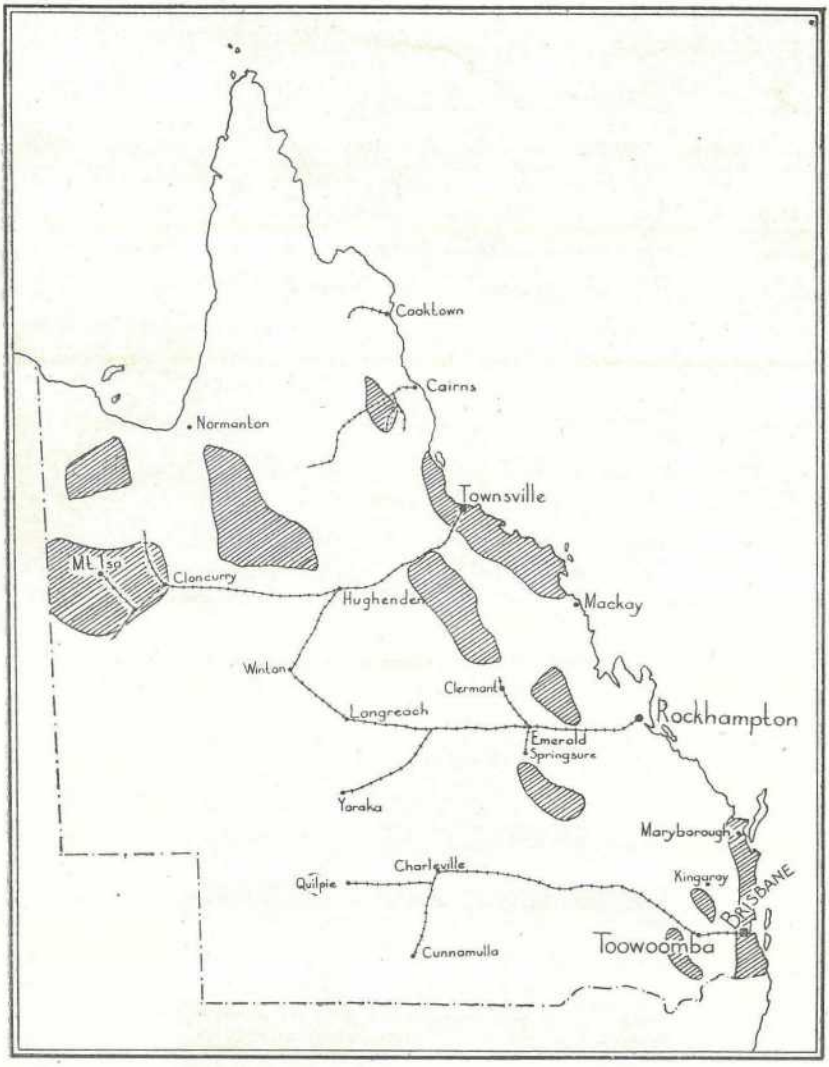


Plate 1.

Sketch Map of Queensland Showing Areas in Which Phosphorus Deficiency is Known to Occur. Phosphorus deficiency of pastures causes depraved appetite of cattle, which leads to the eating of bones and carrion, which are often contaminated with the botulism germ.

The disease in sheep is almost invariably due to the eating of carrion, in most cases the carcases of rabbits. As little as one-tenth of an ounce of rabbit carrion has proved fatal to sheep. The period between consumption of toxic material and appearance of symptoms in sheep may be as short as 12 hours. Death usually occurs in fatal cases within two or three days of the onset of symptoms. However, as many as half the affected sheep may recover in some outbreaks.

As with cattle, well-fed sheep do not eat carrion. However, under dry conditions in Australia, when sheep are

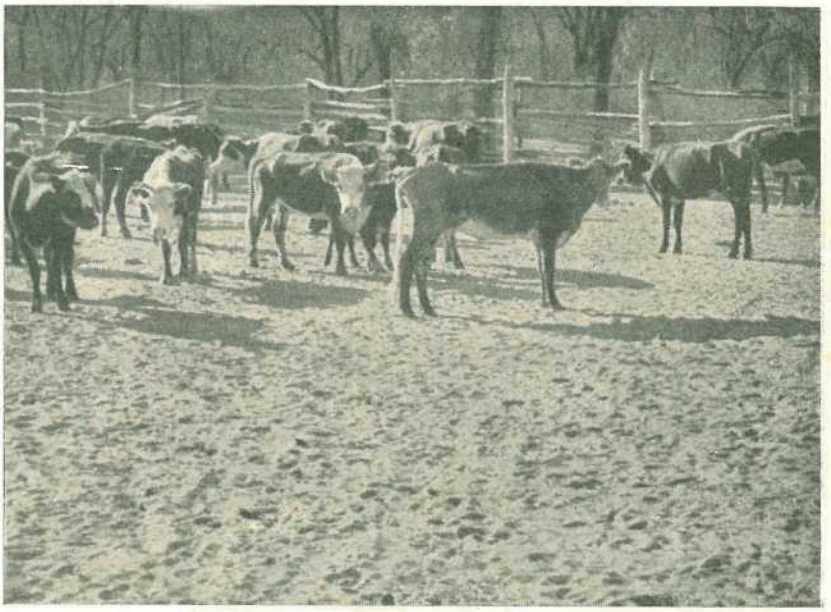


Plate 2.

A Group of Cows Showing Signs of Phosphorus Deficiency. Note the wasting and the enlarged shoulder joints.

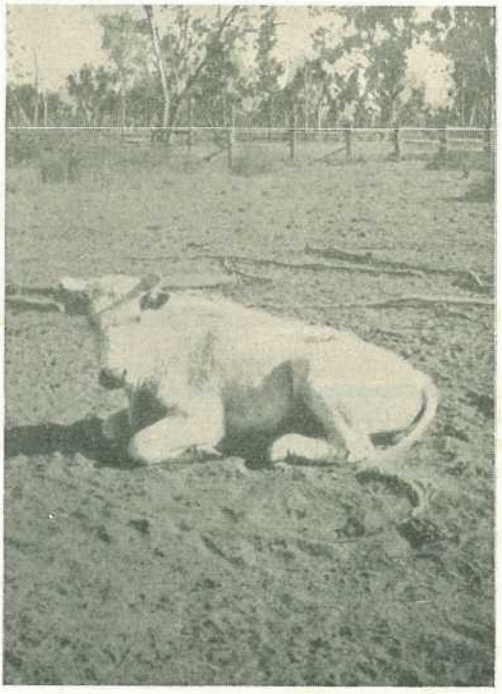


Plate 3.

A Beast in the Early Stages of Botulism, Showing Paralysis.

often grossly deficient in protein, they develop a craving for bones and carrion. Under these circumstances, they readily eat the carcases of rabbits, etc.

The disease is prevalent in fowls, ducks and turkeys in some localities, notably the Townsville district. Apparently ducks and turkeys are more susceptible than fowls. However, very heavy mortalities have been recorded in all three species. The disease in poultry may be caused by the eating of old food scraps or the carcases of animals such as frogs, toads and other fowls. The disease usually follows a rapid course in poultry, death often occurring within a few hours of the first appearance of symptoms. It is commonly referred to as "limberneck" in poultry because of the paralysis of the neck which makes it impossible for affected birds to raise or control their heads. In addition to this symptom, affected birds also show inco-ordination of the gait, drooping of the wings and paralysis of the legs. The feathers strip easily and there is frequently a weeping discharge from the eyes.

There is some difference of opinion as to whether the disease occurs in pigs. Some authorities claim that this species is completely resistant but there are reports of cases very suggestive of botulism in pigs. If the disease does occur in pigs it is certainly very rare.

Diagnosing the Disease.

As it is a very difficult matter to diagnose botulism by detecting the responsible germ or the poison, diagnosis must usually be made on the basis of the symptoms in the animal. In making a diagnosis, evidence of depraved appetite or of the eating of any possible poisonous material should be sought.

Prevention of Botulism.

Prevention of botulism is carried out along the following lines:

(*a*) Preventing access to foodstuffs or material favourable for the growth of the botulism germ.

(*b*) Correcting any nutritional deficiencies which cause the craving to eat bones and carrion.

(*c*) Immunisation of susceptible stock.

Action to prevent access to poisonous material is the most effective means of preventing the disease in man, horses and poultry.

The source of the poison in horses is generally damaged hay, chaff or silage and the disease can be prevented by withholding any such fodder of doubtful quality.

In poultry the disease is much more prevalent under free range conditions than where an intensive system of management is practised. When an outbreak occurs it can usually be arrested by confining the flock to a shed or fowlhouse until all poisonous material has been removed or burnt. Steps should also be taken to provide ample supplies of fresh drinking water, as stagnant water holes or troughs are often contaminated.

As stated above, the source of poisonous material in cattle and sheep is almost invariably carrion and it is not always practicable to dispose of all carrion on large properties by burning or other methods. However, the burning of all carcases in the vicinity of waterholes and stock camps will help to reduce losses when an outbreak occurs.

The most important step in controlling outbreaks in cattle and sheep is to endeavour to correct the nutritional deficiencies which are responsible for the craving to eat bones and carrion. The deficiency in cattle is generally a phosphorus deficiency and this can be corrected by the provision of a phosphorus supplement to the diet. This may be provided by one of the following means:

(*a*) Provision of a bonemeal lick at watering points or other places where stock congregate. The generally recommended lick

is one containing two parts of bonemeal to one of salt and it is usually taken readily by phosphorus-deficient cattle.

(*b*) The addition of superphosphate to the drinking water.

(*c*) Where cattle are being hand-fed, the addition of bonemeal to the ration supplied.

(*d*) Topdressing of pastures with superphosphate. This practice is warranted only on country with a relatively high carrying capacity or on agricultural land.

Full information on the advisability and methods of supplying phosphorus supplements may be obtained from local officers of the Department of Agriculture and Stock.

In sheep, the craving for bones and carrion is generally due to a deficiency of protein in the diet. Prevention of this deficiency is not always possible during prolonged dry seasons. However, methods which may be used to overcome it are the elimination of overstocking, improvement of pastures and provision of supplementary feed.

In both sheep and cattle the expense entailed in undertaking measures to correct these nutritional deficiencies is generally justified by improvement in condition of the stock and reduced losses from malnutrition.

A vaccine for the prevention of one type of botulism is produced by the Commonwealth Serum Laboratories. This is the toxin which is responsible for practically all cases of botulism in cattle and sheep in Australia and the use of the vaccine in Western Australia has greatly reduced losses from the disease.

GETTING CHEAPER BUFFEL GRASS SEED.

Cheaper seed is needed to hasten the large-scale establishment of buffel grass in Queensland. If graziers wish to continue their efforts to develop extensive buffel grass pastures, they may find it worthwhile to harvest all their own seed.

The Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) said recently that Mr. S. Marriott, Senior Agrostologist in his Department, has commented on the high price of buffel grass seed. Reviewing the progress made last season in improving pastures in north-western Queensland, Mr. Marriott suggests that harvesting seed on the station may offset the present high seed prices.

Seeding rates vary from 2 lb. to 4 lb. per acre depending on the type of country. Where large areas have to be sown—and some stations have hundreds of square miles of country suitable for buffel—seed prices of up to £1 per lb. serve as a brake on large-scale plantings.

In Western Australia, where the establishment of buffel grass is proceeding rapidly, graziers have for some time been collecting seed for their own use. They gather the seed from small nursery plots they have planted on their properties. The cost of hand-harvested seed using very cheap labour is often as little as 2s. 6d. a lb. It is expected that the development of simple harvesting machines will enable Queensland graziers to produce their own seed at a comparable price.

The final story of the method of establishing buffel grass is not yet known. Reports from co-operators indicate that, in some soil types at least, satisfactory germination has followed broadcasting the seed in sparsely grassed or heavily grazed native pasture. On most soil types, however, establishment is hastened by cultivation.

Seed costs can also be kept to a minimum by planting "island" plots throughout the area it is intended to grass. Experience has shown that if the new pastures are permitted to seed before grazing, a scattered spread of seedling plants can be found as far as 150 yards from the parent stands within 12 months of the initial planting.

Salmonellosis of Livestock in Queensland.

By G. S. COTTEW, Animal Research Institute, Yeerongpilly.

Salmonellosis is an important disease of domestic animals and birds as well as human beings. Wild animals and birds also contract the disease.

The name comes from the germ Salmonella which causes the disease and which itself is named after a bacteriologist named Salmon. Common names for the disease in its various forms are paratyphoid, typhoid fever, "gastro" and food poisoning.

Deaths in farm animals may amount to as much as half the flock or herd affected by the disease. As the bacteria usually lodge and multiply rapidly in the bowel, they are discharged in enormous numbers in the droppings and so contaminate the surroundings, including feed and water. Hence infection takes place usually through the mouth.

Recovered animals or birds may not throw off the infection but continue to discharge bacteria. These are called carriers, and a fresh outbreak is often started by the introduction of a carrier to a herd or flock.

From the bowel, the bacteria can spread by way of the blood stream to other organs, multiplying to such large numbers that the defences of the animal are overwhelmed. No symptoms may be shown in this acute form of the disease.

On the other hand, the course of the disease may be protracted, during which time the bacteria damage the intestine, causing scouring, or the lungs and joints may be affected, causing pneumonia and arthritis.

Transport of stock by rail or road over long distances may make them more susceptible to the disease.

In Queensland, 360 outbreaks of salmonellosis were confirmed by the Animal Research Institute in the last nine years. Table 1 sets out the types of animals affected in these outbreaks. It will be seen that most kinds of animals and birds have suffered outbreaks of the disease. It is certain that the disease actually occurred more often than would appear from the table, because many outbreaks are not reported.

TABLE 1.

SHOWING THE NUMBER OF OUTBREAKS OF SALMONELLOSIS DIAGNOSED IN QUEENSLAND SINCE 1946.

——	1946–49.	1950.	1951.	1952.	1953.	1954.	Totals.
Pigs	37	15	17	12	16	17	114
Fowls	25	16	24	4	12	8	89
Cattle	8	2	9	8	21	31	79
Ducks	12	10	2	5	3	0	32
Sheep	5	8	1	1	4	6	25
Horses	3	2	1	1	2	1	10
Geese	0	0	0	0	1	0	1
Guinea Pigs ..	1	1	1	0	0	0	3
Dogs	1	0	1	0	0	0	2
Cats	0	0	1	0	0	0	1
Kangaroos ..	0	0	0	1	0	0	1
Mice	0	0	0	1	0	0	1
Canary	0	0	0	0	1	1	2
Totals ..	92	54	57	33	60	64	360

One outbreak means that one or more infected animals or birds have been found on one property.

Pigs.

Over one hundred outbreaks of salmonellosis were diagnosed in pigs in nine years, and doubtless many others occurred. From 1 to 46 pigs died in each outbreak.

The symptoms shown are fever, lack of appetite, reddish-purple discolouration of the skin, discharge from eyes and nose, coughing and scouring. In the acute septicaemic form in which the bacteria invade the blood stream, death may occur without symptoms being shown. When the disease is less acute, pneumonia, arthritis, and enteritis are often seen.

Pigs of all ages may be affected, but the greatest losses occur in the 3-5-month age group. The infection is commonly introduced into a piggery by recently bought pigs or from contact with infected animals as at a show.

A more complete account of the disease in pigs appeared in the Queensland Agricultural Journal for September 1954.

Fowls.

Most of the 89 outbreaks recorded in fowls occurred in chickens under three weeks of age. Losses were often high, sometimes up to 80% of the hatch. In 18 of the outbreaks that occurred in 1951, 8,000 chickens died.

Infected chickens huddle together to seek warmth, chirp excessively and are dull. Diarrhoea is often present. Deaths occur rapidly after symptoms are first shown, but many may be found dead without symptoms having been noticed. On post-mortem examination, enlarged, mottled or bloodstained livers, pneumonia, anasarca ("water-belly") or enteritis may be observed, but none of these conditions is present in all cases.

Chickens recovering from salmonellosis may continue to shed the bacteria in their droppings up to adult age. The infected droppings may stick to the eggshell during laying, and in the incubator the bacteria may spread very rapidly to healthy chickens. Spread may also be rapid in the brooder as the floor becomes badly contaminated.

Pullorum disease is a type of salmonellosis, the germ responsible being *Salmonella pullorum*. Until a few years ago pullorum disease was the commonest form of salmonellosis in fowls, but since pullorum testing was begun by the Department of Agriculture and Stock the incidence of this disease has declined. Unfortunately, it would not be practicable to use a similar test for dealing with the other types of salmonellosis because almost any of the 200 related types could be involved.

In chickens surviving an outbreak of pullorum disease, the bacteria may be present in the ovary. Such chickens may remain carriers and lay infected eggs on reaching adult age.

A more detailed article on the disease in chickens appeared in the January 1951 issue of this Journal.

Ducks.

The incidence in ducks and ducklings was high in 1950 (see Table 1) but has been lower each year since, probably because fewer ducks have been raised. Affected ducks are usually below the age of 10 weeks. Again mortality can be up to 50 per cent. Symptoms seen are weakness, lack of control over movement, catarrhal eye and nasal discharge, with occasional diarrhoea. The common changes seen after death are rhinitis (inflammation of the membrane lining the nose), with discharge in the nasal sinuses extending to the air sacs. Enteritis may also be present.

The disease can be transmitted through the egg or contracted from contaminated feed and water. Ducks infected with salmonellosis may infect feed and water troughs with their droppings. Other animals or birds in contact with the ducks can be the source of the bacteria.

Cattle.

The number of cases of salmonellosis diagnosed in cattle has increased over the last two years. Chiefly dairy cattle are involved and both adults and calves can be affected. The disease usually runs an acute course over 2-7 days, death occurring from invasion of the blood stream by the bacteria. Marked scouring, sometimes with blood and mucus in the droppings, is usually seen. After death, general inflammation is found throughout the internal organs, this being particularly intense in the abomasum (4th stomach) and intestines. The number of deaths in each outbreak is usually not high. A few cases have occurred in cattle during and after travelling. The resistance of these animals has been lowered as a result of fatigue due to the journey. Other outbreaks have occurred without apparent inciting causes. Carrier animals can occur.

Sheep.

Salmonellosis in sheep is not common. The majority of the cases recorded occurred in 1950 when many sheep being trucked long distances were affected. The symptoms and appearance are those of blood invasion by bacteria and gastro-enteritis.

The occurrence of salmonellosis during or following long journeys appears to be related to several factors, including the following—

(1) Infection acquired at contaminated stopping places could be easily spread in the trucks.

(2) Starvation probably allows Salmonella bacteria present in the intestines to invade the body of the animal. Diet before and during the journey may have an effect.

Further information on the disease in sheep was published in the Queensland Agricultural Journal for August 1951.

Horses.

Three of the nine outbreaks in horses occurred during or after long rail journeys and the remarks concerning travelling sheep apply to horses also. One other outbreak was in young foals in a thoroughbred stud. The remaining five were single cases.

Other Animals.

Dogs have been shown overseas to be an important source of human infection, but insufficient numbers have been examined to estimate the incidence of the disease here.

The kangaroo listed in Table 1 was a zoo animal, and the guinea pigs and mice were among the animal stocks kept at this laboratory. The disease has not been diagnosed in goats. Turkeys are not listed, although pullorum disease was diagnosed in one flock. In addition Salmonella have been isolated from native rats and cockroaches.

Prevention and Control.

Once the disease is introduced it will spread more easily in animals housed under insanitary conditions. Good hygiene should therefore be practised, especially where animals are closely confined.

Affected animals should be separated from the healthy and pens occupied by them cleaned out and disinfected. If the floor is of concrete or other impervious material, hot 2% caustic soda is recommended. Earth floors cannot be satisfactorily disinfected, so should be spelled for some months. The organisims die rapidly when exposed to sunlight on dry ground but in shaded damp ground may survive for months.

On poultry farms, good hygienic conditions are usually easy to provide. Incubators should be fumigated with formaldehyde 6-8 hours after the hatch is set. This must not be done between 24 and 96 hours because it impairs egg fertility.

Brooders should be taken to pieces and each part scrubbed with hot soapy water. It is very important to remove

all droppings and particles of food as the disinfectants do not penetrate these easily. Immersion of the parts in 5% lysol for at least 1 hour should follow scrubbing. Then they should be rinsed and allowed to dry in the sun. Vermin such as rats, mice and cockroaches should be controlled because they can harbour and spread infection.

Prevention in animals depends on the kind involved.

Many of the outbreaks of salmonellosis in sheep, horses and cattle have occurred during or after the animals have been travelled. The ensuing fatigue together with the change of diet before and during the journey appear to favour development of the disease. Precautions to be observed in transporting animals include keeping them off irrigated succulent or heavily stocked pasture for 2-3 weeks before the date of departure, and feeding a low-protein ration with ample roughage. During transit, oaten hay should be provided in racks in the transport or oats or oaten chaff fed at resting points. Periods of starvation should be short. Ample fresh water should be provided in clean troughs at resting points and precautions taken to hold the animals in a clean yard or paddock.

Laboratory tests may be carried out on blood from animals and birds to detect carriers, if the type of infecting Salmonella is known. The pullorum agglutination test is the best known test of this type and its use has markedly reduced the incidence of pullorum disease in Queensland. Those birds which react are infected and must be removed from the flock.

Examination of samples of droppings may also lead to the detection of carriers, and these, of course, should be removed.

Vaccination of animals and birds is not a practical measure. This is because a variety of types of Salmonella may cause outbreaks and a vaccine from one type may not protect against another. Some success has been achieved in cattle in South Africa, where the disease is common and where nearly all outbreaks are caused by one particular Salmonella type.

Treatment.

The most successful practical treatment is the use of sulphonamides given intravenously, intramuscularly or by mouth in the recommended dosage. However, farmers are advised to consult a veterinarian or their local stock inspector or livestock adviser before using such drugs.

BUSHEL WEIGHTS.

	lb.		lb.
Barley	50	Oats	40
Beans	60	Peas	60
Bran	20	Pollard	20
Cowpeas	60	Rye	60
Grass Seeds	20	Sorghum	60
Linseed	56	Soybean	60
Lupins	60	Sunflower	28
Maize	56	Tares and Vetches	60
Meals	20	Wheat	60
Millets	60		

White Cedar is Poisonous to Pigs.

By L. W. MONROE (Inspector of Stock) and B. PARKINSON (Divisional Veterinary Officer).

The white cedar tree (*Melia dubia*) is quite often seen on farms as it provides very useful shade in the hot summer months. Unfortunately, it has one disadvantage in that the berries which fall from about April onwards can cause death of stock if eaten in numbers.

As the tree is more commonly seen in pig yards, mortality amongst pigs is experienced more often than with other stock, although cattle and poultry are sometimes affected. Cases are also recorded of children having been poisoned. Many feeding trials with berries have been carried out which have proved beyond doubt their toxicity to pigs and other stock.

Occurrence of Poisoning.

Poisoning is usually only seen when ripe berries are present and falling off, though green berries may also cause losses. Poisoning by green berries is rare, however, as they must either be gathered direct from the tree by the pigs or be blown off in numbers by a wind storm. The death of three sows in the Mundubbera district following the eating of green berries has been recorded. The berries when ripe are quite soft and are easily digested in the stomach of pigs.

Single trees in a pig yard may not cause much trouble, as when pigs have constant access to small numbers of berries as they fall losses are rarely recorded. However, if there are a number of trees present or few pigs, and large numbers of berries fall, the pigs are likely to become engorged and die. Such a circumstance may occur following a wind storm, when more berries than usual fall. Losses are commonly sustained when pigs are allowed access to free range containing white cedar trees after having been penned up. There are records of a sow and litter of nine, 21 out of 25 weaners and nine store pigs being lost on different properties in these circumstances.

Symptoms.

Symptoms are rarely observed, as animals are usually found dead. Variable symptoms have been described on occasions when sick pigs have been observed. These include nausea, vomiting, violent colicy pains and bloating, followed by diarrhoea, sweating, uncertain staggering gait and in some cases, prostration, intense thirst and convulsions. Death is usually preceded by respiratory embarrassment, as indicated by rapid breathing and a bluish discolouration of the skin, and death is due to asphyxia.

These symptoms are considered to be due to two toxic principles present in the berries, one, an alkaloid nerve toxin, producing excitement, and the other interfering with the oxygenation of the blood stream.

Post-mortem Findings.

No significant lesions are seen on post-mortem examination. Gastro-enteritis as indicated by inflammation of the mucus linings of the stomach and small bowel is usually present. Haemorrhages may also be seen on the surface of the body organs—spleen, liver, kidney, heart, lungs, etc. The stomach contents reveal the presence of the berries, either partly digested or undigested.

Diagnosis.

As symptoms and post-mortem findings are not very characteristic, definite diagnosis must rely upon the presence of the berries in the stomach. These can usually be seen quite readily, but an odd case may be found in which vomiting has occurred and berries cannot be found.

Treatment.

No specific antidote is available with which to treat pigs. The use of an emetic followed by a purgative may be tried, but the condition is usually so well advanced before symptoms are seen that even if treatment is effective in removing residual berries those that have been digested and absorbed are still sufficient to cause death.

Control.

The obvious way of preventing losses is to remove the cause. This can be quite readily done by preventing access of pigs to large quantities of berries, either by fencing off the area during dangerous times, by harvesting the berries daily as they fall, or cutting down the trees.

Pigs may eat small quantities of berries daily without causing any undue ill effects and it is only when large numbers are consumed that trouble is experienced. The plant flowers in the spring and the berries are usually ripe about the end of summer, though they often remain on the trees after the leaves fall in winter. Thus, autumn and early winter are the dangerous periods for eating ripe berries. It has been estimated that suckling pigs about 5-6 weeks old would have to consume about 2-3 dozen berries before symptoms and death are observed. The quantity required to produce death in older pigs would, no doubt, be proportionate to size.

CORRESPONDENCE COURSES IN AGRICULTURE.

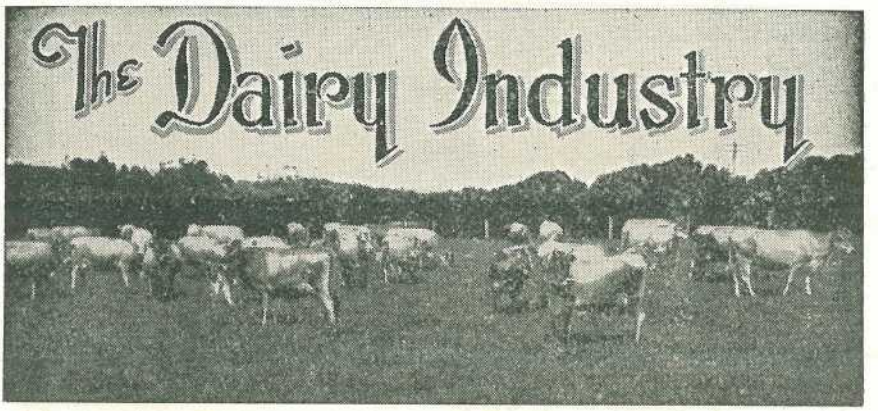
The Department often receives enquiries from people desirous of undertaking correpsondence courses in some form of agriculture. Such courses are provided by the Brisbane Technical Correspondence School, a unit of the Department of Public Instruction.

Courses are available in the following subjects:

Raising and Management of Dairy Cattle
Raising and Management of Horses
Pig Raising
Sheep
Poultry Farming
Agriculture I.
Agriculture II. (Tropical)
Milk and Cream Testing
Milk and Cream Grading
Buttermaking
Cheesemaking
Market Milk
Apiculture I. and II.
Wool Classing I. and II.
Farm Mechanics

A Certificate Course in Agricultural Science is also available through the School.

Further information may be obtained from the Supervisor, Brisbane Technical Correspondence School, P.O. Box 40, South Brisbane.



The Queensland Dairy Produce Acts.

Their Chief Provisions Affecting Dairy Farmers.

By E. B. RICE, Director of Dairying.

The advantages of maintaining a high standard in dairy production and manufacture are obvious to everyone engaged in the dairying industry.

The primary objects of the Dairy Produce Acts are to help in achieving this by prescribing provisions for safeguarding the quality and wholesomeness of milk and its derivatives. These provisions ensure adequate supervision over the manner in which milk and other dairy products are produced or manufactured, stored, distributed, and sold.

The attainment of these objects is provided for by the following means.

Dairy farms, factories, and depots have to be registered and are subject to inspection. Other kinds of dairy produce premises are also subject to inspection, but do not require to be registered.

Buildings and equipment have to conform with prescribed standards, and the production, manufacture, storage, distribution, and sale of dairy products have to be carried out under approved hygienic conditions.

Inspectors and other officers, who have been given wide powers for the enforcement of the Act, can be appointed.

The occurrence on dairy farms and in factories of certain specified diseases of persons, as well as outbreaks of certain diseases of dairy cattle on dairy farms, are required to be notified.

The keeping of dairy produce in unsuitable premises, the adulteration of dairy produce and the sale of unsound dairy produce or dairy produce which does not comply with prescribed standards of quality and composition are prohibited.

Milk and cream on receival at factories have to be graded and, if necessary, tested for butterfat or other constituents, and paid for by the factories according to volume or weight, as well as grade and test if converted into certain products.

Manufactured dairy products have to be packed and labelled according to quality and are subject to official grading.

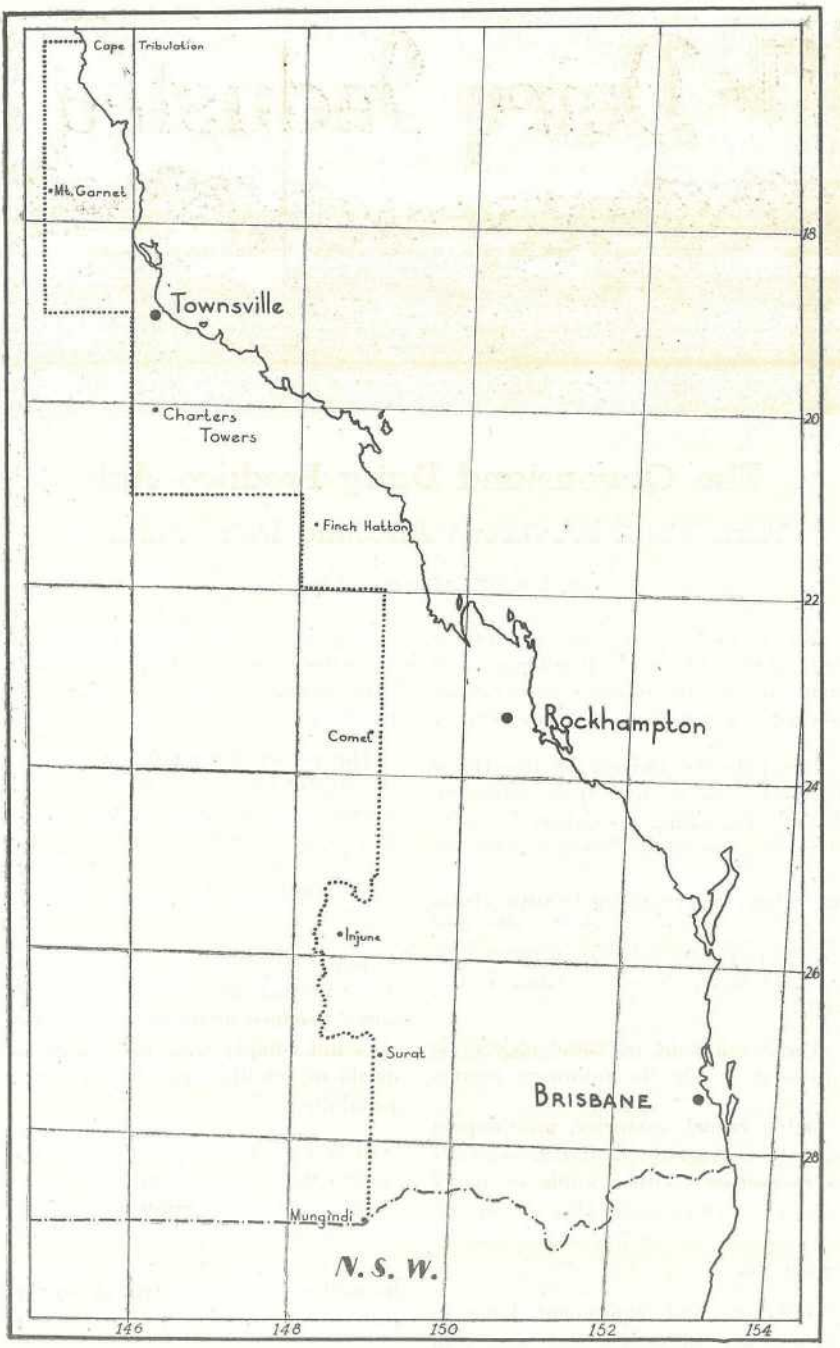


Plate 1.

All Farms in Queensland East of the Dotted Line Are Within the District Notified Under the Dairy Produce Acts.

Standards of composition and quality of dairy products and the materials used in their manufacture or treatment are prescribed.

Factory operatives who are engaged in performing certain skilled work must possess certificates of competency granted after an examination in the theory and practice of the respective subjects.

The transport of milk and cream from farms to factories is controlled by the notification of milk and cream routes and the licensing of carriers.

The original Act was passed in 1904. Amendments have been made from time to time to enable the Act to conform with changing conditions and developments in the dairying industry.

APPLICATION.

The Act applies in notified districts, which include all parts of the State where dairying is carried on to an appreciable extent as a commercial enterprise.

The proclaimed districts include all the coastal strip of Queensland from the New South Wales border to the Daintree River and the sub-coastal districts of the Darling Downs, Maranoa, Burnett, Dawson and Callide Valleys, and the Atherton Tableland. Plate 1 shows the boundaries of the districts in which the Act has been proclaimed.

The Act is not applicable to private dairies; that is, it comes into force only where dairy produce is distributed or sold.

All dairy produce premises come within the Act. These premises include dairy farms, factories, cold stores, depots and any place where dairy produce is distributed, treated, dealt with or sold. All factories, depots, cold stores and dairy farms must be registered, and other dairy produce premises, though not requiring to be registered, are subject to inspection. Certain standards in regard to buildings and equipment must be complied with before registration is granted or renewed. The registration of factories is renewable annually, but when once effected the registration of a dairy remains in force until it is cancelled. New butter and cheese factories can only be established by the consent of the Governor-in-Council.

REGISTRATION OF DAIRIES.

Any person who distributes or sells milk from a dairy which is not registered is liable upon conviction to incur a fine of up to £50. It is the responsibility of any person operating a dairy to have it registered. The necessary forms of application are available on request from any dairy officer or from the Department of Agriculture and Stock, Brisbane. On transferring ownership or occupancy, a person is required to complete a form of transfer of registration of the dairy to the new owner or occupier. Similarly, if dairying ceases to be carried on, application must be made for cancellation of registration.

The Act provides that a factory cannot be registered unless it is equipped with all necessary machinery and other facilities for the efficient manufacture or treatment of the particular kind of dairy produce to be handled, but does not require a dairy to comply fully with all requirements before registration is granted.

Registration of a new dairy is permitted if it has on it a milking shed in a reasonable state of repair, with an impervious concrete floor and so constructed as to enable efficient disposal of drainage. There must also be attached to the milking shed a room in a reasonable state of repair with a waterproof roof and an impervious floor. Adequate space must exist in this room for the proper cleansing and storage of utensils. Other requirements are a water supply at the dairy and a means of providing hot water for washing up purposes.

The standard or dairy hygiene and the quality of milk and cream produced must also be satisfactory.

If these requirements are met, a Dairy Officer may recommend registration of the dairy provided that milk or cream produced thereon will be supplied to a factory for manufacturing purposes. No dairy is, however, permitted to produce milk for the market milk trade—that is, for sale direct to consumers or a milk pasteurisation factory—unless it is registered and equipped with the primary essentials for milk production.

Where registration is granted to enable milk or cream to be produced for supply for manufacturing purposes, the farmer is obliged to bring his premises into full compliance with the requirements of the Act within a period of 12 months from registration. He otherwise renders himself liable to prosecution for breaches of the Act or the issue of an order by an inspector forbidding the removal or conveyance of milk or cream from his farm.

PRIMARY ESSENTIALS.

For the production of a perishable human foodstuff, such as dairy produce, there must be an insistence on the provision of certain buildings and equipment to ensure that, as far as practicable, contamination is avoided. The primary essential facilities required under the Act may be regarded as the following:—

Dairy Buildings.

On every dairy the owner must erect a suitable milking shed or bails, with an impervious floor and efficient drainage, in which to milk his herd. In addition, if a milking machine is used and unless it is driven by an electric motor, the engine must be placed in a room or a space between the bails and the milk room which forms part of the milking shed. An electric motor to drive the milking machine or an electrically-operated hot water boiler may be placed in a milk room.

A room for the separation or cooling of milk and the washing of utensils may be attached to the milking shed. Alternatively (and this would apply to a dairy where a milking machine is not installed), the separation or cooling of milk and cleaning of utensils may be done in a dairy house or on a veranda attached thereto.

Milk and cream may be stored in a milk room at the milking shed provided the cowyard is placed at the side of the milking shed so as to minimise contamination from dust, or if the cowyard is placed directly in front of the bails, its surface is concreted. If the cowyard is not so placed or concreted, milk or cream must be stored in a detached dairy house situated at least 30 feet away from the milking shed, or, in the case of milk only, in a covered milk stand.

A milking machine engine, which uses oil, wood, coal or other fuel, or a water heater which uses any such heating medium, is not permitted in a room where milk is cooled, separated or stored, or where utensils are cleaned or stored.

The milking shed and any room or dairy house used for the production or storage of milk or cream must have an impervious floor, be properly ventilated and lighted and be effectively drained. The drains must be continued for a minimum distance of 30 ft. from these buildings. Nothing other than milk or cream and utensils and equipment necessary for the purpose of producing milk or cream is permitted to be kept in a milk or cream room or a dairy house.

The minimum height of the walls in a milking shed is 7 feet. In other rooms used for dairy purposes it is 8 feet. All premises must be constructed so as to enable them to be thoroughly cleaned and, when required, painted or limewashed.

Most dairy sheds now being constructed conform with what is known as the Combined Dairy Building Plan

which is illustrated in Plates 2-4. It is not possible in this article to give further details of the construction and layout of dairy buildings, but full information, or copies of plans and specifications, can be obtained from Dairy Officers. It is suggested that any person who is contemplating the erection of new buildings, or the renovation of old ones, should consult the local Dairy Officer before proceeding with construction or alteration to ensure that the requirements of the Act are complied with. These officers can also give useful advice on the best situation for erecting buildings and constructing them with economy consistent with requirements for the particular conditions prevailing on the farm.

The Department allows some latitude in departing from the plans made available by it for the guidance of farmers in the construction of dairy buildings, provided the buildings conform with the essential requirements of the Act.

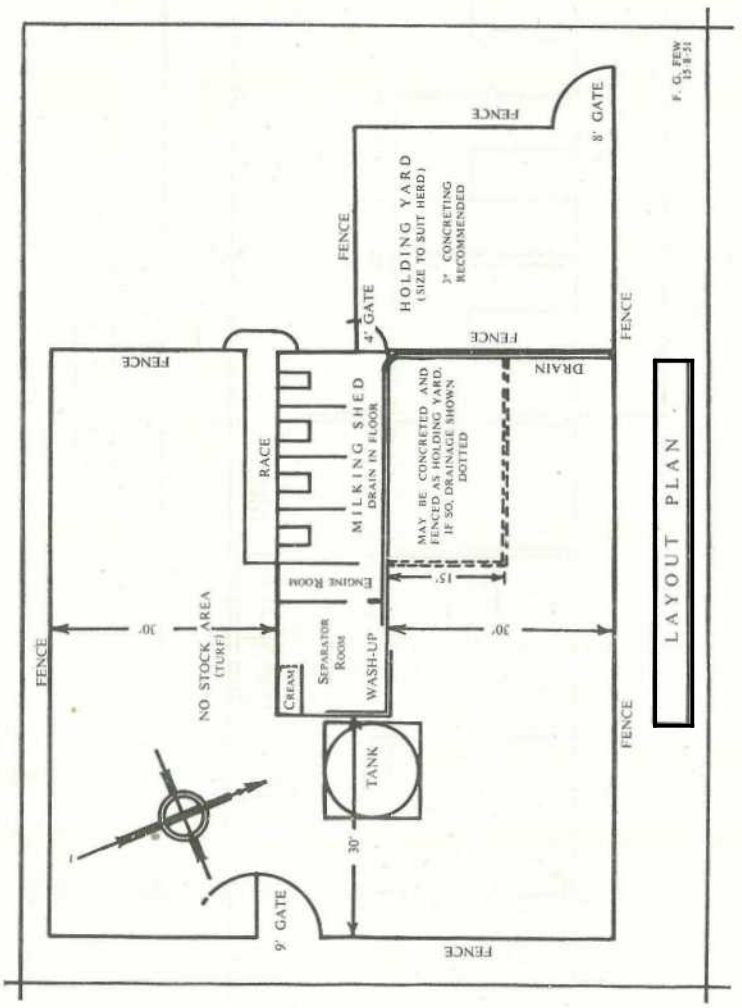


Plate 2.

A Good Layout of a Combined Dairy Building in Relation to the Yards.

Water Supply.

A tank or other approved means of water storage having a capacity of at least 2,000 gallons must be provided at the milking shed or the place where equipment or utensils are cleaned, unless an abundant and permanent supply of water of suitable quality for cleansing purposes is reticulated from a well, bore, or other source.

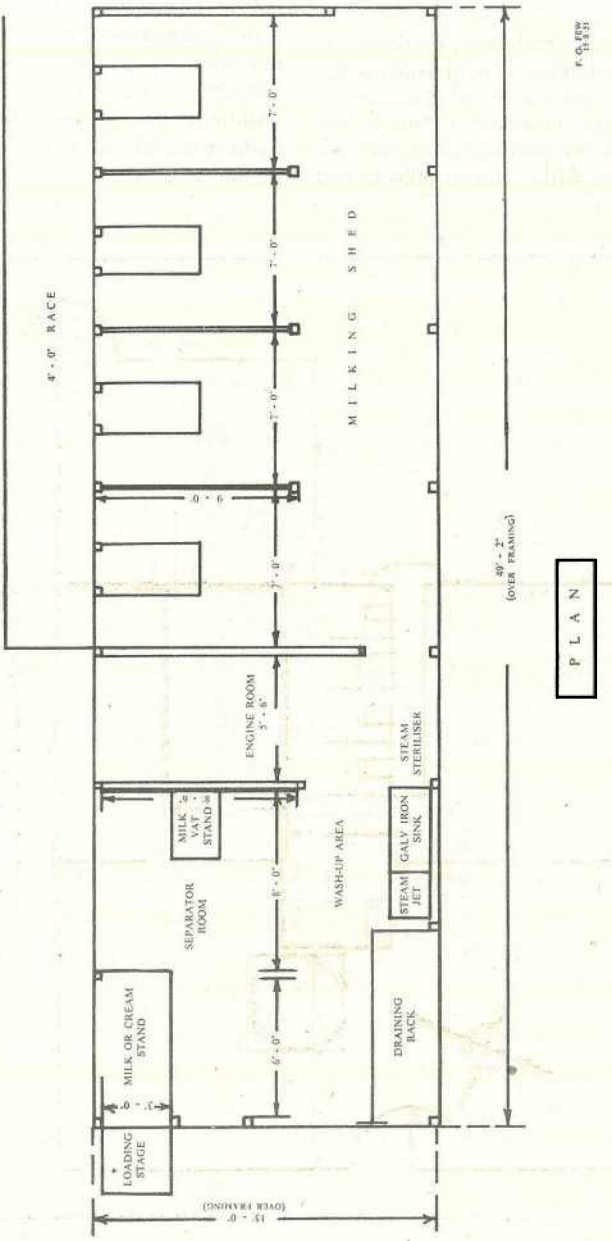


Plate 3.

Plan of An Approved Combined Dairy Building.

Hot Water Supply.

On a dairy which does not use a milking machine, a set-in boiler of not less than 12-gallons capacity must be provided within 15 feet of the milk room or dairy house if utensils are washed at the dairy house. On any farm where a milking machine is installed, there must be provided an approved steam sterilizer or water boiler having a draw-off capacity of not less than 14 gallons of water where the

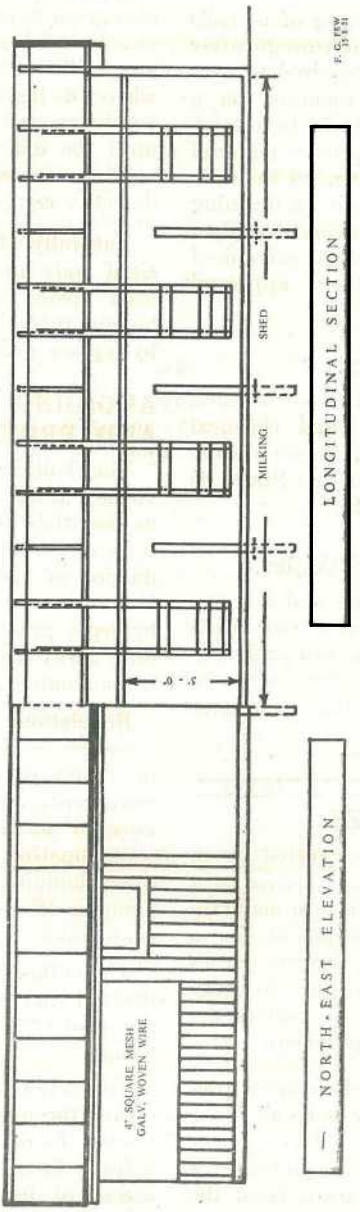


Plate 4.

North-east Elevation and Longitudinal Section of a Combined Dairy Building.

size of the milking machine is not more than 3 units, or not less than 18-gallons capacity if the machine has four or more milking units.

Wash-up Trough and Draining Rack.

For the efficient washing of utensils and their drainage and storage after washing, a farmer is required to provide in the wash-up room or on a veranda attached thereto or to a dairy house, a trough of approved material not less than 34 in. long, 20 in. wide and 11in. deep, fitted with a draining plug and a draining rack not less than 16 in. wide constructed of galvanised iron piping or other approved material.

Cleansers.

An adequate supply of brushes, detergents (cleansers) and chemical sterilants (chlorine compounds are the most commonly used in this State) is also needed at the dairy.

Milk or Cream Cooler.

A milk or cream cooler and a means of keeping milk or cream cool while it is held on the farm are other requirements. This matter will be dealt with in more detail at a later stage.

POWER TO HAVE PREMISES CLEANSED.

Strong powers are entrusted to an inspector to take prompt action on a dairy where a farmer fails to maintain his premises and equipment in a hygienic condition or persists in an attitude of refusal or neglect to carry out necessary work or to replace defective buildings or equipment.

In cases where uncleanliness prevails, an inspector may issue an order to have the premises and equipment forthwith cleansed or to prevent the removal of milk or cream from the farm and its conveyance to a factory or other place until the requirements of his order have been complied with.

If any premises, machinery, or utensils are unfit or defective for the purpose of dairy produce, an inspector may forbid their use either wholly or until the defects have been remedied to his satisfaction.

Authority to forbid conveyance is also given in order to prevent a farmer or a licensed carrier from transporting any milk or cream from any farm where the inspector considers there are ample grounds for closing the dairy until the dairy buildings and equipment have been thoroughly cleaned or defective equipment has been replaced.

Naturally, these powers are exercised only in cases where there has been gross neglect of hygiene or blatant refusal or neglect by a farmer to replace defective equipment.

AVOIDING CONTAMINATION AND PROTECTING QUALITY.

The buildings and equipment previously referred to can be regarded as essentials on every dairy farm, but it is, of course, necessary for the production of high quality dairy produce that the producer should adopt hygienic practices and keep the produce away from potential sources of contamination.

Regulations have accordingly been promulgated dealing with the situation of dairy produce premises and the conveyance and storage of dairy produce so as not to allow of probable contamination from any piggery, closet, building where animals are kept, manure, offensive trade, or any other contaminatory source.

The milking yard must be effectively drained and no part of it extend in front of a milk room or an engine room.

To prevent the spoilage of milk and cream through taints imparted from impure food, an owner is required to refrain from allowing cows to have access to impure water, rubbish or refuse or to be fed with musty, unsound, decayed, or taint-producing food. Dogs, cats, fowls, other

domestic animals or birds must not be allowed to remain in any separating room, milk room or dairy house.

Dairy produce intended for use as human food cannot be kept in any domestic room or any place or conveyance which might cause it to be unwholesome or injurious to health or deteriorated, or in any place where injurious smells or goods or materials may taint or contaminate it.

Where a farmer conveys the milk produced on his farm to a factory it must be covered with canvas or other approved material.

If cream is kept in a dairy house and unless it is held in a refrigerator, it is to be stirred once every four hours during the daytime.

As a precaution against contamination, minimum distances by which a dairy house or milk room and milking bails must be separated from certain other places on a dairy have been laid down. These minimum distances are:—

Place, &c.	Distance from Dairy.	Distance from Milking Shed.
	feet.	feet.
Dairy house	..	30
Milking Shed	30	..
Residence..	50	80
Stock	30	..
Stables	100	50
Sanitary convenience (except septic system)	150	150
Calves, calf pen	50	50
Fowlhouse	50	..
Manure	130	100
Pigs or piggery ..	150	150
Trap drain	30	30

Stagnant water is not to be allowed to remain in any position where it might lead to contamination of dairy produce. The milking shed, the milk room or a dairy must be kept in a clean and wholesome condition. The floor of the milking shed is to be thoroughly swept and cleaned after each milking, such work to be done not later than 11 a.m. in the morning and 8 p.m. in the evening.

All utensils, machinery and equipment used for dairy produce must be capable of being thoroughly cleansed and sterilized and must be cleaned after being used for such purposes. Apart from this cleaning after each period of use, the owner of a milking machine is required to completely dismantle and clean it at least once weekly.

Although the responsibility is placed on a factory or depot to clean all cans before returning them to suppliers, this does not relieve the farmer of the obligation of scalding cans again before reusing them. Forthwith on arrival at its destination any can which has been used to carry whey from a cheese factory must have the whey removed from it, be washed with warm water and finally near-sterilised with steam or boiling water.

CLEANING PREMISES AND EQUIPMENT.

Regulations have been drafted to deal with the use of clean water, receptacles and cloths for the washing and drying of the cows' udders and clean towelling for drying the milker's hands. All persons engaged in milking are required to wash cows' udders and their own hands at the time of milking, wear clean washable clothing and maintain personal cleanliness.

COOLING AND STORAGE.

The cooling of milk and cream is one of the most important aspects of quality control. The Act provides that

milk must be strained through cotton-wool, filter discs and cooled by a process and in a manner approved by an inspector. Cream, too, is required to be cooled.

Milk or cream must be stored in a milk room or detached dairy house, or, in the case of milk only, in a covered milk stand. Provision has been made, however, for milk or cream to be stored in some other place approved by an inspector if he is satisfied that any such alternative place of storage will keep it cooler. Such places include a charcoal cooling cabinet and a storage place provided by an extension of the water pit to a water cooling tower.

Protection of the milk or cream while standing in a dairy is provided for by requiring the cans to be covered by a lid made of flyproof brass woven wire of No. 12 mesh and No. 24 gauge, or other approved material, attached to an approved metal rim. This cover must be fitted in such a manner as to prevent rodents, insects and dust from entering the container.

OTHER PROVISIONS.

It is generally in the interest of economy and quality for milk and cream to be sent to the nearest factory. A farmer who wishes to divert his supply or portion of his supply of milk or cream from one factory to another is required to give 28 days' notice of such intention to the factory he is supplying. There is, however, special provision made for a farmer to divert from supplying cream to a butter factory to sending milk to a cheese factory without giving any such notice.

It should be noted that the Act does not prevent a farmer from changing his factory, but it does stop him from doing so without first giving notice to the factory to which his supply is being forwarded.

If any farmer feels that he is dissatisfied with the grading or testing of his milk or cream at a factory, he is entitled to request a check or test grading by an officer of the Department.

The farmer is, of course, relieved of giving notice of diversion of supply if such diversion was necessitated by circumstances over which he had no control.

Definite powers for the orderly control of the transport of milk and cream from farms to factories have been provided. These have been designed to eliminate overlapping in the transport of milk and cream and to overcome other disabilities which existed prior to legislative control, such as persons with unsuitable vehicles operating a service and unfair practices amongst factories in the competition to attract suppliers.

There is no need to discuss here the powers conferred by the Act in regard to transport, other than to mention that any farmer may convey milk or cream produced on his own farm to a factory, but he cannot carry any milk or cream of other persons along a notified route. This may appear to be arbitary, but if a carrier is prepared to provide a regular and satisfactory service it can only be successful if the service is supported by all dairymen on the route.

CONCLUSION.

Large-scale factory manufacture of dairy products has developed in Queensland on a more extensive scale than in any other country with a tropical or subtropical climate. Queensland butter is renowned for its good body and texture, and the quality of pasteurised milk available compares favourably with that of countries with much cooler climates. There is no doubt that the regulatory control of the industry under the provisions of the Dairy Produce Act has played an influential role in these achievements, which have been to the benefit of the dairying industry, consumers and the economy of the State.

The Supplementary Feeding of Sheep in Queensland.

Part 4. How Does the Plane of Nutrition Affect Adult Sheep?

By G. R. MOULE, Director of Sheep Husbandry.

Changes in the plane of nutrition affect adult sheep in many ways. Fluctuations in liveweight are the most obvious to many people. However, the fineness of the wool and actual composition of the fleece may also be altered.

Adult sheep usually fatten when the grass is green after summer rain. They may lose weight again when the grass dries off towards the end of the year. If winter rains fall, as they commonly do in the southern part of the State, the fresh growth of herbage helps the sheep maintain their weight. Even if winter rains do not fall, the sheep in some districts are able to graze edible trees such as mulga, and this helps them maintain their weight.

Provided they are not very large, changes in body weight have little adverse affect on wethers. However, their market value might decrease, especially if they are to be sold as fats. The rate of wool growth may also be decreased.

However, changes in body weight may have a serious effect on ewes that are in lamb. During the last two months of pregnancy the lamb that a ewe is carrying grows quickly. This means that in-lamb ewes have to provide for two instead of one! To do this they require more food, and if the quality of the pasture is falling off and is insufficient to meet the requirements of their lambs and themselves they draw on their own reserves of body fat.

Before these can be used to feed the growing lamb and to provide the energy its mother requires to forage, they have to be changed into different kinds of chemical substances. These changes take place in the liver, but sometimes, when the demands made upon the liver exceed its capacity, the ewe becomes poisoned.

Some of the substances produced by imcomplete chemical changes circulate in the blood stream. The ensuing condition, which is frequently called "twin lamb disease," is more accurately named pregnancy toxaemia. It can be responsible for heavy losses amongst pregnant ewes and it can be prevented by supplementary feeding.

Another condition that is commonly seen when in-lamb ewes have insufficient feed is known as milk fever. Like

twin lamb disease, this term is inaccurate, as it does not indicate the true nature of the disease. Milk fever occurs when the amount of lime circulating in the blood falls below the normal level. When this happens, the sheep become dull and paralysed and they may die within 24 hours of symptoms first being noticed.

Insufficient lime in the food is one of the causes of milk fever. During the late winter and early summer of years when no worthwhile winter rains fall the grass does not contain enough lime to meet the sheep's requirements. Therefore they draw upon the mineral stores they keep in their bones. Although these reserves are very large, a shortage of lime in the blood is likely to occur, especially when the sheep are subjected to stress, such as pregnancy, starvation or driving. Making sure the sheep have sufficient lime in their food is one way of preventing this condition.

Diet and Wool Production of Adult Sheep.

In experiments undertaken by C.S.I.R.O., adult sheep were given a daily ration containing 1 oz. of digestible protein. Others were given a daily ration containing 8 oz. of digestible protein. This second group produced nearly 2½ times as much wool as the first.

Although the difference between the amounts of protein fed to the sheep may seem to be extreme, a similar sort of thing does occur in Queensland. When the grass contains 5% of protein, about one-third of this total amount may be available to the sheep. A sheep eats about 48-50 oz. of grass a day, so that it might digest only one-third of 5/100 of 50 oz., which equals 0.8 oz. of protein a day.

C.S.I.R.O. has shown that such a low protein intake may affect wool production in several ways.

Firstly, it may cause the fleece to become finer. A strong-woolled Merino that grew a 60-64's fleece might produce one containing fibres of 100's count. The way in which this happens is shown in Fig. 1. The left hand side of the diagram shows the comparative size of the fibres produced from the primary follicles when the sheep are well fed, and later when they are poorly fed. When the sheep were well fed these fibres have an average diameter of 28.3 microns—this represents a 50/56's count. When the sheep were poorly fed the primary fibres had an

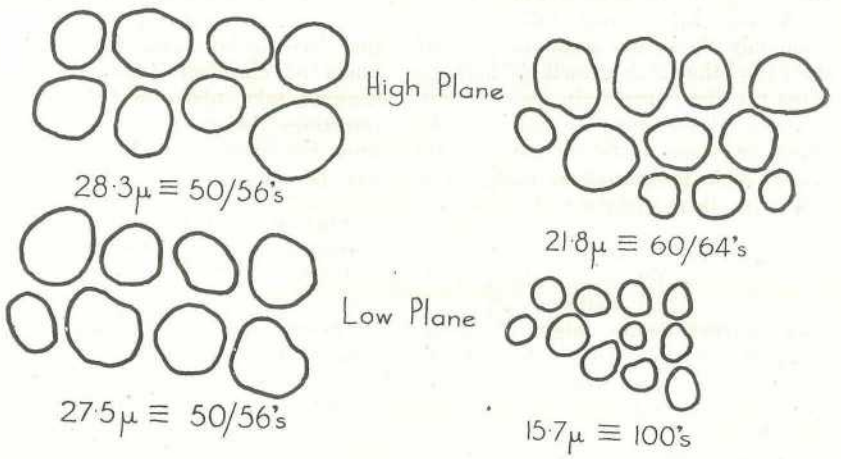


Fig. 1.

Effect of the Plane of Nutrition on Primary (left) and Secondary (right) Fibre Thickness in an Adult Strong-woolled Merino.

average diameter of 27.5 microns; this also represents a 50/56's count. The fibres growing from the secondary follicles had an average diameter of 21.8 microns (a good 60-64's count) when the sheep were well fed, but it fell to 15.7 microns (100's count) when the sheep were poorly fed. As a result, the weight of the fleece decreased and the fleece itself became uneven.

If conditions become severe enough some of the secondary follicles may cease producing wool, so the sheep loses density and the fleece becomes thin and wefty. The length of the staple may also decrease and sometimes the fleece becomes tender.

The effects upon fibre diameter on the way sheep are fed can be judged further from Fig. 2, which compares the results obtained in one C.S.I.R.O. experiment designed to study the effects of good and poor feeding upon the diameters of the fibres grown by Merino and Corriedale sheep.

One group of animals from each breed was well fed for about 18 weeks. The other group from each breed was fed poorly. The groups were then

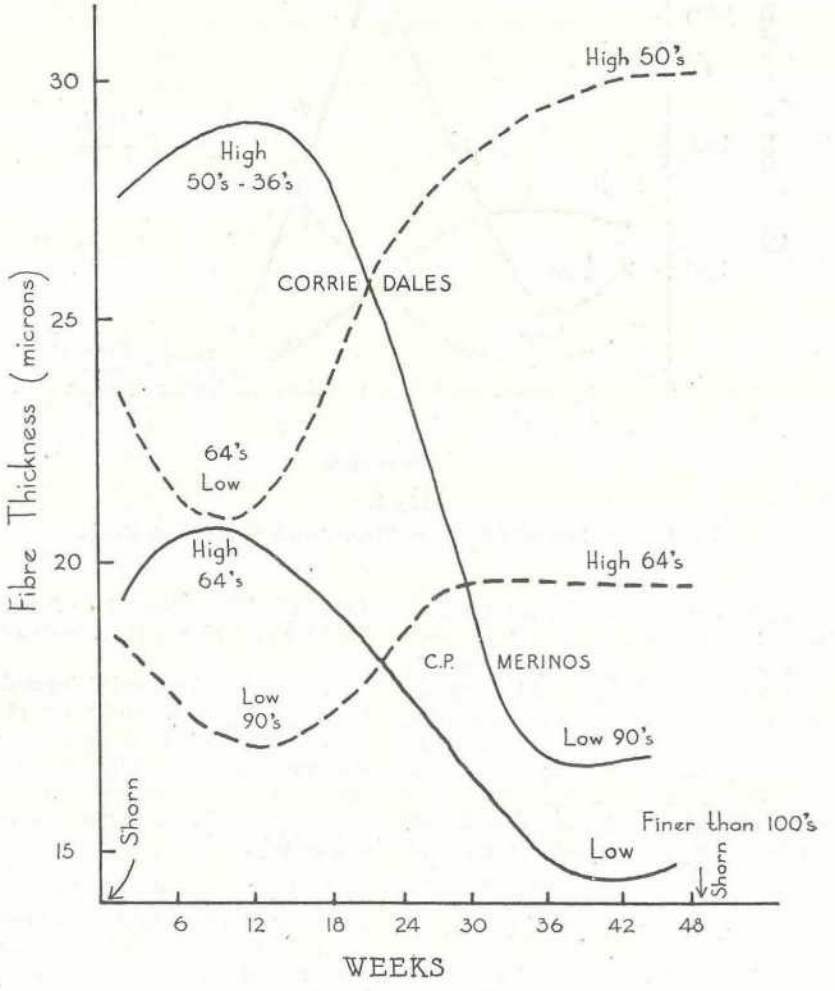


Fig. 2.

Effect of the Plane of Nutrition on Fibre Thickness in the Adult Sheep.

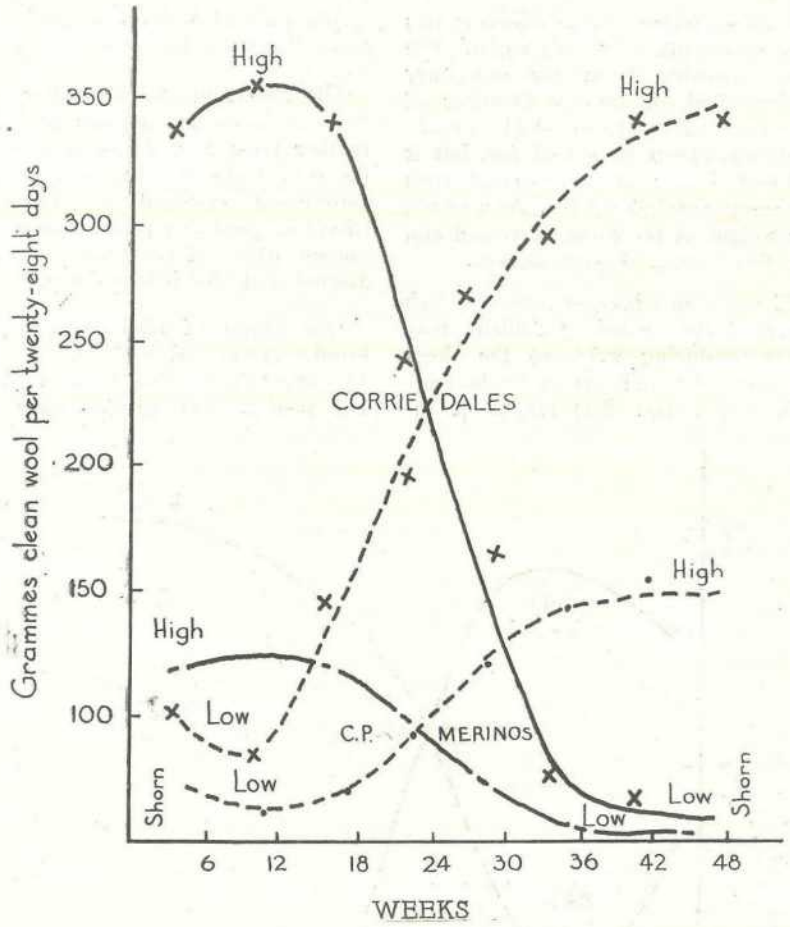


Fig. 3.

Effect of the Plane of Nutrition on Wool Growth in the Adult Sheep.

changed over, so that the groups that were well fed became poorly fed and those that had been poorly fed initially were well fed at the end of the experiment. The well-fed Corriedales produced wool that was almost 30 microns in diameter and was between 36's and 50's count. However, by the 48th week of the experiment (that is, 30 weeks after the change from good to poor feeding) the average fibre diameter had fallen to about 17 microns and the count had risen to a 90's.

Similarly, the Merinos that were well fed grew wool with an average diameter of 21 microns (a 64's count), but this changed to finer than 15 microns in diameter and higher than 100's count.

By contrast, the Corriedales and the Merinos that were poorly fed at the commencement of the experiment grew fine wool to start with but within 12 weeks of being given good feed they grew wool of 50's and 64's count respectively.

Fig. 3 compares the amount of wool grown by the sheep in the same experiment. The wool was shorn every 28 days and it was carefully scoured. The clean scoured wool production of the Corriedales fell from 350 grams

per 28 days (that is, 12 lb. 8 oz. per year) to about 60 grams each 28 days, or only 2 lb. per year. Similarly, the rate of wool growth of the Merinos fell from an equivalent of about 4 lb. 8 oz. of clean scoured wool per year to 1 lb. 8 oz. per year.

The rate of clean wool production by the Corriedales that were poorly fed rose from the equivalent of about 3 lb. per year to 12 lb. per year when they were well fed. The Merinos that received this treatment rose from about 2 lb. per year to 5 lb. of clean scoured wool per year.

Contrary to popular belief, the percentage yield of clean scoured wool fell as the feed became poorer. This occurred in both the Corriedales and Merinos and the way it happened is shown in Fig. 4.

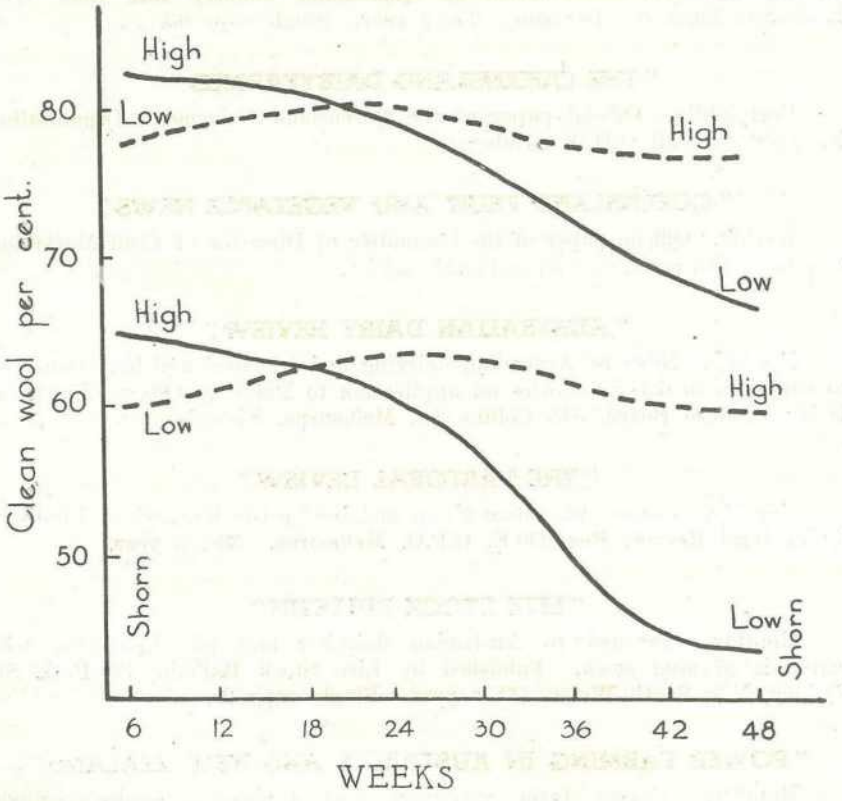


Fig. 4.

Effect of the Plane of Nutrition on the Yield of Clean Scoured Wool.

SHOW DATES.

Wondai	.. .. ..	Sept. 2–3	
Imbil	.. .. ..	Sept. 2–3	
Canungra	.. .. ..	Sept. 3	
Nerang	.. .. ..	Sept. 10	
Beenleigh	.. .. ..	Sept. 16–17	
Brookfield Country Fair		Sept. 17	
Kenilworth Bushmen's Carnival	.. ..	Sept. 24	
Mt. Tamborine	.. ..	Oct. 1	

Selected List of Farm Periodicals.

"THE PRODUCERS' REVIEW"

Monthly. Large section devoted to cane-growing, but deals also with other crops and dairy farming. Special sections on answers, legal, motoring, farm home and junior farmers. Published by Producers' Review Co., G.P.O. Box 1079 N, Brisbane. 15s. a year. Single copy 1s. 6d.

"QUEENSLAND COUNTRY LIFE"

Weekly farm newspaper. Covers the pastoral industries, dairying, pigs, poultry and crops. Published by Queensland Country Life Ltd., Wool Exchange, Eagle St., Brisbane. 25s. a year. Single copy 6d.

"THE QUEENSLAND DAIRYFARMER"

Fortnightly. Official paper of the Queensland Dairymen's Organisation. Distributed to all Q.D.O. members.

"QUEENSLAND FRUIT AND VEGETABLE NEWS"

Weekly. Official paper of the Committee of Direction of Fruit Marketing. Covers C.O.D. activities and technical articles.

"AUSTRALIAN DAIRY REVIEW"

Monthly. News of Australian dairying and technical articles. Sent free to suppliers to dairy factories on application to Publicity Officer, Australian Dairy Produce Board, 515 Collins St., Melbourne, Victoria.

"THE PASTORAL REVIEW"

Monthly. Covers Australian sheep and beef cattle industries. Published by Pastoral Review, Box 230 E, G.P.O. Melbourne. 39s. a year.

"LIVE STOCK BULLETIN"

Monthly. Devoted to Australian dairying and pig industries, with emphasis of stud stock. Published by Live Stock Bulletin, 39 Park St., Sydney, New South Wales. £1 a year. Single copy 2s.

"POWER FARMING IN AUSTRALIA AND NEW ZEALAND"

Monthly. Covers farm machinery and vehicles. Service sections. Published by Power Farming, G.P.O. Box 1813, Sydney, New South Wales. 30s. a year. Single copy 2s. 9d.

"COUNTRY HOUR JOURNAL"

Monthly. Contains selected A.B.C. rural talks. Published by The Country Hour Journal, Watson House, 9 Bligh St., Sydney, New South Wales.

"BETTER FARMING DIGEST"

Monthly review of progress in farming science and practice. Published by The Sydney and Melbourne Publishing Co. Pty. Ltd., 27 Alberta St., Sydney, New South Wales. 24s. a year.