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R. Kennard, Collar Stud, Warwick
A. C. H. Gibbons, Mt. Glorious
A. Kanowski, "Exton," Pechey
L. C. and E. Wieland, Lower Cressbrook

Tamworth.

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F. N. Hales, Kerry road, Beaudesert
T. A. Stephen, "Withcott," Helidon
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A. Herbst, "Hillbanside" Stud, Bahr Scrub, *via* Beenleigh
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R. H. Coller, Tallegalla, *via* Rosewood
A. J. Potter, "Woodlands," Inglewood
D. V. and P. V. Campbell, "Lawn Hill," Lamington
S. Kanowski, "Miecho" Stud, Pinelands
N. R. Potter, "Actonvale" Stud, Wellcamp
L. C. and E. Wieland, Lower Cressbrook

Wessex Saddleback.

W. S. Douglas, "Greylight" Stud, Goombungee
C. R. Smith, "Belton Park" Stud, Nara
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
J. B. Dunlop, "Kurrawyn" Stud, Acacia road, Kuraby
R. A. Collings, "Rutholme" Stud, Waterford
M. Nielsen, "Cressbrook" Stud, Goomburra
G. J. Cooper, "Cedar Glen" Stud, Yarraman
"Wattledale Stud," 492 Beenleigh road, Sunnybank
Kruger and Sons, "Greyhurst," Goombungee
A. Scott, "Wanstead" Stud, Grantham
G. C. Burnett, "Rathburnie," Linville

Tuberculosis-Free Cattle Herds.

The studs listed below have fulfilled the conditions of the Department's Tuberculosis-free Herd Scheme to 30th April, 1957.

Breed.	Owner's Name and Address.
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, "Grovely," 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
	A. H. Webster, "Millievale," Derrymore
	W. H. Sanderson, "Sunlit Farm," Mulgildie
	R. A. and N. K. Shelton, "Vuegon" A.I.S. Stud, Hivesville, via Murgon
	R. R. Radel & Sons, "Happy Valley," Coalstoun Lakes
Ayrshire	L. Holmes, "Benbecula," Yarranlea
	J. N. Scott, "Auchen Eden," Camp Mountain
	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
	D. J. Pender, "Camelot," Lytton road, Lindum
	S. E. G. Macdonald, "Freshfields," Marburg
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
	G. L. Johnson, "Old Cannindah," Monto
	A. Ruge & Sons, Woowoonga, *via* Biggenden
	G. Miller, Armagh Guernsey Stud, Armagh, M. S. 428 Grantham
	N. H. Sanderson, "Eden Valley," Monto
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
	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. Meir 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. Cramb, Bridge St., Wilsonton, *via* Toowoomba
	G. & V. Beattie, "Beauvern," Antigua, Maryborough
	J. A. & E. E. Smith, "Heatherlea" Jersey Stud, Chinchilla
	W. C. M. Birt, "Pine Hill" Jersey Stud, Gundiah
	T. Nock, Dallarnil
	P. Fowler & Sons, "Northlea," Coalstoun Lakes
	F. Porter, Conondale
	H. M. State Farm Palen Creek
	B. T. Seymour, "Upwell" Jersey Stud, Mulgeldie
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

What Can Sheep and Wool Extension Contribute?

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

Wool has always been Queensland's most important single export commodity. Almost £A900 million worth, including Joint Organisation stocks, has passed over Brisbane's show floors since auction selling commenced in 1898. During the last decade alone wool has earned £A483.5 million for Queensland.

Practically all of our wool is sold overseas; therefore the income it produces is important to everyone—even to those who feel they have no association with the sheep industry. Fortunately this point of view is shared by those who form national policy.

The State has established an extension service for the sheep industry; the Commonwealth has contributed from Wool Funds to further its development. The industry too has paid its share through levies under the Diseases in Stock Acts, and during recent years between £40,000 and £50,000 has been spent annually in Queensland on sheep and wool extension.

But what has been the return from this investment in the extension service? Firstly, let us be clear in our minds as to what an extension service really is. It aims at doing more than transmitting to the industry the findings of research. It aims at helping the industry define its own problems and develop a logical attack upon them.

Fortunately the sheep industry is always anxious to help itself. It has developed despite losses from periodic droughts, and from parasitism during good seasons. It has survived periods of low prices, and it has used available capital to develop the natural resources of some of the 185 million acres of semi-arid pastoral land it occupies.

During more recent years this has been facilitated by taxation concessions. Thus expenses of clearing timber and establishing grass or grazing crops are, for taxation purposes, deductions from income. Similarly, the cost of permanent improvements for the provision of water and fencing to control pests can be deducted from income before taxation. Most of the outlay for equipment required to carry out the work on a property can be written off in five years. These measures have assisted to develop and equip properties during the last few years. The original terminal date for these arrangements has been extended twice; the present terminal date is 1959, though in a few instances it is 1960.

The State has furthered development by encouraging the provision of additional watering facilities and the more intensive use of the available land. This has been evidenced in the past by the granting of long-term developmental leases, and more recently by increasing the flow of information through the extension services. These have aided the woolgrowers to overcome many problems.

It is here the extension service has played its vital role. Blowfly strike in sheep may be cited as an example. This first occurred in Queensland in 1883. During the ensuring 60 years it caused serious loss to the industry. By 1941 reasonably efficient methods of preventing strike were available,

and an intensive campaign was launched to assist woolgrowers to apply them. However, strike that started upon the shoulders or back of a sheep during prolonged wet weather still remained a problem. It is more than likely, for instance, that the wave of body strike in 1950 cost the Queensland sheep industry no less than £10 million. Since then a number of additional insecticides have become available. When used in conjunction with such methods as the Mules operation, these will give extremely effective protection against blowfly strike. The extension service has publicised these results and helped woolgrowers apply proven methods of preventing blowfly strike. In the choice of methods alone, the service has helped the industry effect outstanding economies, while the savings in the national income derived from the prevention of blowfly strike are beyond accurate estimate.

There are approximately 14 million sheep in areas where body lice usually occur. It is hard to get accurate data about the cost of lice infestation to the sheep industry. It has often been estimated by wool-brokers that lice infestation reduces returns by as much as 25 per cent. The extension service has been successful in focussing the industry's attention on this source of loss. It has also helped further the adoption of adequate control measures. These can be achieved by the annual expenditure of something like £300,000 on labour and insecticides. Failure to control lice could cost the industry anywhere between £12 million and £14 million annually.

Progress resulting from sheep breeding is comparatively slow because both wool quality and fleece weight have to be maintained. By selecting sheep on their appearance it is hard to speed up the rate of improvement in their cut per head beyond about one-third of an ounce per head per year. However, this can be trebled by using fleece measurement as an aid to selection. The extension service provides these facilities and has explained their use to flock master and stud master alike. As a result, the rate of genetic improvement of Queensland's sheep has been increased. The use of these facilities by stud masters can add an extra ounce of wool per head per year to the cut of Queensland's sheep. Spread over the State's flock this means something like a cumulative £300,000 a year to our income.

Drought is the oldest and largest problem facing the sheep industry in Queensland. It would have taken over 100,000 tons of maize, grain sorghum or wheat to feed sufficient ewes to maintain average numbers in each shire between 1943 and 1950. This would have cost between £2 million and £3 million. Since then, sheep and wool extension has helped popularise the conservation of silage and bush hay. Probably 36,000 tons of silage are already in pits in central and north-western Queensland. However, it would have taken 10 times this amount to maintain ewe flocks between 1943 and 1950. Had it been available this would have reduced feeding costs to a little over £1 million, allowing for the addition of a meatmeal supplement. In contrast, the sheep saved by feeding would have earned an additional £19 million from the sale of wool alone.

These are just some of the problems that extension has helped the industry tackle. It's not hard to draw up a balance sheet and to show the return the State receives from its annual investment in the sheep and wool extension service. To do so you would have to put a cash value on such things as worm control, improved fertility and better land use. But extension is not concerned with cash values alone. It encourages in sheep men a will to increase their skills and improve their methods. It helps them share with one another an eagerness to define their problems and to attack them where they are—within the industry itself.

Nitrogen-Phosphate Fertilizer for Grass

By G. J. CASSIDY, Adviser in Agriculture.

"When I first came to this district the paspalum was over the fence. What has happened to it?"

Anyone who lives in the coastal dairying country of south-eastern Queensland must have heard this question. Where has it gone, indeed? We cannot avoid the fact that the yield of good grass from our best dairying land is getting less season by season.

The question is, then, what to do about it. This article does not provide a complete answer. It points out that by the moderate use of chemical fertilizer something can be done about this problem.

The decline in yield from paspalum and kikuyu paddocks is due largely to the decline of available nitrogen and phosphate in the topsoil. When the fertile scrub land was first cleared 50-60 years ago these two elements were available in large quantities. The land was cleared, burnt and planted with grass seed. Nature did the rest. The paspalum grew prolifically and farmers had few feed worries.

In the intervening years much of this original fertility has been sold off the farm as dairy produce. Also, however, much of the nitrogen has been washed out of the soil by constant rains during 50 wet seasons.

The nitrogen is easily taken away by drainage water because the form in which it is available to the plant is very soluble. Phosphate is relatively stable unless the soil is of light texture, but nevertheless soil phosphate has been reduced over the years. Thus the rich store of these elements built up in the topsoil by

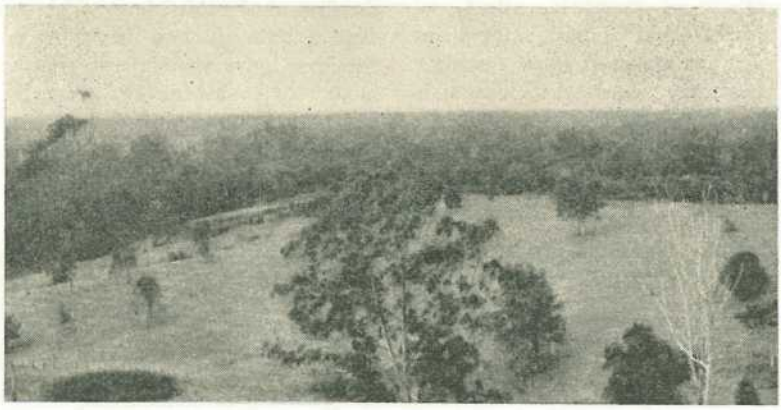

Plate 1.

Typical Hillside Paspalum and Mat Grass Pasture in the Cooroy District. This type of pasture responds to spring renovation and fertilizing. On the distant slope may be seen contour furrows for moisture conservation.

the original scrub has been whittled down. It could not be expected to last for ever.

Other elements such as calcium have also been lost by leaching or by removal in dairy produce. Loss of calcium results in increasing acidity, and the pH status of these coastal dairying soils now varies from 5.0 to 5.6—that is, from acid to moderately acid.

On much of the country where reduced pasture productivity is occurring the situation is being remedied by the planting of clovers after topdressing with lime and superphosphate.

The clovers, of course, are legumes and therefore not only provide high quality feed but improve the nitrogen content of the soil as well. Unfortunately, they are limited in their use. They are winter and spring-growing plants which require adequate soil moisture at that time of the year. On the steeper, shallow hillside soils this moisture just does not accumulate and clovers are of little practical use. It follows then, that if this source of nitrogen cannot be obtained, another must be found.

Chemical nitrogen in such forms as sulphate of ammonia, nitrate of soda, urea and liquid anhydrous ammonia can be used as a fertilizer for pastures, but the economic aspects of such treatments must be considered. Sulphate of ammonia and superphosphate fertilizer mixtures have been applied on a small scale to pastures in the Gympie district with encouraging results.

Trial Results.

During 1953-54 small cutting trials were established on a typical unproductive paspalum pasture. The fertilizer used was a mixture containing equal parts of sulphate of ammonia and superphosphate.

Three rates of application were used—160 lb., 320 lb. and 480 lb. per acre, respectively. The fertilizer treatments were applied in the spring, at the beginning of the paspalum growing season.

During the season two cuts were made from each treatment, and the yield of each treatment worked out in terms of dry grass hay per acre. A summary of results is presented in Table 1.

A glance at the table will reveal an increase in pasture yield for each 160 lb. bag of mixed fertilizer applied. It will also reveal that the second bag applied resulted in a greater increase in yield than either the first or the third bag. This means that a rate of two bags of mixed fertilizer gave the highest return for money expended on fertilizer.

TABLE 1.

YIELD INCREASES FROM FERTILIZERS.

Season.	Fertilizer Treatment.	Yield of Air-dry Hay per Acre.	Increase over Unfertilized Pasture.
		Lb.	Lb.
1953	Unfertilized	3,200	..
	160 lb. N/P mixture	5,080	1,880
	320 lb. N/P mixture	7,280	4,080
	480 lb. N/P mixture	9,120	5,920
1954	Unfertilized	2,320	..
	160 lb. N/P mixture	3,380	1,060
	320 lb. N/P mixture	4,710	2,390
	480 lb. N/P mixture	5,170	2,850

TABLE 2.

COST OF FERTILIZING PASTURE.

Bags per Acre.	Increase of Air-dry Pasture per Acre over Untreated Area.	Cost.	Cost per Ton of Air-dry Pasture.
	Lb.	£ s. d.	£ s. d.
1	1953 1,880	2 5 0	2 14 0
	1954 1,060	2 5 0	4 15 0
2	1953 4,080	4 10 0	2 9 0
	1954 2,390	4 10 0	4 4 0
3	1953 5,920	6 15 0	2 11 0
	1954 2,850	6 15 0	5 6 0

Costs.

It is important to know what extra pasture growth will cost. This nitrogen-superphosphate mixture cost £2 5s. (local price 1956) per bag of 160 lb. and the costs of extra hay produced are shown in Table 2.

In both seasons the cost of extra grass was least at the rate of 2 bags per acre—in 1953 £2 9s. per ton and in 1954 £4 4s. per ton on an air-dry basis. The greater yield during 1953 was due to seasonal differences. Compared with the value of hay of equal quality, this additional grazing would be cheap at £4 4s. per ton, and very cheap at £2 9s. per ton.

Time to Apply.

The nitrogen in the applied fertilizer all becomes available over a period of 10-12 weeks. As it becomes available to the pasture it is also subject to leaching by heavy rains, in the same way as the original soil nitrogen. It would not, therefore, be advisable to use this fertilizer at the beginning of the wet season in February. Much of the nitrogen in the soil solution could be lost instead of being used by the grass.

The best time to apply these nitrogen-rich fertilizers is early in the growing season (during October or

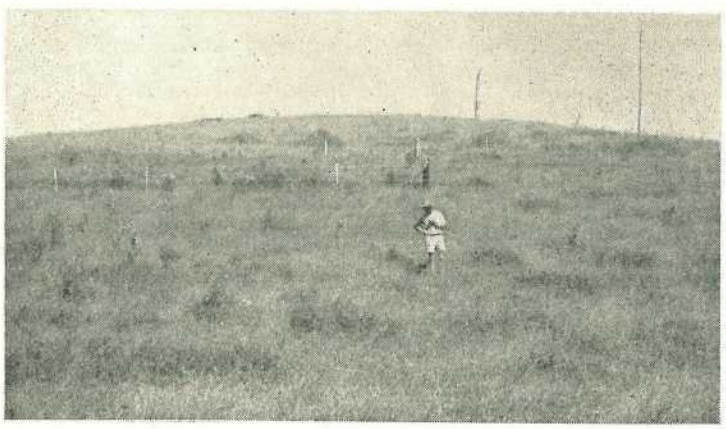

Plate 2.

The Results of Fertilizing a Run-down Paspalum and Mat Grass Pasture. Picture shows the end-of-season growth on a hillside pasture following renovation and fertilizer application.

November) or at the end of the wet season in late March or early April. This means that the extra bulk of grass is obtained and the fertilizer used to the best advantage.

Other Effects.

Better grasses, such as paspalum and kikuyu, respond to nitrogen-rich fertilizers more vigorously than inferior pasture species such as mat grass. Under conditions of increased fertility the inferior pasture species tend to be crowded out. This effect can be noticed around manure patches in night paddocks and cattle camps.

Management.

With the use of nitrogen-rich fertilizers it is possible to restore hillside pastures to something like their original vigour. In order to use the extra grass to the best advantage a planned programme of grazing management is necessary. An example of such management is the storage of surplus pasture from the topdressed paddocks as hay or silage. This can be fed out in times of inevitable shortage of grazing on the farm.

Problems relating to the utilization of improved pastures in south-eastern Queensland are receiving attention at the present time.

WATCH OUT FOR GIANT SENSITIVE PLANT!

Some importations of centro seed have been found to contain small quantities of seed of giant sensitive plant, and landholders intending to plant centro, one of the State's most valuable tropical pasture legumes, would be well advised to check on the purity of the seed they purchase, stated the Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) recently.

The only commercial sources of centro seed are overseas. Because of the potential danger of introducing the giant sensitive plant into new districts, even in small quantities, in tropical legume seed, the giant sensitive plant was recently declared a prohibited weed seed under the Agricultural Standards Act.

No comparable action has been taken elsewhere in Australia. Consequently, some North Queensland landholders who bought imported centro seed from another State have brought seed of the giant sensitive plant on to their properties. For example, a small patch of this pest introduced in this way has been found in the Ingham district.

All farmers who have planted centro seed during the last 12 months are asked to check their pastures to see if the pest has appeared. Once detected, it should be destroyed immediately. Farmers who have centro seed on hand are advised to have it examined for seeds of the giant sensitive plant before sowing it. Those who are making purchases of centro seed or, in fact, of any imported tropical legumes, either should buy from Queensland-held stocks that have already been sampled and passed by the Standards Branch of the Department, or should submit a sample of the seed to the Standards Branch for examination. Such tests are free when the seed is to be sown by the person submitting the sample.

With regard to the giant sensitive plant in pastures, early recognition is essential. The leaves are bright green and feathery, and they fold up when touched. The plant grows into a big sprawling scrambler with square stems carrying numerous sharp, hooked thorns. It can remain as a bush 3–4 ft. high, and it can also grow into thorny thickets impenetrable to stock.

Giant sensitive plant can be destroyed by hand-pulling in the young stages, by grubbing or by spraying. Although it is readily killed by all of the common weedkillers, including hormone preparations, so also is centro. For this reason, spot spraying is recommended where giant sensitive plant in pastures is being tackled by sprays.

Landholders who are not familiar with the weed should send specimens of suspected plants to the nearest officer of the Department, or direct to the Government Botanist, Department of Agriculture and Stock, Brisbane, for identification.

Lucerne Investigations on the Biloela Regional Experiment Station

By J. H. TEAKLE, Experimentalist, Regional Experiment Stations.

Investigations into lucerne growing have been carried out on the Biloela Regional Experiment Station in the Callide Valley during the past five years. The Hunter River variety has been used and it has been shown that this lucerne is the outstanding perennial legume tested at the Station.

Palatable and of excellent fodder value, the lucerne plant with its deep rooting system is able to withstand dry conditions yet make heavy growth when moisture is plentiful. This variety is also sufficiently frost resistant to make growth possible throughout the year in this climate.

Lucerne can be used as a valuable protein supplement to grass pastures for the maintenance of high production of dairy cows, and for growing or fattening beef cattle. As a drought reserve, irrigated lucerne can be regarded as a cheap high-protein fodder in this district. Grown in association with grass, lucerne has been found to improve both the nutritive value and the longevity of active production of a pasture and, at the same time, increase the yield and the annual growth period.

SOILS.

The soils on the Biloela Regional Experiment Station are of the Callide Valley alluvial types which originally carried blue gum, Moreton Bay ash and broadleaf (or silverleaf) ironbark, with some black wattle and poplar box. Soils which carried a large proportion of poplar box are the least suitable for lucerne on account of being tight shallow clay loams with a relatively impermeable subsoil.

Those soils which give best lucerne growth typically show a sandy or sandy loam subsoil below 2–3 feet, and thus allow faster infiltration of rain and irrigation by virtue of their better drainage. It is possible, however, to have a big variation in soil type within a small area.

Although lucerne is capable of utilizing a large amount of water, the crop is very susceptible to excessive water, particularly in the summer. Areas liable to flooding or waterlogging, or with a very shallow water table, should therefore be avoided.

The ideal soil for lucerne production appears to be a fertile free-draining soil which has a permanent water-table at some depth. On such soils it is possible to maintain lucerne in good production for 10 years without the use of irrigation. Extensive areas of soil of this type have not been available on the Biloela Regional Experiment Station, but lucerne has been grown successfully in pure stands lasting 3–4 years under rain-grown conditions.

Rainfall.

The average annual rainfall at the Biloela Regional Experiment Station over the past 30 years has been approximately 28 in. This rain is predominantly summer in distribution, with over 70 per cent. of the total falling in the six months

October to March inclusive. However, the irregularity of the rainfall, particularly in autumn, winter and spring, means that best results with lucerne can be achieved with supplementary irrigation.

RAIN-GROWN LUCERNE INVESTIGATIONS.

Under natural rainfall conditions annual yields of lucerne can be very variable in this district, depending as they do on the amount, type and distribution of rainfall. During the first year of growth on deep fertile land that has been fallowed sufficiently, yields up to 7 tons of hay per acre have been obtained in the investigations. In subsequent years yields have averaged 2–3 tons of hay per acre per annum.

Row and Sward-Grown Lucerne.

Previous trials at this Station have indicated that satisfactory stands of rain-grown sward lucerne cannot be maintained for more than 3–4 years. (Sward lucerne is lucerne sown broadcast or in closely spaced rows.)

More recent investigations have shown that cultivated rows of grass spaced 42 in. apart produce more material and can be maintained longer than grass grown in swards. Accordingly, the merits of growing lucerne in swards and in cultivated 42 in. spaced rows have been compared in the present programme of investigations of this crop.

Total yields in a comparison of 42 in. row-spaced and sward lucerne over 3½ years from June 1950 to December 1953 favoured sward lucerne under rain-grown conditions. However, a study of particular yields during dry periods indicated that growth in cultivated 42 in. spaced row lucerne continued longer during these dry periods. It is possible, therefore, that row-cultivated lucerne will give greater seasonal yields than sward under an annual rainfall of less than 25 in.

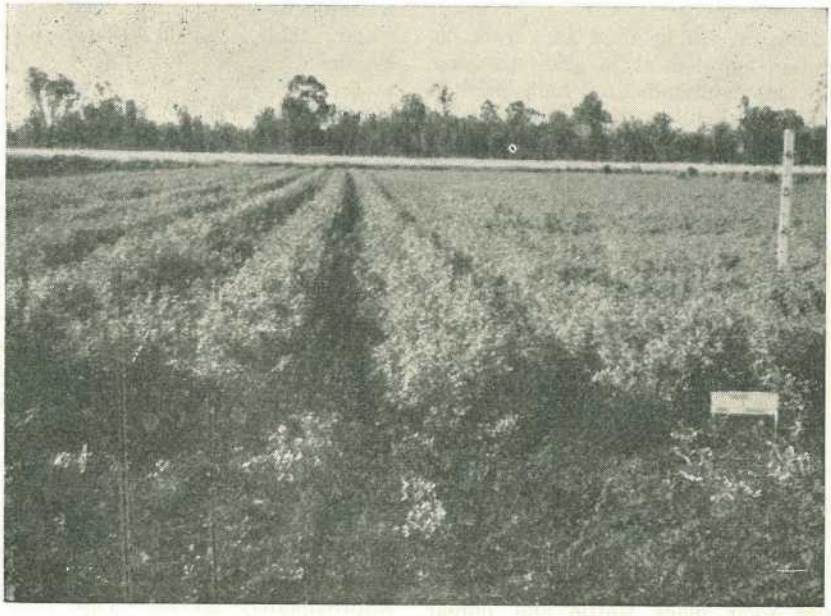

Plate 1.

Lucerne in Cultivated Rows and in Sward at Biloela Regional Experiment Station.

With annual rainfall conditions of 25-30 in., total seasonal yields will probably be slightly in favour of sward lucerne, the sward being superior when good rain is received and the rows leading in dry periods.

In years experiencing more than 30 in. of rain, sward lucerne can be expected to yield more heavily than row lucerne and this advantage in favour of the sward will increase in proportion to the amount of water available.

Row Lucerne.

Under Callide Valley conditions, lucerne grown in cultivated 42 in. spaced rows will give a more regular growth than sward, especially when the rainfall is irregular. This superior growth in dry times can be extremely valuable for livestock. Weed control is also much more effective and the life of the stand, under either rain-grown or supplementary irrigation conditions, is likely, therefore, to be much longer in rows than in sward. Development of the plants in row lucerne has been observed to be superior to that in sward lucerne in dry times, and regrowth after grazing or cutting has been more rapid.

However, on the heavier alluvial soils the row-cultivated lucerne has been less suitable for haymaking than the sward-grown, as clods of soil left after a recent cultivation may be raked up with the hay and also some hay is lost in the depressions between the rows.

Another feature of row-cultivated lucerne is that the improvement of the structure of the surface soil over a period that takes place with sward lucerne cannot be expected under row lucerne due to the destructive action of the cultivating operations.

W. G. Robertson, in an article in this Journal for September, 1954, estimated the cost of each inter-row cultivation to have been approximately 3s. 6d. per acre on the Darling Downs in 1952 and that 3–4 cultivations per year are necessary. This extra cost, which is now approximately 15s. per acre annually, must therefore be debited against row-cultivated lucerne.

Sward Lucerne.

Sward lucerne that received 25-30 in. or more of water annually in fairly regular amounts will give a greater annual yield than row lucerne. In the Callide Valley, sward production will exceed row production during the rainy period and will be less during drier periods, but will still normally give a slightly greater annual production than will the 42 in. row lucerne. The greater the amount of annual water available, the greater the advantage the sward maintains. For this reason, lucerne that is to receive supplementary irrigation will be more productive if grown in the sward.

IRRIGATED LUCERNE INVESTIGATIONS.

In view of the possibilities of substantial development of individually owned supplemenatry irrigation facilities in the Callide Valley, investigations in irrigated lucerne have been conducted at this Station since April 1950. The source of water has been from a well equipped with a pump delivering 10,000–12,000 gallons per hour applied through portable 4 in. spray lines.

Water Requirements.

Under conditions of ample moisture, lucerne has been found capable at this Station of utilizing 7½ in. of water per month during the summer and over 70 in. per year. Investigations have shown that the most efficient use of water by the lucerne plant occurs when the monthly water supply is in the vicinity of 6-7 in. in the summer. Below 6 in. per month in this period, the efficiency of production to water use drops rather quickly, so that each inch of water produces progressively less lucerne as the amount of available water is reduced.

The efficiency of water use to yield appears to be slightly better during the warmer months than in the colder months, but the difference has been slight.

It has been the practice to spray irrigate following cutting or grazing, and again, if necessary, before the lucerne becomes mature. Applications of 3 in. per setting of the spray line are generally used. This is as much as these soils will absorb without severe runoff, and under good conditions 3 in. of water wets the top 18 in. of dry soil to field capacity.

A rate of application of 1½ in. of irrigation per hour has been found to be too rapid on the relatively heavy alluvial soils, but halving that rate allows good penetration of the water and is thought to be the maximum rate advisable on soils comparable to those of this Station.

Yields.

Under conditions of ample moisture achieved with supplementary irrigation, lucerne is capable of a maximum production of 10 tons of hay per acre annually on this Station. The greatest production under these conditions is in the spring and summer. Autumn is a period of reduced vigour, and while growth is slow in the winter, good yields are obtained. During the 3-year period July 1952 to June 1955, the average production in the six months September-February was double that of the six months March-August, the crop having ample moisture at all times.

Under what might be termed "normal irrigation practice," when roughly 24 in. of irrigation (applied in eight irrigations each of 3 in.) supplements the 28 in. of rainfall, yields in the vicinity of 7½ tons of hay per acre per annum have been obtained.

Cost of Producing Hay.

Land preparation and planting costs estimated at £4 per acre, plus seed cost of £2 10s. per acre, give the approximate cost of £6 10s. to establish lucerne. The average life of the lucerne as a pure stand is four years, so the annual cost per acre of lucerne

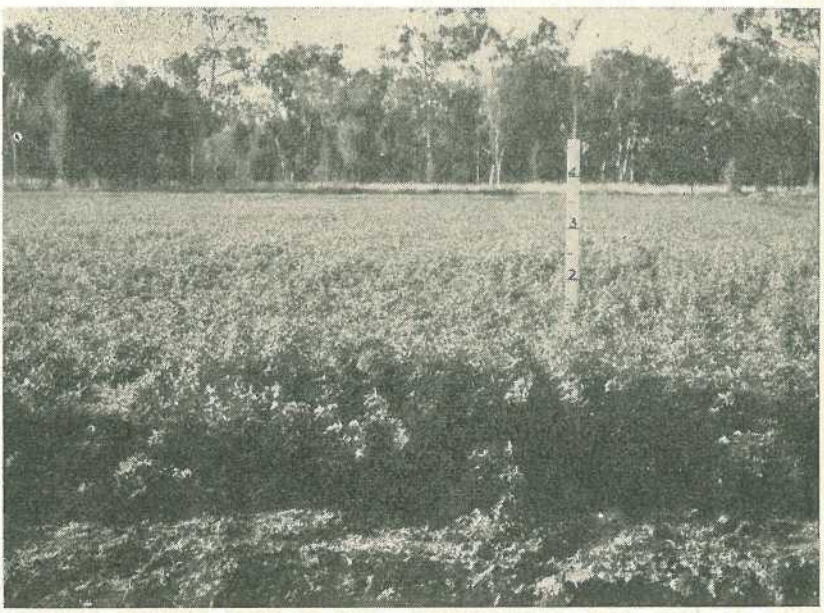

Plate 2.
Irrigated Hunter River Lucerne at Biloela Regional Experiment Station.

is £1 12s. 6d. Estimated land rental values of £2 10s. per acre per year, calculated as 5 per cent. of capital value of good irrigable land, bring the overhead charges to £4 2s. 6d. per year. Baling and handling charges approximate 3s. per bale of 80 lb. weight, which equals a cost of £4 4s. per ton of hay.

Based on a well equipped with diesel engine and centrifugal pump delivering 12,000 gallons per hour and ample 4 in. portable pipe-line with sprays having an effective cover of 35 ft., the cost of eight applications of 3 in. of spray irrigation per acre over 20 acres of lucerne is approximately 18s. per acre-inch. Data from the Gatton Irrigation Research Station indicate that the cost of border (or flood) irrigation —where it is practicable—is only 8s. per acre-inch.

Costs per ton of hay have been calculated from the above figures, using the average yields of 2½ tons per acre under rain-grown conditions, 7½ tons per acre under "normal irrigation practice" (24 acre-inches of irrigation annually), and 10 tons per acre under "maximum production" (40 acre-inches of irrigation annually), and are shown in Table 1.

TABLE 1.
LUCERNE HAY—PRODUCTION COST PER TON.

Rain-Grown Lucerne.	Irrigated Lucerne.		
	—	"Normal Irrigation Practice."	"Maximum Production."
		£ s. d.	£ s. d.
£5 17s. 0d. per ton	Spray Irrigation	7 12 6	8 4 3
	Border irrigation	6 0 6	6 4 3

Cost of Lucerne for Grazing.

The baling costs of £4 4s. per ton of hay material do not apply when the lucerne is grazed. Comparative costs per ton of grazed material are shown in Table 2.

TABLE 2.
GRAZING LUCERNE—COST OF PRODUCTION PER TON.

Rain-Grown.	Irrigated Lucerne.		
	—	"Normal Irrigation Practice."	"Maximum Production."
		£ s. d.	£ s. d.
£1 13s. per ton	Spray irrigation	3 8 6	4 0 3
	Border irrigation	1 16 6	2 0 3

Net Return to Producer.

Based on the data in Table 1 it would appear uneconomic to irrigate lucerne. However, the net return per acre is the final criterion, and the estimations expressed in Table 3 indicate the value of lucerne irrigation.

The arbitrary value of £10 per ton of hay material has been selected to represent the average value of both hay (*on the farm*) and grazed lucerne per ton of hay material. From this value the net return per acre under each of the different systems has been calculated. These approximate net returns per acre are included in Table 3.

TABLE 3.
NET RETURN PER ACRE PER ANNUM.

Hay.

Rain-Grown Lucerne.	Irrigated Lucerne.		
	—	"Normal Irrigation Practice."	"Maximum Production."
		£ s. d.	£ s. d.
£10 7s. 6d.	Spray irrigation	17 16 3	17 17 6
	Border-Flood	29 16 3	37 17 6

Grazing.

Rain-Grown Lucerne.	Irrigated Lucerne.		
	—	"Normal Irrigation Practice."	"Maximum Production."
		£ s. d.	£ s. d.
£20 17s. 6d	Spray irrigation	49 6 3	59 17 6
	Border-Flood	61 6 3	79 17 6

The greater number of tons of hay produced by the irrigated lucerne has thus meant that there is a greater net return per acre from the irrigated than from the rain-grown lucerne, despite the fact that there is a higher production cost per ton for the irrigated lucerne.

To receive the same net return per acre for hay as from grazing the hay price *on the farm* must be approximately £4 4s. per ton (which is the cost of baling) greater than the value per ton of hay material used for grazing.

It is pointed out, however, that variation in rainfall and crop response from year to year, as well as the type of irrigation system, cultural, seed and baling charges, prices, etc., all complicate the estimation of the costs. The above approximate figures are subject to variation from year to year.

SEEDBED PREPARATION.

Regular success has been achieved in obtaining a stand of lucerne where clean fallow has been maintained during the summer and the soil has been cultivated to a fine seedbed for planting.

Only a poor stand or complete failure has resulted, however, from a single working of ploughed grassland prior to planting. Subsoil moisture is very necessary for the successful establishment of the crop.

INOCULATION OF SEED.

Although successful nodulation has sometimes occurred without seed inoculation with a suitable strain of rhizobium, failures have resulted from the retardation of growth once the nitrogen supply provided by the fallow has been utilized. In one location where part of an area was planted with inoculated lucerne seed and the rest with uninoculated seed, the treated lucerne five months later was yielding more than three times as much per acre as that which was not treated.

It is therefore necessary, when lucerne is to be planted on land which has not previously grown lucerne, that the seed be treated with inoculum. This is supplied free on request by the Queensland Department of Agriculture and Stock.

Plate 3.

Grazing Lucerne at Biloela Regional Experiment Station.

PLANTING.

Planting is most successful when carried out with a small-seeds box on a drill or combine. An even depth of ¾–1½ in. is then possible in a fine moist seedbed, and a satisfactory stand of sward lucerne is obtainable with a sowing rate of 6 lb. per acre. In rows spaced 42 in. apart, 1-2 lb. per acre will give a good stand.

Broadcasting of the seed is an alternative method of sowing. With this method the sowing rate should be doubled to ensure a good even stand. and harrowing should follow sowing.

For a winter planting, lucerne may be sown with 10-20 lb. per acre of a grazing wheat such as Lawrence or Celebration, which is later grazed or made into hay or silage. In this case the wheat protects the lucerne seedlings to a certain extent from frost, but it also competes with them for moisture and plant foods.

Lucerne is most successfully planted in this district in late March and April. At this time temperatures are mild, soil moisture evaporation is less than in the summer, the rainfall is still fairly reliable and generally of low intensity, and the young lucerne crop does not have to compete with vigorous summer weeds and grasses until it is strongly established.

TIME OF CUTTING OR GRAZING.

During the warmer months the lucerne is cut or grazed when the crop is well in flower and there is growth of young basal shoots from the lucerne crowns. Lucerne does not flower during the cooler months in the Callide Valley and cutting or grazing is carried out when basal shoots are produced and the crop commences to lodge and appears mature.

Earlier cutting or grazing is inadvisable, resulting in weakening of plant vigour and reducing the longevity of the stand. The stand should not be grazed too close to the ground. These points are of importance particularly in the autumn and winter when growth is slower, and the practice of allowing the crop to mature thoroughly pays dividends in increased plant vigour in the following spring.

INSECTS AND DISEASES.

Jassid control with DDT soon after crop establishment has been the only insecticidal treatment necessary, and this is not a general practice. Although various other insects such as army worms, Heliothis and web spinner grubs may make isolated attacks, control normally can be effected by mowing or grazing. The lucerne crown-borer beetle has been noted in small numbers on occasions, but this pest apparently does little damage.

Several diseases are encountered in lucerne and affect the crop with varying degrees of intensity. Black spot, downy mildew (or blue mould) and rust appear regularly but can be controlled when necessary by early mowing or grazing before infected material such as leaves has fallen to the ground. Anthracnose, which occurs particularly on the stem and is controlled in the same way, is only occasionally encountered but is capable of a big reduction of yield in the warmer months. Witches' broom, a virus disease in which a profusion of fine stems and leaves is produced, normally affects, and later kills, isolated plants in an area. No practicable control is known.

DURATION OF PRODUCTION.

Weed competition after 2–3 years becomes a problem in sward lucerne, especially in the autumn.

It is likely that in the Callide Valley ploughing out of rain-grown lucerne after 3–4 years (when weed and grass competition becomes severe), followed by cropping for several years, or oversowing the lucerne with valuable grass species

such as green panic, will be more profitable than persevering with the lucerne or attempting to regenerate the stand.

However, it has been found in a trial at this Station that where irrigation is available, regeneration of stand can be achieved by the following method:—

Plough to get rid of weeds and grass and later disc when the ground is suitably moist, to prepare a satisfactory seedbed for oversowing broadcast lucerne seed. An excellent strike of lucerne can then be obtained with the regular use of irrigation, but it is not yet known how long this regenerated lucerne stand will resist further weed encroachment.

Attempts to control summer weeds such as khaki weed and grasses in sward-grown lucerne have not been particularly successful. Renovation of the old sward with narrow tines spaced about 12 in. apart may do more harm than good, particularly where khaki weed is a problem, apart from the temporary effect of improving moisture penetration. The renovation kills a certain percentage of lucerne plants as well as distributing and providing a seedbed for weed seeds, and generally has not achieved complete destruction of growing weeds.

LUCERNE IN THE CROP ROTATION.

An important factor in correct land use is the practising of rotations which allow of the maintenance of both structure and fertility of the soil. The results obtained in many countries indicate that the inclusion of pastures in rotation with crops in the farming programme most successfully achieves these objectives. This period of pasture, or pasture "ley" as it is known, may vary from three years upward according to the farm programme. Mixed grass and legume pastures appear to be the most efficient soil renovators, but pure lucerne in either 7 in. drills or broadcast will materially improve the structure and the fertility of the soil during a 3–4 year period of growth.

Accordingly, in the investigations at this Station, when the stand of pure lucerne has diminished sufficiently to affect yields, the area is well disced when the soil is moist, to destroy grass and other weeds present. Afterwards the area has been oversown with a suitable grass such as green panic. The resultant mixed pasture has been of superior quality and experiments are in progress to ascertain the period of usefulness of such pasture.

Lucerne was also used to improve the yield and quality of a grass-lucerne pasture by a different method. The procedure in this method was to plant the grass and lucerne in separate rows spaced 42 in. apart, two rows of grass to one row of lucerne, repeated over the field. Marked increase in yield compared with broadcast grass was obtained over a 3-year period. Details of the experiments were published in the July 1954 number of this Journal.

SUMMARY.

Lucerne has proved to be the outstanding perennial legume tested at the Biloela Regional Experiment Station and it has produced a protein-rich supplement for grass pastures. Grown with supplementary irrigation, relatively cheap production of high quality hay has been obtained. When weed and grass invasion has necessitated renovation of lucerne, valuable grass species have been successfully oversown in the resultant seedbed to provide excellent mixed pasture.

Rows of lucerne spaced 42 in. apart have shown certain advantages over sward lucerne when not irrigated in that there is a longer period

of growth in dry times and also greater longevity due to effective weed control. However, an outlay of at least 15s. per acre annually will be expended in most seasons on inter-row cultivation. The destructive action of this cultivation on the surface soil will not result in as much improvement in soil structure as is obtained under sward lucerne.

When rainfall exceeded 25 in. for the year, annual yields favoured sward lucerne, and any additional water applied increased the yield advantage of the sward over rows. Thus, greater annual productivity from sward lucerne is assured under irrigation.

The life of the rain-grown lucerne may be limited to approximately 3–4 years by death of plants and weed and grass encroachment. Although successful regeneration of the stand by oversowing is possible where irrigation is available, it is likely that the most satisfactory procedure after that stage is reached is to disc the lucerne when the soil is moist and oversow with green panic to establish a valuable mixed pasture. An alternative would be to plough out the lucerne and resume cropping to annuals.

Spray application of eight 3 in. irrigations annually—"normal irrigation practice"—produced an average of 7½ tons of hay per acre of sward-grown lucerne per annum over a 3-year period, this being treble the yield from rain-grown sward lucerne. Ten tons of hay per acre were obtained over the same period when lucerne was supplied with all the water it could utilize under a system of "maximum production." Irrigation greatly increased the net return under either spray or border irrigation.

GROWING DEMAND FOR HYBRID MAIZE SEED.

The demand for seed of Queensland hybrid maize varieties is increasing, Mr. A. A. Ross (Standards Officer, Department of Agriculture and Stock) said recently. Production in 1956 exceeded 9,900 bushels, and there are indications that the whole seed crop will be sold.

The growing popularity of hybrid maize is a healthy sign in the industry. It is clear evidence that more farmers are realising that hybrids have the ability to produce higher yields than open-pollinated varieties.

The high yield of 37 bus. per acre was an outstanding feature of last year's seed crop. It showed a marked increase over the 25·6 bus. per acre harvested in 1955 and 29·6 in 1954. These yields, of course, do not include the grain produced from the male tassel rows. This grain, which is harvested for stock food, is normally about one-quarter of the total yield of a crossing plot.

Two grades of hybrid maize seed are now being certified. One has a germination of 80–89 per cent. and the other of 90–99 per cent. In the 1956 crop, 87 per cent. of the seed certified fell into the 90–99 per cent. category. This is a notable achievement, as the weather at harvest time was not ideal.

Mr. Ross said producers of certified hybrid maize seed should realise that it is in their own interests to produce seed with the higher germination.

Pea Varieties in Southern Coastal Queensland

By D. DOWDLES, Horticulture Branch.

In Queensland, peas are grown commercially for sale as a fresh vegetable. The industry is not extensive, for the crop can be produced satisfactorily only during the cooler months. Nevertheless, from the 1,000 or so acres planted each year, some 50,000 bushels of peas are harvested.

Climatic Requirements.

The pea is essentially a cool climate crop. In the Stanthorpe district, plantings are made either in early winter for a spring crop or in early spring for an early summer crop.

In southern coastal Queensland, plantings are restricted to autumn and early winter. In this area, spring plantings are hazardous owing to the harmful effects of rising temperatures as the crop approaches maturity. Nevertheless, speculative sowings of a quick-maturing variety at this period of the year are sometimes profitable.

Commercial varieties of pea have been developed in temperate climates. Production in Queensland therefore involves the growing of a cool climate plant in a subtropical environment. Even when locally selected varieties and strains are available, commercial production must be restricted to the cooler months and to a number of districts where the soil and climatic conditions are known to be satisfactory for the crop.

The pea plant is fairly tolerant of low temperatures but cannot stand severe frost. Moreover, temperatures which are not sufficiently low to injure the vine may damage the flowers and pods and reduce yields.

On the other hand, the crop is very sensitive to temperatures above 80 deg. F. High temperatures not only shorten the growing period but also interfere with pollination and are therefore sometimes responsible for an excessive number of poorly filled and unattractive pods.

Commercial Varieties.

Pea varieties are classed as early-maturing or late-maturing types according to the length of the period from planting to harvesting. They differ from each other in vine characteristics as well as in pod shape, size, texture, colour and the flavour of the peas themselves. Pod texture and colour are particularly important when the crop is sold on critical markets.

According to the variety, the vine may be dwarf, erect, semi-erect or sprawling. In the sprawling types, harvesting is difficult and the vines are prone to lodging and rots in wet weather. As in other crops, varieties differ in their resistance or susceptibility to specific diseases.

Two varieties have dominated the industry in southern Queensland for a considerable time. They are Greenfeast and Massey, which is also known as Little Gem, Earlicrop and Melbourne Market. Both have proved reasonably satisfactory under our local subtropical conditions.

A long growing period is necessary for high yields and good quality pods in the late-maturing Greenfeast. When planted on the coast in autumn, this variety develops a rather long vine (3–4 ft.) with a semi-erect habit of

growth, dense foliage and long pods. Yields are often disappointing, however, when the crop encounters adverse weather conditions during its development. The seeds are wrinkled, well flavoured and sweet.

Massey is an early-maturing, dwarf variety with rather sparse foliage. The pods are smaller than those of Greenfeast, lighter in colour and relatively straight. Under good growing conditions, this variety is not so heavy a cropper as Greenfeast. Nevertheless, it bears more consistently in both autumn and spring plantings. The short period from planting to the first pick (Table 1) is an advantage in subtropical areas, as it allows some latitude in planting times.

Varietal Trials.

Varieties of commercial interest in other States and overseas have been grown in comparative trials at Redlands Experiment Station during recent seasons. Some of these, such as Shasta, Canner 75, Emperor and Onward, are primarily canning types.

With canning varieties, characteristics such as pod shape, pod colour and growth habit are of minor importance, for the crop is harvested and shelled mechanically. However, a good canning variety must yield heavily, mature its crop in a relatively short period and produce seeds of uniform size, good colour and good flavour.

On the other hand, pea varieties grown for the fresh vegetable market must produce attractive pods with good colour, shape and texture as well as freedom from puffiness and abortive seeds. For ease of hand harvesting, which is an expensive and time-consuming operation, the vines should preferably be dwarf to medium in size, with supple stems and able to withstand the repeated handling associated with frequent picking.

Table 1 summarises the results obtained from autumn and spring trials with the two standard varieties—Greenfeast and Massey—and the introduced types. The recorded harvesting periods are striking and show decisively the effect of time of planting on time of harvesting and yield.

TABLE 1.

PEA VARIETAL TRIALS—REDLANDS EXPERIMENT STATION.

Variety.	Harvesting Period (Days from Planting).		Yield (lb./ac.).	
	Autumn.	Spring.	Autumn.	Spring.
Canner 75	81–117	63–77	5,849	2,072
Shasta ..	81–110	71–81	4,485	2,908
Emperor	109–120	67–81	3,837	2,316
Greenfeast	104–121	71–81	2,854	1,582
Massey ..	49–90	56–63	2,074	1,829
Onward ..	111–123	74–81	2,033	943

Varietal Characteristics.

The following comments on the several introduced varieties are based on their performance in autumn plantings in southern Queensland.

Shasta and Canner 75.—Late-maturing types which are very similar in appearance; vine growth vigorous, with leaders 4–6 ft. long. Harvesting period prolonged (29 and 36 days respectively). Subject to foliage damage and loss of pods during wet weather. Yields heavy but pod quality inferior to that of Greenfeast and Massey.

In spring plantings, the vines are less vigorous, the period to maturity is reduced and yields are substantially less than in autumn plantings.

Emperor.—A late-maturing type which is similar to Greenfeast in growth habit and period to maturity, but the pods are thinner skinned. Yields are generally greater than in Greenfeast.

Spring crops harvested in dry, hot weather produce excessive numbers of small pods with dull-coloured seeds which lack flavour.

Onward.—A late-maturing variety. Vines vigorous with leaders up to 5 ft. in length; pods coarse, puffy and unattractive, with few seeds in later picks. Yields low.

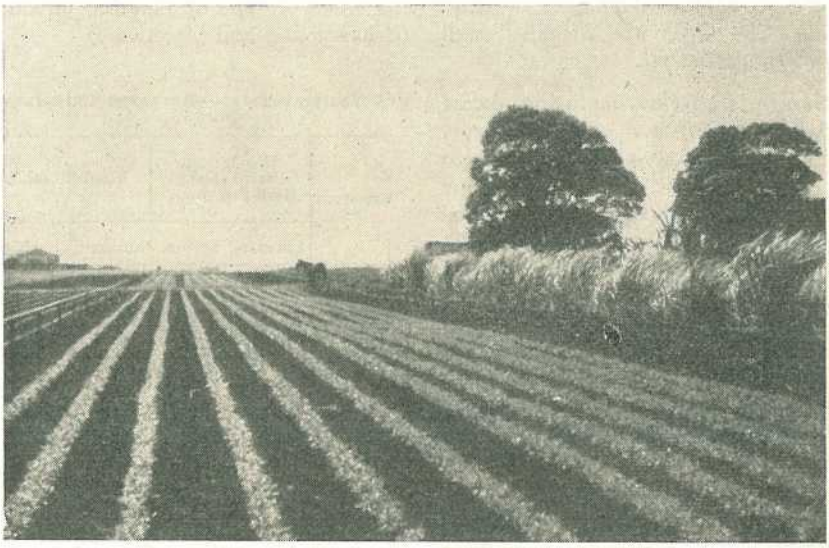

Plate 1.

Pea Crop Grown Under Irrigation in the Redlands District.

Plate 2.

Pea Variety Trial. Massey, a dwarf variety, in centre; Greenfeast, a semi-erect, late-maturing variety, at right.

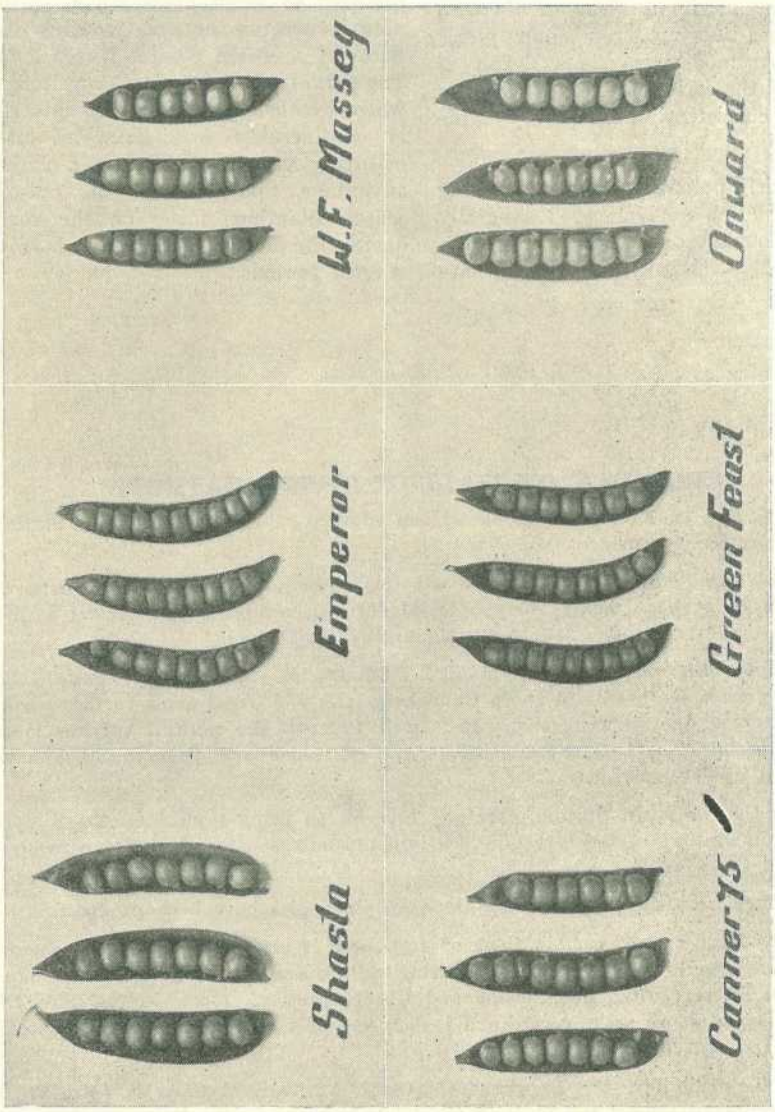

Plate 3.

Pod Characters in Pea Varieties. Note differences in pod shape and seed development.

Pod quality is extremely poor in the spring plantings.

Other Introductions.—Other varieties under observation in Queensland are Feltham First, Gladiator, Laxton's Superb, Meteor and Rei de Conserve. The only one of these which shows any promise is Meteor, an early-maturing variety with a dwarf, many-branched vine and attractive pods of excellent quality. Its cropping cycle is much the same as that of Massey but yields are slightly lower and the flavour of the seeds is less satisfactory. Lack of seed flavour is a normal characteristic in smooth-seeded varieties, of which Meteor is a typical representative.

Massey's Place.

Massey merits a niche of its own in the pea industry, even though yields are only moderate. This defect is offset by the early maturity of the crop and the consistently high quality of the pods.

The yield potential of early-maturing varieties such as Massey is generally less than that of late-maturing varieties. Nevertheless, the former are better adapted for the successional planting of small areas which is the normal practice in pea growing districts of southern coastal Queensland. The risk of total or partial crop failure when weather conditions are adverse is considerably less than in late-maturing varieties. This is a major advantage, particularly in out-of-season plantings made on the coast during the February-March and July-August periods.

FIELD DAY ON WALLUM INVESTIGATIONS.

Crops and pastures growing on wallum country at the Coolum Field Station were inspected at a field day on April 24.

The Station was opened four and a half years ago to investigate the manner in which the wallum country may be used for agricultural purposes, and initial trials have advanced sufficiently to be of interest to landholders.

Queensland's wallum country, about 2 million acres of low, sandy, coastal land stretching from the border to about Bundaberg with additional areas further north, is well served by rail and road. It is well watered, the rainfall varying from 40 in. to 60 in. a year. Deficiencies in plant foods and poor drainage have prevented its development.

The Coolum Field Station, carefully selected as being typical of the wallum lands, is the centre of the investigations into the nutritional and drainage requirements of these soils.

In fertilizer trials, satisfactory crops of pineapples have been produced.

Use of the correct combinations of fertilizers is also enabling a wide variety of pasture species to be grown. Promising results are being obtained with para, molasses, Biloela buffel, green panic and Rhodes grasses. Most successful of the tropical legumes are stylo, centro and kudzu, and of the temperate climate species lucerne and red clover are most promising.

At the field day, the Department's Chief Agricultural Chemist (Mr. C. R. von Stieglitz) discussed the aims of the trials and the results that are emerging.

Mr. A. McDonald (Soils Technologist) spoke of the nutritional requirements of the soils for the various pastures and crops and also discussed the drainage practices used on the Station. Mr. R. C. Cannon (Senior Horticulturist at Nambour) compared the performance of pineapples at Coolum with yields and practices in North Coast horticultural districts. Mr. G. D. Bowen (Assistant Pathologist) spoke on the search for suitable strains of inoculum for pasture legumes in these soils.

The Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) pointed out that the studies at Coolum are not concerned only with finding out how to grow crops in the wallum. It is also necessary to determine how the land can best be used in the interests of the State's overall economy, particularly in view of the proximity of transport and marketing facilities.

Fusarium Foot Rot of Cucurbits

By D. S. TEAKLE, Assistant Pathologist.

A foot rot of plants of the pumpkin or cucurbit family has been known in Queensland for many years, probably since 1919, when "sleeping sickness of pumpkins apparently caused by *Fusarium cucurbitae*" was recorded in the Department's Annual Report.

Since 1934, the disease has occurred in most years, with varying severity. In many plantings a small but continual loss has occurred throughout the life of the crop, gradually reducing the number of profitable vines remaining. In other cases the stand of seedlings has been so depleted that replanting has been necessary.

SYMPTOMS.

The obvious aboveground symptom of foot rot is a sudden wilting of the foliage. Examination of affected plants reveals that this is caused by an orange-coloured rot near ground level. In young seedlings, this rot often appears to originate near the seed. If diseased plants are pulled from the soil they come away easily, leaving the rotting roots behind.

THE CAUSE.

Investigations have revealed that the foot rot is caused by a fungus (*Fusarium solani* f. *cucurbitae*). The organism survives and spreads by means of both fungous strands and large numbers of spores.

In 1937, a Departmental pathologist showed that pumpkin (Queensland Blue), watermelon (Ice Cream), squash (Early White Bush Scallop) and marrow (Long White Bush) were susceptible to foot rot, but that cucumber (Early Fortune) was resistant. However, cucumber was attacked when seedlings were damaged above ground level and the fungus inserted into the wound. These results on the varietal reaction of cucurbits are supported by recent work by the New South Wales Department of Agriculture, in which many varieties of pumpkin, squash, marrow, watermelon and citron were found to be very susceptible to foot rot. Varieties of cucumber and rockmelon were generally less susceptible.

Fortunately, only the pumpkin is regularly attacked in Queensland.

REASONS FOR OUTBREAKS.

Evidence in Queensland and in other countries shows that the foot rot fungus is both seed-borne and soil-borne.

In the Kallangur district, near Brisbane, losses have been occurring for more than 20 years, and in this locality the fungus is believed to be well established in the soil. Under suitable conditions the fungus can attack and kill cucurbit plants by entering from the soil. The occurrence of soil-borne infection has been verified experimentally by raising plants in pots of soil to which the fungus has been added; in these cases a high proportion of plants has died.

The fungus can be introduced to areas free from foot rot by planting contaminated seed. Seed contamination usually results from the fungus entering cucurbit fruit from the soil and penetrating to the seed. If seed from rotting fruit is saved, some of it may contain the fungus and later give rise to diseased plants. On no account should seed be saved from rotting fruit.

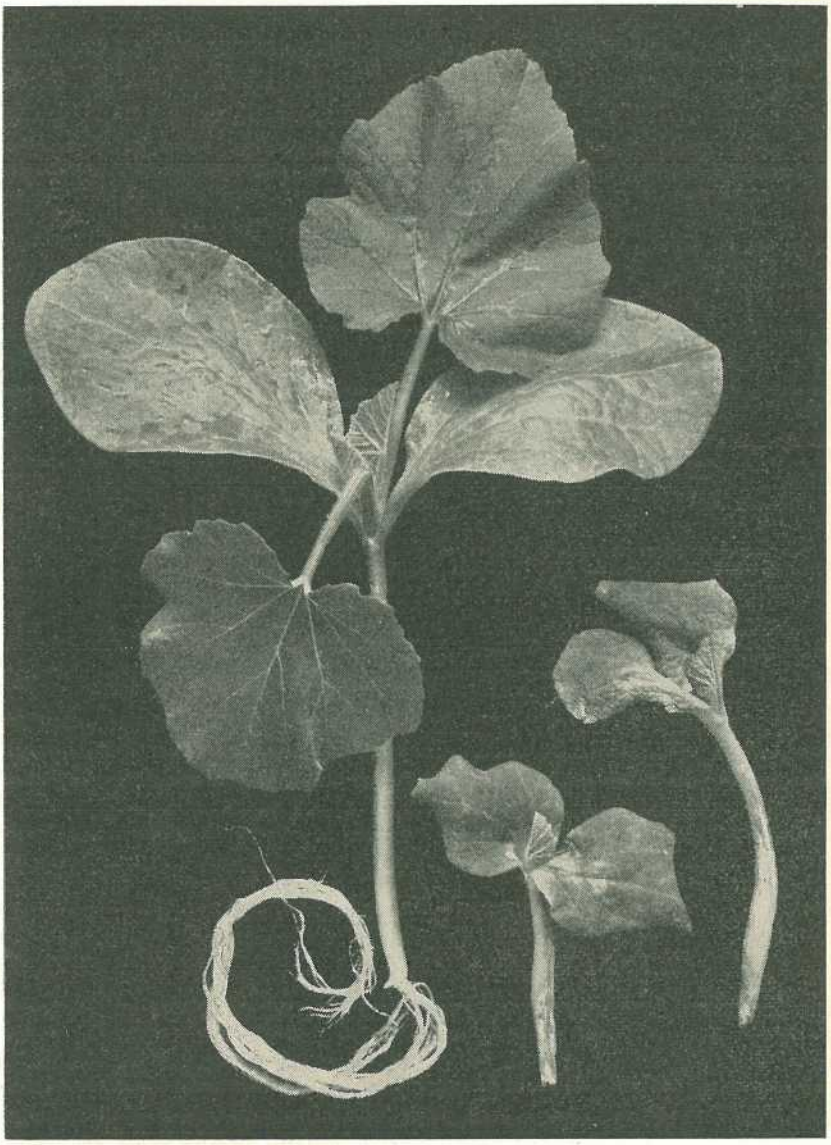

Plate 1.

Fusarium Foot Rot of Pumpkin. Right, two diseased seedlings artificially inoculated with the fungus. Left, healthy plant of the same age.

The practice of pre-germinating cucurbit seed in order to get an early planting can lead to outbreaks of foot rot unless care is taken. If seed is germinated under crowded, moist, warm conditions, a few contaminated seeds can spread the disease throughout the rest. Further, if the germinator is used again without sterilization after once carrying infected seed, it will infect the next seed lot placed in it.

Trouble in the pre-germinating process can be reduced by several means. The germinating equipment should be thoroughly boiled between batches of seed. The seed should be only lightly spread in the germinator. Seeds showing signs of fungous attack should be discarded immediately, care being taken not to touch healthy seeds after handling rotting ones.

SEED DISINFECTION.

If there is doubt as to the purity or origin of the seed, treatment with mercuric chloride (corrosive sublimate) will reduce the amount of seed-borne infection that may be present.

In one Queensland experiment, when seed was sown after being inoculated with a spore suspension of the fungus, all plants died. However, when the inoculated seed was treated for 15 minutes with 1 in 1,000 mercuric chloride solution and then rinsed thoroughly with several changes of clean water, only a small percentage of plants was lost.

Mercuric chloride treatment is effective if the contamination is superficial and is satisfactory in most circumstances. If it fails, it is likely that the fungus has penetrated the seed coat and a hot water treatment is necessary for its destruction.

With this method, seed is suspended for 15 minutes in water held at 55 deg. C. (131 deg. F.) Care should be taken not to exceed the temperature or the time, but even when these precautions are followed, the germination percentage of the seed may still be reduced by the treatment. The use of hot water is therefore recommended only when it is desired to retain a special line of infected seed.

CONTROL OF SOIL-BORNE ATTACKS.

Crop rotation is a useful method of reducing the incidence of soil infection. In America it has been found that this is particularly the case if organic matter is incorporated in the soil between crops of cucurbits. Apparently the organic matter encourages the growth of other competitive soil organisms, which suppress the foot rot fungus. In any case, an interval of at least three years should be allowed before planting cucurbits on land in which the disease has occurred.

Attempts have been made to control foot rot in the field by applying soil amendments such as lime, but no practical solution has been found along these lines.

SUMMARY OF CONTROL MEASURES.

(1) Never save seed from a cucurbit fruit which has any sign of rot in it.

(2) If doubt about the purity of the seed arises, it should be treated by soaking in a 1 in 1,000 mercuric chloride solution for 15 minutes, after which it should be washed thoroughly in several changes of clean water and sown as soon as dry. Preferably, the doubtful seed should be discarded and a fresh lot of clean seed obtained.

(3) If the seed is being pre-germinated, it should be spread lightly in the germinator. Mouldy seed should be discarded, care being taken not to touch nearby healthy seed. The germinator should be sterilized between batches of seed.

(4) An interval of three years should elapse before planting cucurbits in land in which foot rot has occurred.

The Strawberry Root-Knot Nematode

By R. C. COLBRAN, Entomologist.

Several species of root-knot nematodes occur in Queensland but only one (*Meloidogyne hapla* Chitwood) reproduces on strawberries.

The distribution of this introduced nematode is largely due to the use of infested planting material, and it is now present in the majority of strawberry plantings.

This pest may seriously reduce strawberry yields. The use of clean or lightly infested runners has resulted in larger plants, earlier fruiting, and yield increases of up to 80 per cent. Further increases have been obtained by soil fumigation before planting.

The strawberry root-knot nematode attacks the roots of a number of plant

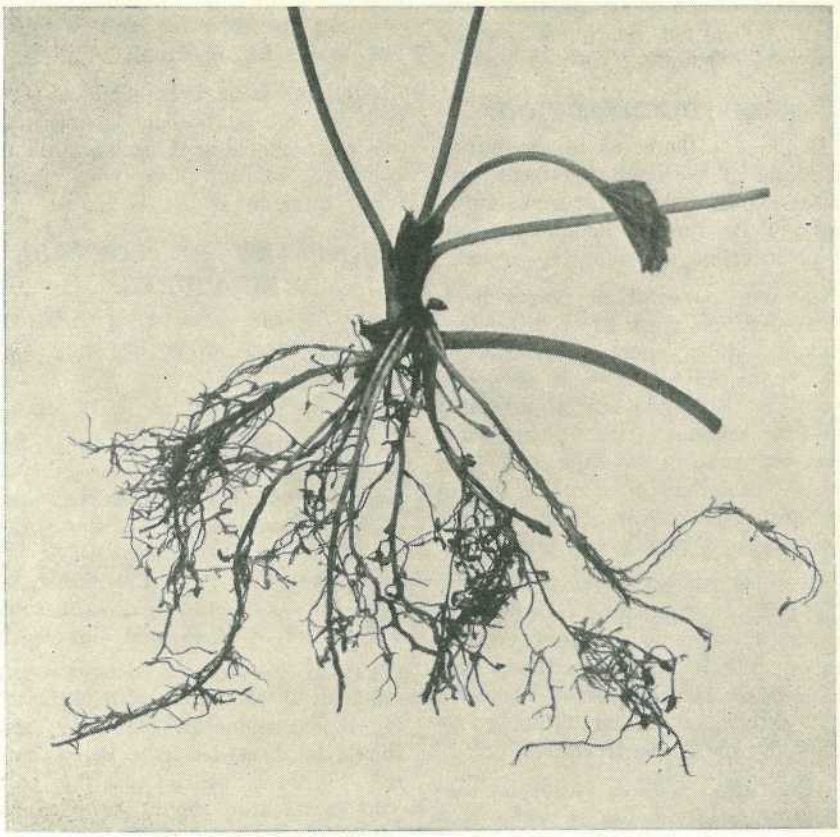

Plate 1.

A Strawberry Runner Heavily Infested with Root-knot Nematode. This type of material should not be planted.

Plate 2.

Strawberry Roots at the End of the Growing Season. The plant on the left with long straight roots is free of nematodes; the one on the right with the densely matted roots is heavily infested.

hosts but never causes the large galls so typical of most other species. The small galls on the fibrous roots of strawberries may be numerous but are often overlooked on casual examination.

CONTROL.

Use of Clean Runners.

Selection of planting material is most important. Runners should be washed free of soil and the roots examined before planting. Any runners with a moderate or heavy nematode infestation should be discarded.

The percentage of clean runners from infested plantings can be increased by mulching between the rows with sawdust (borax-free) or stable manure to a depth of four inches. The soil between the rows need not be cultivated before mulching but should be level and free of weeds. The nematode larvae do not migrate from the soil into the mulch, and provided the rooting is restricted to the mulch, the runners will be clean. The parent plants should be vigorous and adequately fertilized before the mulch is spread.

As an alternative method, the inter-row spaces may be treated with EDB (12½ per cent. v/v) at the rate of 20–25 gallons per acre (¼ pint per chain of row).

The fumigant is applied in rows six inches to the side of the parent plants and one foot apart, one line of fumigant being used for every foot of inter-row space. For best results, fumigation should be carried out 10-14 days before runners are allowed to root between the rows. The soil should be moist and friable.

Field Fumigation.

Field fumigation before planting out is recommended only in areas where nematode damage to strawberries has been experienced, particularly during the previous season. EDB (12½ per cent. v/v) is applied in rows one foot apart at the rate of 20-25 gallons per acre, 10-14 days before planting.

Crop Rotation.

On areas where strawberries have been heavily infested, the most suitable cover crops are Sudan grass, panicum, oats, wheat and *Crotalaria* species. Truck crops resistant to the strawberry root-knot nematode include water-melons, cucumbers, capsicums, cabbages and cauliflowers.

WARNING.

Fumes from EDB in a poorly ventilated room are dangerous. Splashes of the concentrate 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.

FODDER STOCKS MUST BE INCREASED.

The dry summer in coastal and south-eastern Queensland this year emphasised the need for a planned fodder conservation programme on every property, the Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) said recently.

Seasons in which the heavy summer rains on which we depend so much fail to come clearly show the need for a system of conserving fodder in good seasons as an insurance against dry periods and drought. Dairy production reached a peak early in January, but began to drop at the beginning of February. Normally production is maintained at a high level until late in March. Beef cattle, too, began to lose condition early.

Although statistics show that there is a steady increase in the amount of fodder being stored, the total is very small in comparison with the needs of the State's livestock.

Rainfall is unreliable, and for this reason primary producers should make every effort to get the best production that the climate will allow. Scientific studies into the problems of dry farming have evolved improved techniques for growing crops under conditions of limited rainfall. In crop production, this means the employment of good fallowing practices to conserve all possible supplies of subsoil moisture to enable crops to produce satisfactorily on a minimum of rainfall during their growing period.

The Department has been encouraging fodder conservation for many years, and its advisory officers are available to help interested landholders.

Recently, officers of the Department prepared a series of booklets dealing with modern methods of conserving fodder. Pamphlets on haymaking and the handling and storage of cereal grains have already been published. Publications on silage making and the machinery for making hay and silage will be issued shortly.

Mr. Collins said these publications describe the latest practical advances in fodder conservation as well as modern technical developments. The information in these booklets will familiarise farmers with the newest labour-saving methods of storing fodder.

Urea Sprays in Deciduous Fruits

By T. J. BOWEN, formerly Assistant Horticulturist.

Urea sprays are unlikely to replace soil application of nitrogenous fertilizers in apple orchards.

But they may be useful as booster sprays in old orchards which have lost their vigour.

The major plant foods—nitrogen, phosphorus and potassium—can all be taken up by plants when certain chemicals are applied in solution to the leaves. The only commercial development of any significance to orchardists, however, concerns the use of nitrogen in the form of urea.

Nitrogen is deficient in most soils which have been under cultivation for many years. As adequate amounts of this plant food are essential for tree growth, fruit set and fruit development, regular applications of fertilizers containing nitrogen are made in any well-managed orchard. In practice, the source of nitrogen may be sulphate of ammonia, blood and bone or nitrate of soda.

Preliminary work with urea sprays as an alternative method of supplying nitrogen to orchard trees has been in progress at Stanthorpe for about three years.

What is Urea ?

Urea is a white, crystalline, water-soluble substance containing 46 per cent. nitrogen, which is more than twice as much as that in sulphate of ammonia. It is an organic compound and is manufactured synthetically from ammonia and carbon dioxide.

In the soil, urea is converted first to ammonium carbonate and later to the nitrate, which can be assimilated by the plant. When urea is used as a fertilizer, the nitrogen becomes available rather slowly, but, unlike sulphate of ammonia, urea does not acidify the ground to any great extent. At present prices, urea is more or less competitive with the better known nitrogenous fertilizers, but main technical interest lies in its possible use in foliage sprays.

Foliage Sprays.

As early as 1943, it was reported in the U.S.A. that it was easier to control the nitrogen status of McIntosh apple trees by urea foliage sprays (5 lb. urea in 100 gallons water) than by applications of nitrogenous fertilizers. It was suggested that such sprays may be useful in areas of low rainfall where lack of soil moisture reduces the availability of nitrogen to the trees at certain periods of the year. Later, it was reported that careful timing of foliage sprays was important in the apple; early sprays increased fruit set and colour, while late sprays reduced the storage life of the fruit.

It was subsequently demonstrated that the under-surface of the leaf absorbed greater amounts of urea than the upper surface, and that the uptake through young leaves was greater than that through old leaves on the same tree. The rate of absorption appeared to be related to the nitrogen status of the leaves, high nitrogen content being associated with high intake.

Foliage sprays containing urea are now being used commercially on pome fruits in America and Canada

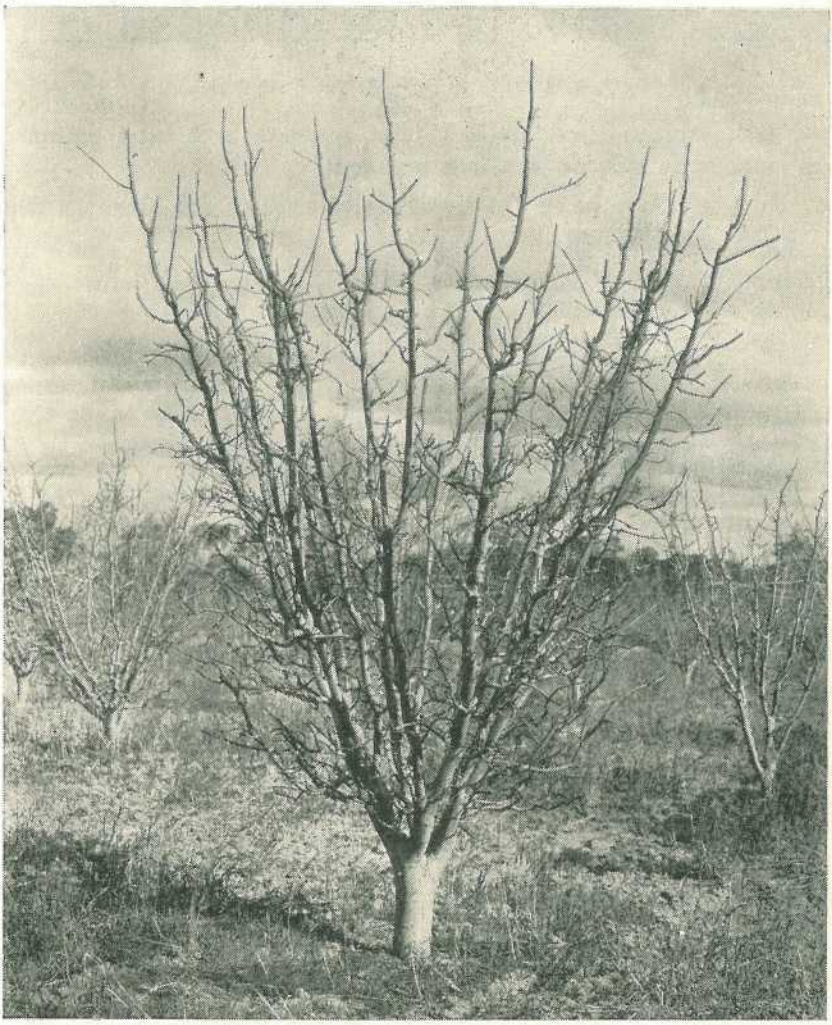

Plate 1.

Apple Tree in Winter. The strong leader growth indicates that supplies of nitrogen are adequate.

and to a lesser extent in England. Experimental work has been in progress in various Australian States for some time to determine their value under our conditions.

Advantages Claimed for Urea.

The main advantages claimed for urea foliage sprays are that nitrogen can be applied when the trees actually need it and that wastage is reduced to a minimum. With ordinary nitrogenous fertilizers, much of the nitrogen applied is lost through leaching and other causes.

The apple tree must have ample nitrogen prior to flowering and fruit set in order to ensure a good crop.

It is not surprising, therefore, that the most generally accepted foliage spray schedule is based on three or four urea sprays applied between mid-September and early November. As the best coloured apples are produced by trees on the verge of nitrogen deficiency, such a schedule does not interfere with the development of normal skin colour late in the season. Trees are said to respond more rapidly to foliage sprays containing urea than to nitrogenous fertilizers applied directly to the soil; the effect is, however, more transient.

Nitrogen uptake through the leaves of the tree after the sprays are applied is very rapid. Approximately 60 per cent. of the urea is absorbed in eight hours and up to 90 per cent. within 24 hours after application.

Where necessary, urea sprays can be combined with other sprays used primarily for pest and disease control purposes.

Stanthorpe Experience.

Urea sprays have now been under trial in the Stanthorpe district for three seasons on pome fruits. The trials were restricted to schedules in which three or four foliage sprays (5 lb. urea per 100 gallons water) were applied during the 7-week period after the green-tip stage (between mid-September and early November). Data were collected on fruit set, growth increment, yield, fruit colour and fruit size.

Compared with trees receiving standard fertilizer schedules, the only differences in tree response to treatment occurred in the 1953-54 season, when an increase in terminal growth was recorded in Delicious and Granny Smith apples and a decrease in terminal growth in the Jonathan variety. Variations from tree to tree were high, however, and the results do not justify any change in current fertilizer practices at the present time.

A quick response in leaf colour, growth and fruit set was invariably noted after the application of urea sprays to trees which showed symptoms of a deficiency in nitrogen. It is probable, therefore, that urea can be used as a "booster" spray in old orchards which for any reason are lacking in vigour.

Compatability.

Urea is compatible with most fungicidal and insecticidal materials, although caution may be necessary when it is mixed with lime sulphur. Under Stanthorpe conditions, the urea-lime sulphur combination spray has not injured the trees, but leaf burn has been recorded in America. It may therefore be advisable to avoid this spray.

Urea cannot be mixed with dinitro (DNOC) sprays but this is not important here as they are not used in Queensland orchards.

Leaf Injury.

Urea applied at a concentration of 5 lb. in 100 gallons water caused no apparent damage to the leaves or apples. When applied at a concentration of 10 lb. in 100 gallons water, however, marginal scorch was recorded if the sprays were used prior to petal fall. The leaf burn is apparently due to an impurity known as biuret and can be reduced by the addition of small quantities of sugar to the spray.

Recommendations.

It seems unlikely that urea sprays will generally replace nitrogenous fertilizers applied directly to the soil in apple orchards. Nevertheless, growers who wish to try the best of the experimental schedules on an exploratory scale should use a solution containing 5 lb. urea in 100 gallons of water at the following times:—(*a*) at the green tip stage: (*b*) immediately after bud-burst; and (*c*) three weeks later. Such a

schedule should supply an adequate amount of nitrogen for normal fruit set without any ill-effects on the quality of the fruit.

Growers who are interested primarily in foliage sprays for the treatment of trees which are obviously deficient in nitrogen should defer the spray application until the trees are in full leaf. Only a single spray is required at the standard concentration of 5 lb. urea in 100 gallons water.

Foliage Sprays on Other Fruits.

Urea sprays have proved of little value on stone fruits and there is a considerable difference of opinion as to the concentration which individual varieties can tolerate. Marginal burn has been reported from sprays with a concentration as low as 5 lb. urea in 100 gallons water.

Little is known of the response of grapes to urea sprays, but marginal scorch has been recorded at Stanthorpe with concentrations greater than 4 lb. urea in 100 gallons water.

MILK PRODUCTION IN VARIOUS COUNTRIES.

In a recent review of production and trade in dairy produce, the British Commonwealth Economic Committee tabulated the average milk yields per cow in gallons. This table is reproduced below.

Commenting on the table, the Committee stated: "These do not necessarily afford a basis of comparison between one country and another, partly because of different methods of calculation and partly because of varying circumstances in which dairying is carried out. Thus, in New Zealand and Australia, where dairy farmers supply mainly a manufacturing market, the average gallonage of milk produced by each cow appears low in comparison with some other countries, although, with Channel Island breeds of cows predominating, the fat content of the milk is high. Also, the average yield per cow in no way indicates the levels which are achieved by the more efficient producers. Despite these limitations, the figures give a fair indication of the general improvement in yields which has been evident since the war as well as the comparatively high yields which prevail in some countries."

Country	*1938*	*1951*	*1952*	*1953*	*1954*	*1955*
Netherlands	758	798	808	830	828	825
Denmark	725	713	716	769	762	736
Western Germany ..	531	565	583	613	626	629
United Kingdom	542	586	602	608	621	614
Sweden	525	629	619	630	619	599
United States	449	516	517	529	549	565
New Zealand	510	558	563	579	527	544
Australia	370	378	343	402	378	409

Horticultural Districts of Queensland. 5. North Coast

By Officers of the Horticulture Branch.

The North Coast horticultural district extends from Landsborough on the south through Nambour and Gympie to Gunalda on the north, and inland as far as Kingaroy (see Plate 1). It is a well populated, prosperous district supporting a diversity of primary industries, which include fruit growing, dairying, general agriculture, sugar-cane growing and timber milling.

The topography is very broken, the central feature being the Blackall Range and its associated network of subsidiary ranges, many of which extend to within a few miles of the coast. The country west of the main range is less broken and develops into an undulating tableland.

Horticultural production is mainly restricted to the relatively narrow

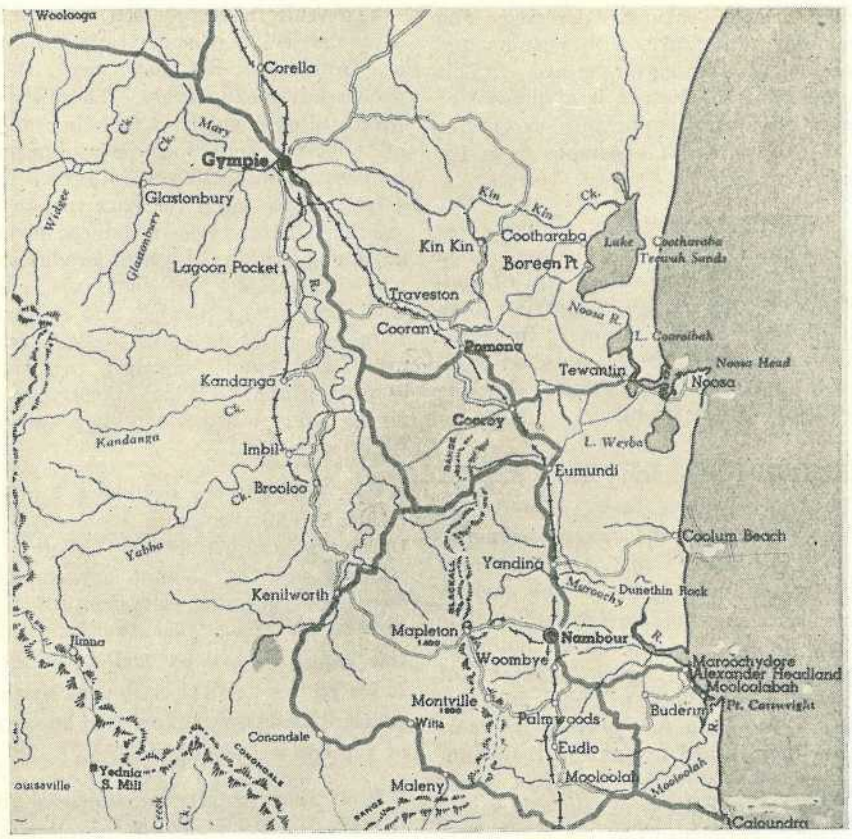

Plate 1.

Sketch Map of the Coastal Section of the North Coast District.

coastal strip eastwards from the Blackall Range. This area has been aptly termed "the garden of the State," since both tropical and subtropical crops flourish in it and have contributed largely to its development and prosperity. The principal horticultural crops in order of economic importance are pineapples, beans, bananas, citrus, strawberries, papaws, ginger, avocadoes and Macadamia nuts.

In addition to fruit growing, dairying is an important industry north from Nambour and in the Gympie area, while sugar-cane is grown on the Maroochy River and its tributaries.

The sub-coastal tableland, with Kingaroy as its centre, and including Kilkivan, Goomeri, Murgon, Wondai and Proston, is devoted primarily to beef cattle raising, dairying and general agriculture, with peanuts and grains as the major crops. This portion of the district is at present of no horticultural importance, except for the production of vegetable seeds for use elsewhere.

The timber industry, which was responsible for opening up the coastal land in the first place, is still of considerable importance, supplying both hardwoods and softwoods. In recent years, extensive re-afforestation projects have been undertaken by the Forestry Department.

HISTORICAL DEVELOPMENT.

Settlement first took place in the hinterland, which was originally developed for grazing, followed later by general agriculture. The earliest records from the coastal region date back to 1865, when good stands of valuable timber were located at Buderim. Owing to difficulties of access, it was a few years before this area was opened up, and in the meantime, timber was obtained from Petrie Creek, a tributary of the Maroochy River. However, the earliest settlement took place at Buderim Mountain, which was then served by sea through ports at Mooloolaba and Maroochydore. Although there was a road northwards from Brisbane, which carried much overland traffic during the Gympie gold rush of 1867, its condition was bad and Buderim continued to be served by sea for many years.

Following the opening of the Buderim Mountain country for timber, sugar-cane was introduced and at one time two mills operated at Buderim. When the Kanaka labour used in field work was withdrawn, the industry rapidly declined, but it was subsequently re-established on the Maroochy River, the cane being milled at Nambour. This, more than anything else, was responsible for the growth of the town of Nambour as the centre of the district.

The fruit industry came into being after the decline of sugar-cane growing at Buderim. Bananas were then grown fairly extensively. The district produced excellent fruit, but thousands of bunches were sometimes dumped because of difficulties encountered by ships in crossing river bars in rough weather. Citrus was introduced about 1890 and within 10 years production was considerable. At about the same time, coffee was planted and a small industry, with its own factory, was established and supplied a high quality product. This industry continued till a world-wide slump caused its abandonment.

In 1890, a railway linking Landsborough and Brisbane was opened, thus providing a better outlet for primary produce. This was an important stage in the development of the district and from that time onwards the fruit industry expanded rapidly. Much of the new country, such as the Blackall Range, was pioneered by some of the early Buderim settlers.

Pineapple growing commenced in the Woombye district at the close of the century and has since expanded to become the foremost fruit industry in

the State. This industry has contributed in no small measure to the development and prosperity of the North Coast.

FACILITIES.

The North Coast district is closely settled and supports a number of prosperous towns, chief of which are Gympie (pop. 9,000), Nambour (pop. 4,000), Kingaroy (pop. 4,000), Maroochydore-Mooloolaba (pop. 3,000) and Caloundra (pop. 2,000). It is well served by rail and a network of roads linking the more important centres with Brisbane, and there is a considerable tourist traffic to mountain resorts at Montville, Mapleton and Buderim, and beaches at Caloundra, Mooloolaba, Maroochydore, Coolum and Noosa.

Electric power in the rural areas has done much to improve the amenities of country life, and primary schools in smaller centres, with high schools at Nambour, Pomona, Gympie and Kingaroy, provide excellent educational facilities.

The technical needs of the primary producer are met by a staff of research and advisory officers of the Department of Agriculture and Stock, with offices at Nambour, Palmwoods, Cooroy and Gympie. The Maroochy Experiment Station at Perwillowen, 3 miles from Nambour, was established in 1945 and is the centre for research in the major horticultural crops grown in the district.

CLIMATE.

The climate (Table 1) is subtropical, but varies with elevation and proximity to the sea. That of the coastal fringe is more temperate than that of the sub-coastal tableland, where the temperature range is greater and the rainfall lower. Near the sea, temperatures range from a mean minimum of 42 deg. F. to a mean maximum of 88 deg. F., with light to medium frosts on the lower land during the winter. Inland temperatures range from a mean minimum of 36·2 deg. F. to a mean maximum of 86·0 deg. F., and severe frosts are regularly encountered during the winter months.

Plate 2.

Nambour, The Principal Town in the Maroochy Shire.

TABLE 1.

CLIMATIC DATA FOR NORTH COAST TOWNS.

Temperature (Gympie).

—	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
Mean Max. Temp. °F. ..	88·5	86·9	85·1	82·1	76·9	72·0	71·6
Mean Min. Temp. °F. ..	66·6	66·5	63·8	57·9	49·9	46·3	42·9

—	Aug.	Sept.	Oct.	Nov.	Dec.	Year.	
Mean Max. Temp. °F. ..	74·1	78·9	83·7	86·7	88·5	81·2	..
Mean Min. Temp. °F. ..	44·2	50·2	56·5	61·3	64·9	55·9	..

Mean Monthly Rainfall (Points).

—	Jan.	Feb.	Mar.	Apr.	May.	June.	July.
Caboolture ..	796	782	783	448	327	274	237
Nambour ..	937	957	941	613	509	369	267
Gympie	657	658	613	343	291	260	207
Kingaroy ..	481	299	284	171	113	191	142

—	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly Total.	
Caboolture ..	162	176	273	351	548	5,189	..
Nambour ..	188	226	323	421	665	6,416	..
Gympie	165	202	273	333	540	4,542	..
Kingaroy ..	79	158	203	298	388	2,807	..

The coastal ranges intercept moist air carried by the prevailing easterly winds and result in an average annual rainfall ranging from 45 inches at Gympie to 64 inches at Nambour. In the agricultural areas further inland, the rainfall is lower, the average for Kingaroy being 28 inches. The heaviest falls occur from December to March, with rainfall tapering off into the winter. The spring rainfall is characteristically erratic.

SOILS.

Most horticultural crops grown in the district are susceptible to frost and are largely confined to the slopes for this reason. The soils of horticultural interest range from sands to clay loams and fall into the following broad groups:—

(1) Among the best horticultural soils are the dark-brown to red-brown sandy loams, which are characteristic of the Woombye area and occur to a lesser extent in other parts of the coastal strip. They are derived mostly from sandstone and are usually fairly well drained by virtue of a reasonably open-textured, reddish subsoil. Generally speaking, they are low in plant foods and fairly acid in reaction (pH 5.4–6.2), becoming much more acid with cropping and the regular application of fertilizers containing large amounts of sulphate of ammonia.

(2) Probably the most common soil type of the coastal lowlands is a grey-brown sandy soil with a yellow-brown

subsoil. This soil type tends to be coarse in texture, and having been subjected to erosion is usually shallower than the red-brown sandy loams and more subject to water-logging during periods of high rainfall.

(3) The soils of Buderim and the Blackall Range (Montville-Mapleton) are basaltic red loams to clay loams. Many of these have been badly leached and eroded and are now low in plant foods and organic matter.

(4) In the Mary Valley, in the Gympie district, the soils are red loams to clay loams, derived from jasper and quartzite. They are for the most part higher in plant foods, and usually less acid, than the other horticultural soils. Their high content of available manganese, which imparts a purplish tinge to the soil, is responsible for a manganese-induced iron deficiency in many crops if corrective measures are not applied.

Alluvial soils near the coast are not used to any extent for horticultural crops on account of the frost risk, and are largely devoted to sugar-cane growing. A considerable area of land in close proximity to the coast, known as "wallum," includes a large proportion of heath land with a high water table. These soils are under investigation, but until such time as more is known of the manner in which they may be handled, they cannot be recommended for horticultural crops.

On account of the high rainfall during the summer months, and the steepness of much of the horticultural land, one of the major problems is that of soil erosion. The horticultural importance of the North Coast is obviously due less to the inherent fertility of its soils than to its climatic advantages. Hence, a high standard of farming efficiency is necessary for successful horticulture.

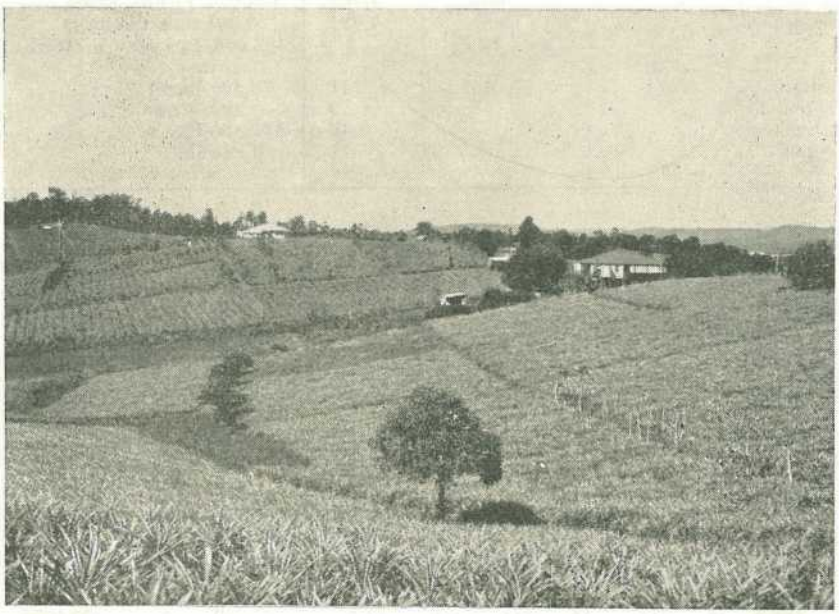

Plate 3.

Pineapple Plantation, Woombye. The pineapple is the main horticultural crop in the North Coast District.

HORTICULTURAL CROPS.

Pineapples.

The pineapple is the major fruit crop of the district (Table 2), and is grown on all soil types, the most favoured being the red loams of the Woombye district and the loams and clay loams of the Mary Valley. Returns per acre are high and intensive farming methods are employed, with the result that the majority of pineapple farms (Plate 3) are small, averaging 20–25 acres, a factor which has contributed to the close settlement of the district.

When the industry began at the end of last century, pineapples were grown solely for the fresh fruit market, but with the increased production and the development of

TABLE 2.

HORTICULTURAL PRODUCTION—NORTH COAST DISTRICT (1955–56).

Fruit.

Crop.	Not Bearing.	Bearing.	Production.
Citrus—	Trees.	Trees.	
Navel Oranges ..	2,387	13,952	15,838 bus.
Valencia Oranges ..	4,322	27,108	35,002 bus.
Other Oranges ..	4,492	23,563	32,020 bus.
Mandarins	4,698	15,329	17,999 bus.
Lemons and Limes ..	627	3,144	6,597 bus.
Custard Apples	185	506	349 bus.
Mangoes	284	1,519	1,865 bus.
Nuts (Queensland) ..	1,993	5,096	63,594 lb.
Nuts (Pecan)	300	470	1,840 lb.
Avocadoes	1,190	944	896 bus.
	Acres.	Acres.	
Bananas	607	1,767	129,634 1½ bus. cases
Pineapples	1,994	4,621	25,084 tons (factory) 462,406 1½ bus. c/s, (fresh fruit)
Papaws	40	111	30,181 bus.
Passion Fruit	1	3	480 ½ bus.
Strawberries	..	45	157,850 lb.
Grapes	..	11	4,884 lb.

Vegetables.

Crop	Area (Acres).	Production.
Potatoes	499	1,236 tons
Sweet potatoes	25	65 tons
Turnips	4	9 tons
Carrots	10	787 cwt.
Beetroot	5	206 cwt.
Tomatoes	165	37,922 ½ bus. c/s.
French Beans	2,754	338,274 bus.
Green Peas	88	5,461 bus.
Cabbage	6	2,998 doz.
Cauliflowers	3	640 doz.
Lettuce	1	377 bus.
Cucumbers	155	18,713 bus.
Melons—		
Water	51	245 tons
Rock	9	38 tons
Pumpkins	334	623 tons
Marrow and Squashes	6	18 tons
Chokos	13	5,010 bus.

canning facilities, more than 60 per cent. of the total crop is now canned for home consumption and export overseas.

The principal variety grown is the *Smooth Cayenne,* which is a world renowned dual-purpose variety particularly suited for canning. Cropping takes place throughout the year, but the peak of production is invariably reached in the summer, from January to April. The fruit, destined for canneries or southern markets, is transported by rail from local centres of production.

Although there has been considerable expansion in the industry over the years, it is now fairly static, and there is relatively little new land for the crop, with the possible exception of the area between Nambour and Gympie.

The generally low fertility of the soil necessitates the use of fairly large quantities of artificial fertilizers to obtain satisfactory yields. Cultural practices have improved in recent years, with the introduction of chemical weed control and the use of hormones to provide better control of cropping times. However, the nature of the terrain does not lend itself to mechanisation, and pineapple growing still involves a considerable amount of hand work.

Bananas.

The banana industry on the North Coast reached its peak following a severe setback to the industry in coastal areas south of Brisbane in the period 1920-25, due to outbreaks of bunchy top—a virus disease. The re-establishment of southern plantations, combined with heavy losses from rust thrips around Gympie, subsequently caused a recession in banana growing on the North Coast. As the banana industry depends solely on a fresh fruit market, and seasonal variations in production in this State and northern New South Wales are pronounced, price levels fluctuate a great deal and banana growing has tended to become rather speculative.

Plate 4.

Portion of a Banana Planting on the Maroochy Experiment Station.

Bananas are now grown on a variety of soils and tend to be relegated to land which is too steep for pineapples. *Cavendish* and its sport, *Mons Mari,* are the main varieties, although *Lady Finger* is also of some importance. Disregarding the periodical fluctuations due to market conditions, the acreage under bananas has not undergone any marked change during recent years.

Citrus.

The citrus industry was established some 50 years ago, mainly at Buderim, Montville, Flaxton and Mapleton. During the early 1930's, low citrus prices led to the abandonment of many orchards in favour of pineapples, which offered better prospects at the time. Very little citrus is now grown at Buderim and Montville. The industry has tended to move to lower land, and is now more or less centred in the Palmwoods district.

The principal varieties are *Late Valencia* and *Joppa* oranges, with a few *Washington Navel* oranges, as well as *Emperor* and *Glen Retreat* mandarins. Lemons are rarely grown in coastal districts.

Pest and disease control constitutes a real problem in this district, largely on account of the difficulty of adhering to a spraying schedule during the rainy season of the year, which is a rather critical period. For the most part, citrus orchards are too small to justify a large capital outlay on efficient spraying equipment. Nevertheless, the North Coast is one of the largest citrus producing districts of the State.

Strawberries.

Strawberries are grown on a range of soils, mainly in the Palmwoods, Buderim, Montville and Eudlo districts. Unfortunately, a fairly large proportion of the crop is grown on inferior land. Production is to a large extent handled by farmers with small properties, who are attracted to the crop because of the relatively low capital cost involved and the high returns per acre obtainable. Where strawberries are grown on the more fertile soils much better results are usually obtained—for example, at Buderim and Montville.

The variety usually grown is *Phenomenal,* which produces high yields of good quality fruit. One of the problems in successful strawberry growing is the control of virus diseases. A Strawberry Runner Approval Scheme, which has been in operation for several years, has been of great value to the industry for this purpose.

Ginger.

Commercial ginger growing commenced at Buderim some 25 years ago and subsequently extended to areas in the vicinity of Eumundi and Cooroy. A co-operative factory operates at Buderim for the treatment and marketing of ginger. Due to certain marketing difficulties the industry declined a few years ago and efforts at present are being made to rehabilitate it.

Ginger (Plate 5) requires a fairly heavy soil and the alluvials are favoured by growers. The crop can be highly remunerative, but is subject to a serious sunburn hazard which cannot be easily overcome. The cost of establishment, principally for the "seed" and the sawdust used for mulching, is high.

Avocadoes.

Commercial avocado growing has only developed in the last 25 years, although there are some seedling trees in the Woombye district which were planted 50 years ago. The avocado is a relatively little known and rather unusual fruit; consequently, the market is rather limited and is likely to remain so until the consuming public becomes better acquainted with it.

Avocadoes require a particularly well-drained soil and are very susceptible to root-rots, which frequently

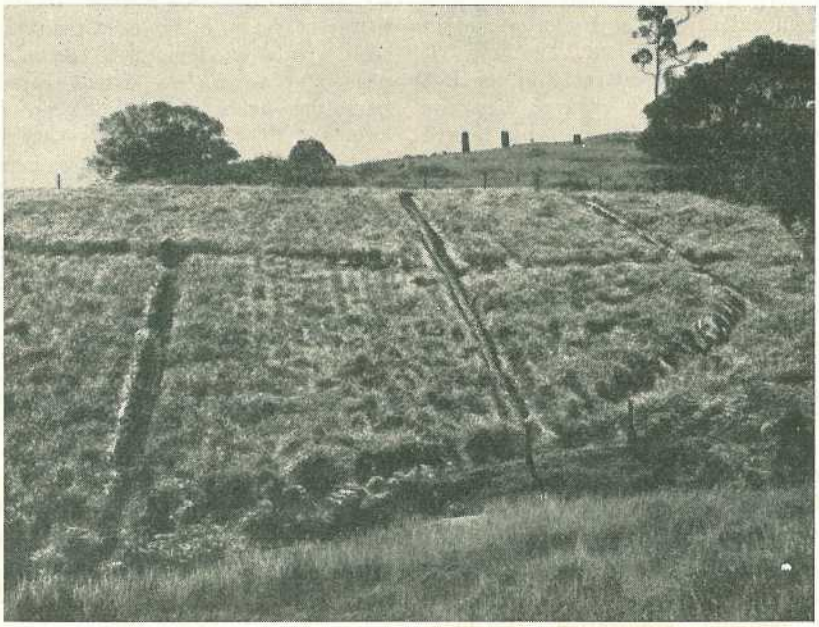

Plate 5.

Ginger at Buderim. The crop is grown in several parts of the district and processed at a factory in Buderim itself.

destroy well established bearing trees. The principal varieties grown are *Fuerte, Nabal* and *Anaheim*. Recently established orchards comprise grafted trees of one or more of these varieties.

Macadamia Nuts.

The Macadamia nut is well known and highly regarded, but development of the industry has been hampered by the difficulty of extracting the edible kernels. During the last few years, commercial processing has commenced and is expected to open up new and better markets.

The Macadamia nut is native to the district and could be grown much more extensively than at present, particularly as broken country, which would be unsuitable for many other crops, could be utilized. Up to the present, orchards have been planted with seedling trees, and there is considerable scope for the use of superior strains grafted on to suitable rootstocks.

Papaws.

Papaws are grown on a limited scale in many parts of the district, usually in conjunction with other fruits. The fruit is very subject to bruising and does not transport well; hence the industry has not developed to any great extent on the North Coast. Cropping is seasonal, with the main harvest during the winter and spring period when losses from ripe fruit rots are fairly heavy.

Papaws are grown commercially from seed of mixed parentage, there being no varieties in the ordinary sense. As a result there is considerable variation in the type and quality of the fruit produced.

Beans.

Bean growing has become an important and highly profitable industry in many parts of the North Coast district. The area district is

the largest producer, but the crop is grown extensively at Buderim and in the vicinity of Nambour. The industry has expanded considerably in the last 10 years and many growers of fruits such as pineapples have come to regard beans as a profitable supplementary crop.

In this district, bean growing is restricted to the cooler months and is carried on most successfully where irrigation facilities are available. The main outlet is an interstate market which depends on warm subtropical regions for supplies of beans in winter. Because of the large labour demand for picking, it is usual to make frequent small plantings at short intervals.

In most areas, fairly fertile soils are used for the crop, although it is often necessary to correct excessive acidity by periodic application of lime. *Brown Beauty* is the principal variety grown. It is favoured primarily because of its cropping habit, which enables harvesting to be completed in three picks, and the excellent quality of its pods. Diseases are of some importance and in recent years difficulty has been experienced in obtaining sufficient disease-free seed to meet the requirements of the industry.

Miscellaneous Vegetables.

With the exception of beans, the North Coast does not rank high as a vegetable producing district. There has nevertheless been a steady increase, in recent years, in the area planted to such crops as tomatoes, cucumbers, peas and to a less extent carrots, parsnips, cabbage, cauliflowers and lettuce. Most notable expansion has been in tomatoes, which are grown on the frost-free slopes of the hills. The most favoured variety is Q2, and trellising is the popular method of managing the crop.

FUTURE PROSPECTS OF THE DISTRICT.

During the past half century the North Coast district has been very largely exploited for the production of fruit crops. During that period the fertility of much of the land has declined considerably and the inroads of soil erosion have deprived much of the country of valuable surface soil. The ultimate survival of the district as one of the major horticultural areas in the State depends on efficient methods of land management and the application of recognised soil conservation measures.

The outlook for most of the crops grown in the district is satisfactory. There is little scope for any great expansion in the area devoted to pineapples or bananas. Ginger and Macadamia nuts have some future possibilities but much will depend on the available markets for these products.

You Make Them or Mar Them at Marking Time!

By R. D. OAKES, Adviser in Sheep and Wool.

Lamb marking is a "must" on every property; but don't rush the job through! In the old days the man who claimed the biggest tallies of lambs marked in a day was regarded as an expert. Today things are different. More attention is paid to detail. Woolgrowers know that carelessness or sacrificing workmanship for speed costs money. How, when and where you cut your lambs' tails are important. Here's why!

Importance of Lamb Marking.

Ear-marks establish your ownership of the sheep. Be certain you put them on correctly. You will find, too, that it is easier to draft your sheep if their age and sex marks are accurate.

Sometimes losses follow lamb marking, but they are seldom seen. Lamb marking is a busy time on any property. As soon as you get one flock out you want to get another in. Some lambs may die in the flock you have just marked, but you may be too busy with the next flock to have noticed.

Careless marking may mean other losses, too: unmothering, wounds that heal slowly and loss of condition. These can also escape your notice.

Blowfly strike is one of the most serious losses that follow bad marking. It may not occur immediately after the tail is cut. But the way you cut the tail governs the number of times the sheep will be struck during the rest of its life.

It is worth thinking over these points every time you pick up a knife to cut a lamb's tail.

How Should We Mark Our Lambs?

Everyone knows how to mark a lamb. You may use an ordinary knife; many of you prefer a Luck knife. Some use clamps; others rubber rings. That's a matter of choice, but there are a few points to watch.

The first is cleanliness. Boil your marking instruments for 20 minutes or so before you start work each day. Always have two knives. Keep the spare one in a good disinfectant and change knives each run or so. If you are using a Luck knife or clamps, lie the spare instrument down in the disinfectant so it is completely covered. There is no point in disinfecting the cutting half only! It is as well not to boil your steel. However, be sure the disinfectant covers the whole of the steel except the handle.

Nothing heals as quickly as a good clean cut. If you bruise or "hack your way" through the lamb's tail you leave a trail of damaged tissues in your wake! These are ideal places for bacteria to breed. That is where tetanus or blood poisoning can start. Either of these diseases can kill lambs quickly. They have occurred in Queensland in lambs castrated with rubber rings, just as they have in lambs castrated with a knife.

"Tipping" the purse is probably the quickest method of castrating. It leaves wethers with a nice cod, too, and this may affect their final sale price.

After cleanliness there are two "musts" in tailing lambs. Firstly, cut the tail at the right length. Secondly, cut the tail so the bare skin from its underside heals back over the stump.

Tails that are too short make the sheep liable to fly strike for the rest of its life. Tails that are too long do this, too; worse still, they collect dags. Cut your ewe lambs' tails so the stump is just long enough to cover the tip of the vulva. You will find this as near to the ideal as you can get. Certainly you can cut the wether lambs' tails a little shorter if you wish. But in any case be certain to turn the bare skin from under the tail back over the cut stump.

You will obtain three advantages from doing this and cutting your lambs' tails at the right length:—

(1) They will heal quicker.

(2) They will collect fewer dags.

(3) They are not so likely to be struck during the rest of their life.

This is the easiest way to be sure you cut that tail correctly:—

(1) Grip your knife so the handle lies flat on the palm of your hand, the blade protruding past your little finger. The cutting edge should be towards your body when you hold your arm straight out in front of you, palm up.

(2) Pick up the lamb's tail in your left hand and hold it horizontally.

(3) Place the elbow of your right arm on your right hip, and the blade of the knife flat on the underside of the lamb's tail.

(4) Be certain the knife is in the right place—just half an inch or so nearer the end of the tail than the spot opposite the tip of the vulva.

(5) Roll the tail back over the knife blade, pulling it gently to pucker the skin under the knife.

(6) Cut through the tail with one clean sweep, keeping your elbow on your hip. You will have to move your arm horizontally across the front of your body to cut the lamb's tail. Keeping your elbow on your hip ensures you don't stab yourself!

Some woolgrowers do the tail strip operation at marking time. This can also be combined with the Mules operation after first shearing. In many parts of the central west and north-west, where the conditions are more severe, it is better to combine the tail strip and Mules operation after first shearing.

Plate 1.

Be Certain the Knife is Half An Inch Nearer the End of the Tail Than the Spot Opposite the Tip of the Vulva.

Plate 2.

Here Again Can be Seen the Position of the Intended Cut in Relation to the Tip of the Vulva.

Plate 3.

Roll the Tail Back over the Knife Blade, Pulling it Gently to Pucker the Skin Under the Knife.

Plate 4.

The Tail Has Been Cut So That the Bare Skin from Its Underside Will Heal Back Over the Stump. The stump is just long enough to cover the tip of the vulva.

Plate 5.

A Good Job Only Half Finished. Correct tail length, but skin not puckered towards the lamb when cutting, so bare skin not there to draw over stump. Compare with Plate 4.

Many millions of lambs are marked each year in Queensland without any dressing of the wounds. If you do your work thoroughly, you won't need to use any dressing.

When Should We Mark Our Lambs?

The "earlier the better" is a fair answer to the question, when should we mark our lambs? Most lambings extend over six or eight weeks. It is hard to muster lambs that are less than two weeks old. Therefore, most woolgrowers aim at commencing marking about two weeks after the lambing has finished.

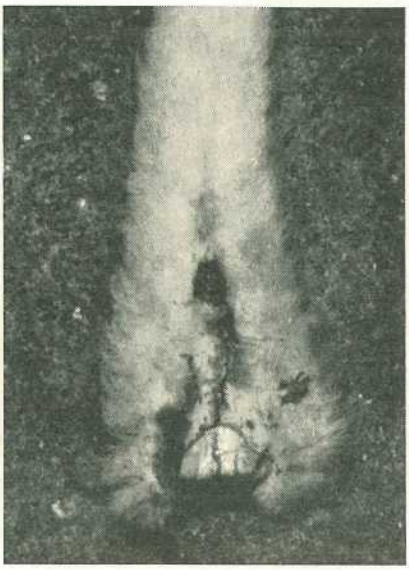

Plate 6.

Every Tail on the Ground Should Look Like This. The concave flap missing from the tail provides bare skin on the marked lamb to heal back over the stump. This is done by puckering the skin towards the sheep before cutting.

It may be hard to get around the whole of your flock quickly, so by the time you have finished it's more than likely that some lambs will be three months old. You can overcome this difficulty by staggering your joining dates, or the dates you take the rams out. Spreading this work over a couple of weeks gives you a chance to spread your lamb marking, too.

Where Should We Mark Our Lambs?

It is easier to work sheep through a set of permanent yards, but it is safer to use temporary yards for lamb marking. If you can't do this you can always make a useful compromise. Water your permanent yards well to settle the dust. Set up your marking rail or cradles on the edge of the yards. As you

Plate 7.

General View of Arrangements for Marking. In this picture, the tail strip operation is being performed in conjunction with lamb marking.

release the marked lambs drop them on to their feet into a small holding paddock next to the yards. Put the ewes into this holding paddock so the lambs can run straight off to find their mothers.

To Sum Up.

To sum up, then, here are the main points:—

(1) Be clean. Keep your instruments clean, and use a temporary yard. If you can't use a temporary yard, get the marked lambs out of your yards as quickly as possible.

(2) Keep your ear pliers and knife sharp. Make clean, decisive cuts.

(3) Take special care when tailing ewe lambs. Cut their tails so they are level with the tip of the vulva, and so the bare skin form the underside of the tail will heal over the cut stump.

TEACH YOUR SHEEP TO EAT FROM A TROUGH.

Sheep that have not been hand-fed previously are not attracted to fodder set out in troughs. However attractive it may appear, it does not resemble the grass and herbage they are used to. In a dry time, before they learn to eat, they may fall away to the point when they will die anyway. On the other hand, if your lambing ewes refuse to eat a supplement, they may develop milk fever or pregnancy toxaemia.

It would be a good time right now to teach some of your young sheep to eat from a trough. These sheep, on being introduced into a flock that has never been fed previously, will soon teach the rest.

Creep Feeding: Calves Have Their Cake And Eat It Too!

By K. F. HOWARD, Adviser in Cattle Husbandry.

If you had a mob of cows and calves to fatten on crop but not enough crop for the whole mob, what would you do?

You could put a portion of the cows and calves on, but the cows would only be putting on cheap beef compared with what calves would gain on the same area. Instead, you could wean the calves on to the crop but you may be concerned that they would be set back too much.

A Predicament.

Last winter two graziers in the Miles area had this type of situation to deal with. They had a 40-acre paddock of lucerne but as it had been well grazed, it would not carry the 20 cows and calves that they wished to fatten. The natural pasture was decreasing in

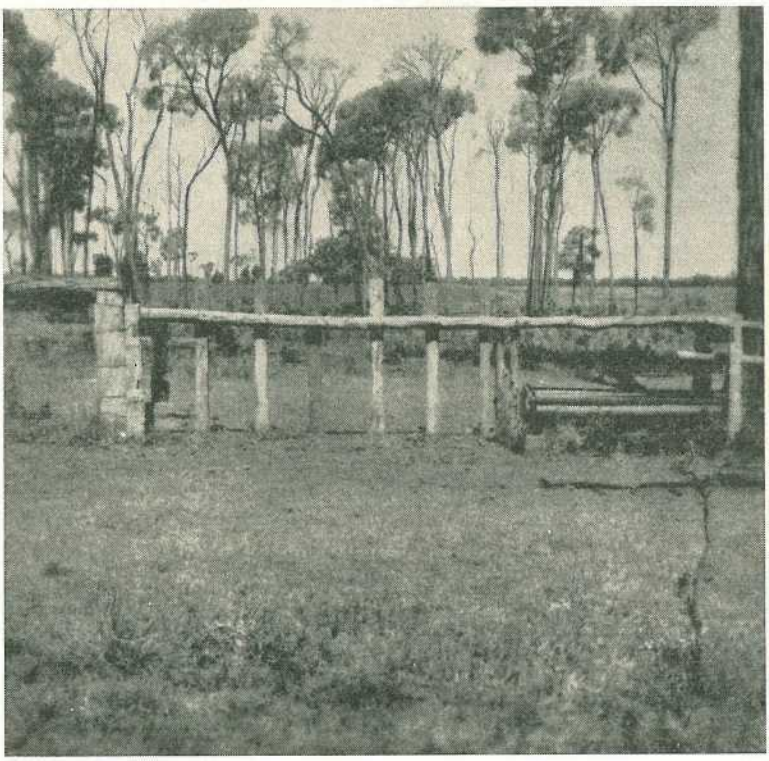

Plate 1.

View of Creep from Grass Paddock. The crop is the far side of the brigalow trees.

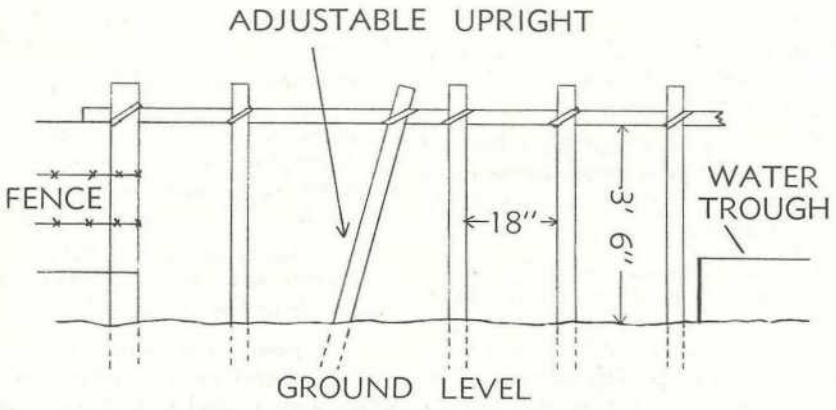

Plate 2.

Sketch of Creep Constructed of Bush Timber and Wire Ties.

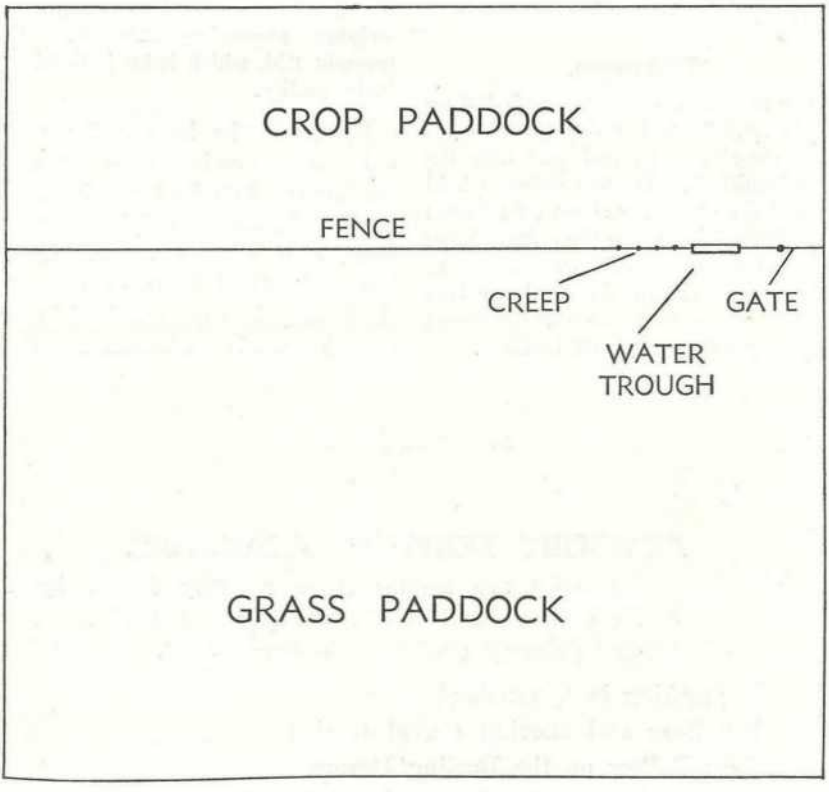

Plate 3.

Layout Indicating Suitable Location for Creep.

food value but was about sufficient to maintain the forward condition of the cows.

The calves were about 8 months old, which meant that the cows were giving very little milk.

The idea was to feed the calves on lucerne yet let them remain on the cows so that they would receive no shock from being separated.

With little trouble, the calves were taught to pass through a creep. They would go on to the lucerne when they felt inclined but could still come back to their mothers. The mothers were in a paddock of native grass which adjoined the lucerne paddock. The water trough was on the fence that divided the two paddocks. The creep was placed next to the water trough so that the calves would be able to walk through to the crop at drinking time.

Technique.

The cows and calves were all fed on the lucerne for a few days. The cows were then cut out and put into the grass paddock. The calves were held around the creep for about 30 minutes and then settled on to the crop. After this had been repeated three times, at intervals of three days, the calves grasped the idea and walked through the creep when they felt inclined.

On the first two occasions, some calves did not find their way back to their mothers and had to be pushed through.

The first two training periods required patience on the part of the stockmen but the time was well spent. By leaving one or two cows on the crop, the calves may be more easily attracted.

After two months, the mothers of the calves were driven off and the vealers showed no signs of distress.

The group of trained vealers were used as coachers for other calves which were weaned and placed in the same paddock. The trained mob provided comforting company for the freshly weaned calves, which settled down very quickly.

The vealers were sold at 12 months of age with approximate dressed weights averaging 330 lb. They brought £26, which is an indication of their quality.

By using the lucerne for vealers only, these graziers were converting the lucerne into beef worth over £7 per 100 lb. dressed weight. The cows were only capable of turning the lucerne into beef worth £5 per 100 lb. As it was, the cows remained in good enough condition to be sold as fats too.

ADVISORY LEAFLETS AVAILABLE.

The following titles are among those recently issued by the Department of Agriculture and Stock. They are available free of charge to interested primary producers in Queensland.

Haymaking in Queensland
Handling and Storing Cereal Grains
Tyre Rollers on the Darling Downs
Specifications of Fruit and Vegetable Packages
Control of Wild Tobacco Tree on the Atherton Tableland

Save The Life of That Can

By J. D. ELRINGTON, Senior Adviser (Machinery), Division of Dairying.

Milk and cream cans are costly. Replacement costs can be minimised if care is taken in their use and re-tinning is done as soon as necessary. The life of many cans is shortened because farmers often fail to have them re-tinned before serious damage occurs.

Continual attack by acid milk or cream and washing solutions destroys the thin layer of tin on cans. The steel, which the tin protects, is then exposed. Air and moisture act on this exposed steel to form iron oxide, which we know as rust. This rusting could extend right through the side or bottom of the can. The depth of a rust mark is difficult to judge, even for an expert. Milk and cream often soak through these rust marks. If the rust mark is opposite one of the bands, the milk or cream lodges between the band and the can body.

If the band is well soldered to the can body a leak under the band will not be seen from the outside. Moisture, milk or cream lying between the can body and the hoops speeds the destruction of the can. This is a very common cause of can breakdown (Plate 1).

REPAIRS.

Sometimes the cost of repairs and re-tinning is more than the cost of a new can. The workshops may not have the labour or the facilities to do extensive repairs. These conditions result in the can being discarded instead of being repaired.

In addition to re-tinning the can, repairs must be made when the body of the can is cracked or has small rusted holes in it (Plate 2). Large holes cannot be repaired. Some

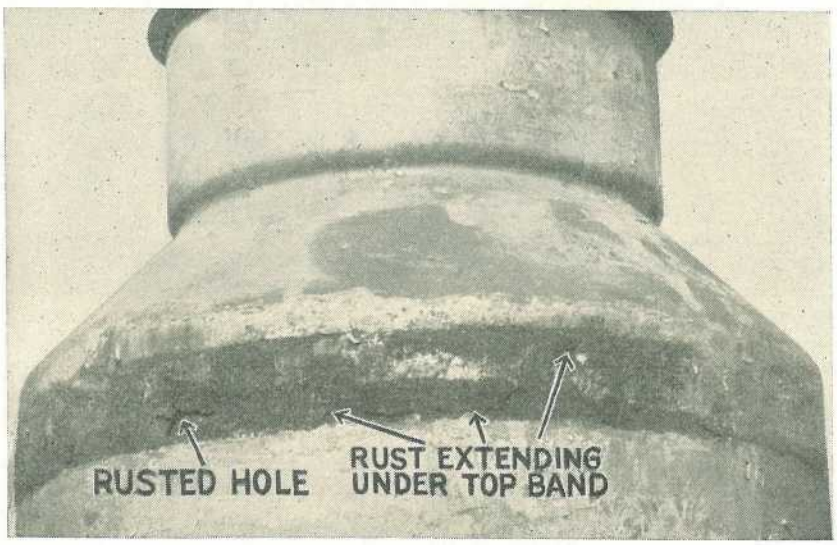

Plate 1.
Rust Under Top Band of a Milk Can.

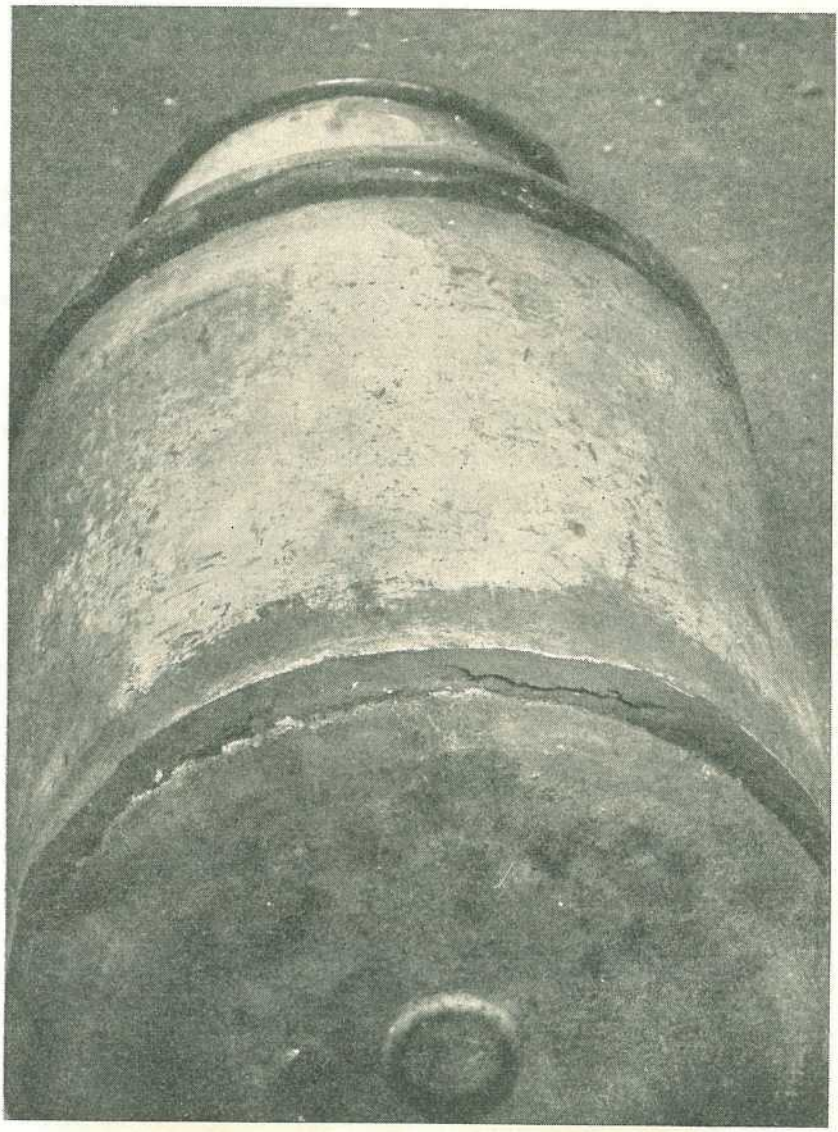

Plate 2.

Can Body Rusted and Broken Under Bottom Band.

repairers cut off the bottom and about two inches of the side, and weld a new bottom into the can. The capacity and the weight of the can are changed when this repair is done.

Dents are removed and handles are repaired before the can is re-tinned. Cracks and small holes are soldered after re-tinning. Soldering is done from inside the can; this is awkward, slow and costly.

Faults which cause rejection of the can are sometimes not discovered until the bands are removed and the rust cleaned away. By this time approximately £1 has been spent in freight, time and labour. A can in this condition with no hoops and a large hole in it is useless, and certainly would not warrant the cost of further freight payments to return it to the farmer.

The loss on rejected cans is not met directly by the owner of the cans, so a small amount is added to the cost of every successful job to cover this loss. Here is a way in which all farmers can reduce re-tinning costs. Send cans along for re-tinning as soon as small rust spots appear. Avoid the losses and increased charges caused when cans beyond repair are forwarded.

Milk and cream cans are often stood in water to cool the dairy produce. The water may attack the tin; if it does, rust spots will develop. Test the water by adding a few drops of phenolphthalein indicator to about half a glass of the water. This indicator is readily available at all butter and cheese factories. The water should turn pale pink when the indicator is added. If it does not show any pink colour, add a tablespoon of metasilicate to the water in which the cans are to stand, mix thoroughly and re-test. Metasilicate gives best results, but soda ash or washing soda may be used. This will make the water relatively non-corrosive.

Handles and Bands.

Broken handles are sometimes repaired on the farm, at a butter factory, or in the local plumbing shop. The common method is to bore a hole through the handle, band and body of the can, rivet the handle in position and then solder both ends of the rivet.

When the handles are riveted in this manner, the cans should not be sent for re-tinning. It is a very difficult task to remove the top hoop from these cans. The rivet holes have to be repaired after the can is re-tinned, by soldering from the inside.

Loose handles should be repaired by a tradesman. The top band is removed, and the handles riveted to this band. Unless the can is relatively new, it would be as well to remove the bottom band also, and re-tin all the parts at the same time.

Carefully examine every can each time it is returned from the factory. If either of the hoops is loose or the solder joint between can body and hoop is cracked, repairs should be done.

Take the can to a good plumber. Instruct him to remove the band and clean and dry it inside. Re-solder it firmly in position all the way around, on both edges. If there is any rust under the bands, have the can re-tinned.

RE-TINNING.

There are two methods of re-tinning cans. Each is satisfactory when properly done. Preparation of the can is similar for both processes.

As cans are usually re-tinned in batches the first job is to number the can body, lid, and both bands. Each part has the same number and each can bears a different number. The bands are then removed, and dents knocked or rolled out of the can.

The parts are then placed in a large vat filled with a weak acid solution, and left to soak for 12–18 hours. This is known as "pickling." During this time the acid eats the iron oxide or rust away, leaving the steel quite clean and with a dull grey appearance.

In the hot tinning method the parts are dipped in flux and then rolled in a trough half full of hot melted tin. This is done twice, the second time with the bottom hoop in position, not to get a thicker layer of tin on the

steel, but to get a smooth layer. The bottom hoop is also well bonded to the can body (Plate 3). A smooth surface of tin on both the inside and the outside of the can is essential. Cleansing may then be effectively done.

The cold tinning process resembles nickel or chrome plating. The body of the can and the other parts are put into a vat and covered with a special liquid known as the electrolyte. They are connected to an electric supply, and the tin from the solution is deposited evenly on the can by an electrical process.

LIDS.

Lids and can necks should not be damaged. If the lid has to be forcibly removed, the solder joint in the flange

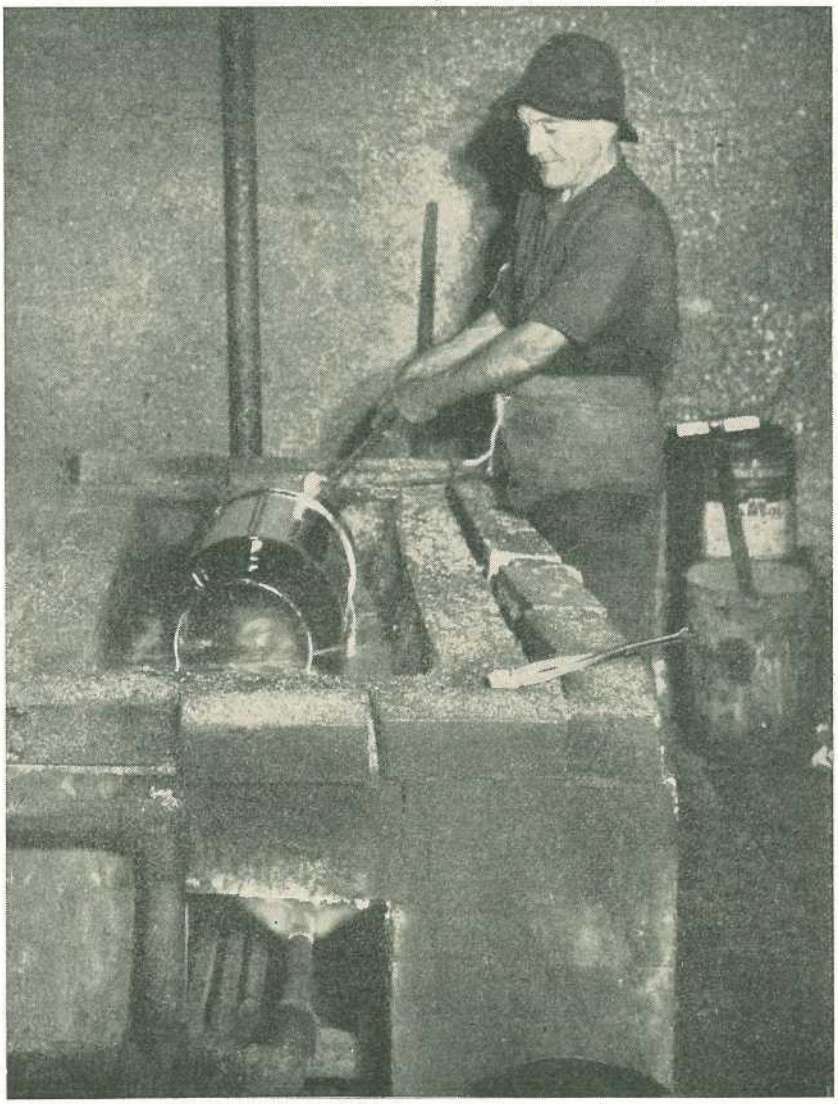

Plate 3.

Re-tinning a Milk Can in a Vat of Molten Tin.

will be broken. Milk or cream putrefying in this crack will reduce the quality of the dairy produce conveyed in the can.

Examine the lids of new cans for "blow holes" in the solder, and lids returned from factories for dints and cracks. The lids and necks of new cans are circular, and the lids are a snug but not a tight fit. Even a slight dent in either the lid or the neck of the can will make the lid tight, and forcible removal with a hammer will only make it tighter. Factories are frequently at fault for damaging lids and can necks, but the farmer should see that the lid on his can does not need forcible removal. Both parties should handle cans carefully. The can should not be thrown neck first on to hard surfaces such as can washers. Lids should not be struck with steel hammers.

LONG LIFE.

Several precautions can be taken to obtain the longest possible life from the tin coating on cans.

(1) Store unused cans clean and *dry*.

(2) Wash and sterilize with boiling water or steam. Stand upright until the steam escapes and the cans dry. Then invert on a storage rack. Do this as soon as the cans are received from the factory.

(3) Use tank water if your normal water supply induces rusting of iron and steel.

(4) Use cleaners at the correct strength and only those which do not contain any grit. Use good scrubbing brushes, not steel wool or metal fabric.

(5) Rinse cans with the correct strength of chlorine solution only a few minutes before use, never after washing, unless the can is to be used immediately.

(6) Inspect the cream stirrer for rough or sharp edges. Plunge the stirrer up and down; do not "roll" it around the sides of the can. Remove the stirrer from the cream; do not leave it in the can.

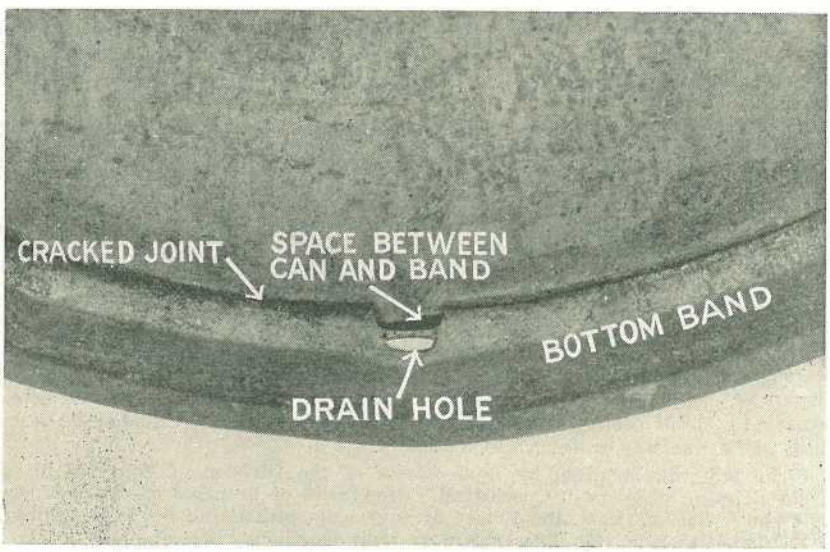

Plate 4.

A Space between the Bottom Band and the Can Bottom can cause a Hole within Six Months.

(7) Cans not being used for a long period should be dried thoroughly and wiped out with an oil-soaked cloth. Thorough washing and airing make the can suitable for use again.

NEW CANS.

When buying a new can, only accept one which is well made. Examine it as soon as you receive it. Look for:—

(1) Rust spots, scratches or rough areas of tin.

(2) Firm attachment of handles and bands.

(3) Cracks between the edge of the bands and the body of the can.

(4) Spaces between the bottom band and the body of the can.

Drain holes are bored through the bottom band, and complete soldering of this band to the can body is difficult where drain holes are close to the bottom of the can body. This space between the band and can is where the drain hole in the bottom band butts on the can bottom (Plate 4). Turn the can upside down and pay particular attention to this spot. It is a common fault in one make of can. A hole here allows water in between the can body and the bottom band. Cans may have holes rusted in them within six months from this cause.

Return any faulty cans to the supplier and demand good products which will last a reasonable length of time.

New cans are sometimes difficult to obtain. Cans are a costly item in dairy farm management. A good layer of tin should last for years, but a neglected rust spot can destroy the can in six months. Neglecting to re-tin the can or postponing the job can be false economy and involve you in unnecessary costs.

ACKNOWLEDGEMENT.

The author is indebted to the management and staff of W. Inglis and Son (1956) Pty. Ltd. for their assistance in compiling this material.

ILLUSTRATED TALKS ON MILK AND CREAM COOLING.

Cooling of milk and cream is a practice known to be one of the most important in the production of good quality butter, cheese and market milk. This is of particular importance in Queensland, where dairying is carried out under subtropical conditions with high temperatures seriously affecting the quality of dairy produce. If Queensland is to compete successfully in world markets and establish a high reputation for the quality of its dairy products, cooling must be carried out by every dairy farmer.

Stating this recently, the Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) said that coloured slides prepared by the Division of Dairying dealt with this essential practice in modern dairying. An Illustrated Talk has been prepared to show the various types of milk and cream coolers now in use, the different methods of storage and the effect on quality of cooled and uncooled milk and cream. The series of 35 slides shows the latest types of refrigerators in use and those now being demonstrated under the Commonwealth Dairy Industry Extension Grant.

The talk is divided into three major sections: The cooling of market milk, the cooling of cheese milk, and the cooling of cream. Two stages are shown in each case:—(1) shock cooling immediately after production; (2) storage in a cold place whilst awaiting transport to a factory.

The talk will be given by local officers of the Division of Dairying in each of the dairying districts in Queensland. Secretaries of branches of the Queensland Dairymen's Organisation should make arrangements with the officer in their district if they wish to have the slides shown at their meetings.

Mr. Collins said that this is the fourth series of coloured slides prepared by the Division of Dairying. Earlier sets deal with dairy premises, equipment and hygiene; the care and operation of milking machines; and herd recording. Arrangements can be made to show these sets also, if required by branch secretaries. Approximately 9,000 dairy farmers have now attended these Illustrated Talks since the first series was shown 18 months ago. This indicates the growing interest being evinced by farmers in improved dairying practices.

Dairy Herd Records

By S. E. PEGG, Chief Adviser, Herd Recording.

Experienced farmers have found that it is necessary to concentrate on cow families when planning a breeding programme.

It is known also that the lifetime production and history of the cow are of much greater value than records of one or two of its lactations.

Unless some permanent records are kept it is not possible to assess the value of the various cows and cow families in the herd. Farmers who have adopted the systematic keeping of herd records have found it to be most useful as well as interesting.

As most dairy farmers are untrained in accountancy methods, and are much too busy to keep complicated records, it is desired to present a simple system for keeping records of the dairy herd.

The main requirements of this system are:—

(1) A shed sheet or some alternative for recording information at the shed.

(2) A herd record book to provide a permanent and complete record of individual cows.

SHED SHEET.

A sheet kept at the shed is essential as a means of making notes of events immediately they occur. All cows are under observation at milking time and particulars of services, calving dates, &c., can be entered there quickly and conveniently. For this purpose a shed sheet made of fairly stiff cardboard is possibly most suitable. The sheet should be firmly fixed in a convenient place in the milking shed or separator room where it will not be splashed by milk or water. A pencil should *always* be attached by a string in a handy position.

Shed sheets can be simple or very complex. The design of a simple shed sheet is shown in Plate 1. The information on this sheet is divided into three sections:—

(1) Particulars of cows.

(2) Particulars of calving and calves.

(3) Particulars of mating.

(1) Particulars of Cows.

The minimum requirements in this section are:—

(*a*) *Recording Number.*—Each cow retains the same recording number during her lifetime. When a cow goes out of the herd her number is not used for a new cow until the beginning of a new herd recording year (that is, October 1 each year). For this reason a new sheet is required each herd recording year.

(*b*) *Name of Cow.*—As there is only a limited space allowed for the names of cows, any stud prefixes should be abbreviated or noted by the first letter only.

(*c*) *Tattoo or Identification of Cow.*—This space is used to show the tattoo or branded number of the cow. If the cows are not named this is the only means of identification.

(*d*) *Age at Commencement of Lactation.*—It is important to record this information accurately, as comparisons of production are made according to age. Information on age is essential when considering lifetime production. Soundness at 10 years is certain proof of a good constitution.

(2) Particulars of Calving and Calves.

(*a*) *Date of Calving.*—This is basic information. It is used to plan time of mating and to assess the length or

SHED SHEET

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SIRES

Initial of Sire	Name	Breed	H.B. No

Particulars of Cow				Particulars of Calving						Particulars of Mating						Remarks
Recording Number	Name	Tattoo No	Age	Date of Calving	Normal or Abnormal	Sire of Calf	Sex	Reared Sold or Destd	Tattoo No	Dates of Services			In Calf To	Due to Calve	Date Dried Off	
1																
2																
3																
4																
5																
6																
7																
8																
9																
0																
1																
2																
3																
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Plate 1.

Design of a Suitable Shed Sheet.

stage of lactation. It also allows the production of cows according to the time of calving to be assessed.

(*b*) *Calving—Normal or Abnormal.*—Abnormal calvings may indicate the presence of disease, especially when considered in conjunction with the number of services required. Abnormal calving can adversely affect the production during the ensuing lactation.

(*c*) *Identification of Sire of Calf.*—This should be recorded when the calf is born. It allows the production ability of a sire to be assessed.

(*d*) *Sex of Calf.*

(*e*) *Calf Reared, Sold, Died or Destroyed.*—It is advantageous to keep particulars of every calf born. This allows a check of the effects of disease to be made and assists in the selection of replacements.

(*f*) *Tattoo Number of Calf.*—Calves should be tattooed as soon after birth as possible to ensure positive identification.

(3) Particulars of Mating.

(*a*) *Dates of Services.*—It is an essential part of herd management to record these dates, as the nature of each cow's lactation depends on the date she goes in calf. Return to service several times indicates the presence of disease. To record returns to service, at least three columns should be allowed on the shed sheet for the recording of dates of service.

(*b*) *Identification of Bull Used.*—If more than one bull is used on the farm, the initials of the bull are placed in the date-of-service column until it is certain that the cow is in calf. The initials of the last bull used are then placed in the column provided for the identification of the bull.

(*c*) *Date Due to Calve.*—This can be worked out from a gestation chart. A normal gestation period for a cow varies, but the average length is considered to be about 280 days. If no chart is available, the date can be worked out by allowing this period after the last service date. This date is very important and should be referred to frequently to ensure that the cow has an adequate, but not excessive, dry period before calving.

(*d*) *Date Dried Off.*—The actual date on which the cow was dried off should be entered. It enables the length of lactation and the length of dry period to be worked out accurately and quickly. This entry, together with the date of calving and date due to calve, can tell an interesting and revealing story—it is amazing how long some cows are in the dry paddock.

(*e*) *Remarks.*—In this column are noted occurrences of disease or other events which happen throughout the year. If desired, the dates of heat periods can also be entered in this column.

Details entered on the sheet should be transferred to a Herd Record Book regularly in order to preserve a permanent record. A convenient time for entering these particulars is the monthly recording day or the last day of each month.

A new shed sheet should be commenced each herd recording year.

HOW MANY FARMERS USE SHED SHEETS?

A recent survey of 866 members of Herd Recording Groups showed that only 37·1 per cent. were using shed sheets. This low percentage may be due to the fact that a simple shed sheet is not readily available.

In this survey it was found that the percentage of farmers using shed sheets varied according to the number of years they had been recording. Details are given in Table 1.

TABLE 1.

PERCENTAGE OF FARMERS USING SHED SHEETS.

Number of Years Recorded.	Number of Farms in Survey.	Number Using Shed Sheets.	Percentage of Farmers using Shed Sheets.
6 or more ..	107	53	49·5
5	36	21	58·3
4	59	25	42·3
3	121	62	51·2
2	191	71	37·2
Less than 2 ..	352	89	25·3
Total ..	866	321	37·1

A HERD RECORD BOOK.

A Herd Record Book is kept in the house, and is used to record complete particulars of individual cows during their lifetime. Some farmers prefer to use cards, whilst others prefer a loose-leaf system to a book. Whatever form is adopted, the chief requirement is to utilize one page or one card to record particulars of each cow year by year.

Sire: Rockberg Master — Name of Cow: Beauty — Page No.: 26

Breed: A.I.S — Breed: A.I.S (Grade) — Recording No.: 26

Dam: Bonnie — Remarks: — Other Identifications:

Breed: Grade A.I.S. — Remarks:

Remarks:

Age or Date of Birth	Date of Calving	Aborted Sick Normal	Sire of Calf	Sex of Calf	Reared Died Disposal	Ident. of Calf	Date of Service	No. of Services	In Calf to	Date Due to Calve	Date Dried Off	PRODUCTION Milk	Fat	Test	Days	Nett Profit £ s. d.
17-8-48							23-11-49	1								
2 yrs	1-9-50	N	C.S.	F	R	A6	30-10-50	1	C.S.	23-8-51	7-6-51	4000	160	4.0	270	
3 "	28-8-51	S	C.S.	M	Sold		20-11-51	1	C.S.	11-9-52	3-7-52	4405	185	4.2	300	
4 "	8-9-52	N	C.S.	M	"		28-11-52	2	R.P.	1-9-53	19-6-53	5120	210	4.1	270	
5 "	6-9-53	N	R.P.	F	Died	D12	2-12-53	1	R.P.	10-9-54	17-7-54	5490	225	4.1	300	
					Died		18-8-54	Accident								

Plate 2.

Page from a Herd Record Book.

[*By courtesy of Oxford Press, Rockhampton.*

A page of a suitable record book is illustrated in Plate 2. It shows the identification and short pedigree of the cow at the top of the page and then particulars of each lactation of the animal. These particulars include age, date of calving, disposal of calf, date due to calve, in calf to which bull, date dried off, and production record for the period. Much of this information will be transcribed from the shed sheet at regular intervals, and it is not necessary to discuss the headings which were outlined earlier.

Recording No. 26 — BEAUTY — Index No. 42

DESCRIPTION Red. Little White

TATTOO NO. 7 BREED A.I.S HERD BOOK NO. —

BRANDS, MARKS DATE OF BIRTH 17-8-48

SIRE Rockberg Master DAM Bonnie

INOCULATIONS Blackleg Strain 19

DISPOSAL Died REASON Accident YEAR 18-8-54

Service Date	Calving Date	Production		Test	No. of Days	Dried Off	Dry Period	In Calf To
		Butter Fat	Milk					
22/11/49	1/9/50	160	4000	4.0	270	7/6/51	12 wks	C.S.
30/10/50	28/8/51	185	4405	4.2	300	3/7/52	10 "	C.S.
30/11/51	8/9/52	210	5120	4.1	270	19/6/53	11 "	R.P.
28/11/52	6/9/53	225	5490	4.1	300	17/7/54		R.P.
2/12/53								R.P.

Plate 3.

Herd Record Card. Side containing information on the cow.

[Card printed by Beaudesert Times.

CALF RECORD

Date of Birth	Sex	Tattoo Marks	Description	Sire	Died Reared Sold	Card Index No.	Inoculation	Remarks
1-9-50	F	A6		C.S.	R	86	Blackleg Strain 19	
28-8-51	M			C.S.	S			Bobby calf
8-9-52	M			C.S.	S			" "
6-9-53	F	D12		R.P.	D			Pneumonia

Plate 4.

Herd Record Card. Side containing information on calves.

[*Card printed by Beaudesert Times.*

The chief purpose of the Herd Record Book is to keep a permanent record of the particulars entered on the shed sheet, together with a complete account of the production of each lactation during a cow's lifetime.

The two sides of a card which is used by some farmers in preference to a record book are shown in Plates 3 and 4.

Before putting his system for keeping records into operation it is suggested that a farmer discuss it with the local Dairy Officer or Cattle Husbandry Officer. These officers can advise where suitable Herd Record Books or cards may be obtained. They will assist also in drawing up or obtaining a shed sheet.

Unless records are kept accurately and consistently, it is difficult to manage a herd properly. Without such records it is easy to over-estimate or under-estimate an animal. One cow may produce well for one season, but in later lactations she may not produce as well as expected. It is the one season's high production which comes to mind when thinking of her. Another animal may never be an outstanding producer in any one year, but, by consistent production and regular calvings, she is a valuable member of the herd.

It does not pay to trust to memory when selecting dams from which to breed replacements. The consultation of well-kept records will eliminate guessing.

Bull Paddocks on Dairy Farms

By S. E. PEGG, Chief Adviser, Herd Recording.

When examining production records a doubt often arises as to whether many farmers control the calvings of their cows. In other words, are the bulls paddocked or do they run with the herds? The latter appears to be the general practice. A close examination shows that there is nothing to commend this practice except that it saves some work.

Advantages of a Bull Paddock.

The advantages of paddocking a bull are—

(1) Services are controlled and calvings can be arranged for desired periods—such as seasonal calving.

(2) Service dates can be noted, thus enabling the calving dates to be ascertained with accuracy and precision.

(3) A close check can be kept on the incidence of infertility in the herd.

(4) The vigour of the bull is maintained by limiting the number of services per cow.

(5) Reliable breeding records can be kept.

(6) Attacks on people by bulls are minimised.

Requirements of Paddock.

The bull paddock should be large enough to provide the bull with sufficient grazing to obviate the necessity for hand feeding. It should be provided with water, shade and shelter, and a small service yard is advantageous.

The fence should be strong enough to restrain the bull—4 to 6 well strained barbed wires should suffice.

Farms which have Bull Paddocks.

Having detailed the requirements and advantages of a bull paddock, it is interesting to note the percentage of dairymen who have provided such a paddock.

The advantages are so great and so obvious that one would expect to see a bull paddock on every farm, but a survey showed that amongst members of Herd Recording Groups, only 42.8 per cent. of farms were so equipped.

A total of 866 farms was included in the survey, and it was found that the greatest percentage of farms equipped with bull paddocks was those where herd recording had been practised for five years or more. Details are shown in Table 1.

No. of Years Recorded.	No. of Farms.	No. of Farms with Bull Paddock.	Percentage of Farms with Bull Paddock.
6 or more	107	64	59·8
5	36	24	66·6
4	59	23	39·0
3	121	60	49·6
2	191	76	39·8
Less than 2	352	124	35·2
Total	866	371	42·8

From the table it certainly appears that the farmers who have been recording continuously over a number of years are realising the necessity for providing a bull paddock on the farm.

A bull paddock is a "must" on a dairy farm. It is necessary for controlled calvings and also allows a constant check to be kept on breeding programmes and on the incidence of infertility in the herd.

STUDYING FARM ECONOMICS OVERSEAS.

A senior Agriculture Department officer will study farm economics in the United States and Canada, the Minister for Agriculture and Stock (Hon. H. H. Collins, M.L.A.) announced recently.

The officer is Mr. C. H. P. Defries, Assistant Director of Marketing in the Department. He will leave Queensland in mid-May. In the United States, Mr. Defries will examine American procedures for evaluating farm management methods for two months, mainly at the Universities of North Carolina and Missouri. He will then spend a month studying the extension applications of farm economics and farm management surveys, which will include visits to the Ottawa University and the Ontario Agricultural College.

Mr. Collins said that this is an age of planning. Planning on the farm or in extension programmes can only be really effective when it is based on sound economic information.

Farm management and farm economics are relatively new fields of study in Australia. The difficulties Australia is finding in maintaining overseas markets are focussing attention on the need for greater efficiency in agriculture. This involves reducing costs of production, avoiding waste and guiding resources into the most effective use.

Queensland urgently needs more basic farm information on the economic implications of projects like fodder conservation, pasture improvement, irrigation and diversified farming. Economic surveys of such projects are needed to provide extension officers with the clear-cut information they require to tackle the problems in their own districts.

The United States agricultural industry has a very comprehensive system of investigation into farm economic problems. The trend there is towards using these services more and more in establishing farm production programmes. The information is also drawn on for policy making and planning extension programmes.

With the object of adapting them to Queensland conditions, Mr. Defries will make a special study of the procedures adopted for making economic surveys and their application to extension programmes.

His studies in the United States are being financed by a U.S. State Department leader specialists' grant. The work in Canada has been arranged under the Commonwealth Extension Services Grant.

OPEN SEASON FOR SOME AVIARY BIRDS.

An open season for some aviary birds, all members of the parrot family, commenced on May 1.

The trapping season for budgerigar, king parrot, rainbow lorikeet and red-winged parrot continues until September 30, 1957. For the cockatiel or quarrian, the open season extends until November 30, 1957.

An open season extends throughout the year for rosellas, Java sparrows, nutmeg finches, gold finches and other introduced aviary birds.

"*The Fauna Conservation Act of* 1952" requires all persons trapping aviary birds to hold a permit. Aviaries containing 20 or more birds must be registered. Applications for trapping licences and for the registration of aviaries should be made to the Department of Agriculture and Stock, Brisbane.