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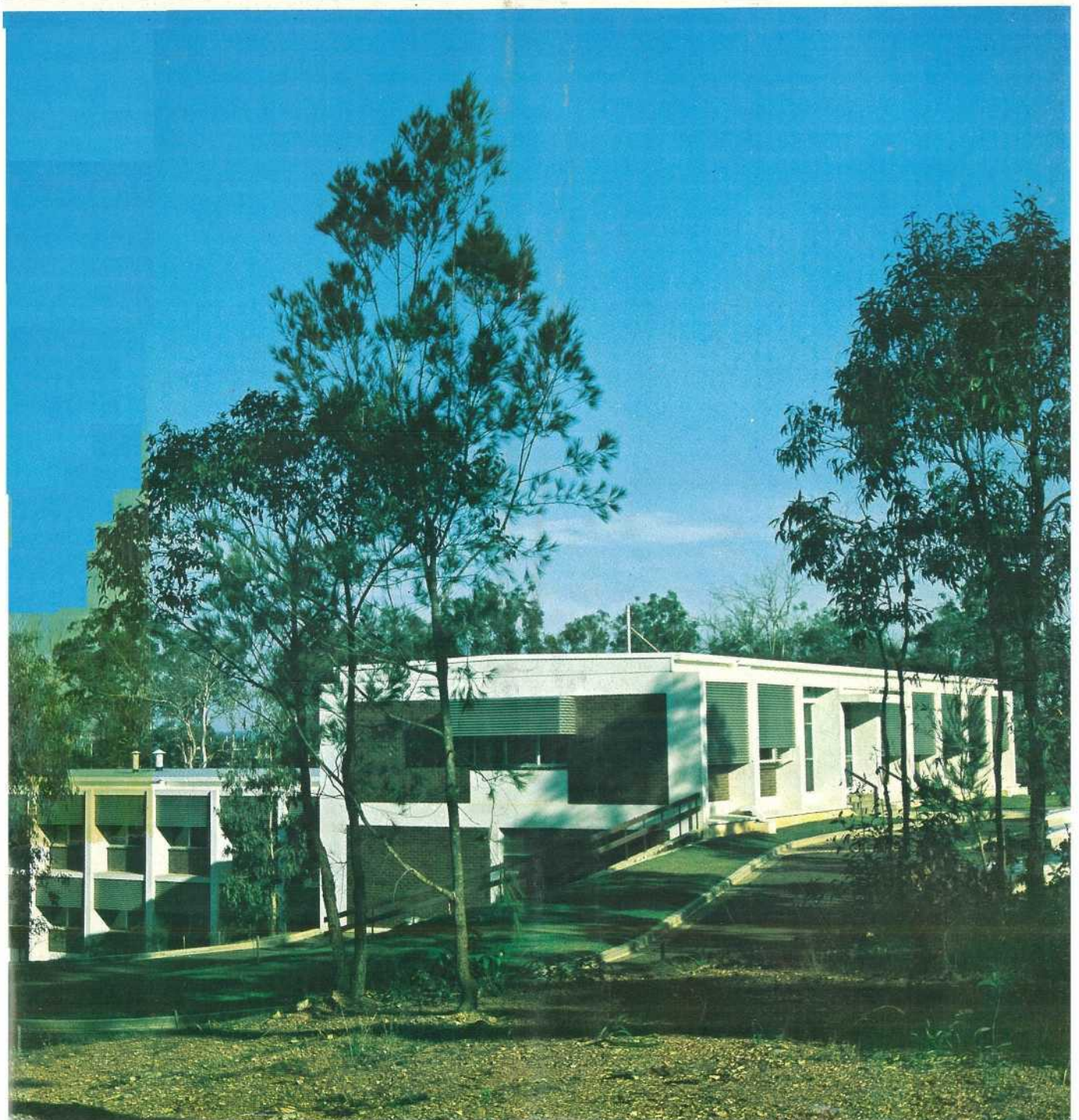

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Serving Queensland's primary industries. A view of the Agricultural Standards Branch laboratories and offices in the Brisbane suburb of Indooroopilly.

Editor: A. E. FISHER

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QUEENSLAND AGRICULTURAL JOURNAL

JANUARY, 1974

Bright Rural Future

The important economic role that primary industries play in Queensland was highlighted in 1972-73 when the gross value of rural production reached $912.2 million, almost $105 million better than the previous year.

Early in 1973, widespread storms and showers promoted a rapid recovery from the existing dry conditions but, for some industries, this was offset by a dry autumn and mild winter with above-average July-September rains.

Wheat plantings were restricted severely and further falls in October-November hampered harvesting and summer crop plantings.

Other major industries, such as sugar, beef and wool continued to enjoy a buoyant market.

I am most optimistic that the future holds promise for Queensland's primary industries generally, realizing that areas of difficulty always will exist because of our erratic climatic pattern and its effect on farm planning and crop yields.

Much of my optimism stems from dramatic developments which have taken place on the export market scene. New, and substantial, outlets have opened, notably in Far Eastern countries, for our produce and the potential for a trade build-up there and in traditional markets in North America, Europe and Japan is encouraging.

Challenge

With the world population soaring, the economies of many developing countries stabilizing and food tastes becoming westernized, the challenge is offered to Queensland producers to help service what must become an enormous market.

Farmers here have demonstrated by their adoption of the latest techniques devised from scientific and field research, and their wide use of mechanization on the farm, that they have the ability to accept such a challenge.

They deserve praise for having, despite the problems of bad seasons, rising costs, diseases and pests, attained a high level of production in 1972–73.

Hon. V. B. SULLIVAN, M.L.A., Minister for Primary Industries.

I was able, during a tour overseas in 1973 to attend the International Sugar Conference, to study agricultural developments and market opportunities in a number of countries.

During discussions with importers, I found them keenly interested in obtaining greater quantities of rural products and high in their praise of the quality of the Queensland product!

I welcome this opportunity to extend to readers of the *Queensland Agricultural Journal,* and indeed to all primary producers in Queensland, the compliments of the season and wish them a prosperous 1974.

I congratulate the Editor of the *Journal,* Mr. Fisher, on the high standard maintained in the *Journal* throughout the year.

Two More Regional Leaders

EXTENSION leaders of the Capricornia and Far South-western regions are introduced this month.

Mr. P. STONARD

Capricornia

Eight years' experience in tropical agriculture in Nigeria accompanies Mr. Stonard to the tropical Capricornia Region, of which he has been appointed Regional Extension Leader.

Mr. Stonard graduated as a Bachelor of Science (Agriculture) from Wye College, London, in 1948. He also holds intermediate certificates from the Chartered Institute of Insurance and in agricultural and estate management from the Royal Institute of Chartered Surveyors.

Between 1948 and 1953, he managed two intensively developed farms in England. These farms ran pedigree cattle, pigs and poultry, and grew a wide range of crops and fruit.

In 1953, he was appointed agricultural superintendent in the Northern Nigerian Ministry of Agriculture. Extension activities formed a large part of his duties in the posts he held during his 8 years in that country.

Mr. Stonard came to Queensland in 1962 as an agrostologist at the Department of Primary Industries 'Brian Pastures' Pasture Research Station near Gayndah. There, he worked on improving native pastures by introducing legumes into the sward, evaluating lucerne strains and plant introductions.

After 5 years at 'Brian Pastures', Mr. Stonard was appointed Agriculture Branch Extension Officer for the Central Burnett district with duties in the Gayndah, Mundubbera, Eidsvold and Biggenden Shires. In this position, he established the Central Burnett Co-ordinated Extension Group, and was appointed its first chairman. This group co-ordinated the extension work of the seven branches serving the district.

In 1972, Mr. Stonard was transferred to Rockhampton as the Agriculture Branch Regional Extension Leader. In this position, he administered and co-ordinated the activities of the nine extension workers in the Central Coast, Central Highlands and the Callide-Dawson areas.

Far South-western

Mr. J. R. CHILDS

Mr. Childs, Sheep Husbandry Officer and Acting Regional Extension Leader in the Far South-western Region, is a graduate in Rural Science from the University of New England.

After graduation, he fulfilled his National Service obligation, serving in the Australian Army in Papua New Guinea. He was posted for 6 months as a recruit training officer and then for a year as Administration Officer at the Papua New Guinea Training Depot.

In 1970, on completion of his National Service commitments, Mr. Childs returned to the University of New England. There, he obtained a post-graduate Diploma in Agricultural Economics.

Mr. Childs joined the Department of Primary Industries in December 1970. Since then, he has been engaged on a study of sheep property management in South-western Queensland.

Monthly Tests For Mastitis

A monthly test on milk from all suppliers to milk factories is included in the Queensland Mastitis Cell Count Programme.

by E. I. CARTER, Dairy Field Services.

This test is being provided by the Dairy Division of the Department of Primary Industries as a service to producers.

Known as the Wisconsin Mastitis Test (W.M.T.) the test indicates the number of white blood cells that appear in the milk to fight the inflammation in the udder commonly known as mastitis. The higher the number of cells, the more serious is the mastitis condition.

Since visibly abnormal milk caused by mastitis (that is, clinical mastitis) is not included with the bulk supply to the factory, this test is used for diagnosing subclinical mastitis only. Subclinical mastitis cannot be detected with the naked eye.

88	53	CARTER	E.O.	W.M.T. RESULTS	JAN 1974

AUG 1973	SEP 1973	OCT 1973	NOV 1973	DEC 1973	JAN 1974
5	14	21	7	10	5

AVERAGE RESULT 10 NUMBER OF TESTS BELOW 15:– 5

LAST RESULT 5 YOU ARE AMONG THE BEST AND IMPROVING.
A RESULT OF EIGHT OR LESS IS GOOD.

THIS IS THE FIRST OF THE W.M.T. (MASTITIS-TEST) RESULTS TO BE FORWARDED TO SUPPLIERS. FOR FURTHER INFORMATION CONTACT YOUR DAIRY ADVISER AT THE D.P.I.

The special Wisconsin Mastitis Test (W.M.T.) advice that will be forwarded to all milk suppliers in 1974.

Test results received from the testing officers are processed by computer at the Treasury Department in Brisbane.

The results of the test will be recorded as a score ranging from 0 to 35. A score of 'below 15' represents a cell count of 'less than 500 000 per ml' and a score of '25', 1 million or more per ml.

Mastitis testing using the W.M.T. began at most milk factories early in 1972. From the beginning of this year, results will be made available to producers and special advice notices will be forwarded.

Information noted on the advice slip is the last W.M.T. score, the previous five scores, and the average score over the last 6 months. For an accurate interpretation, it is best to look at the last result in conjunction with the average result over the period. From this comparison, the success of the farmer's control campaign can be gauged.

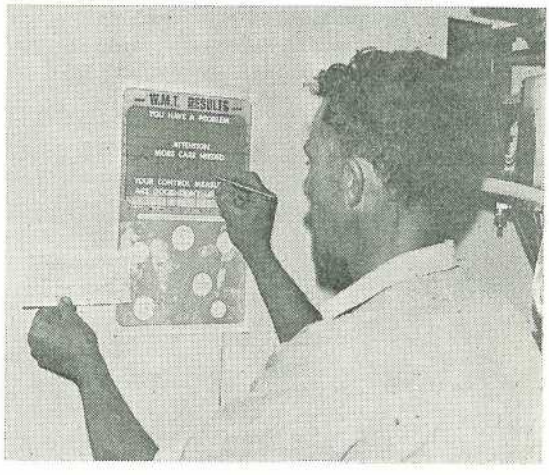
A special message based on the average result and the last result will be printed on this advice slip. This message will help the producer in his interpretation of the scores. Other information included is the number of tests in the 6-month period that was 'below 15'. If all tests were below 15, the subclinical

Interpretation At A Glance

W.M.T. SCORE	
LOW	0–10 Good level picture. Continue measures to keep score low.
	10–15 Control measures should be looked into before the level deteriorates.
MEDIUM	15–20 Steps should be taken to reduce this level. Subclinical mastitis could be widespread in the herd.
MEDIUM-HIGH	20–25 The adoption of a planned control system is necessary.
HIGH	25–35 These herds have a serious mastitis problem. It is imperative to adopt a stringent control programme, together with an intensive check of the milking machines.

mastitis problem in the herd is not serious. On the other hand, any scores 'greater than 25' show a serious problem.

Producers are advised to consult the local dairy officer for interpretation of the score result or any other inquiry on the test.



A poster is available from the Department of Primary Industries on which the farmer may record his results and gauge his progress in his campaign to control mastitis.

Pineapple Quarantine Lifted

PROCLAMATIONS declaring pineapple quarantine areas in the Brisbane metropolitan area and South Coast district, introduced when pineapple scale disease was discovered in the Rochedale area, have been rescinded.

The Minister for Primary Industries (Hon. V. B. Sullivan, M.L.A.) said the Brisbane area was declared in February 1933 and the South Coast district in February 1949.

Since that time, the disease has been found in most of the southern Queensland pineapple-growing areas, although it has not caused any serious damage.

Because of this, there is no longer any point in having a quarantine restriction in these districts and particularly within the city limits of Brisbane, where there is now very little commercial pineapple growing.

Tuberculosis-Free Cattle Herds (As at January 23, 1974)

ANGUS

Corden, E. B., Netherby, Warwick
Crothers, H. J. "Mooreenbah", Dirranbandi
Mayne, W. H. C. & Sons, "Gibraltar", Texas
McKelvie, Mrs. M. R., Boonara, Condamine

A.I.S.

Cox, T. L. & L. M. J., Seafield Farm, Wallumbilla
Davis, W. D., "Wamba", Chinchilla
Evans, E. G., Lauraven A.I.S. Stud, Maleny
Franz, E. L. and E. L., "Amabar" A.I.S. Stud, Amamoor, via Gympie
Henry, Mrs. K. & Sons, "Tara", P.O. Box 4, Cambooya
H. M. State Prison Farm, Numinbah
Klein Bros., Kapleton A.I.S. Stud, Ma Ma Creek, via Grantham
Lawley, E. D. & Sons, Arley A.I.S. Stud, Maleny
Martin, J. P. & R. J., Kentville, via Forest Hill
Middleton, C. W., Airton Vale, Cambooya
Mitchell and Mulcahy, Rosenthal
O'Sullivan, P. W., "Navleigh", M.S. 371, Greenmount
Phillips, J. & Sons, "Sunny View" A.I.S. Stud, Kingaroy
Pagel, E. E., and Hayes, E. M., Trafalgar Stud, Tarampa, via Lowood
Queensland Agricultural College, Lawes
Ross, W. & Co., M.S. 23, Rosewood
Schelbach, N. N. & Co., Allanview Stud, Warwick
Scott, W. & A. G., "Walena" A.I.S. Stud, Blackbutt
Siebenhausen, J. & S. C., "Meniton", M.S. 195, Pittsworth
Thompson, W. H., "Alfa Vale", Nanango
Vohland, A. R., Bevallan, Stoneleigh, M.S. 150, Pittsworth
Voight, E. M., Fernvale
Weier, L. G., Prairie Plain A.I.S. Stud, M.S. 765, Allora

AYRSHIRE

Goddard, B., Inverell, Mt. Tyson, via Oakey
Ross, E. D. & Co., "Ardrossan", Crediton, Mackay
Scott, J. N. & Son, "Auchen Eden", Camp Mountain
Zerner, G. F. H., "Pineville", Pie Creek, Gympie

BRAFORD

Bowden, W. H., "Brendale", South Pine Road, Strathpine
Thompson, M. A. K., "Glen Kyle", Buderim

FRIESIAN

Behrendorff, E. C. & N. G., Inavale Friesian Stud, M.S. 786, Boonah
Chamberlain, C. H., Sherwood, Rocks Road, Gympie
Evans, P. J., M.S. 28, Dragon St., Warwick
Goodwin, A. T. & P. M., Winabee Stud, Killarney
Guppy, N. J. & H. M., Bli Bli Road, Nambour
Hickey, K. A. & M. R., Bunya
Lobley, N. E., "Neloby", Mumford Rd., Narangba
McWilliam, A. A., M.S. 918, Toowoomba
Martin, R. J. and E. L., Kentville, via Forest Hill
Norgaard, M. J. & B. F., Yarrabine Friesian Stud, Yarraman
Panzram, J. & K., Blenheim, via Laidley
Queensland Agricultural College, Lawes
Robert-Thompson & Co., R. D. and A. M., M.S. 411, Beaudesert
Staines, R. V., Bowhill Rd., Oxley South
Stumer, A. O., Brigalow, Boonah
Vonhoff, A. R. & D. G., M.S. 918, Toowoomba

GUERNSEY

Dionysius, R. L. & L., Warana Stud, M. S. 1796, Proston
Dippel, J., Thornton, via Laidley
Gibson, A. & D., Mooloo, via Gympie
Holmes, C. D. (owner Holmes, L. L.), "Springview", Yarraman
Hopper, G. T. & H. W., Elendean Guernsey Stud, Maleny
Scott, Cecil & C. A., "Coralgrae", Din Din Rd., Nanango
Smith, Mrs. E. P., Remleigh Guernsey Stud, Imbil
Wilson, R. A. and M. R., "Okeden", Proston

HEREFORD

Hill, W. W. & P. C., "Mathalla", Dirranbandi
Panorama Stud Pty. Ltd., M.S. 765, Allora

JERSEY

Conochie, I. S., Brookland Jersey Stud, M.S. 461, Kalbar
Forsyth, D. E., Kobarnie Stud, Mulgildie, Q., 4629
H. M. Prison Farm, Capricornia Stud, P.M.B. 11, Rockhampton
H. M. State Farm, Palen Creek
Hodgens, G. & J. F., "Bunyeris", Peachester
Lau, J. F., "Rossallen", Goombungee, Toowoomba
Mahaffey, H. W. & V. N., "Coombooran", via Gympie
McDonald, R. G., "Buffelvale", M.S. 807, Mundubbera
Newton, J. C. & A., Merryvale, Upper Caboolture
Paulger, S. & S. M., "Advale", Kenilworth
Perkins, M. J. & E. M., Byee Jersey Stud, M.S. 692, Sth. Nanango
Porter, F. & Sons, Westwood Stud, Conondale
Postle, R. S. & G. C., "Yarallaside", Pittsworth
Queensland Agricultural College, Lawes
Redgen, H. M. & N. F., Bonbrae, Maleny
Scott, P. E., "Kiaora", Manumbar Rd., Nanango
Semgreen, A. L., "Tecoma", Coolabunia
Snare, A. E. & Son, Laidley Park Stud, Laidley, 4341
Spressor, O. W., Carnation Jersey Stud, Mt. Walker Rd., Rosewood
Todd, J. R., Aberfoyle, Laravale, via Beaudesert
Vohland, A. R., Bevallan, Stoneleigh, M.S. 150, Pittsworth
Wadley, D., "Nindethana", Moggill
Waite, H. M., M.S. 182, Laidley
Westbrook Training Centre, Westbrook

POLL HEREFORD

Anderson, J. H. & Sons, "Inverary", Yandilla
Christensen, B. L. & M. O., "Elavesor", Rosevale
Morris, H. J. & D. I., Gaiview Stud, Clifton
Nee Nee Pastoral Co., Dirranbandi, 4392
Stiller, N. L., "Vine Veil", Guluguba

POLL SHORTHORN

Leonard, W. & Sons, "Welltown", Goondiwindi
Pointon, R. B. & S. C., "Wywurri", M.S. 780, Kingaroy

BRAHMAN

Queensland Agricultural College, Lawes
The Cherokee Group Brahman Cattle Co., Tanby

SANTA GERTRUDIS

Barbara Plains Grazing Co., Barbara Plains, Wyandra
Central Estates, Comet Downs, Comet

SHORTHORN

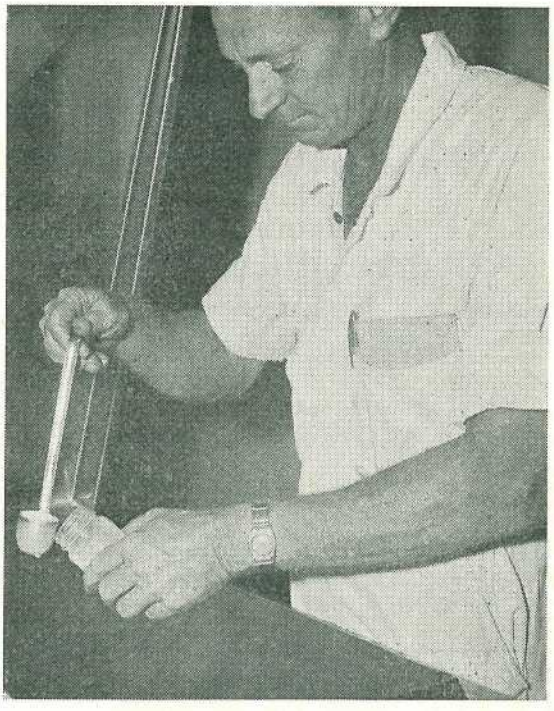
Pointon, R. B. & S. C., "Wywurri", M.S. 780, Kingaroy

DROUGHTMASTER

Ferguson, G. A. E. & H. R., "Charraboon", Toogoolawah
University of Queensland Veterinary School, St. Lucia

W.M.T.— Simple And Accurate

by R. J. ANDREWS, Dairy Science Officer.



1. A sample for the Wisconsin Mastitis Test is taken from the milk sample collected by the tanker driver or the milk grader at the factory.

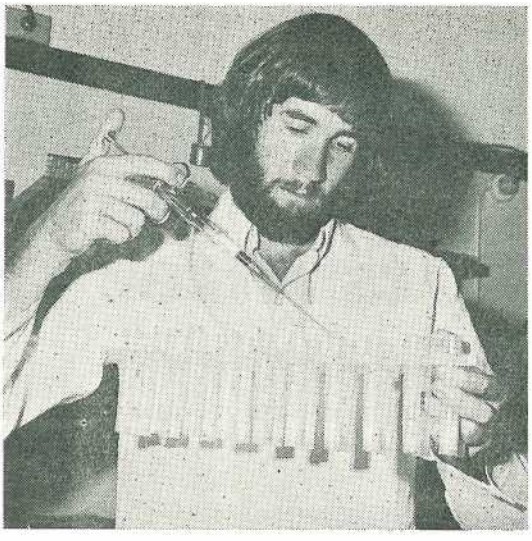
THE Wisconsin Mastitis Test (W.M.T.) is a simple, accurate method of estimating the number of white blood cells in a sample of milk.

The test is used to measure the amount of subclinical mastitis, that is, mastitis that cannot be detected with the naked eye. It is not a measure of clinical mastitis since milk with clinical mastitis is not normally included in the bulk milk supplied to the factory.

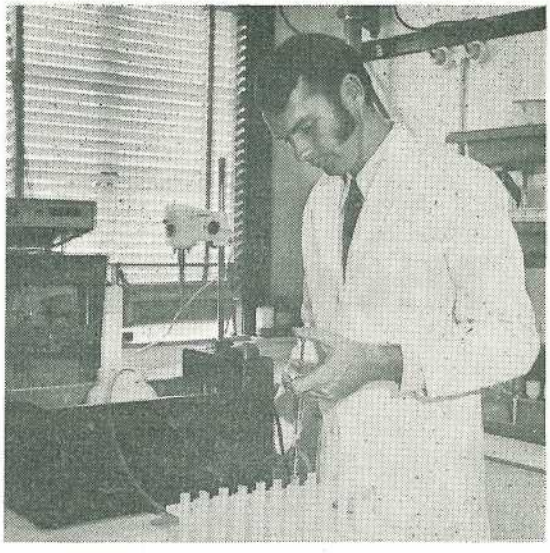
The basis of the test is that, when milk is mixed with a reagent, it reacts with a substance called deoxyribonucleic acid (D.N.A.) which is in leucocytes or white blood cells.

This chemical reaction increases the viscosity of the milk mixture, and the extent of the increase is proportional to the number of white blood cells. The more viscous it becomes, the greater the number of white blood cells present and the more serious the subclinical mastitis condition.

The five steps in performing the test are shown in the accompanying pictures.



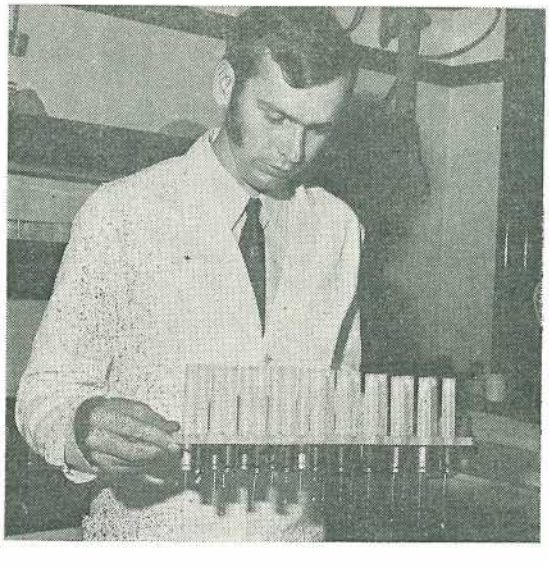
2. In the factory laboratory, each sample is put into a test tube set in a rack.



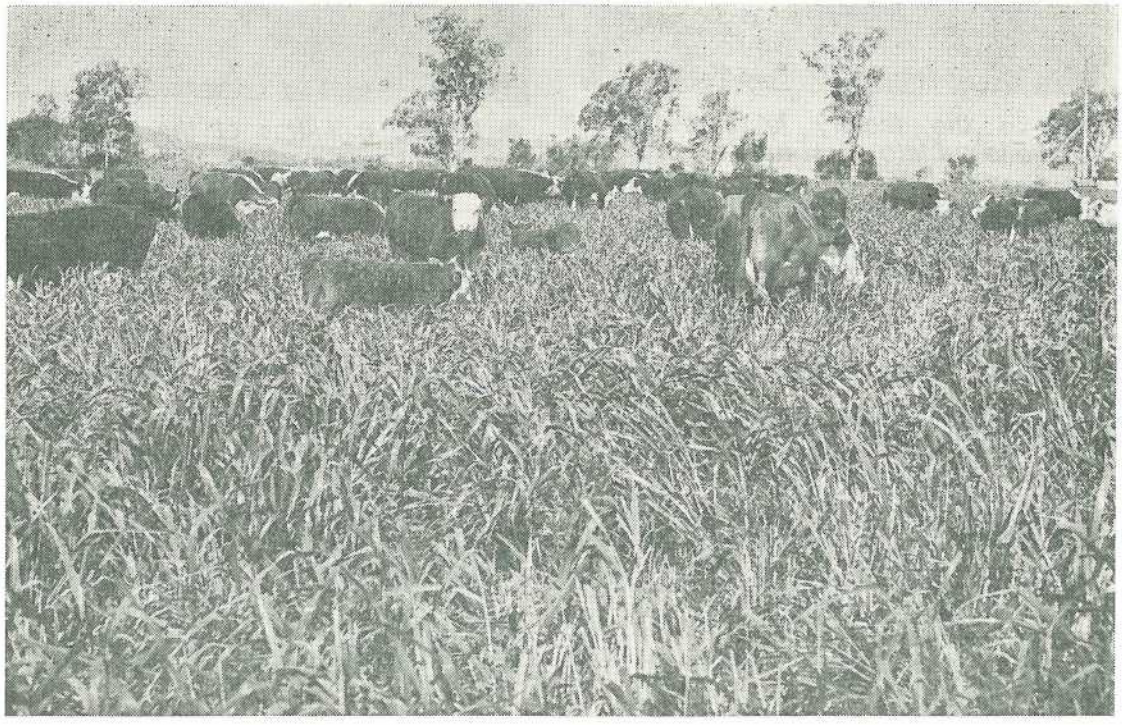
3. Two millilitres of the reagent are added to the milk sample using a mechanical syringe, and the test tubes are capped. Each cap has a standard size hole drilled in it.

4. The rack of test tubes is turned upside down for 15 sec. and then turned upright. During this time, liquid drains away through the hole in the cap.

5. The amount of liquid left in the tube is carefully measured. This is a measure of viscosity and therefore the mastitis score: the more milk that runs out, the lower the mastitis result.



Nitrogen For Oats After The



Oats fertilized with 65 kg urea (30 kg nitrogen) per hectare at planting ensures a good initial growth of high-quality feed.

by J. K. CULL and N. J. DOUGLAS, Agriculture Branch.

First Grazing

GRAZING oats is the bulk of the feed eaten by dairy cattle on the Eastern Darling Downs in winter and early spring.

It is important for farmers to produce adequate quantity but, in addition, the protein level must be high enough to obtain good animal production.

Extensive trials conducted in 1966 and 1967 showed the need for the application of around 30 kilograms of nitrogen (N) per hectare at or before sowing oats on the black and red brown soils of the Eastern Darling Downs.

Sample cuts made on 20 trial sites showed that applied nitrogen gave a mean increase in dry matter yield from 2 350 kg/ha unfertilized to 3 150 kg/ha with fertilizer (33⅓%). In addition, the mean protein content was raised from 13·9% to 18·6% by applied nitrogen. These trials are discussed in detail in the February 1969 issue of the *Queensland Agricultural Journal*.

In these trials, the regrowth following the first grazing showed no response to even the highest presowing fertilizer applications. Rates of nitrogen up to 87 kg/ha were used.

Average crude protein levels of over 11% are needed in the diet of dairy cows to maintain high milk production. During the winter, the rest of the animals' diet besides oats is mostly of low protein feeds such as matured grasses, stubble of summer crops and stubble hays. Crude protein levels in excess of 11% in oats are desirable, except where legumes such as lucerne, medics or clover are available for grazing.

EXPERIMENTS AND RESULTS

1968 Trials

Five trials were laid out in June and July, four on properties in the area from Gowrie Junction to Boodua and one on a property at Greenmount.

Following the first grazing, when the paddocks had been grazed down to an even height, nitrogen was topdressed at nil, 16, 31 and 47 kg/ha in four different forms, urea, urea spray, ammonium nitrate and sulphate of ammonia.

At all sites except one, rainfall exceeding 8 mm was received within 4 days of the fertilizer application. Above-average rainfall ranging from 90 to 130 mm was received in the period from fertilizing to sampling.

The sampling results from these five trials have been averaged and are listed in Table I.

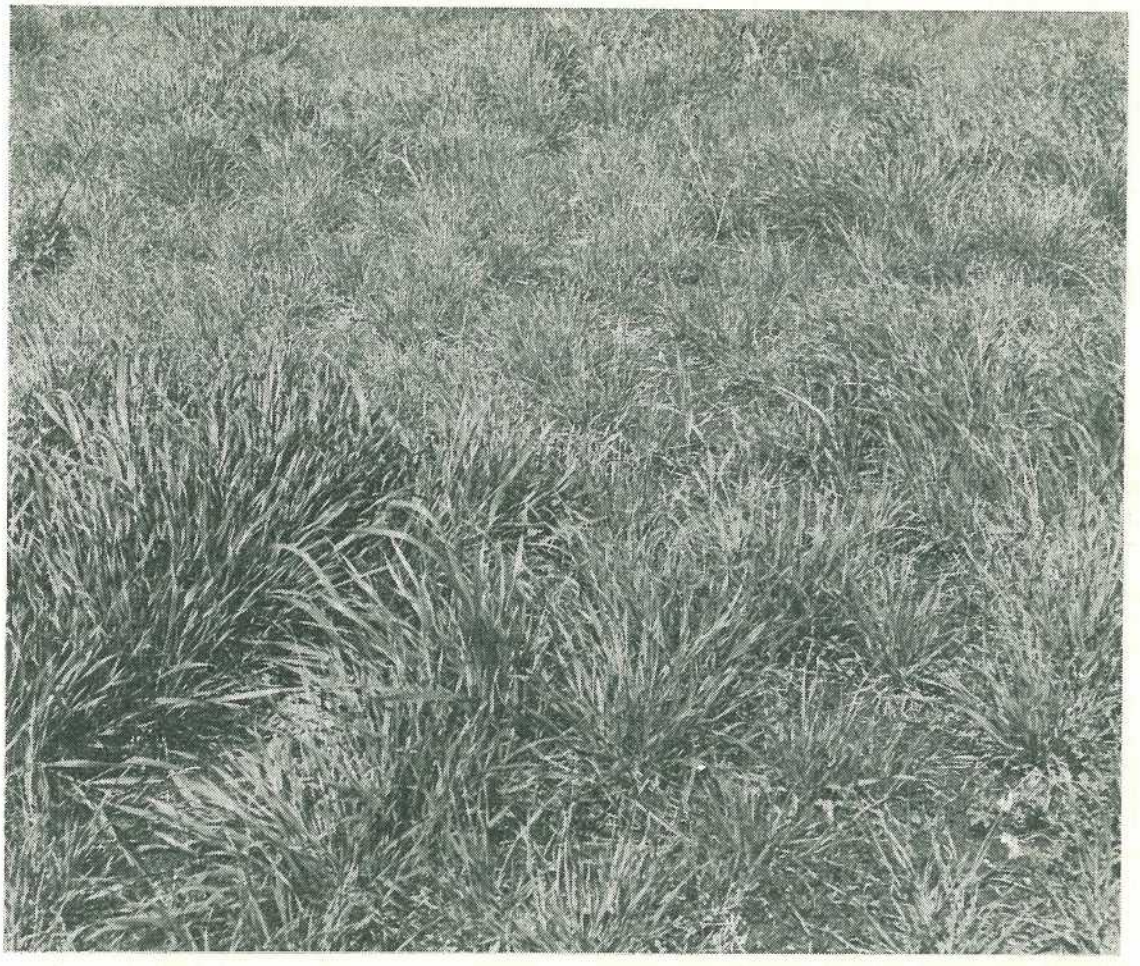
TABLE I

N TOPDRESSING ON REGROWTH OATS—1968
(Mean on 5 Sites)

Form of N Fertilizer	Rate of N (kg/ha)	Yield of Oats (as dry material) (kg/ha)	Crude Protein (%)
Control ..	Nil	1 530	6·9
Sulphate of Ammonia	16	1 690	7·8
	31	2 070	8·4
	47	2 220	9·1
Ammonium Nitrate	16	2 120	7·4
	31	2 620	7·7
	47	3 110	8·7
Urea	16	2 150	7·4
	31	2 590	8·4
	47	3 180	9·4
Urea Spray ..	16	1 940	7·1
	31	1 990	7·9
	47	2 370	8·2

Each increment of applied nitrogen increased both yield and protein content of oats. In areas adjacent to the trials, where more than 47 kg/ha of nitrogen had been applied, further increases in growth were obvious.

Urea and ammonium nitrate gave much better yield increases at the various levels of nitrogen applied than sulphate of ammonia or urea spray. Both urea and ammonium



Urine patches indicate nitrogen deficiency in regrowth oats.

nitrate gave similar growth responses at the various levels of nitrogen. The average effect of applying either of these fertilizers at 47 kg N/ha was to double the yield obtained from the unfertilized control plot.

Individual trial results showed that, at the site with the longest growing period (95 days), the yield in the unfertilized plots was 2 000 kg/ha while the yield from the 47 kg/ha N plots was 4 700 kg/ha. The increase in crude protein percentage was insignificant, from 6·3% to 6·5%. On the other hand, the site with the shortest growing period (42 days) showed the lowest yield increase (from 900 kg unfertilized to 1 350 kg with fertilizer) but the highest protein levels, 8·6% and 12·5% respectively. In this case, yield was sacrificed to improve quality.

1969 Trials

Urea spray and sulphate of ammonia were discarded from the 1969 trials. The rates of nitrogen applied as urea or as ammonium nitrate were increased to 5, 16, 31, 47, 63 and 78 kg/ha.

These trials were laid out at three sites, Douglas, Muniganeen and Biddeston. Rain was received 10 to 16 days after topdressing.

Total rain received from topdressing to sampling varied from 60 mm to 120 mm. It was generally a less favourable year for responses from nitrogen topdressed regrowth oats.

The averaged sampling results are given in Table II.

With urea, the yield response increased progressively up to the 47 kg/ha rate of nitrogen. With ammonium nitrate, a response at least as good was obtained with only 31 kg/ha and 63 kg/ha gave a further response. The individual trial results showed that, at the two sites with the least favourable rain, ammonium nitrate gave a better growth response than the corresponding rate of urea. At the other site, there was little difference between the two fertilizers.

TABLE II

N TOPDRESSING OF REGROWTH OATS—1969
(Mean of 3 Sites)

Form of N Fertilizer	Rate of N (kg/ha)	Yield of Oats (as dry material) (kg/ha)	Crude Protein (%)
Control ..	Nil	1 610	7·4
Urea	16	1 850	8·0
	31	1 950	9·2
	47	2 290	9·3
	63	2 330	10·9
	78	2 340	11·3
Ammonium Nitrate	16	1 970	7·7
	31	2 370	8·9
	47	2 360	10·0
	63	2 880	10·7
	78	2 630	11·3

Response to 63 kg/ha of nitrogen on regrowth oats. The strip in the foreground was not treated.

The crude protein levels up to the 47 kg/ha rate of nitrogen applied were comparable with those obtained in the 1968 trials. With the higher rates of either form of nitrogen the levels rose further.

Discussion of Effects

Topdressed nitrogen relies on the next rain to take it into the soil. It is generally accepted that any form of nitrogen lying on the soil surface loses some of its nitrogen to the atmosphere. Such losses vary between different forms of nitrogen fertilizer, soil types, seasons, relative humidity and the length of time before adequate rain falls.

The results from individual trial sites in 1969 showed that, where there was at least a 14-day interval between topdressing and the receipt of effective rainfall, there was a good yield advantage in using ammonium nitrate instead of urea. However, when rain fell within 4 days of topdressing, as in all the 1968 trials, there was no difference in the yield obtained using either ammonium nitrate or urea.

Recommendations for Topdressing

Good regrowth of oats after the first grazing depends on the rain that falls at that time. The original growth will usually exhaust most of the soil moisture reserves. Rain received just before the first grazing will benefit the regrowth. However, rain is needed after nitrogen topdressing to take the fertilizer into the soil.

Topdressing with nitrogen is best done just before rain is expected. In winter, rain on the Darling Downs mostly comes from the west so that there is often fair warning of its coming even if the amount cannot be predicted. The aim should be to topdress before the main wheat planting rains fall in June or July. Topdressing in August is a greater gamble, but could be worth while if subsoil moisture has been built up in a wet July.

The trial results indicate that, if the area is to receive rain or irrigation shortly after topdressing, either urea or ammonium nitrate is suitable. If rain is not expected then ammonium nitrate should be preferred to urea. The amount to be used is in the range of 45 to 70 kg/ha. Where good moisture is available, use the higher rate; as the gamble on soil moisture increases then lower the N rate. The following table shows the amounts of the different fertilizers required to give these rates of nitrogen.

TABLE III

AMOUNTS OF DIFFERENT FERTILIZERS REQUIRED TO GIVE 45 AND 70 kg N/ha

Fertilizer	N Content (%)	Amount Required to Give	
		45 kg N	70 kg N
		kg	kg
Urea	46	97	152
Ammonium Nitrate .	34	132	206
Ammonium Sulphate ..	21	213	333

Economic Aspects

Darling Downs prices for ammonium nitrate (34% N) and urea (46% N) as at August 1973 are $77.20 and $91.20 respectively per tonne. Thus, the cost per kg of nitrogen is 22·7c for ammonium nitrate and 19·8c for urea.

In 1968, 47 kg/N/ha in either form gave an average yield increase of 1 613 kg over the no fertilizer treatment. With ammonium nitrate, this would cost $10.67 for fertilizer plus say 66c for application, a total of $11.42. In 1969 the best average treatment of 63 kg/N/ha as ammonium nitrate gave an increased yield of 1 268 kg for an extra cost of $15.05.

Accepting a 20% fouling loss with strip grazing, it is estimated that cattle could have consumed 1 290 kg/ha in 1968 and 1 016 kg/ha in 1969.

The major constituents taken into account in comparing sources of animal feed are protein and total digestible nutrients (T.D.N.). As grain and topdressed oats have similar crude protein levels, the cost of obtaining 1 kg of T.D.N. from either source can be compared.

Assuming a T.D.N. level of 55% for oats, the extra yield of T.D.N. from fertilizing in 1968 would have been 715 kg at a cost of 1·6c/kg. In 1969 it would have been 560 kg at 2·7c/kg. With grain at $34 a tonne and 80% T.D.N. level, the cost per kg of T.D.N. is 4·25c. Thus, in the average situation, there is a considerable advantage in topdressing.

When a farmer knows he needs to increase the quantity of grazing oats available he may decide to topdress after the first grazing or, alternatively, to grow an extra area of oats. On the Eastern Downs, oats which received 30 kg N/ha at sowing produced an average of 3 150 kg dry matter per hectare at first grazing. Unfertilized regrowth oats averaged 1 550 kg/ha (mean of 1968 and 1969 results) to give a total of 4 700 kg/ha for two grazings.

Instead of sowing an extra hectare of oats to obtain the extra 4 700 kg, a farmer using these results could topdress 3·3 ha with 63 kg/ha to obtain approximately the same amount of extra feed for a total (fertilizer plus spreading) cost of $49.70.

Compared with this cost, the cost of growing an extra hectare of oats would be the loss in income incurred by not using this hectare for another crop such as barley. A 2 tonne/ha barley crop sold at $37 a tonne would give a gross return of $74. The extra cost (above that which would have been incurred by growing oats) is about $7.50 per ha. Thus the 'opportunity cost' of growing an extra hectare of oats is $66.50. On such figures, topdressing is the more profitable alternative.

Other Deficiencies

Water and nitrogen are not the only nutrients that can be deficient on Darling Downs soil. Responses to phosphorus (P) have been recorded on various soil types including the red and brown soils south of Toowoomba and also most of the soils which formerly carried poplar box (*Eucalyptus populnea*).

Phosphorus, to be effective in aiding plant growth, should be applied at or before sowing. Topdressing with phosphorus after grazing is not worth while. Neither is it worth while to topdress a phosporus-deficient crop with nitrogen.

Another element that can be deficient on Darling Downs soils is sulphur (S). Responses to sulphur have been obtained in oats grown in a double cropping situation under irrigation. However, in the 1968 trials reported in this article, ammonium sulphate (which contains sulphur as well as nitrogen) proved inferior to either ammonium nitrate or urea. This, with previous experimental work, suggests that sulphur deficiency in rain-grown oats is rare.

A Misconception

A major result from these trials is to draw attention to the low protein levels of regrowth oats. This disproves the commonly-held belief that grazing oats is a high production feed until it flowers.

From the eight trial sites mentioned above, the crude protein levels at the time of the second grazing of unfertilized regrowth oats ranged from 6·0% to 8·9%. These values were increased to the range of 9·0% to 13·75% when 78 kg/ha of nitrogen were applied after the first grazing. Milk production in high producing animals could still be restricted by insufficient protein in some cases. This could be overcome by feeding a high protein concentrate. Other ways of overcoming the protein deficiency during the winter-spring period are discussed in a subsequent article.

Vegetable Varieties For February Plantings

by Officers of Horticulture Branch.

CROP	SUGGESTED VARIETIES*					
	Stanthorpe	Lockyer, Fassifern and Beaudesert	Coastal Areas South of Gladstone	Central Queensland (Gladstone to Mackay)	Bowen to Townsville	Far North Queensland (Tablelands)
Artichoke ..	..	..	Globe	..	..	..
Bean						
Fresh Market	Redlands Autumncrop Redlands Pioneer	Redlands Pioneer .. Redlands Autumncrop	Redlands Pioneer .. Redlands Autumncrop	Redlands Pioneer .. Redlands Autumncrop	Redlands Pioneer ..	Redlands Pioneer Redlands Autumncrop
Processing	..	Gallatin 50 Apollo	Gallatin 50 Apollo	..	..	..
Beetroot ..	Detroit strains Early Wonder	Early Wonder Detroit strains	Early Wonder Detroit strains	Early Wonder ..	Early Wonder Detroit strains	Early Wonder Detroit strains
Broccoli ..	..	Green Sprouting Hybrid varieties	Green Sprouting Hybrid varieties	..	..	..
Brussels Sprouts	Hybrid varieties Long Island strains	Hybrid varieties	Hybrid varieties	..	..	..
Cabbage ..	Greengold Greygreen Vanguard Sugarloaf types	Olympic Ballhead hybrid Greygreen Sugarloaf types	Olympic Ballhead hybrid Greygreen Greengold Sugarloaf types	Olympic Ballhead hybrid Sugarloaf types	Ballhead hybrid All Seasons Sugarloaf types	Ballhead hybrid Superette Panorama
Capsicum ..	..	Yolo Wonder Green Giant Northern Belle	Yolo Wonder Green Giant Northern Belle Hungarian Yellow	Yolo Wonder Green Giant	Yolo Wonder Green Giant California Wonder	Yolo Wonder California Wonder
Carrot						
Fresh Market	All Seasons Topweight Western Red	All Seasons Topweight	All Seasons Topweight	All Seasons Topweight	All Seasons Topweight	All Seasons Topweight M.I.A. 220
Processing	..	Amsterdam Forcing Royal Chantenay	Amsterdam Forcing Royal Chantenay	..	..	..

Cauliflower ..	Snowball Y Phenomenal Early Selection 192 Tuckermans Shorts Sharpes Shorts	Snowball Y Snow Gem Snow King Phenomenal	Snowball Y Snow Gem Snow King Phenomenal	Snowball Y Phenomenal	Snowball Y Phenomenal	Snowball Y Snow Gem
Celery ..	Local selections of South Australian strains	..	South Australian White	..	..	..
Cucumber ..	..	Green Gem Crystal Apple	Green Gem Crystal Apple	Green Gem Crystal Apple	Green Gem Polaris Crystal Apple	Green Gem Polaris
Egg Fruit ..	..	Market Supreme	Market Supreme	Market Supreme	Market Supreme New York Purple	Market Supreme Mission Belle
Lettuce ..	Pennlake	Pennlake	Pennlake	Pennlake	Pennlake Great Lakes strains	Pennlake Sunnylake Yatesdale
Marrow ..	..	Long White Bush	Long White Bush	Long White Bush	Long White Bush	Long White Bush
Zucchini ..	..	Blackjack Ambassador	Blackjack Ambassador	Blackjack Ambassador	Blackjack	Blackjack
Parsnip ..	Hollow Crown	Hollow Crown	Hollow Crown	..	..	..
Pumpkin ..	..	Queensland Blue	Queensland Blue	Queensland Blue	Queensland Blue Papaw	Queensland Blue Butternut
Rhubarb ..	..	..	Sydney Crimson Local strains	..	..	..
Tomato ..	..	Floradel Indian River Tropic Grosse Lisse strains Floralou Q3	Floradel Indian River Tropic Grosse Lisse strains Floralou	Floradel Indian River Tropic Grosse Lisse strains	Walter C 1402	Floradel Indian River Tropic Grosse Lisse strains
Turnip ..	Purple Top White Globe	..	..	..	..	..

* These suggestions are based on the more important commercial varieties.

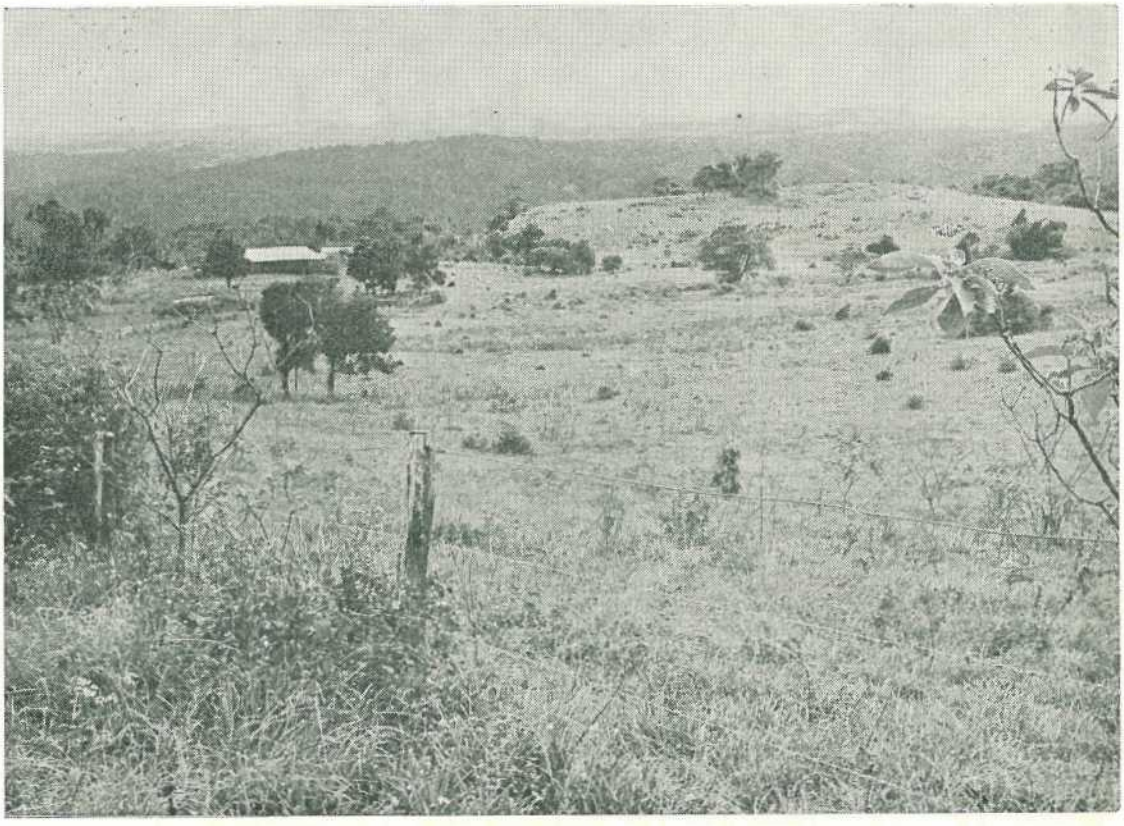
Mat Grass To Milk

AUTHORS: W. H. R. EDGLEY and J. G. HARLE, Dairy Division.

GENERALLY, the higher the quality and quantity of feed which goes down a cow's throat, the better. But this is not always so, and we are obliged to make the best of what is offering.

Mat grass and carpet grass or compressum (*Axonopus affinis* and *A. compressus*) are inferior grasses and occur in many Queensland dairying districts. Their presence often indicates a decline in soil fertility and a fall in animal production. These species usually have replaced more useful grasses such as paspalum (*Paspalum dilatatum*) and kikuyu (*Pennisetum clandestinum*) which require reasonable levels of soil fertility for useful production and persistence.

Many dairy stock will continue to spend a good deal of their time on unimproved pastures, because pasture improvement cannot always proceed as quickly as one would wish. At times, in the early stages of pasture development, it is necessary to increase the stocking rate on areas of the farm that will tolerate the increase in stock densities.



A run-down mat grass farm on the Atherton Table land. This article suggests ways of making better use of this poor quality feed.

Very often, these are unimproved areas offering feed of inferior quality. Any technique that allows better utilization of such feed is particularly useful at these times.

These low quality grasses generally produce a greater bulk of feed in southern than in northern Queensland. Most likely, it is for this reason that more slashing and burning of mat grass are practised in southern Queensland. There should be a greater effort to stop slashing and burning in the south and make better use of this type of feed throughout the dairying areas.

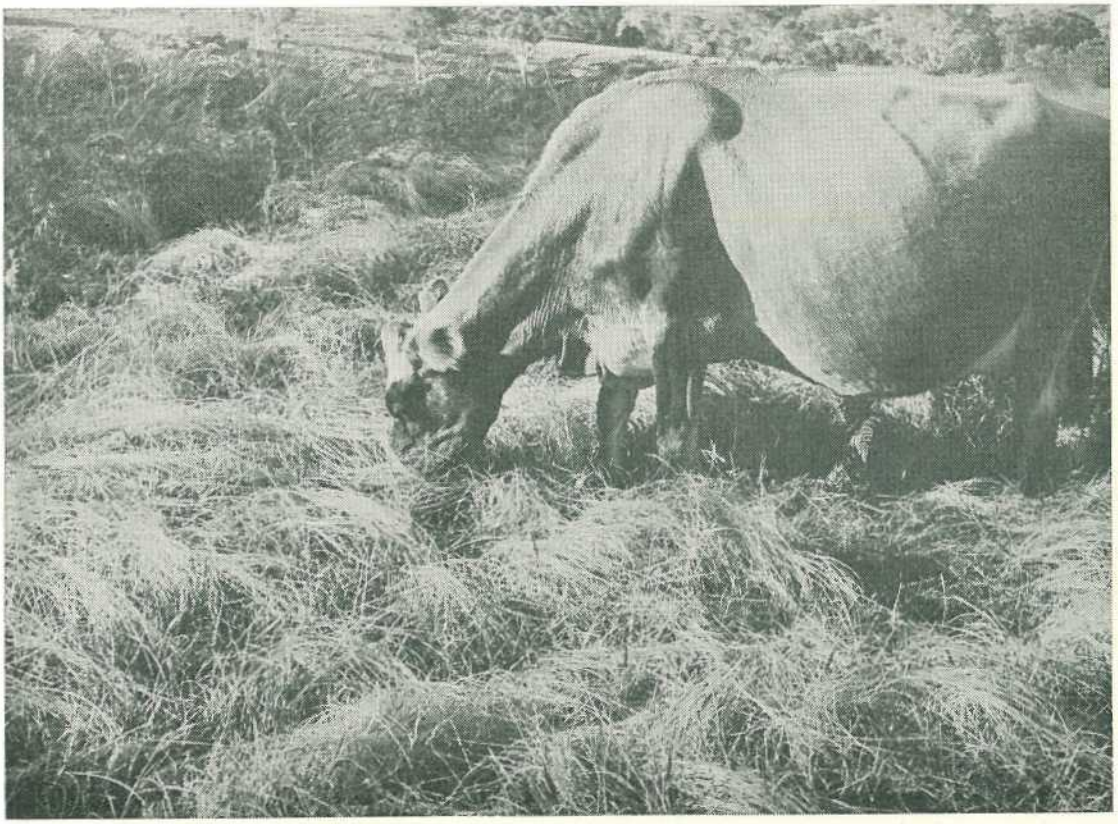
In many parts of the State, from the Atherton Tablelands to South Queensland, a great deal of success has been achieved by using non protein nitrogen (N.P.N.) supplements plus phosphorus in these situations.

The cow has been turned into a sort of mechanical rubbish disposer that eats more 'rubbish' and gets more out of it. Previously, the cow ate smaller amounts and got very little out of it.

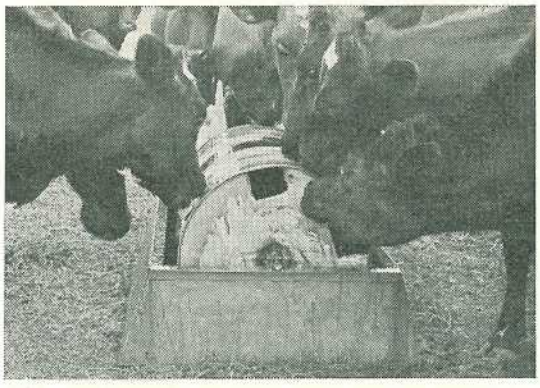
Nutritive Value

Mat grass flowers and sets seed early in the season. This is partly responsible for its nutritive value being low for so much of the year, as the level of crude protein falls well below 8%. The crude protein content of the ration should be from 11 to 16% depending on the level of milk production. The minimum level for a dry cow is around 9%.

After seed set, however, the crude protein level in mat grass may eventually fall as low as 4 or 5%. Animals spending a good deal



A cow selecting a meagre ration from mat grass in the Wide Bay area. Simple types of supplementation increase appetite and better use is made of unimproved grazing such as this.



These dry cows and heifers are keeping their appetites keen while being used to eat off poor quality kikuyu pasture before land preparation and the incorporation of legumes into the sward.

At Kilcoy, a quick response in milk production to N.P.N. feeding could not come from a herd of cows in this condition. An increase in the levels of energy and protein supplements is required. Note this animal's rough coat, a sure indication that phosphorus deficiency is linked with the poor nutrition.

of their time on mat grass areas during these periods perform very badly.

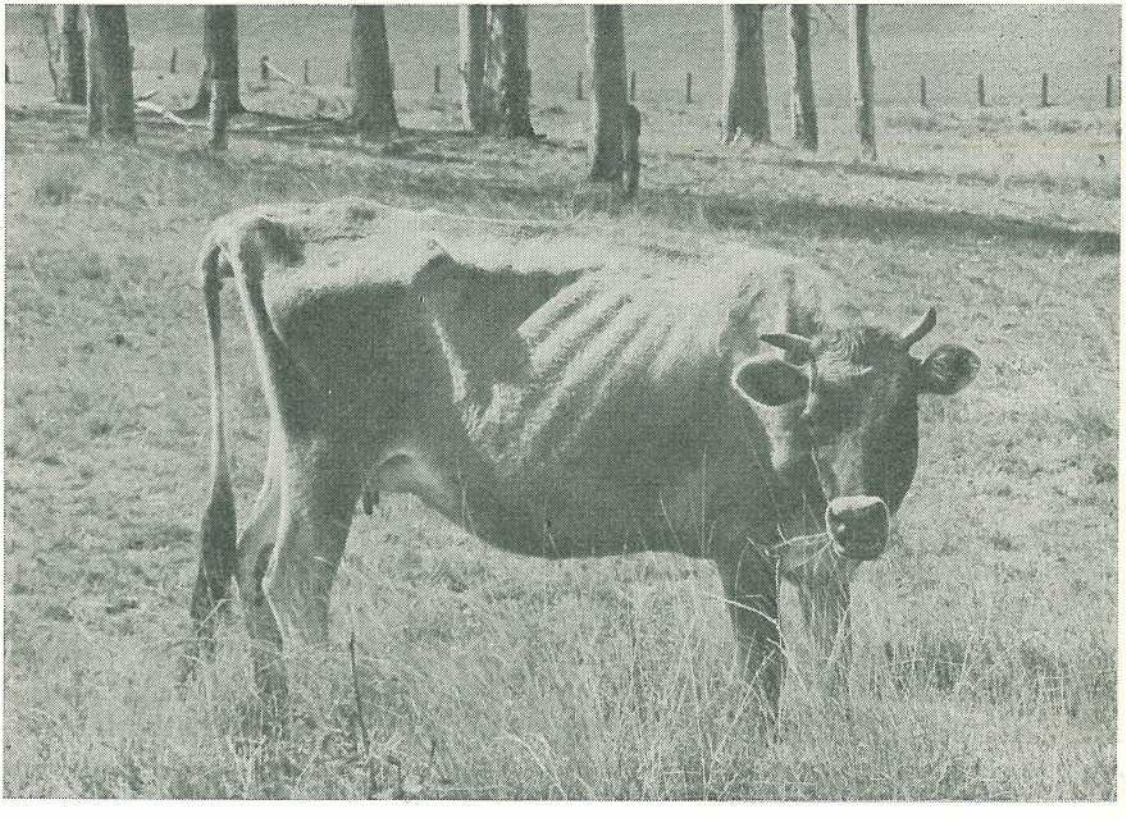
The energy content of mat grass before it flowers can often be quite useful but falls quickly as the plant matures and eventually drops to a very low point.

While such low protein and energy values alone may not support satisfactory rates of milk production or gains in body condition, mat grass can be very useful in certain situations.

Phosphorus levels in the leaves and stems, while inherently low, fall at the time of flowering and seed set so there is also a need to supplement with phosphorus.

Making Cows Hungry

The usual way of getting cows to eat more mat grass is to increase their appetite because, when the quality of grazing falls too low,



digestion slows down, feed passes more slowly through the digestive tract, and the animal eats less.

This is a vicious cycle and typical of what goes on when cows graze poor quality feed. As the animal is not hungry, it spends less time eating and very characteristic patterns of behaviour can often be seen in these situations.

Stock move away from the bails reluctantly, showing little interest in what is out in the paddock. They will spend less time selecting their meagre ration and move on to water or shade earlier than cattle with better appetities. Given the opportunity, they may also arrive back at the bails earlier than they usually do when appetites are keen. Their behaviour is generally sluggish and they may be fractious, particularly in the bails.

Rather dramatic changes usually follow any addition of N.P.N. to the diet in these situations, for it helps speed up the digestion of the low quality material being eaten. Feed passes through the animal faster and it becomes more hungry. Where appetites have been depressed, these changes often occur as soon as 2 or 3 days after the start of feeding N.P.N.

The whole grazing behaviour of the herd changes as animals become more interested in what they have to eat.

Increasing Milk Yield

Extra milk can often be obtained in mat grass situations in one of two ways. It can be obtained either immediately or in the next lactation after a build-up of body condition.

It is seldom possible to get a useful response in milk production quickly with simple N.P.N. supplementation on mat grass without feeding extra protein and energy.

Preformed protein (such as in meat meal or legumes) is usually required for a quick milk production response where the ration protein level still remains too low where N.P.N. is being fed. And rather large increases in energy are often required because a substantial increase in the level of body condition is usually needed where cows are poor.

Initially, grain or molasses must often be fed at 5 kg or more per head per day for larger breeds and then according to the levels of production and body condition.

Up to 7 kg of molasses per head per day have been fed to dairy cows. If animals scour or butterfat percentage is too low, the molasses may have been introduced too quickly, or their intake of roughage from grazing is too low for the level of molasses being fed. In this case, attempt to improve the grazing intake and increase the hay ration where it is being offered. Reduce the molasses if these procedures are not possible or problems such as low fat percentage persist.

Even though additional protein and energy in substantial amounts may be required for higher milk production levels, the continued intake of mat grass will certainly be useful where better grazing is not available. Despite its many limitations, this roughage will supply fibre that is necessary for maintaining normal functioning of the first stomach and for various other tasks.

It helps support feeding higher amounts of molasses without scouring, contributes to satisfying appetite and continues to make some offering to the overall nutrient requirement by the animal. It may often be necessary to feed hay as well and, when the supply of mat grass is largely exhausted, fibrous supplements must then supply the total roughage requirement. Good quality legume hay is very useful as it contributes a bit more protein to the ration.

A simple response in body condition and coat type is usually obtained where enough protein and energy are fed to improve digestion of the paddock feed without really catering for milk production. Even higher levels of condition will result if more energy is fed in this situation. During the following lactation, this accumulated body condition can be mobilized and contribute to the production of milk.

In dry cows, supplementation with N.P.N. often does a very good job. Let body condition be the overall guide. If something remains wrong with body condition, extra energy will usually be needed and perhaps also more protein if the intakes of plant protein plus the N.P.N. are still too low.

A phosphorus supplement should be fed at all times.

Methods of Feeding N.P.N.

Molasses-urea lickers are a simple, safe and relatively cheap method of improving the protein and phosphorus intake, particularly for dry stock and growers. The average daily intake of the mixture for these classes of stock should provide no less than 56 g of urea, 230 g molasses and 10 g phosphorus.

'Superking' and M.A.P. (mono ammonium phosphate) are among the cheapest sources of phosphorus in Queensland.

When using Superking, mix in the proportion of 7 kg to 25 litres of water, stir for 15 minutes and siphon off the clear liquid after allowing to stand overnight. This will provide about 110 daily doses where the daily intake of phosphorus is 10 g.

M.A.P. can be added directly to the water-urea-molasses during mixing: 37 g will provide 10 g of phosphorus. Some sludge may build up in the licker unit and periodic cleaning out is required. Although slightly dearer, phosphoric acid may be more convenient. Use it only for stock over 15 to 18 months of age.

An example of a mixture is:

Urea	45 litres
Molasses	17 kg
M.A.P.	13·6 kg
Water	136 litres

Often such recipes need altering because certain groups of cattle eat too much or too little. Always be sure, however, that the daily intakes of urea and phosphorus do not fall below the suggested levels. Keep the ratio of urea to M.A.P. constant and vary the molasses or water level. The average daily intake is easily calculated by dividing the amount of urea or M.A.P. eaten by the number of cattle and then by the number of days it lasted in the licker.

Most success is achieved by feeding N.P.N. to milkers in the bails, thereby guaranteeing an adequate daily intake. Levels higher than 56 g should usually be offered to milkers and up to 170 or 230 g of urea have been successfully fed where the protein input was low. Spreading the urea intake over as long a period as possible helps with utilization. For example, four separate intakes, each of 56 g a head can be offered where a roughage supplement is being fed, that is, 56 g a head at each of the two daily milkings with the grain ration and 56 g a head night and day dissolved in water and sprinkled on the hay.

Biuret at 110 to 140 g per day is equivalent to the urea and can be fed over one or two feeds because of its lower toxicity and better utilization.

Producers not familiar with the precautions necessary when feeding urea may discuss this aspect with their local advisory officer.

Other Uses

A great deal of success has been achieved by some farmers who use simple urea-phosphorus supplementation with non-milkers to keep appetites keen when chewing off lower quality grazing as a pasture management procedure or in preparation for the establishment of more productive pasture.

Kikuyu-clover combinations require heavy stocking in March to remove the grass canopy ready for the clover growth. At this time, the herbage protein level is often below 8%.

Tackling Winter-Spring Feed Shortages

THE average dairy farm on the Eastern Darling Downs uses about 0·8 hectares of oats, 0·4 hectares of summer grazing crops, 0·2 hectares of lucerne, as well as stubble grazing from grain crops and some native pasture for each milking cow. The range is from 1·6 to 2·8 hectares per cow.

by J. K. CULL and N. J. DOUGLAS, Agriculture Branch.

A series of fertilizer trials carried out by the Department of Primary Industries in 1968 and 1969 showed that regrowth of oats was deficient in protein for dairy cows. (See page 10.)

Application of nitrogen (N) fertilizer to the trial plots improved yield but could not be relied on to improve protein levels sufficiently for high-producing cows.

Most oats are sown in February, March and April. From these plantings, even with slow varieties such as Algerian, the first growth has all been grazed by August. This leaves the 3 months August to October when the cattle depend on regrowth oats of low protein quality.

Several ways of overcoming this problem are discussed in this article.

TOP. A good crop of lablab bean ready for grazing.

BOTTOM. Snail medic has produced up to 8 000 kg of dry matter per hectare when treated as an annual crop.

Late-sown Oats

Late-sown oats is a method proposed by Mr. K. F. Howard of the Beef Cattle Husbandry Branch. It involves saving one quarter of the intended oats area for sowing with the slow variety Algerian in late June or early July, depending on rainfall. This will provide quantity and quality in September and October. There still remains the month of August when the cattle have to rely on regrowth of oats alone.

In weed-free situations and in favourable seasons, annual medics can provide good quality grazing with regrowth oats.

Soil Nitrogen Decline

The low protein content of oats is the result of a decline in soil nitrogen resulting from a farming system which has been practised for many years. If the system is continued, the position will become steadily worse.

The Value of Lucerne

A trial carried out at Jondaryan by Mr. J. W. Littler, an agronomist in the Department of Primary Industries, showed that the trend of declining nitrogen fertility can be reversed by using the legume lucerne (*Medicago sativa*). A good response in wheat yield was obtained even in the sixth year following 3 years of grazing lucerne. Also, it is the experience of some farmers that the regrowth as well as the initial growth of oats is better than in paddocks that have grown oats every year. This effect is caused by a build up in soil organic nitrogen resulting from the lucerne growth.

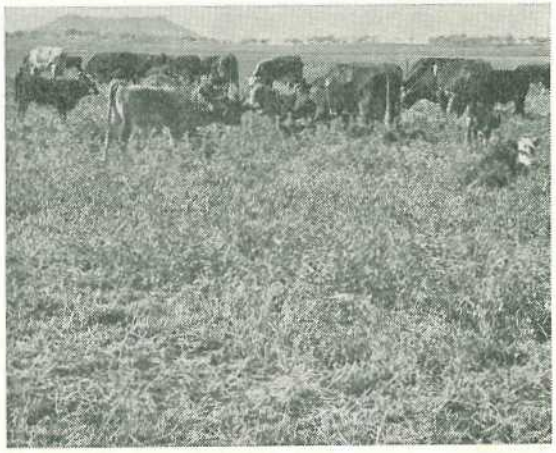
An oats-lucerne rotation appears desirable. The oats could provide the winter and spring feed with the lucerne providing feed for the rest of the year. In the average situation, with no other grazing available, this would require 0·8 hectares of oats and 0·8 hectares of lucerne per milking cow. In practice, each farm situation varies according to size, shape, stock numbers, areas unsuited to cultivation, diversification and irrigation.

To obtain the benefits of the soil nitrogen build up, the lucerne would need to be ploughed out every 4 years. A strictly-kept, neat rotation of 4 years oats and 4 years lucerne would be impracticable under rain-grown conditions. However, with the present trend towards more lucerne, that is, up to 0·4 hectares per cow, there is scope for a restricted lucerne-oats rotation. This would allow some paddocks to regain adequate nitrogen fertility to grow good quality regrowth oats.

Quite often, there is good grazing on lucerne following winter rain. If this is rationed in conjunction with the grazing of the regrowth oats, then the overall crude protein level of the animal diet will rise.

Other Legumes

Other legumes can also be used to restore soil nitrogen. Those currently in use on the Darling Downs are cowpeas (*Vigna sinensis*), lablab bean (*Lablab purpureus,* formerly *Dolichos lablab*) and annual medics (*Medicago* spp.).



Fattening cattle on lucerne on the Eastern Darling Downs.

The summer to autumn crops, cowpeas and lablab bean, have three features:—

1. They offer high protein feed before oats are ready to graze. This avoids the necessity of grazing oats too early.
2. Following these crops, it is easy to prepare the land for a late crop of oats which can be sown in June-July if soil moisture permits.
3. They normally cause an increase in the nitrogen levels in the soil so that following crops need less nitrogen applied as fertilizer.

Annual medics can be sown at the same time as oats, either with oats or by themselves. Protein levels of medics in cultivation can easily exceed 20%.

In mixtures, the stronger the oats grow, the poorer will be the medic growth. Normally, the medics will make little growth with the first growth of oats. Following the first grazing of the oats medic growth can vary from poor to good depending on soil moisture.

With good spring rain and with oats growth retarded by lack of nitrogen good medic growth has occurred. This is especially so in the scrub soils where spraying for weeds with hormones is not practised.

Pure stands of medics have been used in a few instances with good results. The invasion of weeds is a major reason for not using this practice more widely. Snail medic (*M. scutellata*) is the fastest growing medic but is prone to frost damage. Jemalong and Cyprus cultivars of barrel medic (*M. truncatula*) have shown promising results.

Sound Farming Important

Satisfactory levels of animal production can be maintained only where the best land use and soil husbandry are practised. Slopes susceptible to erosion should not be used for oats or any other annual cropping: loss of soil nitrogen goes with loss of soil and poor crops follow.

Provided other nutrients such as phosphorus and sulphur are in adequate supply, the quality of winter-spring feed will be improved by using oats in a legume rotation, sowing annual medics with oats, and by nitrogen topdressing.

Boar Performance Test Report

BOARS 'Approved' under the Boar Performance Testing Scheme at Rocklea during October 1973 are listed below. Average boars score 50 points for economy and 50 for carcass. Points scores can be compared only with those of boars of the same breed.

Breeder	Ear Number	Q.A.R. Number	Points Score		
			Economy of Production	Carcass Quality	Total
	LARGE WHITE				
N. J. COTTER, P.O. Box 23, Goomeri, Q., 4601	SIRE: Sedgenhoe Major Morgon imp. N.Z. DAM: Bettafield Queen 1445				
	142	615	68	58	126
	143	616	62	54	116
R. AND L. M. DUCKETT, 'Fairview', Capella, Q., 4702	SIRE: Peak Downs Stars General 28 Q.A.R. 496 DAM: Peak Downs Flighty 36				
	148	617	45	59	104
K. N. MATHIESEN, 'Naiken' Stud, Box 138, Gayndah, Q., 4625	SIRE: Naiken Field Marshall 102 Q.A.R. 480 DAM: Naiken Flavia 124				
	342	618	45	62	107
	343	619	49	71	120

Make The Most Of Soil Nitrogen

by R. E. REID, Soil Technologist.

FARMERS can make best use of their soil for growing crops and pastures only by understanding the processes that make soil nitrogen available to plants.

Maize plants showing growth response to nitrogen.

These days, high yields are needed to offset rising costs and low prices for some rural products. Nitrogen starvation inevitably results in stunted crops and low yields.

Nitrogen and Plant Life

Because nitrogen is an important constituent of all proteins, it is an essential element for plant growth. All plants except legumes and a very few others must obtain their nitrogen from the soil as nitrate ions, where the nitrogen is combined with oxygen or as ammonia, where the nitrogen is combined with hydrogen.

When in the plant, nitrogen is combined with carbohydrates to form amino acids which are linked together in complex chains to form proteins. Legumes that are effectively nodulated obtain all or part of their nitrogen from the bacteria in their root nodules. These bacteria can combine nitrogen gas from the air into a form available to the plants.

Aside from a lack of water, lack of nitrogen through either failure of inoculation of legumes or shortage of available soil nitrogen is probably the most important factor limiting the growth of agricultural crops.

In a recent trial with rice at the Millaroo Research Station, plots receiving no nitrogen yielded 2 860 lb. per acre of paddy while plots receiving 60 lb. of nitrogen per acre yielded 3 720 lb. per acre. A trial in the Warwick district with rain-grown maize showed that an application of 23 lb. of nitrogen at sowing increased the grain yield from 1 120 to 1 920 lb. per acre.

Soil Nitrogen

Total nitrogen in the soil is a poor indicator of the nitrogen available to plants. Most of this nitrogen is combined with carbohydrate

in the soil organic matter. Nitrogen becomes available to plants in the nitrate or ammonia form only when the soil organic matter is broken down by micro-organisms. This breakdown process is known as mineralization.

When organic material low in nitrogen, such as wheat straw, is incorporated into the soil, the opposite process to mineralization can occur as micro-organisms take up available soil nitrogen to decompose the low-nitrogen material. This process is known as immobilization. Further mineralization can occur at a later stage and release this nitrogen.

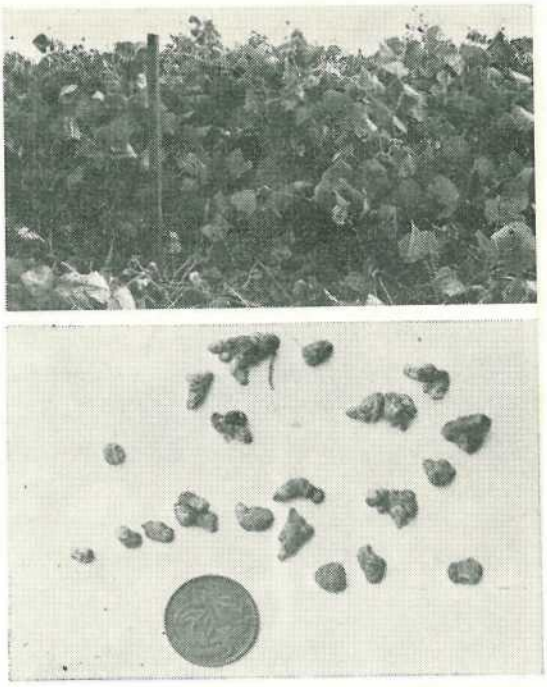
Under some soil conditions, free nitrate in the soil can be broken down to elemental nitrogen or gaseous nitrogen compounds and lost to the air. This process is known as denitrification.

Cycling of Nitrogen

Under field conditions, nitrogen undergoes a cycling, a simplified diagram of which is shown. Some of the changes shown are, under the right conditions, extremely rapid. For example, American work has shown that 75 lb. an acre of nitrogen applied as urea was completely converted to ammonia in 2 days. German work has shown that soil nitrate will increase from approximately 12 to 29 lb. an acre in 1 week through the mineralization of previously incorporated organic matter.

Points of note about the diagram are:—

- The common fertilizers in use add nitrogen to the soil as ammonia, nitrate or urea.
- Volatilization of fertilizer ammonia from the soil surface can cause large nitrogen losses when fertilizers containing urea or ammonia are applied as a topdressing, particularly in hot weather when the soil is wet and alkaline (a high pH).
- Once within the soil, urea is a transitory stage as it is rapidly broken down to ammonia.
- Nitrogen in animal dung goes to the soil organic matter pool while that in urine as urea goes to the ammonia pool.
- Other minor sources of soil nitrogen are from rain-water and from nitrogen fixation by free-living micro-organisms.



TOP. *A dense stand of* Lablab purpureus, *a legume often grown to build up soil nitrogen.*

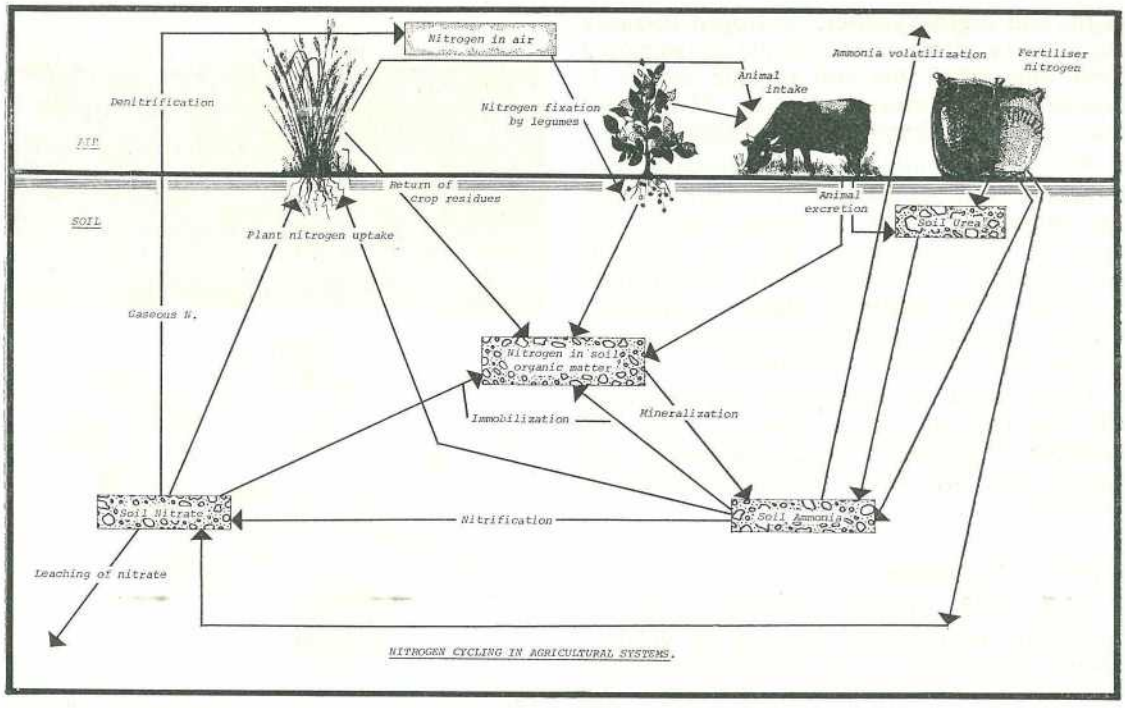
BOTTOM. *Effective root nodules taken from one of the plants in the picture above.*

- Waterlogging greatly increases nitrogen losses from denitrification.
- The rate of leaching (the washing out of soil nitrogen, particularly nitrate, from the root zone by flow of water through the soil) depends on the nature of the soil.
- It is highest in deep, sandy soils and least in heavy clay soils.

Increasing Available Nitrogen

The three methods by which farmers can increase the availability of nitrogen to their crops or pastures are fallowing, growing legumes and using nitrogenous fertilizers.

Fallowing allows a build up of available nitrogen because it prevents its removal by weeds and because it speeds up the breakdown



NITROGEN CYCLING IN AGRICULTURAL SYSTEMS.

of soil organic matter. Under conditions where the soil is supporting a stable plant population, either weeds or a crop, a balance is reached between the rate of nitrogen mineralization and the rate of nitrogen uptake by the plants. When this balance is upset by the removal of plants by fallowing, mineral nitrogen tends to accumulate.

The aerating effect of cultivation involved in fallowing also tends to speed up the rate of nitrogen mineralization.

Growing legumes increases soil organic nitrogen through returning above-ground material high in nitrogen to the soil, through the death of roots and root nodules and, in some cases, through excretion of organic nitrogen compounds from the root nodules. By adding to the soil organic nitrogen pool, legumes increase the total amount available for mineralization so that, even if the rate of mineralization per unit of organically bound nitrogen is constant, the amount mineralized and thereby available to plants is increasing.

When legumes are grown as part of a pasture mixture, this nitrogen becomes available to the accompanying grass species and, when legumes are grown alone, this nitrogen becomes available to the succeeding crop. Only when they are infected with an efficient nitrogen-fixing strain of rhizobium can legumes fix nitrogen. This emphasizes the need for careful inoculation of legume seed before sowing.

Nitrogen fertilization is the most direct method of increasing the availability of nitrogen to crops. Nitrogen is added to the soil as ammonia, urea or nitrate. While some is taken up by soil micro-organisms and immobilized in the soil organic matter, the bulk is readily available to the crop. Decisions involved in nitrogen fertilization should take into account the inherent soil fertility, the past history of the area, particularly recent cropping or legume containing pastures, soil moisture status, the availability of irrigation or the likelihood of good rains during the growing season, and advice of local Department of Primary Industries officers.

Control Of Apple Measles

LOSSES of young apple trees and decreased production in older trees have occurred on the Granite Belt over the years because of the apple bark 'measles' disorder.

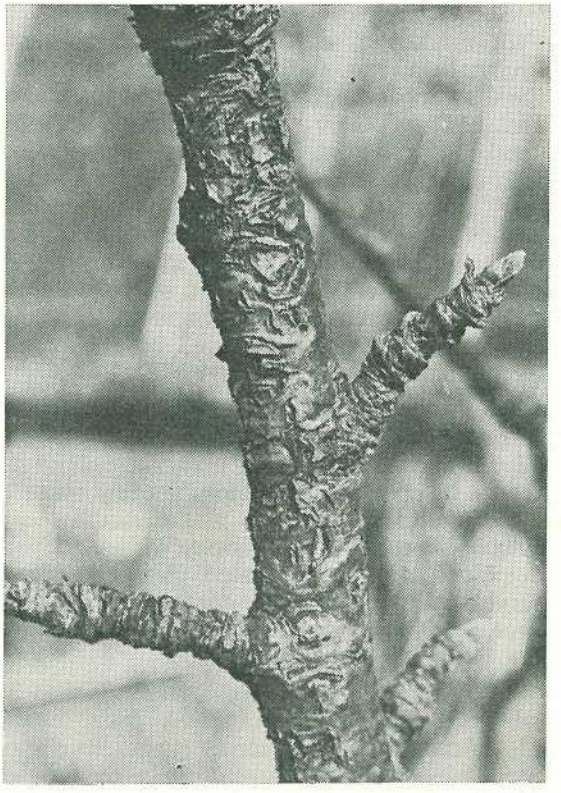
The Delicious variety seems to be the most susceptible but Jonathan may also be severely affected.

Because of the importance of the disorder, studies have been conducted at the Granite Belt Horticultural Research Station for some years.

It appears, from a series of glasshouse trials and field observations, that there are two main types of measles. One type appears as a tanning and cracking of the bark often on the current season's wood. Shoot growth is not normally affected unless the cracking is very severe. Chemical analyses of affected plants indicate that this type is linked with a high level of manganese in the leaves and bark.

The other important form occurs as a dark pimpling or purpling of the bark, generally on 2-year-old wood or appearing late in the season in current wood growth. The pimples may become larger and form pustules, and bark cracking may then occur in concentric rings. Growth is often seriously affected and can lead to distortion of the wood and tree or leader death. Measles of this type is attributed to a deficiency of the element boron.

In this type, an annual foliar spray of soluble polyborate at 1·25 kg to 455 litres applied in November is often helpful or alternatively, routine soil applications of borax at the rate of 56 g per young tree or 113 g for a



The apple measles disorder on the Delicious variety.

by E. T. CARROLL, Senior Physiologist, Granite Belt Horticultural Research Station.

mature tree may be made every third year. The borax should be spread evenly around the root zone in late winter. Foliar sprays and soil applications should not both be given, as excess boron can severely damage trees.

Other factors are known to be associated with measles development. It has been noticed that measles occurrence is worse in a dry season or in areas of poor drainage where growth is restricted.

Irregular Watering

In a glasshouse trial, it was shown that irregular watering leading to water stress caused the disorder to appear. Analyses of the leaves and bark of these trees showed a reduced uptake of essential elements when compared with that of regularly-watered trees. It appears that, under dry conditions, uptake of the elements calcium and boron is reduced, but uptake of manganese is not so affected. A similar situation occurs in acid soils as, at low soil pH, manganese becomes more available to the plant while calcium and boron become less available.

Glasshouse trials have proved conclusively that adequate calcium is essential to offset the effects of toxic levels of manganese, and to reduce its uptake. It therefore appears that the three important elements in the disorder are calcium, boron and manganese. While the exact combination of these three elements necessary to prevent measles is uncertain, conditions necessary to prevent the disorder in the field are becoming better understood.

The important control measures seem to be adequate water and liming. A good uptake of calcium will counteract toxic levels of manganese, and liming will help to provide calcium as well as lowering acidity and thus making manganese less available. Adequate water is essential for uptake of the required quantities of calcium and boron and to promote good growth.

The benefits of liming were demonstrated in a small trial where badly affected young trees were transplanted from the field into 23-litre pots, treated with differing rates of lime and given adequate water. It was found that by mixing lime at the rate of 5 tonnes per ha right through the pot the trees would grow out of the disorder in one growing season. However, placing lime at the same rate on the surface did not cure the problem in one season because lime moves only slowly down to the root zone.

Consequently, the correction of measles symptoms on established trees by liming is slow and difficult as any attempt to achieve deep placement of lime will damage the root system. Even normal cultivation close to trees destroys the small feeding roots that grow close to the soil surface. Apple roots, once damaged, do not regenerate easily.

Very careful attention must therefore be paid to land preparation. Before establishing a new orchard, the grower should arrange with his Horticulture Branch adviser to have the pH or level of soil acidity determined. From the test, the required amount of lime can be calculated and this should be applied well before planting. Deep ploughing and ripping will ensure that the lime is placed in the root zone.

Low banks can also be thrown up and the trees planted on these. This will ensure that the lime is distributed through a greater depth of soil.

If this is carried out and the trees receive adequate water during the growing season, the risk of measles affecting their growth should be eliminated.

Dairy Farmers And A.I.

THREE main factors are involved in any A.I. programme. These are the A.I. Centre, the inseminator and the farmer.

All these have a vital part to play in the success of artificial insemination.

The Centre may produce top quality semen but this could easily be ruined if not cared for and handled properly by the inseminator. No cow will go into calf with unsatisfactory semen, no matter how good the technique of the inseminator.

Accepting that we have an efficient Centre run by fully trained and qualified staff, and producing semen of maximum fertility, and also accepting that the inseminator has plenty of experience and has proven efficiency, what contribution can the farmer make to A.I.?

In Queensland, most A.I. in dairy cattle is carried out by farmer co-operatives. Users of the A.I. services are members of these co-operatives and are therefore concerned with their success.

The co-operatives employ qualified inseminators to carry out the field services. The inseminator is usually on a fixed wage and a mileage allowance for providing his own vehicle.

The major costs of running an A.I. service are wages and mileage. Therefore, it is important to get the maximum number of cows inseminated in a day to reduce labour costs, with the smallest amount of travelling to reduce mileage per cow. Any delay of the inseminator or extra travelling costs money, and this is where the farmer can make a big contribution.

Service rules of most co-operatives generally include the following requests: phone early; keep the cow in the yard; provide details of name and calving date of the cow; provide water, soap and towel.

The reasons for these rules are:—

1. To enable the inseminator to plan his round and keep mileage down.
2. To avoid delay so the inseminator can inseminate more cows in a day.
3. To enable accurate records to be compiled for the benefit of the farmer.
4. For hygiene, to protect the inseminator from the risks of infectious disease, and to obviate transmission of infection.

by R. NIEPER, Experimentalist.

Having complied with these rules, can the farmer expect a good conception rate? In other words is the cow suitable or ready for A.I. For best results, the cow must be ready for breeding, and this is where the farmer can again contribute to successful A.I.

For best results with breeding the farmer must present a cow that is:—

1. On heat; standing to be ridden.
2. At a reasonable interval from her last calving (at least 60 days).
3. Free from disease.
4. On a good plane of nutrition.
5. Under proper restraint.

1. The cow must be **on heat,** or have been on heat in the past 24 hours, otherwise there will be no egg for the male sperm to fertilize. Standing to be ridden is the most obvious and sure sign of heat.

2. At a reasonable interval after calving. Many cows will come on heat 2 to 3 weeks after calving, and a few of them, if mated, could become pregnant. The following scale is based on known results: mated 20 days after calving, 20% conception; 40 days, 40%; 60 days, 60% or more.

Mating at 60 days, or more, will give very worthwhile results, and eliminate many repeat services with attendant extra service costs, mileage and semen.

3. Free from disease. Several diseases affect reproduction in the cow. The most important in Queensland are vibrio, trichomoniasis, brucellosis and leptospirosis.

The first two can be controlled, and elimated, by using A.I. but brucellosis and leptospirosis require other control measures.

If a cow shows any abnormal discharge, has aborted, or shows any continuing irregularity in the heat cycle, veterinary attention should be sought. This could save many repeat services, and loss of lactation.

4. On a good plane of nutrition. Nutrition plays an important role in reproduction. High-yielding cows may prove difficult to get in calf, possibly because of low mineral intake. Cows need a balanced ration sufficient for maintenance, production and reproduction.

5. Under proper restraint. If the cow is not under proper control, it may be difficult for the inseminator to carry out the insemination accurately. Records show that there is reduced fertility with fractious cows.

If you have any doubt about any aspect of insemination, check with the inseminator, the Department of Primary Industries, dairy adviser or the local veterinarian.

The benefits of A.I. are there for all cattle owners. See that you get the full benefits by playing your part in the programme.

Threat In Neglected Bananas

MANY landowners may be unaware that their property contains old, neglected bananas and that these are a threat to nearby plantations.

Neglected plants are a major cause for concern because they may harbour and spread pests and diseases. Department of Primary Industries Inspectors are making a special drive to find neglected banana plantations and to have them eradicated.

In the past year, some well-managed plantations have been infected with disease from neglected plants. The existence of these neglected plants was not previously known to inspectors.

While it is the grower's responsibility to find diseased plants and eradicate them and to notify the inspectors, it is the inspector's function to ensure that growers are honouring this responsibility.

Often, the trouble arises when a property is sold to a man who adopts another form of enterprise. The new owner is often unaware of the banana plants or of the regulations governing the control of disease. However, he is still responsible under the provisions of the Diseases in Plants Acts to eradicate diseased and neglected plants.

If a grower fails to give his plantation adequate care and attention, it may be declared to be abandoned, and he will then be required to meet the costs of eradication.

To safeguard the industry, inspectors will more rigidly enforce the requirements for disease control in bananas. Growers not familiar with the regulations may obtain full details from their local banana inspector.

—F. W. BERRILL, Horticulture Branch.

Queensland Wildflowers

Native Violets, Lady's Slipper And Spade Flower

THE violet (*Viola*) is probably one of the most loved and best known flowers in gardens throughout the world.

by BERYL A. LEBLER, Botanist.

It may come as a surprise to many Australians who have never wandered along shady creek banks or explored damp forest gullies to learn that wild violets, closely resembling the cultivated flower, can be found in places such as these. In addition to the two wild violets that grow in south-eastern Queensland, two other plants are very closely related to them and belong to the same family. These are the two species of *Hybanthus*, commonly known as lady's slipper and spade flower respectively.

Their flowers are very different in shape to violets, and at a casual glance it is difficult to see the close relationship between them.

Viola was an old Latin name used by Virgil, Pliny and others for various sweet-scented flowers. Violets are herbs, either with the leaves produced in tufts at the top of the root stock, or with prostrate branches on which simple leaves are arranged, alternately.

Solitary, nodding flowers arise from the axils of the leaves. Each flower has five green imbricate sepals and five coloured imbricate petals which are unequal in size and which differ in shape. The lowest petal is usually the longest and is produced into a spur at the base. The four upper petals are in two unlike pairs, those in each pair being symetrically alike. The five stamens are very short and do not protrude from the centre of the flower. Their anthers are more or less coherent in a ring around the style. The two lower stamens have nectar-bearing appendages which project backwards into the petal spur. The ovary is sessile and consists usually of three carpels: it is also concealed within the flower.

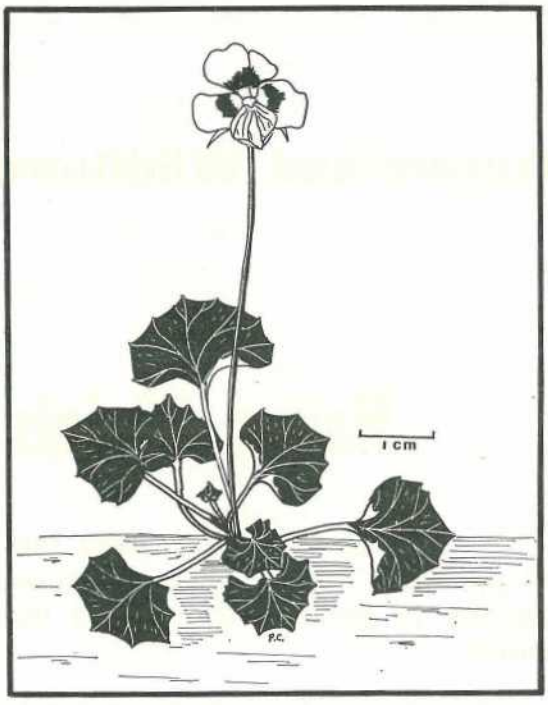
As in the cultivated violet, the plants produce two types of flowers. In spring, the flowers are the showy blooms noticed by passers-by but, later in the season, numerous small flowers are produced on short horizontal stalks.

Normally these are not noticed, as they have either only rudimentary petals or none at all and the flowers are often covered by leaf mould or soil. These flowers are self-pollinating within the closed calyx and are called cleistogamous flowers.

The fruit of a violet is a capsule and can contain as many as 60 seeds. When the capsule is ripe it splits into three boat-shaped valves with thick rigid keels. As the thin sides of the valves dry they contract. The seeds are flung out, one or two at a time, sometimes to a distance of 9 ft.

As the capsules of the cleistogamous flowers mature, the peduncle lengthens and lifts the capsule into the air. The seed is then scattered in the same manner as in the normal flowers.

In south-eastern Queensland, only two wild violets are found: *Viola hederacea* and *V. betonicifolia.*



Ivy-leaved violet (*Viola hederacea*).

Ivy-leaved Violet

IVY-LEAVED VIOLET (*Viola hederacea*). The Latin word *hederacea* means resembling ivy. Apparently, when this plant was first described in 1804, the shape of the leaves were thought to resemble those of the English ground-ivy and the name was chosen for this reason.

DISTINGUISHING FEATURES. The presence of stolons (prostrate branches that produce roots and develop new plants), and the distinctive leaf shape are sufficient to distinguish this violet.

DESCRIPTION. It is a perennial herb, spreading extensively by numerous fine stolons, with clumps of shortly stalked leaves. These are much smaller than those of the cultivated violet, the largest being about 2 in. (5 cm) across and only half as long. The shape of the leaf is also different. It varies from kidney-shaped to almost orbicular. The leaf margin can be either entire or irregularly and coarsely toothed.

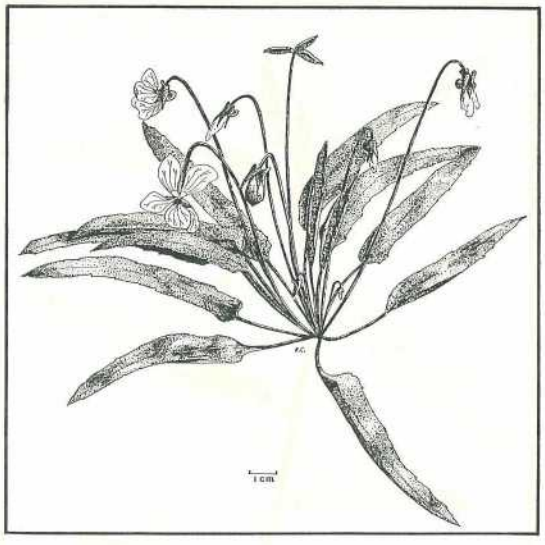
The flower stalks are normally longer than the leaves, and each stalk bears only one flower. By comparison with the garden violet, these flowers are small, but size and flower colour vary considerably. The largest flowers on the longest stalks are found in mountain localities. Sometimes the flowers are pure white, but mostly they are a pale mauve, blotched with purple. At Crow's Nest, isolated plants have been found with very pale mauve flowers lacking the purple blotches.

Usually the four upper petals are flushed or blotched at the base with purple. The lower petal is frequently beautifully veined in this darker colour. A short spur, looking like a deep, blunt-ended pouch, is at the base of this petal. It protrudes between the sepals that lie on either side of it. The green sepals are narrow and pointed and are less than half the length of the petals. The flower is identical in shape to that of the garden violet, but, unfortunately, none of the native violets has the sweet perfume usually associated with violets.

FLOWERING TIME. This plant flowers throughout the year but is most prolific in spring and summer.

HABITAT. It loves moist ground, and grows particularly well on the banks of running streams. It thrives in damp, shady places, such as moist crevices among rocks, or on sheltered banks in eucalyptus forest.

DISTRIBUTION. It grows in all the eastern mainland States, and also in South Australia and Tasmania and does not occur naturally outside Australia. It is the most widely distributed native violet and occurs from sea level to the high mountains.



Purple violet (*Viola betonicifolia*).

GENERAL REMARKS. This has been very successfully cultivated, and makes a splendid rockery plant or ground cover, particularly the forms with long stems and large flowers.

Purple Violet

PURPLE VIOLET. (*Viola betonicifolia*). *Betonicifolia* is a Latin word which means with leaves like Betony. Betony is the common name for a European garden plant once cultivated for use in domestic medicine. The choice of name for this violet indicates that its leaves were considered to resemble those of Betony.

DISTINGUISHING FEATURES. The attractively-shaped, elongated leaves and the deep purple flowers distinguish this violet.

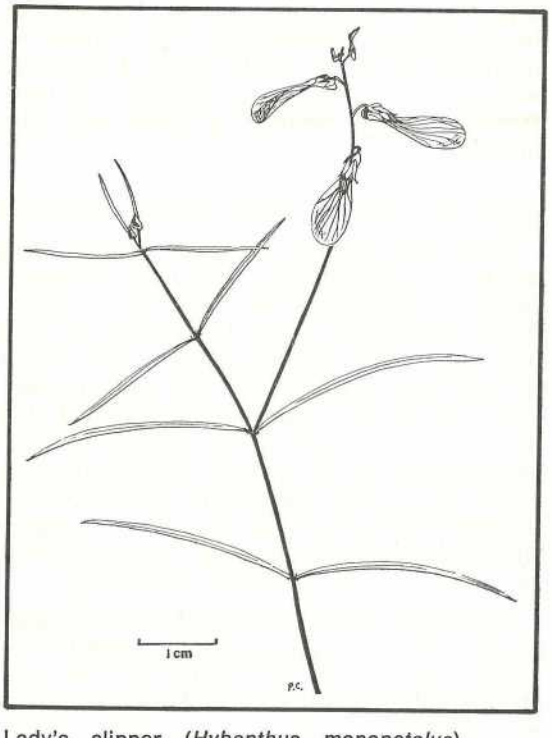
DESCRIPTION. This is a small tufted herb with a clump of leaves arising from ground level. The leaf stalks are up to 1½ in. (3·8 cm) long.

The leaves do not lie close to the ground as those of the ivy-leaved violet do, but point upwards. They are up to 3 in. (7·5 cm) long, dark green on the upper surface and paler beneath. The lateral veins make a very acute angle with the pale green midrib and curve up towards the blunt, rounded leaf tips. The leaf base is truncate or very slightly cordate. Widely spaced, very shallow teeth scallop the margin.

The flower stalks are longer than the leaves and have several small bracts below the middle. These stalks are usually slightly dilated at the tip. The flowers are identical in shape with those of the garden violet, and can be 1 in. (2·5 cm) across.

The spur on the lowest petal is white and is shorter and broader than in a garden violet. Deep purple veins mark the petals and the lower petal is white at the base. When the flower first opens the colour is pale, but this deepens as the flower ages.

The green sepals have pointed tips and are ⅜ in. (0·5 cm) long. All of them are produced into short, blunt appendages at the base. Those on the three outer sepals project back ⅛ in. (0·3 cm) past the point of insertion and flare out around the flower stalk.



Lady's slipper (*Hybanthus monopetalus*).

This is the largest and showiest of the wild violets. I have been told that, in the Numinbah Valley, two forms of this plant can be found which differ in their flower colour and flowering habit. One has stout flowering stalks which hold the flowers erect. The other has weak stems which flop to one side and are almost prostrate. These stems are branched and bear two to three flowers which are a deep violet colour. The plants with erect flowering stems do not have clear violet coloured flowers.

FLOWERING TIME. It flowers in spring and summer.

HABITAT. Although this plant does grow among grass on shady hillsides, it has been found flourishing in grass on frontal coastal headlands, freely exposed to all the elements.

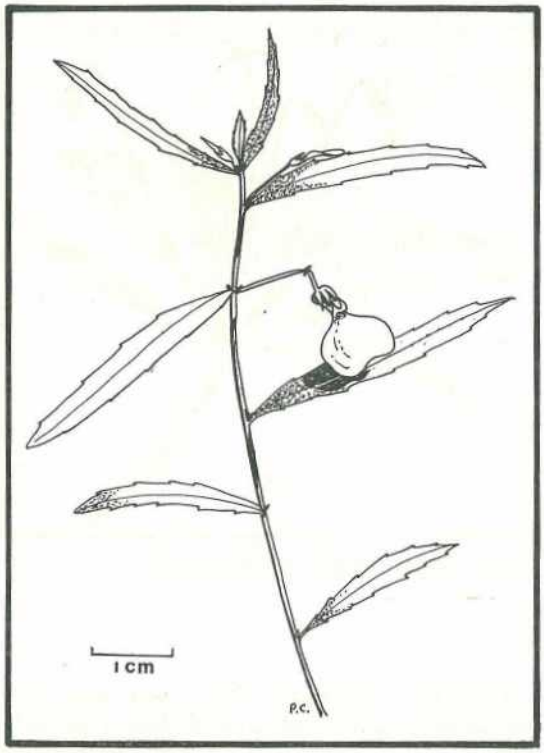
DISTRIBUTION. It is found in all the eastern mainland States, in Tasmania, and in South Australia. It has also been found in Norfolk Island and New Guinea.

GENERAL REMARKS. Although it is the largest and showiest native violet, it is not as common as the ivy-leaved violet. It has also been cultivated successfully. It is ideal for rockeries and as a border plant in situations where it will get plenty of sunlight. It seeds freely and can colonize a large area very quickly.

LADY'S SLIPPER AND SPADE FLOWER

Both lady's slipper and spade flower belong to the genus *Hybanthus*. This name is derived from a combination of two Greek words, *hybos* meaning a bump and *anthos* meaning a flower. The flowers of these two plants do not look anything like the garden violet. Although the four upper petals do spread, they are very small. The lower petal is the conspicuous part of the flower. It is usually very much larger than the others and has either a short rounded spur at the base or projects in a slight swelling or pouch. In these flowers the sepals are not produced at the base.

Hybanthus species are either herbs or small shrubs. Their leaves are mostly opposite and simple, usually with entire margins. In some species, the margins are dentate or crenate. A pair of stipules is found at the base of each leaf but these are usually deciduous, falling off shortly after the bud develops. The flowers are either solitary and axillary or arranged in a terminal raceme. They are either violet-blue, yellow or orange in colour.



Spade flower (*Hybanthus enneaspermus*).

Only two species are found in south-eastern Queensland, *Hybanthus monopetalus* and *Hybanthus enneaspermus* subspecies *stellarioides*.

In *The Queensland Flora* by F. M. Bailey (1898), they were referred to as *Ionidium filiforme* and *I. suffruticosum* respectively.

Lady's Slipper

LADY'S SLIPPER (*Hybanthus monopetalus*). The Latin word *monopetalus* means single-petalled and apparently refers to the conspicuous, long, lower petal which is the only one seen at first glance.

DISTINGUISHING FEATURES. The distinctive form of the flower, its lavender-blue colour and the long, narrow leaves distinguish this plant from other species of *Hybanthus*.

DESCRIPTION. This is usually a slender erect herb from 1 to 2 ft. (30 to 60 cm) high with rather stiff and wiry simple stems. Plants have also been found with a different growth habit. These are low, somewhat densely branched undershrubs, usually less than 1 ft. (30 cm) high.

The leaves at the base of the plant are alternate, but the upper leaves are often opposite. The dark green leaves are up to 2½ in (6·5 cm) long and less than 1/10 in. (0·25 cm) wide. The flowers are arranged in slender leafless racemes either at the end of the stems or in the axils of the upper leaves. These racemes are always longer than the leaves.

In this dainty flower only the lower petal is conspicuous. It is usually parallel to the ground and is ½ in. (1·25 cm) long, oval in shape and narrowed into a concave claw that is prolonged at the base into a short, blunt spur. Towards the base of the petal, there is a conspicuous, crescent-shaped purple patch from which dark lavender lines radiate towards the margin. It is this slipper-shaped petal which gives the plant its common name.

FLOWERING TIME. It blooms from the beginning of spring through to the end of summer.

HABITAT. In the coastal areas, it grows mainly on poor sandy soil in open eucalyptus forest country among grasses and sometimes in bracken. On mountains, it can grow in cracks on rocky slopes or on steep grassy slopes.

DISTRIBUTION. It is found only in Australia, and grows in all the eastern mainland States and also in South Australia. In Queensland, in the coastal areas, it is found as far north as Fraser Island. In the southern part of the State, it has been found farther inland around Crow's Nest and also in the Stanthorpe-Wallan-garra area. In central Queensland, it occurs on the Carnarvon Range and on the Blackdown Tableland.

GENERAL REMARKS. It does not appear to have been cultivated to any great extent which is rather unfortunate. Grown in a mass, the beautiful colour of its unusual flower would surely be an asset in a miniature garden.

In many publications dealing with Australian wildflowers, this plant is included under the name *Hybanthus filiformis*. A recent revision of the genus makes it clear that the correct name for this species is the one used here.

Spade Flower

SPADE FLOWER (*Hybanthus enneaspermus* subspecies *stellarioides*). This plant was originally described in 1753 by Carl Linnaeus as *Viola enneasperma*. The Latin word *enneasperma* means having nine seeds. Apparently Linnaeus considered the small number of seeds was unusual enough to merit the use of this specific epithet. A recent revision of the genus published in Western Australia divides the species into two subspecies, one with blue flowers, the other with yellow flowers. The latter is the plant found in south-eastern Queensland. *Stellaria* is the Latin name for chickweed, and *oides* is a Greek suffix indicating resemblance. The Latinized *stellarioides* therefore means resembling chickweed. The common name of "spade flower" was given to this plant because of the shape of the lower petal.

DISTINGUISHING FEATURES. The flower colour, which varies from deep yellow to bright orange, immediately distinguishes this plant from lady's slipper.

DESCRIPTION. This is a slender, erect, rather spindly herb up to 2 ft (60 cm) high, with alternate sessile leaves up to 2 in. (5 cm) long and ¼ in. (0·6 cm) wide. The leaves are widest just above the base and are narrowed to a blunt tip. They are smooth and green and their margins either are entire or have widely spaced shallow teeth.

The solitary flowers are at the ends of axillary peduncles about ⅜ in. (0·9 cm) long, on pedicels ⅛ in. (0·3 cm) long. Beneath the pedicel is a pair of very minute bracts and the pedicel bends downwards. The green calyx consists of five narrow, pointed sepals, 1/10 in. (0·25 cm) long. The three upper sepals and the pedicel are sometimes tinged with a reddish purple colour.

As in lady's slipper, the most noticeable feature of the flower is the large flat lower petal. This can be ¾ in. (1·85 cm) long and is usually as broad as it is long. It is constricted at the base into a pale green claw, the whole petal somewhat resembling the blade of a spade. Sometimes the tip of the petal is slightly notched.

On each side of the lower petal, two very small cream petals curve upwards and outwards with a single, even smaller, petal separating them from the lower petal.

FLOWERING TIME. It flowers mainly in summer, occasionally in midwinter and early spring.

HABITAT. It grows in sandy loam, stony soil or clay loams in open eucalyptus forests.

DISTRIBUTION. This plant grows close to the coast in New South Wales and Queensland from as far south as the Port Jackson area in New South Wales to as far north as Ayr on the mainland in Queensland and offshore on Dunk Island.

It has also been found farther inland on the Carnarvon Range and the Blackdown Tableland in central Queensland.

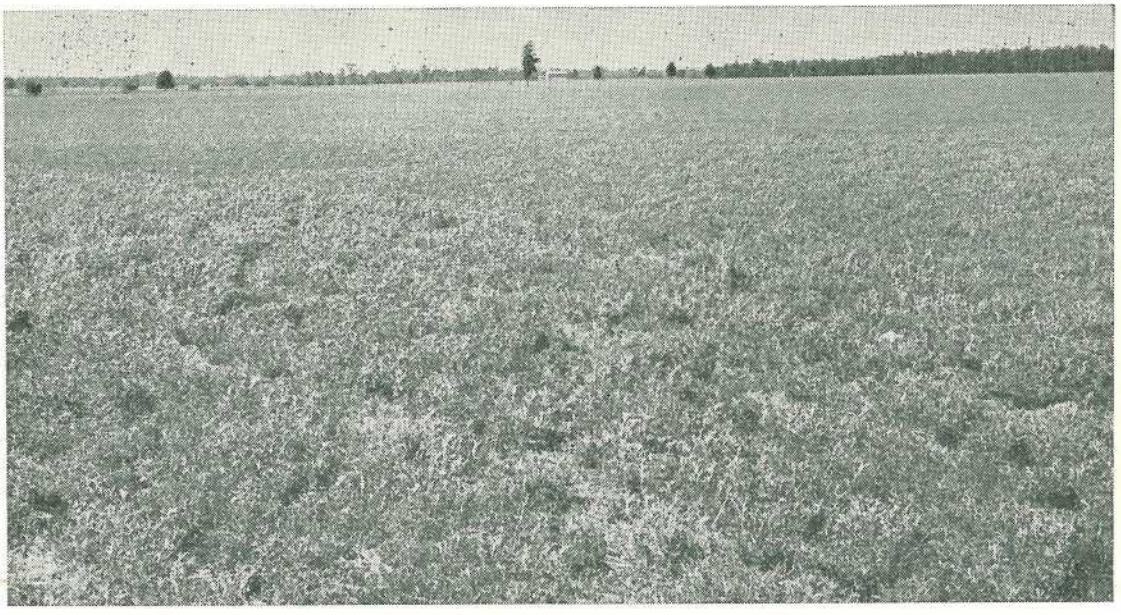
The subspecies *enneaspermus* is found in India, Ceylon, Malaysia and South and East Africa in addition to the north of Western Australia, the Northern Territory and Queensland.

GENERAL REMARKS. Again this plant has not been cultivated.

Boar Performance Test Report

BOARS 'Approved' under the Boar Performance Testing Scheme at Rocklea during December 1973 are listed below. Average boars score 50 points for economy and 50 for carcass. Points scores can be compared only with those of boars of the same breed.

Breeder	Ear Number	Q.A.R. Number	Points Score		
			Economy of Production	Carcass Quality	Total
LARGE WHITE					
R. AND L. M. DUCKETT, 'Fairview', Capella, Q., 4702	SIRE: Wallingford Julius Caesar 735 Q.A.R. 528 DAM: Peak Downs Tania 31				
	160	628	75	38	113
	162	629	69	44	113
K. N. MATHIESEN, 'Naiken' Stud, Gayndah, Q., 4625	SIRE: Naiken Field Marshall 179 Q.A.R. 550 DAM: Naiken Flavia 59				
	375	632	49	63	112
A. F. AND V. M. RUGE, 'Alvir' Stud, Box 20, Biggenden, Q., 4621	SIRE: Alvir Regal Hero 1037 Q.A.R. 539 DAM: Alvir Jewel 935				
	1450	624	64	77	141
	1451	625	65	60	125
LANDRACE					
J. A. CLEGG, 'Kanoma' Stud, Box 148, Mundubbera, Q., 4626	SIRE: Rondel Design 3120 DAM: Rondel Stinette 3279				
	173	626	60	57	117
	174	627	60	58	118
L. A. PETERS, M.S. 1974, Bongeen, Q., 4356	SIRE: Moonlight Royal Avon 166 DAM: Moonlight Alison 27				
	545	630	57	61	118
	546	631	64	58	122



Lucerne is grown throughout the Taroom Shire both as a pure stand and as a pasture component wherever soils are suitable. It is a major aid in maintaining livestock production.

Agriculture In The Taroom Shire-1

by I. N. McCLEMENT, Agriculture Branch.

THE Taroom Shire covers some 4·60 million acres (1·84 million ha). It extends north from the Great Dividing Range beyond the Dawson River to the Bigge Range.

Taroom, the administrative centre of the Shire, is 300 road miles from Brisbane, in a north-westerly direction.

Early Settlement

The first Europeans to enter what is now known as the Taroom Shire were Ludwig Leichhardt and his party of eight on a journey from Jimbour to Port Essington in 1844-5.

The early settlers arrived in the Taroom Shire soon after Leichhardt's trip. From records available, it seems that William Turner was listed as the licensee of Taroom Station on November 18, 1845.

Initially, pastoralists were allowed to take up as much land as they liked as long as they possessed a licence. On January 1, 1848, a regulation relating to tendering for runs became law. Soon after, many properties were established and today many retain the original names.

This devastated landscape is the result of a brigalow scrub burn. When Rhodes grass is sown into the ash, it is tranformed into a productive pasture.

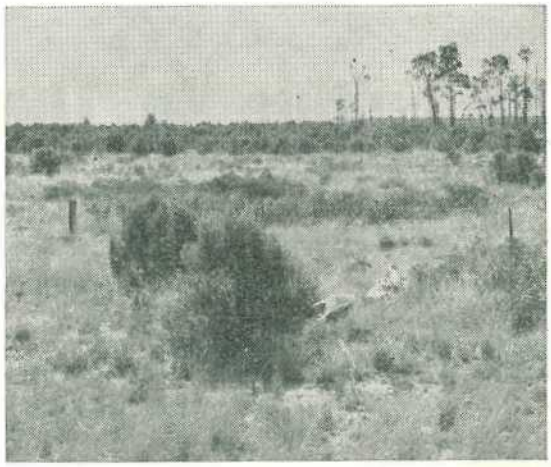
In the early days, sheep were an important industry in the Shire. Settlers entrusted their flocks of sheep to the care of shepherds. The size of each shepherd's flock was about 1 700 and their huts, generally of slabs, were situated several miles apart on the properties.

Taroom became a settlement in the 1850s. The elevated site was close to water and provided a vantage point for lookouts for the fierce Dawson River aboriginal tribes.

Wandoan's history is relatively short. The greatest development has taken place since World War II when the town became the centre of the largest soldier settlement area in Queensland. More than 100 blocks were established in the scheme.

Prickly pear was a major pest in the early days of the Shire. Although many methods of eradication were tried, it was not until cactoblastis was introduced in the 1920s that the pear was finally beaten.

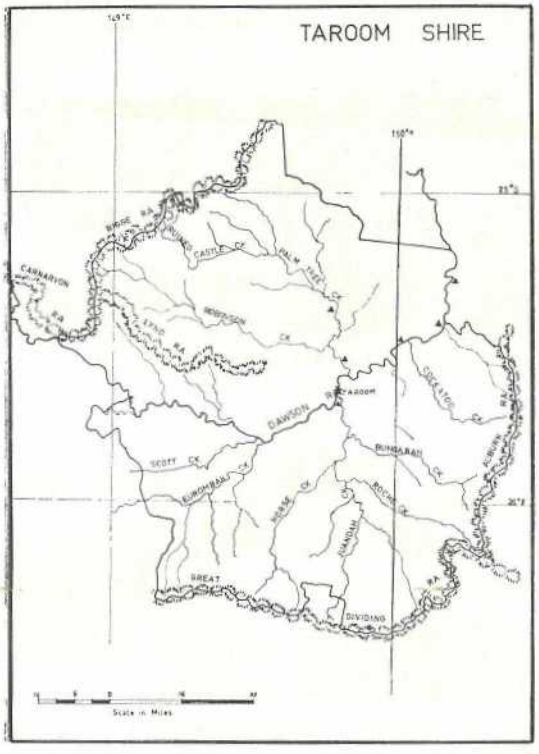
Closer settlement has occurred over the years, particularly since World War II, and the total number of rural holdings in 1969 was 509.



Weedy regrowth invading former Rhodes grass pastures after a series of dry summers. Cultivation has been used to destroy timber regrowth.

Climate

The annual rainfall in the Taroom Shire is typical of Queensland—mainly summer rains with supplementary falls in the winter.



August is the driest month while spring and early summer rains can be erratic.

Drought is part of the environment with a major drought expected on the average once in 8 years.

RANGE OF AVERAGE MONTHLY AND YEARLY RAINFALL

Month	Shire range	Taroom
	pts.	pts.
Jan.	307–430	408
Feb.	308–473	358
Mar.	202–293	261
Apr.	120–197	148
May	202–171	165
June	120–179	159
July	90–168	142
Aug.	135–105	105
Sept.	68–149	137
Oct.	111–241	197
Nov.	258–306	302
Dec.	323–389	328
Year	2 319–2 903	2 710

Source: Bureau of Meterology.

TEMPERATURES—TAROOM

Month	Minimum	Mean	Maximum
	°C	°C	°C
Jan. ..	19	25	31
Feb. ..	19	25	31
Mar. ..	19	25	31
April ..	17	23	30
May ..	13	21	28
June ..	7	15	21
July ..	5	13	21
Aug. ..	4	12	20
Sept. ..	4	13	21
Oct. ..	9	17	26
Nov. ..	14	22	30
Dec. ..	17	24	31
Year ..	12	20	27

Source: Bureau of Meterology

Eight official rainfall recording stations are located in the Shire.

Climate For Agriculture

Because of the predominance of summer rainfall, production from pasture and crop during this period is usually adequate. In the winter, fodder crops are used for livestock production and winter cereal grain crops are grown on adequately prepared fallows.

Successful winter crop production results from summer-autumn fallows when soil moisture reserves are built up. Complementary rains during the winter permit planting, and supplement existing soil moisture.

The range of temperatures has a bearing on agricultural production. Midsummer temperatures can be high, causing heat and moisture stress to crops and pastures. Plantings of grain crops should be so timed that the flowering periods do not coincide with the expected heat wave period.

Similarly, winter grain plantings should be timed to avoid frosting at the critical growth stage. Wheat is usually planted in late May and June to avoid frost damage Even so, a late frost can cause damage.

Frost-free areas on the ridges are common in the Taroom Shire and frequently tropical plants can be found in homestead gardens situated on these ridges.

Hydrology

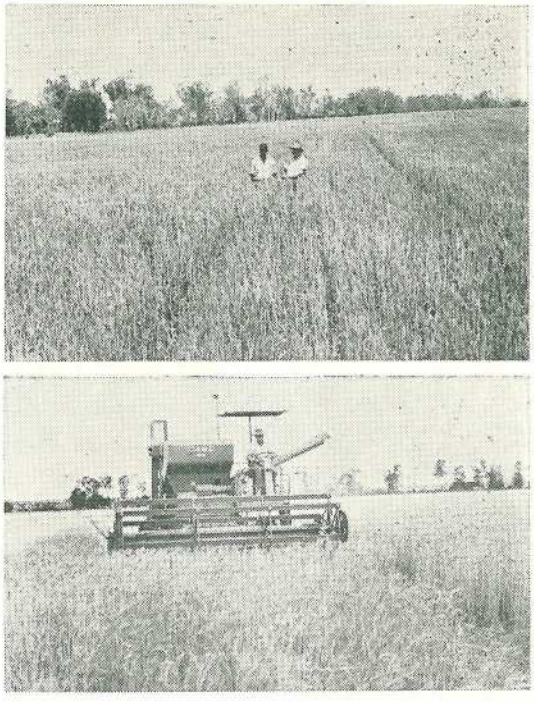
The Taroom Shire lies in the Fitzroy River basin and is drained by the Dawson River and its tributaries.

The Dawson River rises in the Carnarvon Ranges, Robinson Creek in the Expedition Range and Eurombah Creek South of Injune. The other major tributary, Juandah Creek, has its source in the Great Dividing Range in the south of the Shire.

On most properties, surface storages are constructed with varying capacities of 500 cubic yards to 20 000 c. yd. (380 to 15 300 cu. m) holding 85 000 to 3·4 million gallons (390 000 to 15·5 million litres). These storages are earth tanks and the tendency in recent years has been to increase the size of storages because of the irregularities in run-off.

Bores are available on most properties for stock watering. These bores vary in depth from 50 to 5 000 ft. (15 to 1 500 m) with capacities ranging up to 20 000 gallons (91 000 litres) per hour. Artesian bores are not common but are found on some properties.

There are no major irrigation schemes in the Shire, but several small private schemes are in operation.



TOP. *A well-grown wheat crop in the Taroom district.*

BOTTOM. *Harvesting wheat.*

PERCENTAGE CHANCES OF RECEIVING SPECIFIED MONTHLY AMOUNTS OR MORE OF RAIN

Taroom 81 years of Record

Rain in.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
½	98	88	89	67	65	69	70	57	72	81	90	91
1	94	80	74	51	47	56	48	40	53	67	84	84
2	77	59	51	30	27	31	28	17	25	38	62	66
3	60	43	32	15	17	11	10	9	11	20	43	46
4	45	34	19	8	12	7	6	*	5	10	27	29
5	34	25	12	4	8	4	4	*	2	6	15	17
6	24	18	7	2	5	2	2	*	1	4	8	9
8	10	10	4	*	1	1	1	*	*	1	4	2
10	4	4	1	*	*	*	*	*	*	*	1	1

* Amount has not occurred in period analysed.

Source: Bureau of Meteorology.

Topography

The topography of the Taroom Shire varies considerably. Flat lands are generally restricted to those areas adjacent to river and creek frontages. In the rest of the Shire, the topography ranges from low gradient slopes to steep hillsides.

The combination of soil types and topography presents one of the most serious soil erosion problems in Queensland. A

Weeds can be serious competitors with wheat. On the left, New Zealand spinach is smothering a wheat crop while, in the section on the right, the weed has been controlled with picloram.

INCIDENCE OF FROSTS—TAROOM

Frost	April	May	June	July	Aug.	Sept.	Oct.	Year
Light (2–0°C) ..	0	3·0	7·0	10·0	9·0	2·0	0	31·0
Heavy (<0°C) ..	0	0	3·0	6·0	5·0	0	0	14·0

Source: Bureau of Meterology.

EVAPORATION IN MONTHLY AND ANNUAL TOTALS (in.)

Taroom Years of Record 37

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
7·86	6·02	6·06	4·65	3·33	2·29	2·42	3·55	4·91	6·71	7·66	7·98	63·44

Source: Irrigation and Water Supply Commission of Queensland.

considerable amount of cultivation within the Shire is on undulating land. Farming systems are influenced by topography.

Soils

The soils in the Shire can be divided into eight broad classifications. These are not present in district patterns, but tend to be interspersed throughout the area.

Alluvials are found adjacent to the watercourses and areas vary in size according to topography. They are deep, sandy clays and have been successfully used for crop production and pasture. Flooding on these soils can be expected at irregular intervals.

On some properties, sufficient underground water has been obtained for irrigation.

Box soils vary in colour from a light to dark clay and are generally adjacent to watercourses, but on a higher plane than the alluvials. The thinning of the timber stand usually provides good grazing for cattle. Some crops, particularly fodder crops, have been grown on these soils. Superphosphate fertilizer is generally required.

Grey clay loams are probably the most common soils and occur where brigalow predominates. These soils are being used extensively for cropping and are generally found at higher levels in the landscape than the former two groups.

Gravelly, grey clays are associated with patchy plain brigalow and *Bauhinia* spp. These are common throughout the Shire and are generally considered unsuitable for agriculture. However, they are well adapted to native and sown pasture production.

Belah soils are reddish-brown, clay loams suitable for both agriculture and pasture production, but they are prone to wind erosion and are marginally deficient in phosphorus.

Softwood scrub soils are grey loams and usually occur at higher levels in the landscape than the groups previously discussed. Cropping has been successful on these soils and they are regarded highly for sown pastures, particularly green panic. They, too, are prone to wind erosion.

Solodics are found mainly in the northern and southern sections of the Shire and have received very little attention because of physical and fertility problems associated with them.

Hard, stony ridges are scattered throughout the Shire and are totally unsuitable for development. They are useful in shedding run-off for water storages.

Soil Conservation

One of the greatest hazards facing agriculture in the Taroom Shire is soil erosion. Because of the undulating topography and highly erodible soils, the agricultural future of the Shire could be severely restricted if erosion is not controlled.

Protection measures have not kept pace with the rate of agricultural development, Some complacency may have existed before the summer of 1970-71. In December, January and February of that summer, a total of 31 in. (79 cm) of rain fell. Erosion was so severe that many roads were covered with heavy deposits of silt for a long time. Cultivation areas are still showing the ugly scars of erosion from that wet summer.

In 1970, of 270 000 ac. (108 000 ha) of cultivation, some 54 000 ac. (21 600 ha) had some form of conservation applied. This includes contour banks and grass strips.

Experience has shown that mechanical structures alone are insufficient. Sound agricultural practices are also necessary to ensure complete protection. Retaining crop residues reduces the impact of high intensity falls as well as suppressing weeds. The careful use of cultivating machinery also can restrict the impact of erosion.

Where crop residue is retained, modified machinery is used for cultivation and plantings.

Practising soil conservation measures must be an integral part of the whole farming system. It is far better to allow for such practices in the early stages of development than to change the whole structure of the property later.

Vegetation

The Taroom Shire is situated in what is termed the brigalow belt of Queensland. Although brigalow and other associated trees on the finer textured soils used to form an important part in the southern and central

sections of the Shire, large areas of forest country are found in the northern parts. The forest country consists mainly of narrow-leaved iron-bark. Poplar box communities are found throughout the Shire with coolibah, carbeen and apple trees on the stream frontages.

Tree Communities

Brigalow (*Acacia harpophylla*) is located in many parts of the Shire, sometimes as a pure stand but usually in varying communities. It is found associated separately with each of the following communities:—

1. Wilga (*Geijera parviflora*), belah (*Casuarina cristata*) and brigalow grass (*Paspalidium caespitosum*).
2. Softwood scrub or vine thicket species, for example, tree wilga and narrow-leaf bottle tree (*Brachychiton rupestre*), and hooky grass (*Ancistrachne uncinulata*) and *Chloris unispicea*; north-west and west of Taroom solidwood (*Cadellia pentastylis*) is commonly found.
3. Belah (not as common as in the Shires to the south) with sandalwood (*Eremophila mitchellii*) predominant in the understorey.
4. Sandalwood (usually forming a buffer between brigalow-wilga and brigalow-poplar box areas).
5. Blackbutt (limited areas of brigalow-Dawson gum or blackbutt (*Eucalyptus cambageana*) in scrub communities in the northern part of the Shire).
6. Patchy plain (particularly in the northern and western parts of the Shire), made up of a mixture of brigalow and grassland associations. The brigalow occurs in clumps usually with *Bauhinia carronii* or *B. hookeri*. Bottle trees often occur and in larger patches wilga is found. The grasslands are dominantly blue grass (*Dichanthium sericeum*).

Property Development

In the years before World War II, property development within the Shire was slow. Ring-barking was employed to kill the green scrub and native pastures grew in its place. But only relatively small areas were developed with this technique and, as a result, large acreages of virgin brigalow scrub remained at the end of the war.

It was not until the 1950s that large tracts of brigalow lands were developed. Thousands of acres of brigalow scrub were pulled with heavy crawler tractors with chains and/or cables. Very hot fires were used to destroy the debris and Rhodes grass was sown into the ash.

The transformation was outstanding. Carrying capacities were increased from virtually nothing to one beast to the acre (five beasts to 2 ha) in the initial stages settling down to one beast to 10 ac. (1 beast to 4 ha) after the initial flush of fertility was exhausted. The cattle industry prospered under these conditions.

However, not all development schemes were successful. Pulling in dry conditions, poor burns and dry seasons took their toll, allowing the brigalow and other regrowth to gain the upper hand in many areas.

Agricultural Development

During the 1950s and early 1960s, Rhodes grass proved to be an excellent pioneer pasture. However, the dry summer seasons in the 1960s and heavy grazing caused these pastures to fail. Through lack of pasture competition, woody regrowth soon dominated the pasture areas.

Production from the former Rhodes grass areas became very limited and to reclaim the land and have a cash return at the same time, large areas were cultivated, principally for wheat.

From 1958 until 1970, the acreage cultivated increased from 20 000 ac. to 270 000 ac. (8 000 to 108 000 ha). From 1962, the average annual increases were 11 000 ac. (first 6 years), 24 000 ac. (4 years) and 42 000 ac. (last 2 years) (4 000 ha, 9 600 ha, 16 800 ha). Contract stick rakes and farm tractors were pressed into service to clean up areas required for cultivation.

Initially, winter crops were grown. This meant that the crops were growing while the timber regrowth was dormant and cultivation took place when the woody plants were actively growing. Under this system, control was achieved in 3 years. In more recent years,

both summer and winter crops have been grown successfully.

In the main, cultivation was undertaken to reclaim former pasture areas. However, in some areas, green scrub was pulled, burnt as soon as possible and then ploughed for cropping.

Farming Systems

Since early settlement, cattle grazing has been the most profitable industry in the Shire. Today, the Shire ranks fourth in Queensland for cattle numbers.

Cropping developed in the late 1950s and during the 1960s exploded to make graingrowing important economically.

The enterprises undertaken on properties are governed by several factors, such as size of holdings, soil type and distance from railhead. In the north and north-western sectors remote from rail, the holdings tend to be large and the soils generally unsuitable for cropping. In these areas, cattle breeding predominates but some fattening is carried out.

In the west of the Shire property sizes range from 3 000 to 10 000 ac. (1 200 to 4 000 ha) with both breeding and fattening being carried out. Growing fodder crops is common and some grain is produced. A similar situation exists in the eastern section of the Shire.

In a 20-mile (32 km) radius from Wandoan, a closely settled areas exists. This results from the original soldier settlement area developed in 1952. These blocks are approximately 1 200 ac. (480 ha) in size and initially dairying was the major enterprise.

The farming systems of the Shire could be classified as follows:—

CATTLE BREEDING. Breeding cattle as a sole enterprise is carried out on a minority of properties. These are mainly situated in the northern section. Very little cultivation if any is available in these areas, and cattle are usually sold as stores at Taroom and Wandoan.

CATTLE BREEDING AND FATTENING. This is one of the principal income earners. Cattle bred on the property are fattened on crop, mainly oats, and sold by 2 years of age.

Because of the size of the properties involved, 1 200 to 1 3000 ac. (480 to 5 200 ha), herd sizes vary with areas of fodder crops (100 to 1 000 ac.) (40 to 400 ha).

CATTLE FATTENING. Cattle fattening consists of buying suitable store cattle in the late summer and autumn and fattening on oats.

This industry was popular in the early 1960s but in recent years the high price of store cattle has reduced profitability, thus the industry has waned to a great extent.

GRAINGROWING. Very few properties rely entirely on graingrowing. However, where share farming is undertaken, graingrowing is the only industry.

GRAINGROWING-CATTLE BREEDING-CATTLE FATTENING. This, without a doubt, is the most common enterprise in the Shire, involving properties ranging in size from 1 200 to 13 000 ac. (480 to 5 200 ha). Wheat is the principal grain grown but in recent years areas under grain sorghum and sunflower have increased.

The cattle enterprise consists of selling the progeny of a breeding herd as fats off oat crops. Sometimes, as opportunities arise, stores are bought, fattened and sold.

Where enterprises are combined and planning is not careful enough, the cattle may be vulnerable to drought. High stock numbers with insufficient pasture and little or no feed reserves can mean disaster.

GRAINGROWING-FATTENING. Graingrowing usually provides the main source of income. Cattle are bought as stores and fattened on crop as the opportunity arises.

GRAINGROWING-DAIRYING-CATTLE BREEDING-FATTENING. Dairying played a major role in the southern portion of the Shire after World War II. In the last 10 years, however, dairying has been replaced by other farming systems except on a few properties.

PASTURE SEED HARVESTING. Green panic, Rhodes grass and buffel grass pasture seed is harvested on many properties as the opportunity arises. This can be a lucrative sideline with gross returns up to $200 an ac. ($500 per ha).

[TO BE CONTINUED]

Planning For Drought—I

Property Development And Management

IN the long-term planning of an agricultural business, the best plan is not necessarily the one that gives least loss or greatest profit during drought years.

by I. H. RAYNER, Division of Dairying.

This may appear out of place in an article aimed at assisting farmers and graziers in mitigating the effects of drought on their own properties. But for the producer preparing long-term development and management plans, the reality of drought is only one of the important factors that must be considered. Besides safeguarding income and assets in drought years, a satisfactory long-term plan must also allow producers to take advantage of good seasons.

In writing for agricultural producers, it is hardly necessary to point out the need for a long-term view to take account of variations in seasonal conditions. Results from one or even several years do not indicate reliably how well a property is being managed. A programme that best suits a property can be chosen only after looking at the effects of development and management programmes over a full range of seasonal conditions.

Most producers will use two main measures in selecting their long-term programme: annual profits and a change in the value of their assets. If one of several practical, alternative programmes will give both the highest average annual profit and the greatest capital appreciation, it is obviously the one to choose. If none is best on both counts, the choice will depend on the owner's individual requirements. Some will prefer or be obliged to aim at higher income at the cost of some reduction in capital gain. For others, capital gains have advantages that compensate for lowered annual income.

Whether a programme will involve sharply reduced income, or even financial losses, during drought years as compared with one that yields a more stable income is not relevant as a general consideration. In a business, losses in some years are not serious disadvantages if they are more than compensated by increased profits at other times. The special but common problem of the producer whose limited financial resources will not permit him to accept the risk of losses is discussed later.

A simple example may illustrate the main points in this problem of taking account of seasonal variations in long-term planning. Suppose that the owner of a grazing property is considering three alternative development and management programmes. From a study of rainfall records, he has confirmed his experience that seasonal conditions on the property follow a simple frequency of 2 good years, 4 fair years and 1 drought year in every 7. For

each class of season, he has worked out the most likely results for each of the three programmes. He has also estimated the change in property value (walk-in walk-out basis) net of additional capital outlay that would be likely with each programme in the long-run and expressed this as a yearly amount of capital appreciation. The results of all these calculations are shown in Table 1.

It may be assumed that A is a safe, conservative programme. It does not generate high income but minimizes the drought problem. At the other extreme, programme B involves much heavier stocking, which gives high income in good years, but the property tends to be overstocked in fair seasons. Besides, during drought, enforced sales, deaths or heavy hand feeding lead to a significant

TABLE 1

EXAMPLE OF ALTERNATIVE DEVELOPMENT AND MANAGEMENT PROGRAMMES

Programme	Annual Income				Capital Appreciation (Annual Average)	Reduction in Income (from Average) in Drought Years
	Good Years (2)	Fair Years (4)	Drought Year (1)	Long-term Average		
	$	$	$	$	$	$
A	5 000	4 000	3 000	4 143	1 000	1 143
B	10 000	5 000	−3 000	5 286	500	8 286
C	8 000	5 500	1 000	5 571	2 000	4 571

financial loss. Programme C is intermediate and obviously gives the best results in both average annual income and appreciation of assets.

Note that, if the choice had been based only on drought year results (either best income or least reduction in income), the much less profitable programme A would have been chosen. Similarly, an incorrect choice of programme B would have occured if only income in good years (or good and fair years combined) had been used as the gauge.

In this example, the programme with best income in fair seasons is also the best on overall results. However, in practice, this is certainly not always so.

Aids in Decision-making

The procedure discussed is probably no more than what shrewd managers have been doing for years. If we accept this and agree that it is a useful approach to the long-term planning problem where seasons are variable, how do we go about using it? Can we readily work out for a set of complex alternative programmes, the key measures of results as used in the example.

Unfortunately, this is not possible for most farmers at present. In the future, as more producers make use of advanced analytical procedures to assist their decision-making, all-embracing estimates of this type will be used more widely.

In the present, practical, farm management, decision-making situation recognizing that programmes need to be evaluated on the seasonal variation on the property can assist better planning in two ways:—

1. THINK THROUGH THE SEASONAL EFFECTS. Farmers and graziers are not the only ones who tend to evaluate and make decisions about changing methods on the basis of average results expected under average conditions. This is quite normal and appropriate for a first appraisal to decide whether a particular change may be worth while.

If it does appear worth while or even almost good enough to apply, we should then consider what effect it will have on property operations as a whole in at least three different situations: a good season, a fair (as distinct from the hypothetical average) season, and a drought.

Depending on the type of practice under consideration and an appreciation of climatic variations on the property, we may need to consider further situations such as a delayed wet season or failure of winter rain.

It will be apparent that this procedure is appropriate for considering separately particular aspects of property development or management practices. Unless whole-property programmes are unusually simple, it will scarcely be possible to examine them in this way without written budgets. However, if parts of a programme are improved, with attention to the consequences of any adjustment, the whole programme is so much better.

Critical consideration of the effect of a proposed change of programme over the full range of seasons can indicate clearly that results will be better or worse than the average assessment suggests. Joint use of further developments or changes in methods will considerably improve the first proposal. Some examples may clarify this point:—

- Using forage crops in a marginal summer rainfall area may on average expectations appear worth while. However, examine the situation where, in good years, the crops will not give better results than pasture (but will be more costly), and, in drought years, the bare cultivation area will only add to the feed shortage (while plant overhead costs have still to be met). Then, the net financial results of cropping may be much worse than at first expected.

- Strategic weaning in the breeding herd may, on the average, result in an appreciable improvement in branding rate and a shorter calving period at low cost. However, in good seasons, there is little lift in reproductive performance and, in bad years, many cows may be at a susceptible stage of pregnancy during the worst part of the season.

  Expansion of the proposed changes to include strategic supplementary feeding of susceptible breeders, with an advance decision to use hand feeding and reduction of numbers by disposal of non-pregnant cows in drought years, may markedly improve the profitability of the whole programme.

2. APPRAISE THE SEASONAL EFFECTS. Again, to be realistic, we are thinking of particular developments or parts of programmes rather than the whole-property plan. This is simply an extension of the thought process discussed before which occurs naturally when the problem is too large to be worked out mentally.

It will be convenient to use a sheet of paper with a separate column for each of the types of seasonal situations requiring consideration.

For each situation, the physical factors are first estimated: stock numbers, area, yields, amount of fodder, extra labour requirements, sales and so on.

Financial values are then estimated for the factors used and the results obtained; and profit margins calculated. These can be summarized by adding into a total the profit margin for each type of season the same number of times that it occurs in the expected run of seasons and dividing by the total number, that is, a weighted average.

Do not be afraid to use information or estimates because their reliability is doubtful. A budget is only as good as the data used in preparing it, so the best available information should be used. However, even calculations which include some informed guesses are a better basis for decision than none at all.

Budgeting on paper has the same function as systematic mental calculation but it will do more and do it better, if only because more of the relevant factors can be included without losing sight of any.

PLANNING DECISIONS

It is important to recognize that no two farming or grazing businesses are exactly the same. It is common to find apparently similar properties in the same district being managed altogether differently, and, on closer examination, to discover that each is giving good results because of important differences in circumstances. The opposite is also well known: the same programme and methods are used on similar blocks, successfully in some cases, but unsuccessfully in others.

The good manager recognizes that his planning and operations must give due weight to all the factors peculiar to his venture. The

fact that a practice or programme has given good results on a neighbouring property is only a useful starting point in working out whether it is likely to be appropriate for his property.

Discussed briefly are some of the factors that commonly vary between property situations and require major differences in planning and management:—

Physical Resources

We may include under this heading factors such as climate, soil type, and typography. These are all the basic facts about the property's natural resources that determine how it can best be used and what developments are feasible. Answers to many specific questions should be included in this knowledge. Some of these questions are:—How well does the country maintain stock during a dry season or drought? What is the pasture response on the various soil types to several different quantities of rain at different times of the year? How much stored soil moisture is needed to ensure a crop on the arable soils?

It appears self-evident that the property owner-manager should be the person best informed on the technical capabilities of his own property. He can acquire this knowledge only by careful observations, coupled with the study of relevant information from other sources.

Financial Resources

We all know that farming and grazing, particularly in those regions most subject to drought, require a large amount of capital. Ability, skill and the will to work are not enough without adequate capital resources or financial backing.

The fact that drought can cause heavy and crippling capital loss is related to the high capital requirements of modern agriculture.

The problem is that many farmers and graziers are not able to command sufficient capital to develop and operate their properties in the most businesslike way, taking into account the full range of circumstances and seasonal conditions that will predictably occur. Where adequate funds are available, it is not very difficult for the owner, using the assistance he can freely obtain, to work out a sound reliable programme to get the best long-term return from his capital and other resources. When capital is limited some aspects of the programme must be worse than he would like. The discrepancy may range all the way from minor delays in development to being forced to gamble on a good season or a bumper crop to survive.

The producer with insufficient land is also likely to feel forced into the same dangerous situation of over-using his land in an attempt to obtain a satisfactory income. Properties on which this is done, either by overstocking or too frequent cropping, are, of course, very vulnerable to drought.

Although this appears to be an example of inadequate physical resources, the real problem is usually financial. If the owner can command sufficient finance, the obvious and only satisfactory solution is to buy more land or sell the original holding and move to an adequate block. Similarly, where, on a lease-hold block, the main factor limiting development of a satisfactory enterprise is insufficient area and not the lessee's financial or managerial capabilities, sympathetic treatment in granting an additional area, when this is possible, may be expected.

Farmers and graziers whose businesses fail because of insufficient finance can hardly justify more favourable treatment than investors experiencing the same difficulties in non-agricultural business ventures. In his own interest, and for the benefit of the community as a whole, it is important for the capable manager to be able to enter or remain in the form of primary production best suited to his skills and ambitions. However, it is no less important that he should avoid buying an inadequate or unsuitable property or settling on a block which he is not able to develop into a viable unit because of insufficient finance.

Two main avenues enable him to avoid this risky situation. The first is by fully exploring the various sources from which supplementary finance may be borrowed. Loans are fairly readily available for sound propositions, even when the owner's equity is low, but a well-prepared case setting out the capital requirements and likely results is essential.

Lenders of development capital also favour a proposal requiring a greater loan to ensure a better chance of success and reduce risk,

including the risks from drought, rather than one which requires less assistance but still leaves the property inadequately financed.

The other alternative for the capable manager with limited capital is to obtain employment as a property manager. Increasing investment in agriculture by Australian businessmen as well as by overseas interests is expanding the opportunities for financially and personally satisfying employment in this capacity. Even the opportunities of sharing in capital gains are being extended to their managers by enlightened investors who appreciate the need to attract and retain capable staff.

Shortage of finance is not only a hindrance to development or a problem during drought. It also results in significant financial loss during good seasons when, for example, a producer is unable to increase stock numbers to use the available feed or to stockpile cheap fodder because of a shortage of funds.

Managerial Competence

As with financial resources and the other factors used in agricultural production, it is important for the managerial ability and skills of the operator to be appropriate for the type and size of enterprise. There are, however, important differences between the managerial input and other factors of production.

With capital or land, a simple quantitative assessment may be used to decide whether the amount available is sufficent for a satisfactory enterprise. With management skills, requirements must be assessed also in major differences in type. For example, the capabilities in broad-scale herd and pasture management and handling of staff required to manage an extensive grazing property are quite different from the detailed knowledge of plant and soil science necessary for an intensive horticultural enterprise.

Measurement of managerial competence is also much more difficult. With factors such as land or capital, the owner can fairly readily, and with little outside assistance, decide whether he has sufficient for a particular form of production or how best to use the resources he can command.

With management ability, extreme deficiencies, such as the man who cannot make a good property pay, or exceptionally high competence, for example, the individual who succeeds where several others have failed, are easily recognized. In less extreme cases, it is more difficult for outsiders, and sometimes impossible for the individual himself, to make an unbiased assessment of a person's capabilities.

On the positive side, a competent manager can usually improve his management skills or hire skilled services to deal with his problems more easily than he can obtain additional land or capital. The main aim of the Department of Primary Industries' extension services is to assist farmers and graziers to improve their managerial abilities and skills. This assistance is freely available. Private farm management consultants are also available to producers in Queensland.

Making the best use of his particular abilities may also be critical in determining the best and most profitable form of production. It may make the difference between success and failure. In beef cattle production, for example, one manager may be particularly capable in buying and selling, while another's particular competence may be in feed management and cattle husbandry. With identical properties, the first may do best by buying cattle for fattening and so making the fullest use of his dealing ability. For the second producer, breeding and fattening and having as little to do with marketing as possible may be highly profitable.

The most successful drought strategies would also be quite different for these two managers. The competent dealer may do best by selling every hoof in a severe drought and buying again before prices rise as seasonal conditions improve. For the skilled husbandry man, feeding his herd through the drought may be best.

The advantages of intensively using specialized skills are widely recognized in industry and commerce where executives commonly have restricted functions such as buying, selling or production. Primary producers can seldom afford to specialize to this extent. There is no doubt, however, that many producers would be better off if they re-organized their enterprises to make the greatest use of their

special abilities and, at the same time, greatly reducing their involvement in the fields of management at which they are least successful.

Availability of Labour

Shortage of labour at the expected price when required can seriously upset management programmes, whether permanent labour or short-term hiring for development or drought mitigation programmes is required. For the individual producer any type of labour, regardless of how specialized or skilled, is always available at a cost.

The problem is that the cost may be unexpectedly high. This difficulty is most serious when the producer is already committed to a programme and is then forced to employ excessively costly labour. Exactly the same problem occurs with other inputs when their cost is under-estimated or their price unexpectedly rises.

Planning decisions are, of course, influenced by labour costs and the relative costs of different types of labour. For example, decisions whether to grow permanent pastures or forage crops or to conserve or buy fodder depend on the labour costs as well as other factors.

Attitude to Risk

Agriculture is not a risky business, but individual producers can easily, and often do, get themselves into very risky situations. There is, of course, a great deal of uncertainty about the season from year to year and a varying degree of uncertainty on market prices for agricultural products and costs of production. If a producer gets into a situation where his future depends on one of the unpredictable factors, such as having a good season or striking a high market for his produce, he is certainly facing a high risk.

A farmer or grazier who has insufficient resources, particularly finance, will, if he is a gambler, often be found in such a risky situation. However, it is not clear that his problem is very much different from that of the punter who stakes his future on the speed of a racehorse.

An example may clarify this point. A capable, experienced man can establish himself in beef production in central Queensland if he has $80 000 to invest. With this amount of his own capital, coupled with sound planning and management, he is able to establish himself so that he is able to withstand, during his first few years on the property, the worst run of bad seasons reasonably likely to occur in the area. If he attempted to start on the same property with only $30 000 of his own capital his chances of success could be only one in three. The man who does this is certainly gambling.

Although we are more likely to feel sympathy for persons with restricted funds attempting to make a start in primary production, they are not the only ones who take big risks. Farmers or graziers with large capital resources can gamble just as much if they go after the high returns expected from risky investments or fail to appreciate the need for long-term planning to even out the effects of wide year-to-year variations in results.

Long-term planning to make the best of good seasons and provide for drought years is, of course, the answer to the problems of seasonal uncertainty. However, even among producers who recognize this fact and plan accordingly, there are differences in the extent to which they choose to spread the inevitable costs of drought over other years by providing reserves, rather than accepting these costs during and immediately after droughts.

These are not important or serious differences but are part of the reason for the different division of profits between personal expenditure, investment and reserves by equally capable and well-established managers. Although their long-term results may not differ greatly, there are differences in their development and management programmes, arising in part from personal differences in their attitude to risk.

[To Be Continued]

Looking At Fertilizers—4

Pollution And Fertilizers

by J. W. LITTLER, Senior Agronomist; and J. K. LESLIE Director, Queensland Wheat Research Institute.

THE technology of Western civilization, which has contributed so much to population growth and standards of living, has created serious problems through environmental pollution and exploitation of limited natural resources.

Man has been forced to realize that he does not live in isolation and that many of his actions have far-reaching consequences which may ultimately influence his own survival.

Science has the immense task of understanding these problems and identifying the techniques by which our planet may be maintained for habitation by all forms of life in the future. The complexity of the issues which are unfolding is so great that it is still not possible to foresee the repercussions of actions initiated many years ago and to whose end results we are probably committed.

It would be irresponsible to avoid these issues, but it is vital that we maintain correct perspective in the growing clamour for action: often any action at unknown cost.

Modern agriculture illustrates the dilemma. High productivity is essential for existing world populations and economic viability. The latter problem need not represent a permanent obstruction to less intensive agricultural production, if that should become necessary. Population growth, however, seems certain to place a pressure on intensive food production which we cannot avoid.

Intensive production requires accelerated exploitation of natural resources of soil, water, mineral deposits and fossil fuels. It has led to the use of pesticides, fertilizers, irrigation and clearing of vast forest areas, all of which in some way have caused significant environmental changes.

The major agents of pollution associated with agriculture are:

1. Silt: soil solids moved by erosion.

2. Salt: referring specifically to excessive sodium and chloride accumulations.

3. Other inorganic substances: a. Soluble salts including nitrites, nitrates, phosphates, potassium and other elements utilized by growing plants. b. Heavy metals including some essential for plants such as copper, zinc; and others non-essential such as mercury.

Siltation

Soil erosion and run-off are greatly accelerated by agricultural development, particularly by those forms of agriculture which maintain continuous crop production.

Apart from the effects of erosion on the productivity and longevity of soil, the deposition of silt in farm dams, major reservoirs, streams, rivers and estuaries has major economic and ecological consequences. In many erodible situations, it may be preferable to utilize commercial forests, pastures, and pasture rotations to reduce erosion than to maintain an arable farming system with the use of nitrogen fertilizer.

Natural deposition of silt has been accepted as a desirable source of renewed fertility in areas like the Nile Valley in Egypt, and

reduction in downstream siltation by major dam constructions also changes the environment for terrestrial and aquatic life forms.

While acknowledging that changes (in both directions) in siltation and associated discharge rates of run-off water, induce changes in dependent living communities, it should be recognized that the results are changes and not destructions of all life.

Much of the effect of the Aswan High Dam on the south eastern Mediterranean is the result of a reduction in the rate of fresh water discharge from the Nile delta, and not to the increased use of synthetic fertilizers to offset the loss of annual silt depositions. As with most forms of development, issues like these depend on weighing the advantages against the disadvantages. It should be accepted that inadequate scientific knowledge may limit the accuracy with which these can be forecast. On the other hand, change should not be considered wholly undesirable simply because it is a change.

Salt

Clearing land frequently increases the proportion of rainfall that percolates beneath the root zone of vegetation and which leaches soluble salts present naturally in soil profiles and underlying rocks. These effects can lead to rises in ground water tables and to increasing salinity of soil, underground water and stream flow. Irrigation can induce similar effects by imposing leaching action on soils that are rarely leached by natural rainfall.

Some of these effects are among the most worrying problems of modern agriculture. Their correction is generally costly and may involve extremely difficult political and social issues.

Effects of clearing forest vegetation of upper catchments on increased salinity in arable areas lower down the catchment are common in many parts of Australia, including southern Queensland. Such occurrences are usually independent of fertilizer usage, and many have arisen in the complete absence of fertilizer treatment.

In other localities, agriculture has been made possible by irrigation coupled with fertilizer, for example, the Murray Valley. It is incorrect to associate the increased salinity of the Murray River with superphosphate. The fact is that many of the irrigated soils in that area contained high salt concentrations at depth in the virgin condition. These salts are being leached out by irrigation and discharged in drainage water.

The effects are serious indeed, and the remedy is tremendously expensive. Phosphate levels in Murray River water have increased, but it appears that this increase may be beneficial rather than detrimental to aquatic life. The Murray River drains a huge tract of phosphorus-deficient country, and it has been argued that the Murray River water was naturally phosphorus deficient.

Many of the soils used for cereal production in Queensland contain high levels of soluble salts at depths below 2 ft., for example, the black earths of the Darling Downs, some of the brigalow and many of the belah soils. Although some areas exhibit salinity effects on plants now, it is not known whether large-scale development for agriculture will lead to salt movement and accumulation in the future. This question is the subject of concerned scientific inquiry.

Soluble Nutrients

As mentioned in an earlier article, a study made on a virgin forest in New Hampshire, U.S.A. showed that clearing of the forest increased the levels of such elements as calcium, magnesium, potassium and nitrogen in stream discharge from the catchment. Nitrate nitrogen rose to peaks of 80 p.p.m., a level in excess of U.S. Health Standards for human consumption. The stream became congested with plant forms using the increased nutrient content of the water.

This study highlights the fact that disturbance of natural balances by any agency usually has far-reaching consequences. In this example, excessive nitrate levels were caused by accelerating the decomposition of organic matter developed under forest, and a general increase in the loss of soluble nutrient elements occurred.

Any enrichment of soil fertility will tend to increase the rate of nutrient loss in drainage water, unless the amount of drainage decreases

at the same time. Consequently, it is not surprising that soluble fertilizers can induce pollution effects. These can arise only from permeable soils where leaching is a significant process. There is little opportunity for fertilizer pollution from most of Queensland's cereal soils, but stream pollution could arise from irrigated areas when drainage installations become necessary.

It is incorrect to assume that a fertilizer that is soluble when it is added to a soil will remain soluble in the soil. Most fertilizers react in the soil to produce less soluble compounds. In calcareous soils, superphosphate reverts to insoluble mineral forms almost identical to rock phosphate.

On acidic soils, rock phosphate may be changed to a soluble form of phosphorus quite rapidly. It will be appreciated from this that superphosphate need not induce pollution problems at all on many soils and that, on other soils, rock phosphate may cause increases in drainage phosphorus levels equivalent to those caused by superphosphate.

The metallic components of soluble compounds like zinc sulphate and copper sulphate are made insoluble so quickly in soils like the black earths that it can be difficult to detect an effect of heavy applications on soluble zinc or copper levels within a day of application.

On acidic, sandy soils, solubility is partly maintained and rates of application have to be carefully determined to avoid toxicity problems. The authors are unaware of any substantial pollution problems arising from the use of trace elements as fertlizers in agriculture.

The occurrence of heavy metal pollutants from industrial wastes is significant. Substantial areas of vegetation are affected by heavy metal toxicities associated with natural mineral deposits.

Mercury pollution has received much publicity. Mercury at low levels is very widely distributed and it is not yet clear whether high mercury levels in certain marine fish owe their existence to pollution by man or to natural origins. Nevertheless, stream and fresh water lake pollution with mercury from industrial wastes are very serious. Although agriculture uses a small percentage of world consumption, mercury fungicides do introduce additional mercury direct into the human food chain, and the use of mercury compounds in agriculture is being reduced for this reason.

Organic Substances

The persistence of compounds like DDT and their degradation products, their widespread distribution and the concentration of some of them in food chains are cause for great concern. Discussion of these problems is beyond the scope of this article, but it should be pointed out that control of pests and diseases is vital to the health and nutrition of the existing world population. Science has a tremendous responsibility to ensure the protection of life on earth from toxic chemicals and to determine alternative methods of control where existing methods have undesirable consequences.

Strong pressures in the community seek action against "unnatural" fertilizers and chemicals at any cost. Often these pressures have an anti-science base and scientific progress is blamed for our pollution problems.

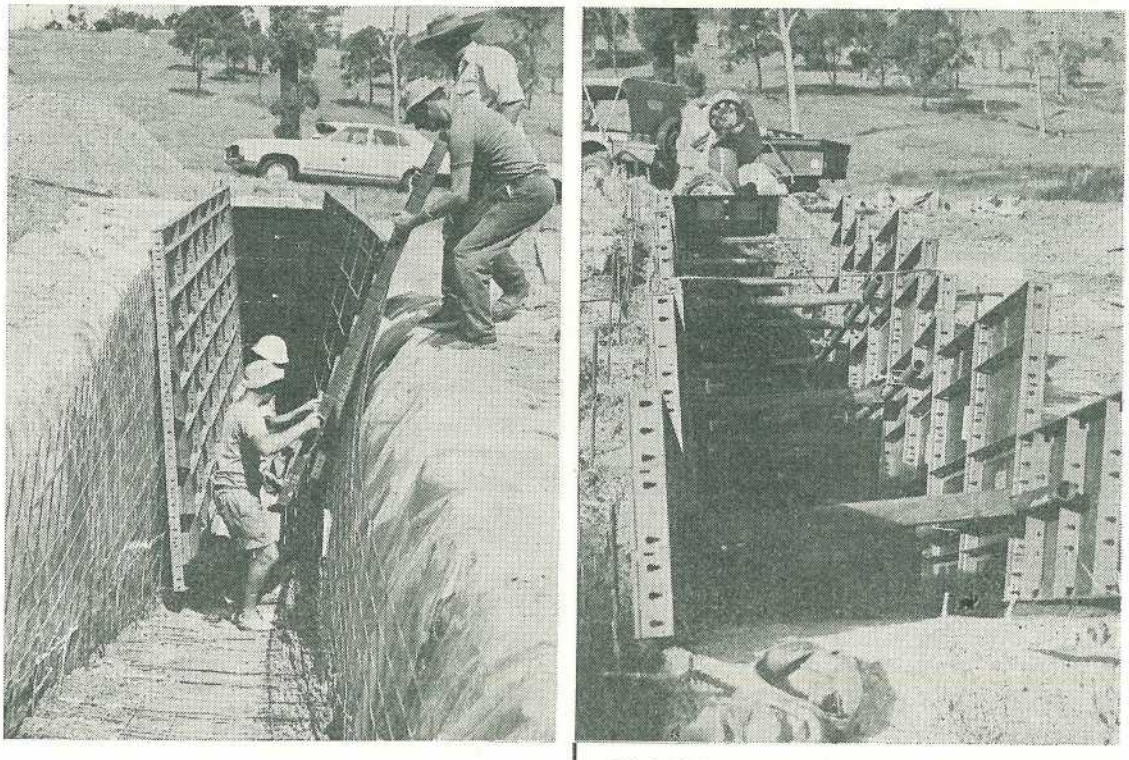
It is wise to recognize that the identification of these problems is the result of scientific investigation. Their solution can be achieved only by further scientific investigation. There is no place for irrational thinking or precipitate action. Science is not an anti-human conspiracy as some would contend, but is dedicated to the resolution of human and environmental issues.

These articles have attempted to present both sides of the fertilizer controversy. They have indicated where fertilizer usage presents hazards. They have identified instances where man's activities create environmental problems which have been misrepresented as evidence of fertilizer malpractice.

There are certainly larger problems than those discussed. There is the problem of maintaining huge world populations with dwindling nutrient mineral resources. There is the problem of fertilizer manufacture when fossil fuels such as coal, oil and natural gas are exhausted.

None of these problems can be solved or significantly reduced by resorting to mineral fertilizers. They may be resolved if man accepts the challenge.

Dip-building Moulds On Hire



Dip-building mould in use. Left, placing the moulds in the dip excavation. Right, the moulds in position with the concrete poured.

CATTLEMEN can now hire a set of moulds suitable for building concrete cattle dips from the Department of Primary Industries.

The hiring rate is $10 a week or part of a week. A returnable deposit of $10 is also required.

The moulds, which were bought by the Veterinary Services Branch, were brought into use last May.

At present, only one set of moulds is available, and this is insufficient to satisfy the demand. Another set is expected to be brought into service soon.

To get the greatest use from a set of moulds, it is sent to an area where a demand exists and left there for a time. When this demand has been satisfied, the moulds are transferred to the next area where a demand exists.

The normal construction time for the dip vat is 7 to 10 days.

Arrangements for hiring the moulds can be made through local stock inspectors. These officers can also supply details of the method of dip construction using the moulds.

—J. F. KEARNAN, *Tick Control Extension Officer.*

The lagoon Messrs A. C. and R. Haigh, of Monto, use for strategic irrigation.

Milk Meters Help Lift Dairy Yield

by K. E. BOURKE, Division of Dairying.

ADJUSTING the feed ration on the information given by milk meters lifted the yield from a 100-cow herd by 2 000 lb. (908 kg).

This increased yield was obtained on a Monto district farm in 1971-72.

Messrs A. C. and R. Haigh, "Lagoona", Monto, have completed a 12 months' demonstration using milk meters supplied from Commonwealth Extension Services Grant funds.

Meters Installed

In May 1971, eight milk meters were installed in the walk-through milking shed. These were used at both the morning and the afternoon milkings to measure the quantity each cow gave. This information supplemented records obtained from bi-monthly recording which began in July 1971.

Increased Production

The 1971–72 yield was 8·3% above the previous highest level in the last 5 years. It was also 31% above that of the previous year. An added bonus was 18 495 gal. (84 150 litres) extra skim-milk for calf and pig feeding —18 495 gal. (84 150 litres) more than in the 1970–71 season.

Total production in 1971–72 was 26 000 lb. (11 800 kg) butterfat.

TABLE 1

PRODUCTION LEVELS FOR 5-YEAR PERIOD

Year	Cows	Butterfat		Season
		(lb.)	(kg)	
1967–68	100	24 000	10 896	Good
1968–69	100	22 000	9 988	Poor
1969–70	100	20 700	9 398	Poor
1970–71	100	17 780	8 072	Floods
1971–72	100	26 000	11 800	Good

The advantages of using meters are:—

- They give a daily check on production and allow the ration to be adjusted accurately.
- They can be used with bi-monthly recording for culling low yielding and short lactation cows.
- They give an early indication of the ability of heifers.
- Together with the gestation record, milk meters indicate when a cow is drying off.
- They give an early indication of sickness in cows, especially tick fever. A lower milk yield showed up although the cows appeared normal. Temperature checks led to early treatment which saved lives.

Land Usage

The property consists of a 240-acre (108 hectares) home block on Three Moon Creek, the lease of a 234-acre (105 hectares) aerodrome reserve and a back block of 608 acres (246 hectares).

Soil types range from creek flats of alluvial sandy loam to light forest of sandstone origin carrying spotted gum and ironbark. Lagoons on the home block cover an estimated 10 acres (4 hectares). Irrigation is limited to strategic watering from the lagoons.

Strategic watering by a portable pump from lagoons supplements the 30-in. (760 mm) average rainfall.

Stock Management and Breeding

Stock numbers on the property are 100 cows, 20 heifers, 56 calves and two bulls.

Improved pastures of green panic-Siratro and buffel grass supply nutritious grazing. A stand of green panic-Siratro is illustrated.

Artificial insemination has been used for two years. Selected Guernsey cows were inseminated with Friesian semen. This cross was chosen so that the farm would be able to change readily to milk supply should a demand for market milk spring up.

Cows are given a 6 weeks' dry period, and seasonal calving begins in June.

Supplementary Feeding

Fresh cows are bail fed 3½ lb. (1·6 kg) hammer-milled grain twice a day (barley or sorghum) containing lucerne (4 bales to 18 bags) for the first 3 months, or depending on production. After that, the cows are fed a basic ration of 2⅓ lb. (1 kg) of feed-mix each milking.

Urea-molasses lickers were used during the early winter and spring of 1971. They supplied 2 oz. (57 g) of urea per head per day to help utilize the mature pasture.

Hay was fed at night to balance a roughage deficiency during the strip-grazing of oats and early season lucerne. No bloat was reported and the herd maintained excellent body condition. Conserved fodder was mainly baled lucerne hay and sorghum grain.

Pasture

Pasture improvement had then moved towards the establishment of green panic-Siratro and buffel grass. Pastures being grazed were scented top, paspalum, water couch, blue couch and native forest species. Little fertilizer was used before these observations as periodic floods deposit silt on the alluvial creek flats.

TABLE 2
FEED YEAR PROGRAMME

Season	Pasture	Crop	Daily Grain-Mix (lb.)	Daily Grain-Mix (kg)	Daily Lucerne Hay (lb.)	Daily Lucerne Hay (kg)	Daily Molasses (lb.)	Daily Molasses (kg)	N.P.N. (oz.)	N.P.N. (g)
Winter	dry native ..	sorghum ..	$2\frac{1}{3}$ to $3\frac{1}{2}$	1–1·6	5	2·3	1	0·5	2	57
		stubble .. oats								
Spring	dry native ..	oats	$3\frac{1}{2}$	1·6	5	2·3	1	0·5	2	57
Summer ..	green panic ..	feed	$2\frac{1}{3}$	1						
	Siratro	sorghums								
	scented top ..	lucerne								
	paspalum									
	water couch									
	blue couch									
	buffel									
Autumn ..	as above ..	as above ..	$2\frac{1}{3}$	1						

Mineral Supplement

Phosphorus was offered but not readily accepted by milkers.

Messrs. Haigh plan to maintain or increase production guided by the information supplied by milk meters. Close liaison was maintained with the Department of Primary Industries during the demonstration. The ready co-operation of Messrs. Haigh is gratefully acknowledged.

Boar Performance Test Report

BOARS 'Approved' under the Boar Performance Testing Scheme at Rocklea during November 1973 are listed below. Average boars score 50 points for economy and 50 for carcass. Points scores can be compared only with those of boars of the same breed.

Breeder	Ear Number	Q.A.R. Number	Points Score: Economy of Production	Points Score: Carcass Quality	Points Score: Total
	LARGE WHITE				
K. N. MATHIESEN, 'Naiken' Stud, Box 138, Gayndah, Q., 4625	SIRE: Naiken Field Marshall 102 Q.A.R. 480 DAM: Naiken Cleopatra 66				
	365	621	72	71	143
G. H. AND I. E. RUGE, 'Al-Lester' Stud, Box 20, Biggenden, Q., 4621	SIRE: Al-Lester Julius Caesar 237 Q.A.R. 362 DAM: Bettafield Jewel 1687				
	1334	620	76	78	154
	LANDRACE				
DANDARAGGA STUD PIGGERY, care of R. S. Little, Jimbour, Q., 4406	SIRE: Dandaragga Sinatra 15 DAM: Dandaragga Sally 326				
	985	622	53	70	123
	986	623	43	64	107

Brucellosis-Tested Swine Herds (As at January 23, 1974)

BERKSHIRE

Bishop, N. H., Three Moon, via Monto
Clarke, E. J. & Son, "Kaloon Stud", Boonah
Cochrane, S., "Stanroy", Felton
Crawley, R. H., Rockthorpe, Linthorpe
H. M. State Farm, Numinbah
H. M. State Farm, Palen Creek
Handley, Est. J. L., "Meadow Vale", Lockyer
Handley, G. R., "Locklyn" Stud, Lockyer
Kimber, E. R., Tarella, M.S. 805, Mundubbera
Ludwig, A. L., "Beau View" Stud, Cryna, via Beaudesert
Neuendorf, W., M.S. 794, Kalbar
Queensland Agricultural College, Lawes
Research Station, Hermitage
Westbrook Training Centre, Westbrook

LARGE WHITE

Ashwell, J. & B., "Green Hill", M.S. 465, via Cambooya
Ballon, E. E. & E., Maclaglan
Barrier Reef Islands Pty. Ltd., Hayman Island
Barron Bros., "Chiltern Hill", Cooyar
Batterham, P. & N., Raby Park, Inglewood
Beutel, G. R. and Son, Brookdale Stud, M.S. 786, Boonah
Bishop, N. H., "Three Moon", via Monto
Bool, A. R. and B. E., Rossvale, Crow's Nest
Briskley, R. G. and M. J., Wallingford, Pittsworth
Brosnan, D. J., "Bettafield", Mt. Murchison, via Biloela
Cauley, J. R., M.S. 918, Toowoomba
Cauley, T. P., M.S. Jondaryan 444, Rosalie
Clegg, J. A. & M. A., "Karoma" Stud, Mundubbera
Coleman, C. J., Merriland Stud, Britannia Station, Charters Towers
Corney, Messrs. F. D. and E. C. W., Pagel, Tara
Cotter, N. J., "Olaroy", Goomeri
Craig, K. F., "Echoes", Bancroft, via Monto
Department of Aboriginal and Island Affairs, Cherbourg
Diete, E., Ingoldsby, 4343
Duckett, R. and L. M., Fairview, Capella
Duncan, C. P., "Colley", Flagstone Creek, Helidon
Duncan, J. A. & B. L., Ma Ma Creek
Dunlop Meats Pty. Ltd., Coondulla, Robertson Pk., Murray Upper
Eagle, D. R. & J. A., "Walugra", 134 Hogg St., Toowoomba
Fisher, J. & L., Lyndhurst, Jimbour
Flegler, T. C., Wongabeena, Dalby
Fletcher, L., "Par-en-eri" Stud, M.S. 806, Mundubbera
Forster, I. S. & D. E., 112 Drayton Rd., Toowoomba
Fowler, K. J. & B. D., "Kenstan", M.S. 195, Pittsworth
Fowler, K. P., Northelea Stud Farm, 156 Hogg St., P.S. 1436, T'wba
Franke, K. H. and B., "Delvue" Stud, Cawdor
Freeman, W. A., "Trevlac", Rosewood
French, A., "Wilston Park", Pittsworth
Gosdon, T. C. & E. A., "Naumai", Dalby
Graham, T., Dunleigh, Highfields
Grayson, D. G., Wodalla, Killarney
Harwood, L. B., Cobar, Tara
H. M. State Farm, Numinbah
Head, G. A., M.S. 825, Ipswich
Hinchcliffe, D. F. & R. K., "Oakview", Milman, 4702
Hockings, J. & M., "Quambi", Kumbarilla
Hudson, R. F. & V. D., "Rondel", Hogg St., Wilsonton, Toowoomba
Jones, K. B. & I. R., "Cefn" Stud, Clifton
Kajewski, C. & D. I., "Glenroy", Glencoe, via Toowoomba
Kanowski, A., "Exton", Pechey
Kimber, E. R., "Tarella", M.S. 805, Mundubbera
Kruger, V. F. & B. L., "Greyhurst", Goombungee
Kuhl, V. and C. A., "The Mounts", M.S. 222, Oakey
Le Gros, W., "Elourea Stud", Marburg
Little, R. S., P. M. & G. W., "Glengarry", Jimbour
Maranoa Stud Piggery, Mitchell
Marsden, M., "Fernflat" Canaga
Marsh Pastoral Co., Brymaroo
Mathieson, K. N., "Iderway", Gayndah
Philip, R. J. and M. M., Boolarong Stud, Elimbah
Postle, R. S., G. C. & Son, "Yarallaside" Stud, Pittsworth
Queensland Agricultural College, Lawes
Quilter, P. R., Paga Paga Piggeries, Postman's Ridge
Radel, V. V., "Braedella" Stud, Coalstoun Lakes
Reiser, G., Brisbane St., Beaudesert

LARGE WHITE—continued

Research Station, Biloela
Ruge, A. F. & V. M., "Alvir" Stud, Biggenden
Ruge, G. H. & I. E., "Al-Lester" Stud, Woowoonga, Biggenden
Sharp, D. W. & L. J., "Arolla", Lavelle, Q., 4357
Smyth, R., Barambah Rd., Goomeri
Ward, R. J., "The Plateau", Mulgildie
Willdo Farming Co., Southbrook
Willet, L. J., "Wongalea", Irvingdale
Williamson, K., Cattermul Ave., Kalkie
Withcott Stud Piggery, Rowbotham St., Toowoomba
Wolfenden, C. B. & J., Rossmoya

TAMWORTH

Kanowski, S. E., Pinelands, via Crows Nest

WESSEX SADDLEBACK

Douglas, Mrs. W. S. & Son, "Greylight" Stud Goombungee
Jurgensen, R. H. and R. R., Kildare, M.S. 1065, Boonah
Smith, C. R. & Son, "Belton Park", Goombungee

LANDRACE

Ashwell, J. & B., "Green Hill", M.S. 465, Cambooya
Ballon, E. E. & E. Maclaglan
Barrier Reef Islands Pty. Ltd., Hayman Island
Batterham, P. & N., Raby Park, Inglewood
Bertolotti, F. E. J. & N. I., "Mascotte", Wallumbilla
Bishop, N. H., Three Moons, via Monto
Bool, R. A. and B. E., Rossvale, Crow's Nest
Bosnan, D. J., "Bettafield", Mt. Murchison, via Biloela
Cauley, J. R., M.S. 918, Toowoomba
Cauley, T. P., M.S. Jondaryan 444, Rosalie
Clegg, J. A. & M. A., "Karoma" Stud, Mundubbera
Coleman, C. J., Merriland Stud, Britannia Station, Charters Towers
Crowle, N. & D., Cooranga North, 4408
Diete, E., Ingoldsby, 4343
Dowling, A. M. & C. M., "The Anchor", Wutul, via Toowoomba
Duckett, R. and L. M., Fairview, Capella
Dunlop Meats Pty. Ltd., Coondulla, Robertson Pk., Murray Upper
Fisher, J. & L., Lyndhurst, Jimbour
Flegler, T. C., Wongabeena, Dalby
Fletcher, L., "Par-en-eri" Stud, M.S. 806, Mundubbera
Forster, I. S. & D. E., 112 Drayton Rd., Toowoomba
Fowler, K. J. & B. D., "Kenstan", M.S. 195, Pittsworth
Fowler, K. P., "Northlea", Hogg Street, Wilsonton, Toowoomba
Fowler, N. E. P. & M. P., Kingaroy
Gosdon, T. C. & E. A., "Naumai", Dalby
Graham, T., Dunleigh, Highfields, 4352
Grayson, D. G., "Wodalla", Killarney
Harwood, L. B., Cobar, Tara
Hinchcliffe, D. F. & R. K., "Oakview", Milman, via Rockhampton
Hockings, J. & M., "Quambi", Kumbarilla
Hudson, R. F. & V. D., "Rondel", Hogg St., Wilstonton, Toowoomba
Jones, K. B. & I. R., "Cefn" Stud, Clifton
Kajewski, C. & D. I., "Glenroy", Glencoe, via Toowoomba
Little, R. S., P. M. & G. W., "Glengarry", Jimbour
Maranoa Stud Piggery, Mitchell
Marsden, M. "Fernflat", Canaga
Marsh Pastoral Co., Brymaroo
Nielsen, L. R., "Sunny Hill", Ascot, via Greenmount
Peters, L. A., "Moonlight", Bongeen
Philip, R. J. and M. M., Boolarong Stud, Elimbah
Quilter, P. E., Paga Paga Piggeries, Postman's Ridge
Radel, R. M., Turua Stud, Biggenden
Ruge, A. F. & V. M., "Alvir", Biggenden
Sharp, D. W. & L. J., "Arolla", Lavelle, Q., 4357
Smith, E. J., "Avrvale" Stud, Borallon, via Ipswich
Trout, L. B. and L. J., "Caminda", Crawford, Kingaroy
Willdo Farming Co., Southbrook
Willet, L. J., "Wongalea", Irvingdale
Williamson, K., Cattermul Ave., Kalkie

Anne Cook's farm home

Cheese is Easy to Store

STORING wine is quite easy when you know how. So is storing cheese. All you have to do is follow a few simple rules.

First of all, prevent the cheese from drying out. You can use the original wrapper, or foil, plastic film, or airtight plastic box.

Next, keep all cheese under refrigeration, about 4 to 5°C, but make sure it is well away from foods with strong flavours or odours.

If refrigeration is not available, a cool, dark place is a good alternative.

Pay careful attention to the maturing period of the particular cheese in your refrigerator. Hard, grating cheese will keep for several months. Firm, table cheese will keep a month or longer; Mozzarella a few weeks and fresh varieties up to 1 week.

And what about those small pieces of left-over cheese? Well, they can be grated and stored in a covered container for use in sauce or baked foods.

Don't panic if mould forms on stored cheese. This is quite natural and harmless. Simply remove it by cutting a wafer-thin slice from the surface.

Finally, remember that perishable types such as cottage cheese and cream cheese are best stored at 2 to 3° C. near the freezer section of the refrigerator.

—Australian Dairy Produce Board.

The Crying Baby

What is the answer to the crying baby? Many young parents often ask this question.

Unfortunately they ask themselves or those around about them. The answer frequently is 'try a dummy'. It would not be possible to find a worse answer. True, a sucking baby may cease to cry, but this may only last for a short time.

The real answer to the crying baby is to find the cause of the crying. Babies cry for many reasons, and nurses and mothers frequently can work out what the babies' cry means, for example, hunger or pain. A pain cry can be from colic, an uncomfortable position, a wet, dirty napkin or in an attempt to gain attention.

The most difficult cries to diagnose are the cries of colic and attention seeking.

The cry of colic characteristically begins about ½ to ¾ of an hour after the feed in a baby who is otherwise happy and contented. It lasts for 3 to 4 minutes and then baby settles for 10 to 15 minutes, only to start again.

It is frustrating for parents to try and calm a baby in pain, as nothing works permanently. Sucking on a dummy helps to soothe and if it is given near the end of a spasm of pain it is assumed that the dummy is responsible for the calmness between the spasms.

The answer to colic is correct feeding technique and a visit to a doctor for a medicine to help cure the problem.

The other type of crying is perhaps even more difficult to diagnose, the cry of the baby seeking attention. Two types of problems can result in this type of crying: the baby with pain who cries and is neglected, and the baby who is played with and over-stimulated and is not prepared to settle without attention.

The first should be treated by attending to the baby who cried so that the problem is removed. The second type of baby should not be given excessive attention (babies should eat and sleep for the first 6 to 9 months) and should be allowed to cry it out until a new behaviour pattern is established.

Dummies can readily carry infection as they are not always clean. In addition, the type of sucking on the enlarged end of the dummy leads to a wrong sucking technique. The baby will then suck badly on breast or bottle. Feeding will prove difficult and problems can result, for example, poor weight gain or an exhausted baby.

The answer to the crying baby is to find the cause and not to give a dummy.

Any further information on this or other matters concerning children, may be obtained by personal communication with the Maternal and Child Welfare Services, 184 St. Paul's Terrace, Brisbane, or by addressing letters to Post Office, Box 285, Broadway, Brisbane, Q., 4000.

★ ★

Hepatitis

Hepatitis, sometimes known as 'yellow jaundice', is an infectious and quite common illness caused by a virus that affects the liver. Actually, the jaundice is merely one of the signs of the disease, and can also occur as a sign in several other diseases too. A more serious form of the disease, hepatitis B, can be spread where unhygienic conditions exist during blood transfusions, drug injections, acupuncture, tattooing and similar activities.

The virus is present in the bowel and is spread by person-to-person contact, for example, by infected fingers, flies, clothing and towels. It may also be transmitted through contaminated milk, food and drinking water. Children and young adults are the most frequent victims.

It is usually about 25 days after exposure before the disease becomes apparent, but can be from 15 to 50 days. First symptoms are loss of appetite, nausea, vomiting, fever, abdominal pains, dark yellow urine and pale yellow stools. The patient is infective for several days before and about 7 days after the onset of symptoms. Generally, an attack lasts for 2 or 3 weeks but, in adults, recovery can take much longer, sometimes up to several months. In a few cases, chronic liver trouble develops.

Even when the disease is mild, proper medical care is essential to lessen the risk of complications. Rest in bed and a restricted diet may be recommended during the early stages. Alcohol in any form is probibited until the patient has completely recovered. If you have come in contact with a hepatitis sufferer, or a known suspect, your doctor may recommend 'gamma globulin'. Studies show that gamma globulin does not prevent infection, but does modify the resulting disease. This mild disease is thought to confer lasting immunity.

Prevention of hepatitis depends largely on proper sanitation and personal hygiene:—

- Always wash your hands thoroughly after visiting the toilet, and before eating or preparing food. Where possible, don't handle food with your fingers. Protect food from flies.
- Ensure each member of the family has his own facecloth and towel.
- Wash the dishes thoroughly in hot water (65°C), rinse in clean hot water of the same temperature, and stack to dry. Do not use tea towels.
- Don't allow children or babies to sit on tables, food counters, or even in food baskets at the supermarket.
- Don't sit on tables or benches where food is prepared, served or eaten.
- Consult a doctor at the first suspicion of the disease.

Food counter employees should not handle food and money. Ideally, a cashier should collect the money after the attendant has served the customer.

Remember, once a person has had hepatitis, the lingering course of the disease could cause that person to become an unsuspected carrier.

—Queensland Health Education Council.

Cool Meat Cookery For Summer

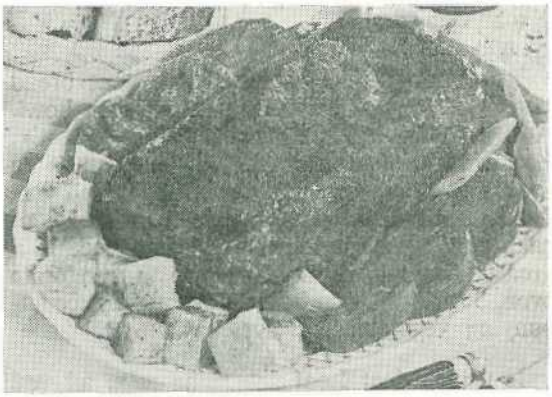
WHILE all families like to have at least one hot meal a day even during summer, it is usually mother who has to put up with the heat of the kitchen preparing it.

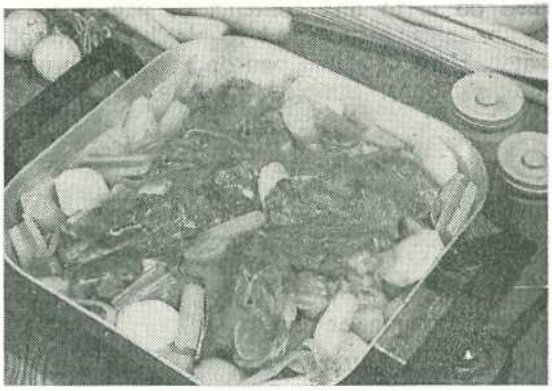
Grills are always popular as they are quick and easy. Sometimes it would be nice to have an economical alternative, especially during summer holidays.

The following hints will help you serve any one of a range of hot meals and still 'keep your cool':

- Limit the heat source in your kitchen to one area. If the main dish requires oven cooking, place your green and root vegetables in small pudding steamers and cook them in the oven as well. Plan a complete meal in one pot or pan if top-of-stove cooking is called for. An electric frypan is excellent for preparing such meals, particularly in holiday accommodation.
- Cook, or partly cook, the main dish in the cool of the early morning. Refrigerate, then heat up or complete cooking just before dinner.
- Make use of convenience products to cut down preparation time. A wide variety of basic flavourings is available for meat dishes like Meat Loaf, Beef Stew, Chilli Con Carne, Beef Stroganoff, Goulash and Spaghetti Sauce. These eliminate the need for a wide range of flavourings and seasonings. They are compact and have a long shelf life.

The following recipes have been kitchen-tested by Tess Mallos, food consultant to the Australian Meat Board.





TOP. Meat loaf is everyone's favourite. Quick to prepare and easy to cook, it will help keep your cool in the kitchen.

BOTTOM. Lamb chops Hungarian is a delicious change for a hot meal in the summer and, best of all, the whole meal is prepared and cooked in an electric frypan.

The standard 8-oz. measuring cup and level standard spoon measures are used in recipes.

Meat Loaf

1½ lb. minced beef

4 slices stale bread, crusts removed

1 onion, grated

2 eggs, lightly beaten

¼ cup tomato sauce

1 tablespoon Worcestershire sauce

1 teaspoon salt

1 tablespoon chopped parsley

½ teaspoon dried thyme.

Place mince in a mixing bowl. Cut bread into small cubes and place in another bowl. Add remaining ingredients and mix lightly. Leave for a few minutes to allow bread to soak and break up. Pour onto meat and mix lightly until blended. Place in a greased loaf cake pan, or shape into a loaf, and place in a greased baking dish. Cook in a moderate oven, 350°F, for one hour. Oven-cook accompanying vegetables. Serves six.

If using Meat Loaf seasoning mix, all you need do is to mix contents of packet with 1½ lb. minced beef and required amount of water, place in a loaf pan or baking dish and cook as above. Simple, isn't it?

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Lamb Chops Hungarian

6 lamb forequarter chops

1 tablespoon butter

2 onions, sliced

2 medium carrots, cut in chunks

2 stalks celery, cut in 2-inch lengths

2 tablespoons paprika

1 tablespoon tomato paste

1 teaspoon salt

Pepper to taste

1 cup stock or water

4 medium potatoes, sliced.

Trim excess fat from chops and brown on each side in butter. Lift out and keep aside. Add onions to pan and sauté gently until soft. Add carrots and celery and cook a few minutes. Stir in paprika, tomato paste, seasonings and stock or water. Bring to simmering point and return chops to pan. Cover and simmer gently for 30 minutes. Add potato slices, cover and cook for further 30 minutes or until meat and vegetables are tender. Check seasoning, thicken if desired, and serve. Serves four to six.

Beef Mexicana

1 large onion, chopped

1 clove garlic, chopped

2 tablespoons butter or oil

1½ lb. minced beef

1 teaspoon chilli powder (not the red-hot variety)

1, 1 lb. can tomatoes, chopped

¼ cup tomato sauce

1½ teaspoons salt

Pepper to taste

2 cups water

¼ cup raw rice

1 cup fresh or frozen peas or sliced beans

1 cup canned or frozen corn kernels

Chopped parsley.

Sauté onion and garlic in butter in a frypan (with lid) or saucepan. When soft, increase heat and add minced beef, stirring well to break up mince. Cook until meat begins to brown. Add chilli powder, tomatoes, tomato sauce, water, salt and pepper. Cover and simmer over low heat for 15 minutes. Stir in rice and vegetables, bring to boil, stirring occasionally, cover and reduce heat. Cook gently for 20 minutes, stirring occasionally, until rice is tender. Sprinkle with chopped parsley before serving. Serve with a tossed green salad. Serves six.

Curry powder may be used instead of chilli powder: the same quantity is adequate.

S. G. Reid, Government Printer, Brisbane

Soybean Diseases - 2

Diseases Caused by Fungi and Viruses

1. and 2. RUST *(Phakopsora pachyrhiza).* Rust is a common and often damaging fungal disease of soybeans in coastal and northern areas of Queensland. It has not yet been serious in the main producing areas. The disease generally occurs first on the older, lower leaves but it is unusual to detect it before the pods are set. First, the leaf surfaces show small, necrotic spots surrounded by circular yellow halos. Pustules then form on the lower leaf surfaces in positions corresponding with these necrotic spots. The pustules are light-brown and easily seen with the naked eye.

Rust is difficult to distinguish from bacterial pustule as both diseases produce leaf pustules. However, one difference is that rust is first noticed on the older leaves while bacterial pustule often appears on the younger leaves first. Spread of rust is favoured by showery weather, and weather like this is common in coastal and northern districts from December to April.

Control of the disease is offered by fungicides used at regular intervals if the disease enters a crop before the pods are set. After this stage, however, little or no benefit is gained by applying fungicides, as a late build-up of the disease is then unlikely to reduce yield. As rust also affects the common pasture legume *Glycine wightii*, it is recommended that soybeans be grown well away from pasture containing this legume wherever possible.

3. SUDDEN WILT *(Macrophomina phaseoli).* The early symptom of this disease is a light-brown discoloration of the sub-surface tissues of the tap root and basal portion of the stem. Plants affected for longer periods show a brown diffuse lesion extending from ground level up the stem. When the bark of the roots and crown is peeled away, large numbers of minute, black resting bodies of the fungus may be visible. These may also be present in the woody tissues farther up in the stem.

The disease has the effect of hastening the maturity of affected plants and sometimes to cause a pinching of seed in the pod. It has been shown that this disease may cause extensive damage when stress conditions such as excessive heat or drought follow periods where crop growth has been good.

As a control measure, an even supply of moisture is recommended where irrigation is practised.

4. MOSAIC (Soybean mosaic virus). The first indication of this disease is a temporary clearing of the veins of the newest leaves followed by the appearance of a light and dark green mosaic pattern. Often, this symptom is very noticeable with leaves showing dark green, blistered areas. Leaves may also be distorted, twisted or crinkled to some extent.

The causal virus can be carried in the seed but can also be spread by plant sap and sucking insects called aphids. Losses to the whole crop from this disease are not considered to be of any concern but individual plantings can at times sustain significant losses.

[Further information can be obtained from the nearest Plant Pathology office or by writing to the Director, Plant Pathology Branch, Meiers Road, Indooroopilly, Q. 4068.]

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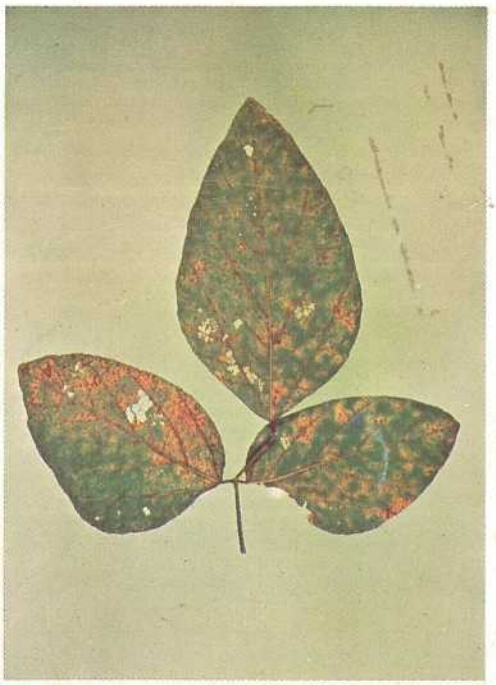
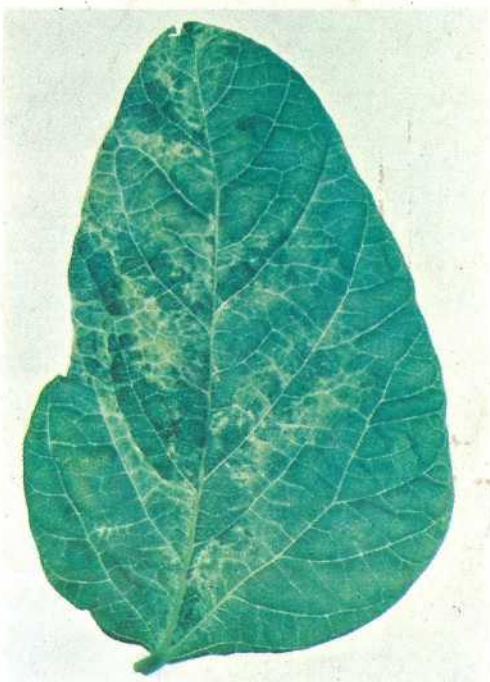
Soybean Diseases - 2



1. Rust

2. Rust (close up)

3. Sudden wilt



4. Mosaic