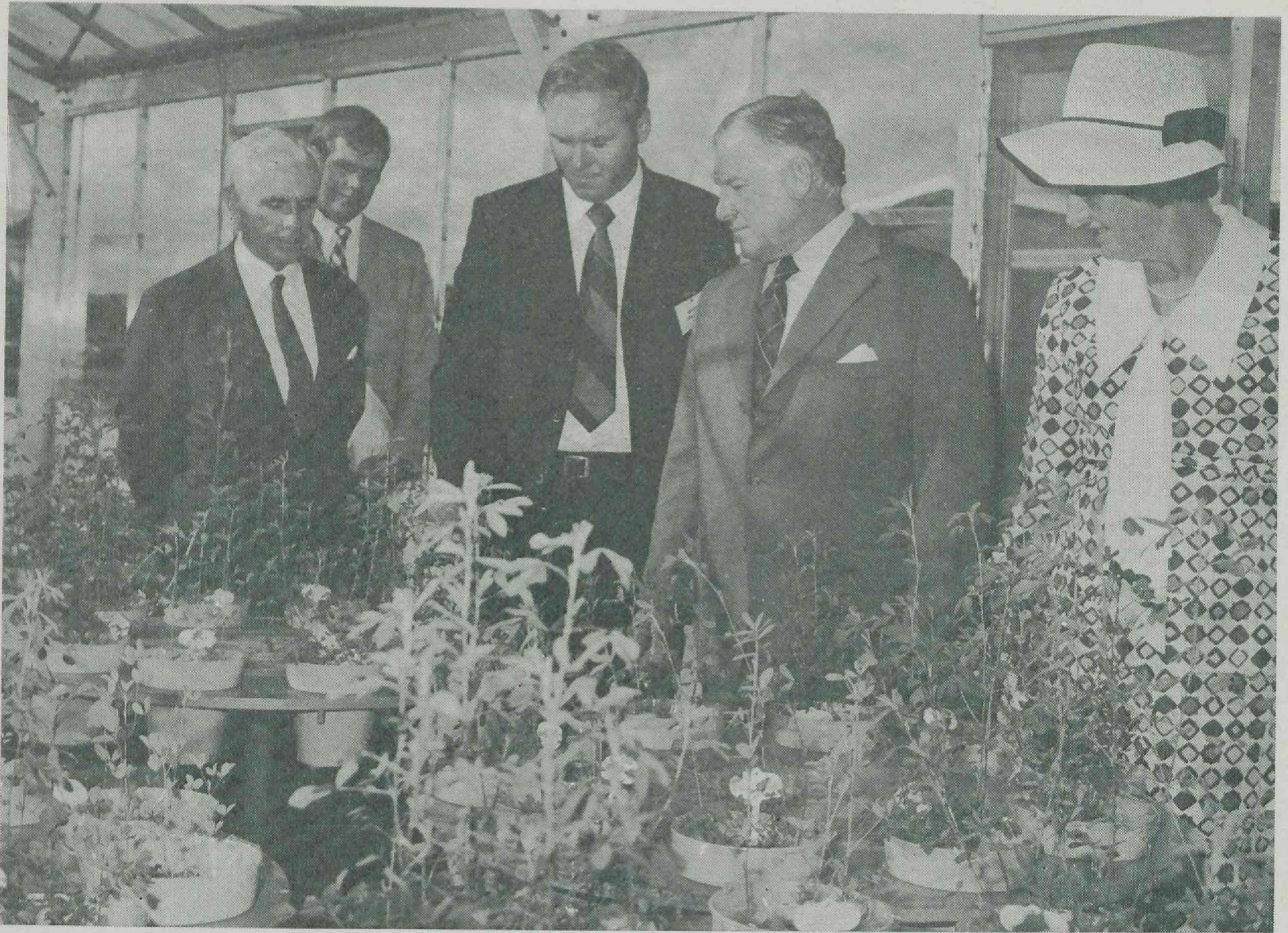


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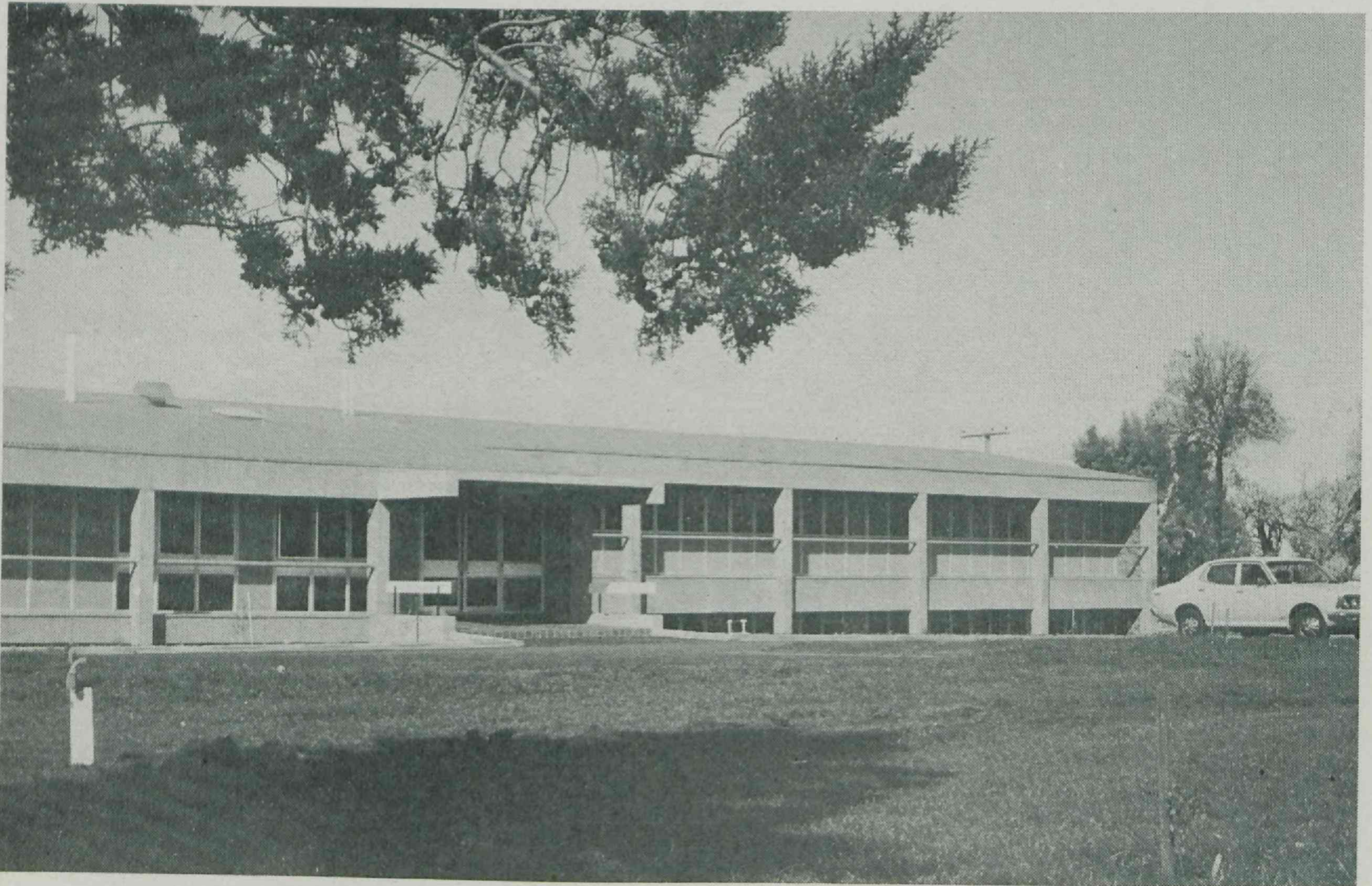
Queensland Department of Primary Industries **ANNUAL REPORT 1974-75**



Presented to Parliament by Command



Mr. T. Dickson, Senior Agronomist at Kingaroy, discusses the significance of these glasshouse trials on lucerne with members of the official party at the opening of the J. Bjelke-Petersen Field Station near Kingaroy. They are (from the left): the Director-General, Department of Primary Industries (Dr. J. M. Harvey), A.D.C. to the Governor (Captain G. Roberts Thomson), the Governor (Sir Colin Hannah) and Mrs. J. Bjelke-Petersen.



The new administration block and laboratory complex at the Hermitage Research Station, near Warwick, which will be officially opened in September by the Minister for Primary Industries (Hon. V. B. Sullivan, M.L.A.).

COVER PICTURE—The official party at the opening of the J. Bjelke-Petersen Field Station near Kingaroy: the Minister for Primary Industries (Hon. V. B. Sullivan, M.L.A.) left, the Premier (Hon. J. Bjelke-Petersen, M.L.A.), the Director-General, Department of Primary Industries (Dr. J. M. Harvey), and the Governor of Queensland (Sir Colin Hannah).

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ORGANIZATION OF THE DEPARTMENT

As At 30 June 1975

MINISTER FOR PRIMARY INDUSTRIES	Hon. V. B. Sullivan, M.L.A.
CENTRAL ADMINISTRATION AND CLERICAL AND GENERAL DIVISION—	
Director-General and Under Secretary	J. M. Harvey, D.Sc., F.R.A.C.I., I.S.O.
Deputy Director-General	A. A. Ross, M.Agr.Sc.
Chief Advisory Officer (Administration)	E. O. Burns, B.Com., F.A.S.A.
Assistant to the Director-General	A. Winterton, B.Sc., Dip.Bus.Admin., Q.D.H.
Assistant Under Secretary	H. J. Evans, A.A.U.Q., A.A.S.A.
Accountant	J. D. Reardon, A.A.U.Q., A.A.S.A.
Executive Officer, Research Stations Section	G. H. Allen, Q.D.A.
Executive Officer, Extension Services Board	J. Gibb, B.V.Sc., Dip. Agric. Ext.
General Manager, Agricultural Bank	F. J. Strutton, A.A.S.A., A.C.I.V.
Director, Information and Extension Training Branch	J. L. Groom, B.Sc.Agr., Q.D.A.
DIVISION OF ANIMAL INDUSTRY—	
Director of the Division	A. L. Clay, B.V.Sc.
Deputy Directors	L. G. Newton, M.V.Sc., J. W. Ryley, B.V.Sc.
Animal Research Institute—	
Biochemical Branch	C. W. R. McCray, B.Sc., A.R.A.C.I. (Director)
Husbandry Research Branch	L. Laws, M.V.Sc. (Director)
Pathology Branch	W. T. K. Hall, M.V.Sc. (Director)
Beef Cattle Husbandry Branch	B. A. Woolcock, B.V.Sc. (Director)
Veterinary Services Branch	K. M. Grant, B.V.Sc. (Director)
Sheep and Wool Branch	A. T. Bell, B.V.Sc. (Director)
Slaughtering and Meat Inspection Branch	B. Parkinson, B.V.Sc. (Director)
Pig and Poultry Branch	F. N. J. Milne, B.Sc. (Director)
DIVISION OF DAIRYING—	
Director of Dairying	G. I. Alexander, B.V.Sc., M.S., Ph.D.
Deputy Director	V. R. Smythe, M.Agr.Sc.
Dairy Cattle Husbandry Branch	I. H. Rayner, B.Econ. (Director)
Field Services Branch	W. D. Mitchell, B.Agr.Sc., Dip.Agric.Ext. (Director)
Research Branch	W. C. T. Major, B.Agr.Sc., A.S.B.M. (Director)
DIVISION OF LAND UTILISATION—	
Director	J. E. Ladewig, B.Agr.Sc.
Assistant Director	A. Hegarty, B.Sc., Q.D.A.
Development Planning Branch	A. Hegarty, B.Sc., Q.D.A. (Director)
Soil Conservation Branch	H. W. Pauli, B.Agr.Sc., B.E.(Civil) (Director)
DIVISION OF MARKETING—	
Director of Marketing	D. P. Lapidge, B.Com., A.A.U.Q.
Deputy Director of Marketing	A. C. Peel, Dip.Ind.Chem., A.R.A.C.I.
Economic Services Branch	
Marketing Services Branch	D. R. Lewis, B.Sc. (Econ.) (Director)
Standards Branch	W. V. Mungomery, B.Agr.Sc. (Director)
DIVISION OF PLANT INDUSTRY—	
Director of the Division	B. L. Oxenham, B.Agr.Sc.
Deputy Director	N. F. Fox, B.Agr.Sc.
Agriculture Branch	J. K. Leslie, Ph.D., B.Agr.Sc. (Director)
Horticulture Branch	H. M. Groszmann, B.Agr.Sc. (Director)
Agricultural Chemical Laboratory Branch	T. J. Beckmann, M.Sc., F.R.A.C.I., F.C.S. (Director)
Botany Branch	S. L. Everist, B.Sc. (Director)
Entomology Branch	T. Passlow, M.Agr.Sc. (Director)
Plant Pathology Branch	G. S. Purss, M.Agr.Sc. (Director)

QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES

Annual Report 1974-75

To the Honourable the Minister for Primary Industries.

SIR,

I have the honour to submit the following report on the operations of the Department of Primary Industries for the year ended 30 June 1975.

Yours faithfully,

J. M. HARVEY,
Director-General.

I. General Comments

In this preliminary section of the report, brief comment is made on points of particular interest related to production, departmental organization and staff matters, and miscellaneous aspects of the Department's operations.

BEEF IN TROUBLE

Overshadowing all other considerations in 1974-75 was the depressed state of the beef industry, caused by the virtual disappearance of overseas market outlets.

The decline in market prices, which began in 1973-74, continued during 1974-75 with prices falling to new low levels. Fat stock prices during February 1975 fell to levels around 20c to 30c per kg (dressed weight), which were the lowest fat stock prices for more than 20 years.

Ironically, beef cattle were in good to excellent condition through most of the season and, at the end of the year, were entering the winter in good state. Slaughterings increased as the year progressed as producers were forced to dispose of cattle because of their overstocked position. As a result, abattoir throughputs during 1974-75 exceeded those of the previous year by 14%, while production of beef and veal in 1974-75 increased by 20% over the previous year to 418 737 tonnes.

The value of cattle slaughtered, however, slumped from a record \$279m. in 1973-74 to \$136m. in 1974-75, largely as a direct result of the decline in export outlets.

Significant efforts were made by industry and government bodies to seek out new overseas markets. The Minister for Primary Industries led a general trade mission to the Middle East, Asia and Japan in the early part of 1975 and beef was the principal commodity discussed in the countries visited.

Towards the end of the year, there were signs of a gradual improvement in overseas demand. The Japanese had indicated their intention to resume limited imports, and a large beef contract was concluded with the U.S.S.R.

In February 1975, the Queensland Government made \$10m. available to beef cattle producers in necessitous circumstances for essential carry-on finance. Loans were being made available to producers through the Rural Reconstruction Board at an initial interest rate of 2½% with the intention of ensuring that producers would be viable when the market improved.

Other Queensland Government measures of assistance included: the suspension of road permit fees on the transport by road of cattle and sheep in Queensland; deferment of land rents, freeholding instalments, and loans to graziers through special Government schemes for 1974-75; short-term deferment of the payment of stock assessments; and a renewal of leases in entirety in certain circumstances.

In April 1975, the Federal Government agreed to match the assistance being provided by the State Governments and an extra \$10m. was provided through the Rural Reconstruction Board for loans to producers in Queensland at an interest rate of 4%.

In June 1975, the Queensland Government established a top-level joint committee to investigate ways and means of stabilizing and rejuvenating the beef cattle industry. This committee, which is chaired by the Minister for Primary Industries, comprises Government Members of Parliament, producer representatives and officers of the Department of Primary Industries. Submissions have been invited from groups and individuals.

A widespread industrial dispute resulted in closure of most of the major meatworks in Queensland in July and August 1974. The strike had little effect on domestic meat supplies because, in addition to interstate introductions, ample supplies of frozen meat were available for local distribution as a result of the slump in export markets. The strike resulted, however, in cancellation of the beef carcass and break-up competition at the Royal National Show in August for the first time for many years.

The slump in beef export markets resulted in large quantities of export meat being released on to the domestic market. This has resulted in depressed cattle prices being offered to producers and meat prices to the consumer being at their lowest for many years.

Avenues for the sale of bulk meat to the consumer have increased markedly and a considerable increase in the volume of meat sold to the public has resulted. Competition among butchers has never been greater.



Progress is being made in top rot and root rot (*Phytophthora*) control in pineapples under a system worked out in trials like this one on a Beerwah farm. Plant pathologist Mr. K. G. Pegg inspects some diseased plants.

SUGAR AT PEAK

In direct contrast to the state of the beef industry, the sugar industry established new records in production and value of the crop.

The gross value of cane cut was \$428m., an all-time record. The sugar harvest for the 1974 season yielded 2.72m. tonnes compared with 2.40m. tonnes in 1973. This figure slightly exceeded the previous record crop of 2.71m. tonnes in 1972. Cane harvested for milling totalled 19.42m. tonnes, 5.5% more than the previous record in 1971.

The total value of the 1974 sugar crop is estimated at \$760m., an increase of 142% over the 1973-74 figure of \$313m. The No. 1 Pool price is \$255 per tonne 94 n.t. while the No. 2 Pool price is \$300 per tonne. The corresponding figures for 1973 were \$129.85 per tonne and \$134.95 per tonne. The abnormally high prices were the result of a very tight world supply situation.

A total of 1.71m. tonnes of sugar was exported in 1974, 270 000 tonnes fewer than in the previous year. Reduced sales in 1974 to Japan, Canada and the U.S.A. were responsible for the overall decline. The United Kingdom was the largest market in 1974 and accounted for 368 000 tonnes, while significantly increased sales were made to Malaysia and South Korea.

The negotiation of long-term contracts for the sale of sugar to Japan and China, together with existing contracts with Malaysia, South Korea and New Zealand, has introduced an important element of stability into a significant portion of the export market, at least until 1980.

The average London Daily Price for 1973 was £stg99.32 per tonne, which was a near-record level, but a surge in prices followed a progressive tightening of world supplies throughout 1974. As a result, the average price for 1974 was £stg304 per tonne (\$A523) while the highest price reached was £stg650 per tonne (\$A1118). Other causes of these price movements were the lack of an International Sugar Agreement and the failure to renew the United States Sugar Act.

The immediate outlook is for the tight supply and demand situation to continue, with world prices remaining high, although far below the highest point reached during 1974. Prices have recently fallen to below £stg200 per tonne. The controlled expansion of the sugar industry, in line with the negotiation of long-term market commitments, is providing the industry with a stable future and a reduced reliance on the fluctuating world free market.

Prospects at this stage for the 1975-76 harvest are good and, with favourable harvesting conditions, sugar-cane production could establish a further record.

VALUE OF PRODUCTION

The gross value of Queensland rural production in 1974-75 was estimated at \$1 203m., an increase of \$131m. on 1973-74. Beef, sheep and wool showed a marked decline in value compared with last year but the increase in sugar-cane production and a high price rise, dealt with in an earlier section, more than balanced this downturn. Wheat, barley and fruit also showed increases. Although the value of production increased, the volume remained relatively unchanged from that of the previous year.

High fuel costs, exchange rate movements and an economic recession in many major trading nations had an adverse effect on international trade. The sharp downturn in the volume and value of beef exports, detailed earlier, overshadowed the overall outlook for exports of Queensland's rural products.

Wool.—A major rescue operation of wool markets was mounted during the 1974-75 season to counter the collapse in demand from overseas buyers.

Demand was weak at the opening of the season in July 1974 and the Australian Wool Corporation attempted to maintain a reserve floor of 300c per kg (clean basis) for 21 micron wool. This resulted in the A.W.C. purchasing some 60 to 70% of offerings at sales and almost exhausting its finances. In August, when sales were cancelled, the Commonwealth Government agreed to back the reserve price operations of the A.W.C. at a new lower reserve of 250c per kg (clean basis) for 21 micron wool. An attempt to reduce this price to 200c per kg was not adopted.

By November 1974, the Commonwealth Government had committed some \$350m. to the scheme and the A.W.C. was the major purchaser of wool at most sales. A stockpile of more than 1.75m. bales was built up.

Towards the end of the season, demand began to improve, mainly through renewed interest from Japanese buyers. Prices at auction in April rose for the first time since the introduction of the reserve price in September 1974.

Dairy Products.—World prices for most dairy products were near the high prices of 1973-74, but the price of skim-milk powder weakened and the high level of stocks of

dairy products held in the E.E.C. caused concern. Japan remained Australia's major export market for dairy products. The U.S.A., Canada, South-east Asia and Brazil were also of significance.

The modification to the Equalisation Plan brought into operation for one year was due to expire on 30 June 1975. The scheme, which gives deficient butter States full returns on at least 80% of their domestic production, is still under review following moves by some of the larger companies to withdraw from the scheme.

Pigmeats.—Pig prices remained attractive throughout the year because of a continuing tight supply position which developed towards the end of 1973-74. Prices remained high despite the very low prices of competing meats, particularly beef and sheep meats.

Because of the low beef prices, pig producers were very cautious about the prospects for pig prices and production capacity was generally not expanded. This situation was reflected in slaughterings of pigs in Queensland during 1974-75, which decreased by 21% compared with 1973-74, while production of pigmeats decreased by 22% for the same period.

Eggs and Poultry.—During the year, the surplus egg production in Queensland was aggravated by a decline of about 4% in local sales of eggs in shell. Sales in the Northern Territory, a traditional market for south Queensland eggs, fell sharply and competition from low-priced red meats reduced egg sales significantly.

Profitability of the industry in Queensland is influenced by the surplus position in which the industry finds itself on a national level, and the cost of cold storage of the accumulating stockpile. Stocks of frozen pulp for export are expected to reach 14 500 tonnes by the end of 1974-75 and will not be sold until late 1976. Meanwhile, the 1975-76 surplus will accumulate. Cold storage costs are around \$125 per tonne a year.

During the year, the Hen Quota Committee allocated 408 quotas to Queensland egg producers. Fifty-nine appeals were made to the Hen Quota Appeals Tribunal and 17 were upheld.

Grains.—Early in the year, grain prices rose in response to an expected lower world production, and a stable price had developed by December 1974. However, a wheat surplus in the E.E.C. brought a 30% decline in wheat prices and the demand for coarse grains fell as beef prices slumped. The Australian export price for wheat levelled off at around \$100 a tonne.

The 1974-75 wheat crop was the first marketed under the current Wheat Stabilisation Plan. The guaranteed export price for 5.445m. tonnes of wheat was set at \$73.49 per tonne, bulk basis, f.o.b. ports. The home consumption price of wheat was set at \$83.40 per tonne, bulk basis, f.o.r. ports. This included \$12.32 per tonne increase in the cost of production index, plus 67c per tonne for Tasmanian loading freight.

Wheat export sales during 1973-74 increased markedly to 7.1m. tonnes compared with 4.1m. tonnes in 1972-73. Significant increases in sales were made to India, Egypt and the People's Republic of China. Carry-over stocks at the end of the 1973-74 year are estimated to approximate the previous season's low level of 478 000 tonnes.

In an attempt to increase production to meet expanding market outlets and achieve a reasonable level of carry-over stocks, wheat delivery quotas were suspended for the 1975-76 season. In addition, the first advance to growers was increased by \$11 per tonne to \$55.10 per tonne, f.o.r. ports.

Receipts by The Barley Marketing Board reached a record 231 150 tonnes compared with 104 387 tonnes in 1973-74. Of this, 134 937 tonnes were classified as malting grade. A record 193 000 tonnes were exported compared with 57 000 tonnes in 1973-74.

Exports of grain sorghum from the southern Queensland crop were expected to exceed 360 000 tonnes compared with 350 000 tonnes in 1973-74. Exports from central Queensland are expected to exceed last year's level of 77 000 tonnes.

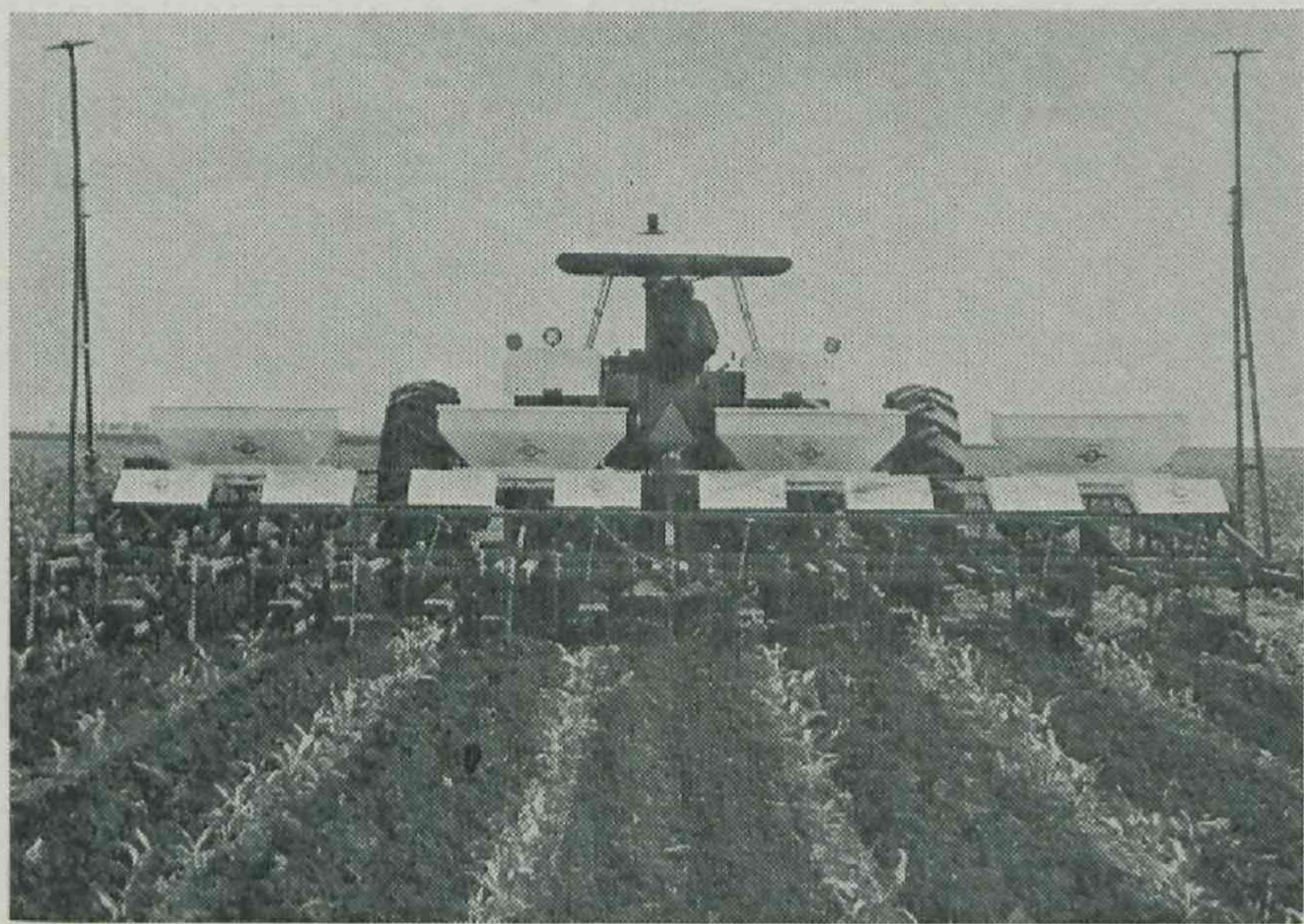
Oilseeds.—Oilseed prices were satisfactory. Average price for safflower was approximately \$225 per tonne at depot while sunflower growers received about \$209 per tonne. Linseed returned \$245 per tonne at depot and soybean growers will probably receive about \$170 per tonne.

For the first time, 25 000 tonnes of soybeans were exported from Queensland. Other exports of oilseeds included 5 140 tonnes of linseed, 14 500 tonnes of sunflower and 17 600 tonnes of safflower. The outlook for the immediate future is for lower prices for oilseeds, particularly soybeans.

Peanuts.—In anticipation of an export surplus from the 1974-75 crop, The Peanut Marketing Board signed several contracts with major United Kingdom peanut processors. If the crop size and quality match the pre-harvest estimates, sales by the Board for 1974-75 could exceed \$10m., and returns

to growers could reach 30c per kg. The first advance payment to growers was greater than the total crop payment of only 3 years ago.

Navy beans.—A detailed study of the North American navy bean industry enabled The Navy Bean Marketing Board to sell the 1974-75 crop at 44c per kg, ensuring an average return to growers of 39c per kg.



Inter-row cultivation of grain sorghum at Jondaryan using modern machinery.

Cotton.—Returns to growers from the 1974 harvest are expected to be in the vicinity of 70c per kg, but world demand for textiles weakened. Cotton prices declined from their all-time high in January 1974 and remained low until a price rally in early 1975. As a result, returns to growers for the 1975 season are expected to be 60c per kg.

Tobacco.—At the 1974 sales, a total of 8 306 363 kg of tobacco leaf was sold for \$23 639 251. The average price recorded was 284.6c per kg, which was an increase of 36c per kg in the minimum average price announced early in 1974.

The minimum average price for the 1975 selling season was increased by 48c per kg to 336.4c per kg by the Australian Agricultural Council, following negotiations within the Australian Tobacco Board.

To 30 June 1975, 6 880 585 kg of leaf were sold at an average price of 338.3c per kg compared with 6 105 981 kg at an average price of 292.4c per kg at a similar stage of the 1974 sales.

Rice.—Deliveries from the 1974 summer harvest totalled 7 760 tonnes. Although no major setbacks were experienced, some rice was lost through wet weather and flooding. Returns to growers are expected to be about \$115 per tonne.

Ginger.—For the first time, it was necessary to revise domestic prices at the end of 6 months' trading. This was due to increasing labour and production costs. Domestic prices were raised approximately 15% and export prices approximately 18%.

In spite of this, sales of the 1974 crop on the export, and particularly the domestic market, will finish strongly with an expected rundown of approximately 90 tonnes in carry-over stocks. It is hoped the domestic market, which consumes about 40% of the bulk of the crop, will soon use 50% of the harvest.

Fruit and Vegetables.—The Australian Apple and Pear Corporation came into being on 1 September 1974. The Queensland industry is not happy with the basis of financing the Corporation as it means that Queensland growers will have to support a disproportionate burden because the levy is based on area rather than production, which would be more equitable.

The pineapple industry rationalisation plan continues to prove its worth to the industry as the total returns for fruit delivered to the No. 1 Pool reached \$104.11 per tonne for the 1974 cannery year. The No. 1 Pool quota for 1975 has been increased to 4.2 tonnes per certificate.

The National Banana Marketing Development Scheme was suspended during the year as it was judged in contravention of the Trade Practices Act under which minimum prices are specifically precluded. However, following an appeal to the Trade Practices Commission, the scheme was later allowed to resume its operations.

Production of vegetables for processing continued the upward trend of previous years although, in the later stages of this financial year, concern was expressed in the potato industry about the level of frozen potato imports into Australia.

Prices paid for potatoes soared during the year, pumpkins sold at up to \$26 a sack, and other vegetables, notably cabbages and cauliflowers, sold for more than double their normal prices. Vegetable prices have since settled down to more normal levels.



Potato yields are increased by timely sprayings with an insecticide.

PRODUCTION SUMMARY

Despite only moderate rainfall during the year, pastoral conditions were generally favourable, though not bountiful, over most of the State.

The winter of 1974 was a dry, cold one, and drought conditions continued in the Texas-Inglewood district. Relief in the form of widespread, light rainfall followed by milder temperatures came to most areas only at the close of this period, with 50 to 70 mm registration favouring the droughted Texas-Inglewood area.

Spring rains were erratic in quantity and distribution, but most of the State enjoyed above-average feed conditions, although some areas, notably the western sector and the mid southern border area, continued to be dry. Cool night temperatures persisted in coastal and southern areas, and this slowed pasture growth.

Electrical storms in the late spring started bush fires in the dry western sector and large areas of country were burnt out, creating localized feed shortages.

The summer was only moderately wet and rainfall was mainly of light intensity producing little run-off to streams and surface catchments. Parts of the western Downs and Maranoa, extending to the Goondiwindi-St. George border area, missed effective summer rains and early drought conditions developed in parts of this region. However, some relief to the region was afforded by useful rain at the end of February and follow-up falls in March. The autumn was generally dry, with about average rainfall in March but below-average registrations in most parts for the remainder of the period.

Conditions generally were very dry coming into the winter and, although most areas carried a moderate to good body of feed, the outlook for the winter was not encouraging. The western Downs and south-east Maranoa region, extending south to the border from Goondiwindi to St. George, had reverted to early drought conditions and a serious feed situation threatened the area.

Stock water supplies were adequate in most parts of the State. The exception was the drought-affected mid southern region where surface storages have not been fully replenished and supplies are dwindling.

Although seasonal conditions resulted in satisfactory pasture production, they were less favourable for crops.

Some of the coldest winter weather for many years was experienced in 1974 and this retarded crop growth. Dry conditions which prevailed in most of Queensland in January and February 1975 caused moisture stress in crops and subsequent reduction in yields and some abandonments.

The grains and oilseeds industries worked up further substantial gains on the previous year in both production and value. Wheat, barley and maize production increased while grain sorghum output declined marginally, mainly because

some crops were abandoned. The gross value of the principal grain crops improved by about 30% on the previous year to \$159m., a new record figure. Areas planted to sunflower and safflower showed very significant increases and new record productions are expected for the season.

Rice production continues to be disappointing as growers concentrate a large part of their efforts and resources on sugar-cane. Production recovered somewhat but, at about 12 000 tonnes for the year, is still well below the 17 000 tonnes grown in 1973 and still further below the industry's potential.

Good seasonal conditions for wool-growing brought about a minor recovery in wool production to an estimated 61.9m kg but declining prices caused a 20% drop in gross value of wool production to \$80.5m. There was also a drop in numbers of sheep and lambs slaughtered but, despite this drop, the value of this production also declined—a further reflection of the shattered meat market.

Production of eggs and poultry meat increased once again and the gross value of production moved upwards by \$2.9m to a new record of \$41.3m.

Low beef prices were also responsible for a cautious outlook by pig producers and slaughtering of pigs in Queensland during 1974-75 decreased by 21% compared with the previous year, while production of pigmeats decreased by 22% for the same period.

The dairying industry continued its steady decline with numbers of dairy farmers reduced from 5 310 in 1973-74 to about 4 800 in 1974-75. Butter production in 1974-75 decreased to 10 389 tonnes compared with 11 515 tonnes in the previous year. The continuing decline in butter production has forced Queensland to become a substantial importer of butter.

The 1975 cotton crop is estimated to be about 33 000 bales. The peanut crop should produce 32 000 tonnes from 26 500 ha planted. Navy bean production should be about 2 600 tonnes from 3 500 planted hectares. Early sowing expectations were not realized and adverse weather reduced yield prospects. Soybean production could reach 45 000 tonnes.

The 1974-75 growing season for tobacco was satisfactory throughout the various growing areas. Production remains stable under the umbrella of the Tobacco Industry Stabilisation Scheme.

The 1974 ginger harvest produced 3 862 tonnes from 113 ha. Plantings for the 1975 crop were estimated to be 126 ha and a slight increase on last year's production is expected.

Production of fruit and vegetable crops was generally about the same as that recorded for the previous year and the gross value of production was marginally better than the record \$87.3m estimated for the 1973-74 year. Cannery intake of pineapples during the 1974 crop year amounted to 108 000 tonnes. Apple production for the 1975 season was estimated at almost 45 000 tonnes compared with 31 165 tonnes in the previous year.

Citrus production for the 1974-75 season is expected to reach 32 400 tonnes. Potato production should exceed the 86 529 tonnes produced in 1973-74 by a substantial margin, while onions should remain fairly steady at about 21 000 tonnes. The output of most other vegetables was well up on production in the previous year, and this has been reflected in generally lower returns to growers.

MARKET RESEARCH AND INTELLIGENCE

A Queensland Trade Mission to investigate and promote trading opportunities visited the Middle East and the Far East in February and March under the leadership of the Minister for Primary Industries. Two senior officers of the Department were members of the Mission.

The Minister also led another mission comprising leaders of the sugar industry on a goodwill visit to Japan, Korea, Malaysia and Singapore.

The fortunes of the rural industries depend greatly on economic conditions elsewhere in the economy and on the economies of trading partners. Domestic inflation, exchange rate adjustments, and general changes in trade patterns point to the continuing need for market research and for timely and accurate marketing intelligence. To this end, the Marketing Services Branch of the Department carried out a series of studies of benefit to both the producer and the consumer.

The important part played by primary producers in the Queensland economy was highlighted in a report entitled 'The Relative Dependence of the Queensland Economy on the Rural Sector' released during the year.

Producer-oriented research included 'The Future Economic Viability of the Queensland Rice Industry', 'Grower Organisations as Financial Intermediaries: a Critique', 'Wheat Quotas in Australia', 'The North American Navy Bean Industry' and 'An Enquiry into the Methods of Selling Fruit and Vegetables at the Brisbane Market'.

Research into consumer attitudes continued, with the publication of 'Householders' Purchasing Habits and Attitudes to Fruit' being the results of a survey of households in Brisbane.

Investigations were undertaken on behalf of various industries and several submissions were made to the Industries Assistance Commission. Investigations were made into applications from co-operative organizations and marketing boards for financial assistance under Government guarantee.

The issue of crop forecasts, monthly reports on trends in rural production, and market price reports continued to receive wide acceptance from producers, banks and commercial undertakings servicing the primary producer.

RURAL FINANCE

During the year, advances approved under the various Acts administered by the Agricultural Bank totalled \$18 779 249, which represents a reduction of almost \$7.5m. in the figure for the previous year. Included in this amount is \$460 866 approved under the Flood Damage Relief Assistance Scheme in terms of an agreement between the Commonwealth and Queensland Governments which provided for assistance, at concessional rates of interest, to eligible primary producers who suffered loss as a result of flooding in December 1973 and January 1974. This Scheme was terminated on 30 June 1975.

The Bank found it necessary to impose restrictions on lending in late 1974 because of a shortfall in the amount of borrowers' repayments attributable to the depressed state of the beef cattle industry and the general tightening of the economy.

The rate of interest applicable to normal advances was increased from 8½% to 9½% on 1 August 1974.

AGRICULTURAL ECONOMICS

The demand for farm management advisory services continues to increase. This can be attributed to economic pressure through rising costs and declining profit margins in many rural industries combined with a growing realization of the importance of farm planning.

Many graziers for whom the beef crisis has created acute liquidity problems have sought advice in cash flow budgeting. Those most severely affected are small producers and those previously undertaking development with limited equity, as in the brigalow and wallum areas. Graziers generally are undertaking a holding operation and, where possible, income is being supplemented with cash cropping or off-farm work.

The general economic climate is unfavourable for farm investment and, apart from the sugar expansion, little is taking place.

A shortage of skilled rural labour is evident, particularly in western Queensland. As the average number of permanent male labour units is now only 1.2 units per rural holding in Queensland, greater reliance is being placed on family labour and contract services.

The Department now has agricultural economists stationed in 15 country centres. These officers are making a significant contribution to Departmental extension services through being actively involved in district extension programmes.



Economic Services Branch helps farmers and graziers in farm management techniques, financial recording and budgeting.

Agricultural economists in all regions have made extensive use of the mass media, particularly the rural press and radio. A farm costs and returns supplement was prepared during the year for *Queensland Country Life* and it is hoped that this will become an annual feature. Extension publications were prepared on topics such as taxation, leasing of farm machinery, rural credit, share farming agreements, wool futures and labour adjustment in agriculture.

Considerable emphasis was placed this year on farmer training in business management. Since October 1974, a successful series of Property Secretary courses has been conducted in southern and central Queensland, mainly in association with the Queensland Country Women's Association. Attendance has reached almost 700 country women and plans are under way for schools in another 20 country centres. Topics covered included organization of the property office, financial and physical records, cash flow budgeting, taxation, rural credit, insurance and estate planning.

Assessment of the economic feasibility of proposed irrigation projects is of continuing importance but, in the present economic environment, increasing attention is being given to the reassessment of previous proposals.

A reassessment of the Three Moon Creek Irrigation Proposal indicated that, with full use of the water within 5 years of completion, the dam was economically feasible. The Clare Weir Project was also reassessed and the State has now accepted the Commonwealth contribution of \$3 million for construction to begin. Assistance has been given to a Melbourne consultancy firm undertaking an agro-industrial study at the request of the Australian Department of Northern Australia as part of the overall Burdekin Basin Assessment Programme.

Survey work entailing 250 questionnaires has been completed in an Input/Output Study in the Burdekin Region to determine the interdependency between agriculture and other sectors of the economy. The study will also indicate the impact of new irrigation projects on the economy of the area.

A field survey of structural changes in the pig industry has also been completed. Preliminary results indicate that there are no significant economies of size operating over the piggeries studied, ranging from 70 to 260 sows.

An initial economic assessment of a mechanical tobacco harvester, undertaken in co-operation with the North Queensland Tobacco Growers' Co-operative Association and South-edge Tobacco Research Station, has indicated that mechanical harvesting is feasible in the tobacco industry.

The fourth edition of the *Farm Management Handbook* released this year has been in great demand from primary producers, teaching institutions, accountants and bankers as a technical and financial reference manual. Almost 2 000 copies have already been distributed.

EXTENSION SERVICES

The Extension Services Section has a co-ordinating role among the Department's extension field staff to ensure that an effective, co-ordinated service is provided to primary producers and to the whole community. The Section was established in 1972 as a move towards decentralizing control of the Department's extension services.

A major objective of this re-organization was to shift the responsibility for planning and implementing extension programmes from head office to country-based staff. The appointment of Regional Extension Leaders to main country centres and the establishment of District Extension Committees were the main means of achieving this change in emphasis.

During 1974-75, written extension programmes from 24 out of 30 District Extension Committees were submitted to the Extension Services Board for approval. These programmes, in the main, comprised the traditional work of branch officers, but there is an increasing movement towards co-ordinated projects which involve officers of more than one branch.

Many projects now involve staff from other Government Departments, such as Lands Department, Irrigation and Water Supply Commission and the Department of Commercial and Industrial Development. Industry and commercial organizations, including co-operative dairy factories, grain handling authorities and producer organizations, are also being involved.

More projects are being directed towards the satisfaction of community needs. In the last year, the Department supported work as varied as consumer education in the storage and use of primary food products and assistance in farm and community development in a small dairying community.

With the appointment of District Extension Committees in the North-western and Central-western Regions, the Department's extension service re-organization is now complete.



Stubble mulching machinery being demonstrated at a field day in the Kingaroy district. Field days are an important part of the Department's extension activities, and stubble mulching, research has shown, is a valuable soil conservation measure.

LAND UTILIZATION

Within the broad range of activities undertaken by the Division of Land Utilisation, special emphasis was placed during the year on the expansion of soil conservation programmes and on special land use investigations in collaboration with other Divisions and other Government Departments.

The statutory soil conservation programmes initiated in early 1973 by the declaration of five Darling Downs Shires as Areas of Soil Erosion Hazard have been expanded to cover 11 Darling Downs Shires as well as the Isis and Gin Gin Land Use Study areas.

The Darling Downs Programmes are being developed and consolidated as rapidly as possible. This work involves a substantial effort in establishing planning bases and procedural approaches for regulation of the quality and nature of control measures and for the payment of Government subsidy.

The development of State programmes was set back to some extent by the loss, for 12 months, of the services of the Director of Soil Conservation, who is acting as Study Leader for a collaborative Commonwealth-State study to consider the problems and long-term requirements of the nation for resolving soil erosion problems.

The Burdekin Basin Investigations represented the most important inter-Departmental project in which the Division of Land Utilisation was involved during the year. The project includes a wide range of studies and involves a number of branches of the Department as well as other State and Commonwealth Departments.

These Commonwealth-State investigations are under the control of a Commonwealth-State Project Committee and are intended to provide a basis for assessing the potential of the Burdekin Basin for agriculture, hydro-electricity generation, flood mitigation, industrial, mining and urban uses.

The Coastal Lowland Technical and Land Use Studies being undertaken by an inter-Departmental Committee representative of Lands, Forestry and Primary Industries Departments have also made substantial demands on Departmental staff but are now nearing completion.

A significant development during the year was the establishment of an Engineering Services Section in the Division of Land Utilisation and a professional unit has been developed by transfer to the Division of engineers from a number of branches.

The Engineering Services Section will provide engineering services to Departmental branches requiring them. Such services will relate to machinery, equipment and buildings used in rural production or in storage, transport and processing of rural products, together with the engineering aspects of drainage, irrigation and soil conservation.

SOIL CONSERVATION

Summer storms caused severe erosion damage in the Central Highlands and on unprotected land on the Darling Downs. Overall, erosion in other regions was low. Inspection of the erosion that occurred over the entire agricultural area of the Central Highlands, including the Emerald irrigation area, showed that at least 40% of the cultivated paddocks were seriously rilled or gullied. Measurements on one property showed that 200 m from a hill top on a 1.6% slope, soil loss was 370 m³ per ha.

Serious erosion occurred in the Moura and Theodore districts. The greatest damage was caused by the failure of natural and constructed waterways which were designed to contain flood run-off. Moderate to severe erosion occurred on land in fine tilth or newly planted to summer crops during high-intensity falls of rain in November. Losses on some paddocks were estimated at 250 tonnes per ha.

Horticultural areas of the Near North Coast were also subject to serious erosion during November and April. The worst erosion occurred on bare, steeply sloping land in November following falls with intensities as high as 30 mm in 10 minutes. On land in the Glasshouse area planted to pine-apples on a 5% slope, high intensity falls in April caused the complete siltation of one recently-constructed diversion bank. A total depth of 100 to 150 mm of soil was lost from inter-row areas on this unstable soil type during the year.

Stubble and crop cover were found to give adequate protection against soil erosion in the Darling Downs and South Burnett regions, and the Miles, Wandoan and Theodore districts.

Demonstrations on a wide range of soils, soil conditions, residue and moisture levels, and crop type have indicated an economic potential for tillage and planting machinery modified to handle stubble, and interest in such machinery is growing in the Darling Downs, Near South-west and South Burnett regions.

The expansion of sugar-cane assignments in the Mackay district has resulted in some unsuitable land with slopes of up to 14% being cultivated. In the Isis and Gin Gin Areas of Soil Erosion Hazard, every proposed expansion block was examined by officers of Soil Conservation Branch. The Central Sugar Cane Prices Board accepted these officers' recommendations and, as a result, only areas considered suitable were accepted as expansion blocks.

The beef industry slump has led to the cultivation of large areas of grazing land, including land under improved pasture, but the swing to cultivation does not appear to be as great as was first expected. In general, the landholders concerned are giving little consideration to conservation measures.

Overstocking on many properties presents an erosion threat if a dry winter or spring leads to over-grazing. Over-grazing on shallow, light-textured soils, as well as cultivation for fodder crops on steep slopes, is a major cause of the erosion occurring in the Moreton Region.

An upsurge of farmer interest in soil conservation measures occurred in the sugar-cane areas around Mackay, Bundaberg and Childers. Initial requests for service in the Burnett rose from 74 in the year ended May 1974 to 127 this year. Mackay has experienced an increase of 100% compared with 2 years ago. In this district, the most notable increase was in follow-up requests, indicating satisfaction with the service being given.

At Emerald, requests for assistance rose by 50% compared with last year. On the Darling Downs, interest was low for the first half of the year, but rose steeply during the second half. This interest on the Downs is attributed to the availability of incentive subsidies, to the continuing visible evidence of erosion, and to dry periods suitable for construction work.

In the Resource Inventory Mapping project, a further 44 844 ha were mapped this year within the declared shires, bringing the progressive total to more than 144 000 ha. Some 8 000 ha of land have been mapped in shires adjacent to the Toowoomba city boundary. This information will be used for rural subdivision planning.

The area protected by contour banks and other contour measures increased to 33 313 ha in 1974-75 compared with 26 841 ha the previous year, but falls short of the 51 480 ha protected in 1970-71, and 44 494 in 1971-72.

Topographic surveys during the year were confined to Areas of Soil Erosion Hazard. The main area examined was the Jondaryan Plains, with smaller areas around Yarraman, Ellinthorpe, Leyburn and Chinchilla. A total of 20 000 ha was covered during the year.

PROTECTION OF THE ENVIRONMENT

The Ecology group in Botany Branch contributed to the Brisbane Airport Development Environmental Study by undertaking detailed vegetation studies of the proposed airport area and the mangroves of Moreton Bay. Reports on both these studies will be published soon.

At the request of the Co-ordinator-General's Department, the mangrove study was extended to cover the area from Noosa to the New South Wales border. This is the coastal strip involved in the Coastal Management Investigation.

Part 1 of the Western Arid Zone Land Use Survey was completed and the report and maps published, while studies in Part 2 of this survey are well advanced. A second officer of the group has been added to the interdisciplinary team to speed up this project by working on Part 4 of the study (Aughathella-Tambo-Jericho area).

A detailed account of the vegetation of Moreton Island was completed and marked-up base maps at a scale of 1:25 000 have been prepared. This study will provide valuable basic data for preparing a strategic plan covering all facets of the development of the island, including National Parks, tourism, residential, recreational and mining projects.

Studies of the vegetation of the coastal sand dunes were continued. A reconnaissance survey of the sand dunes between Bundaberg and Cape Flattery was undertaken and preliminary analysis of detailed studies at Yeppoon and Currimundi completed. Inspections of revegetation on sand mining leases in southern Queensland showed continued improvement in the standard of work by most mining companies.

Botany Branch received a grant under the National Estate Programme from the Department of Urban and Regional Development to prepare an inventory of plants and plant communities in the Moreton Region. This is part of the assessment of selected areas for conservation planning.

The project involves preparing a series of 1:100 000 scale vegetation maps of the Moreton Region. Inventories will also be made of species and communities occurring in reserves previously under the control of the Department of Primary Industries as Fauna and Flora Reserves. Inventories are also to be made of selected Fisheries Habitat Reserves.

The ecological study on sandalwood (*Eremophila mitchellii*) was continued and an extensive data bank on the structure, floristics and soils of these plant communities has now been built up.

CATTLE BREEDING

Although imported semen of several beef breeds has been introduced to Australia, there has been little evaluation of the resultant cross breeds so far attempted in Australia. The Simmental x Hereford is now being evaluated at Brigalow Research Station and an experiment has been completed to evaluate and compare the Simmental x Hereford with Hereford steers under intensive finishing conditions. The comparison was made from an initial liveweight of 220 kg to a slaughter liveweight of either 400, 460 or 500 kg. Carcass components were measured.

On a high grain diet, the rate of gain of the crossbred steers was greater than that of the Hereford steers. The feed conversion ratios were not significantly different. The overall fat cover of the crossbred steers was less than that of the Hereford steers, resulting in a lower fat percentage in the carcass. The eye muscle area and muscle percentage were greater for the crossbreds than the Herefords, resulting in a greater yield of salable meat. There were predictable increases in fat and decreases in muscle components with increasing weights of slaughter in both breeds.

At 'Swan's Lagoon' Cattle Field Research Station, the Sahiwal breed demonstrated its suitability as an alternative to the Brahman for crossbreeding, at least in the first cross.

Further progress was made in developing two herds graded up from base Shorthorns and containing 50% and 75% Brahman blood.

At Toorak Sheep Field Research Station near Julia Creek, a crossbreeding programme involving the Sahiwal, Africander and Shorthorn is in progress. The aim is to produce a tick-resistant, heat-tolerant beast adapted to the hot, dry conditions.

Large-scale breed evaluation studies continue to dominate the field research programme. Africander, Belmont Red, Droughtmaster and Braford are being compared with the Brahman and Hereford. In central Queensland, weight gains to 316 days favoured the Braford.

The Australian Friesian Sahiwal (A.F.S.), a tick-resistant dairy breed suited to tropical conditions, was developed by the Department by crossing the Friesian and Sahiwal breeds. As the breed is now producing acceptable yields of milk and butterfat, animals are being released to the industry. Dairy farmers on the Eungella and Atherton Tablelands are receiving heifers as part of a co-operative programme to increase numbers of females and gauge their acceptability to the dairy industry.

In spite of the continued decline in dairy farm and cow numbers, dairy semen sales from the Wacol A.I. Centre were only 7% below last year's figures. A decline of 35% in total beef semen sales reflected the depressed state of the beef industry.

A total of 214 000 doses of semen was processed at the Wacol A.I. Centre, with a success rate of 87%.

Exports of 24 800 doses of semen from dairy and beef breeds were made to 11 countries, the main purchasers being the U.S.A., Malaysia and Ghana.

A.I. Proven sires from progeny testing in 1974 are—*Australian Illawarra Shorthorn*: Sunny View Princess Mario rating +177.4 kg for milk and +7.6 kg for butterfat. *Jersey*: Brook Lodge Brilliant's Chief rating +169 kg for milk and +5.1 kg for butterfat.

The Wacol A.I. Centre is expanding its support activities and now provides such services as training inseminators, particularly owner-operators, in the field; helping farmer co-operative artificial breeding associations to maintain and expand their services; and providing a technical, problem-solving support service to inseminators and herd owners.

BEEF CATTLE NUTRITION

At 'Swan's Lagoon', a study of supplementation to improve the performance of cattle has been expanded with commencement of a comparison of dry lick supplements, based on urea and salt, with liquid urea-molasses supplement. Pen studies during the year indicated that the inclusion of extra sulphur in urea-molasses supplements improves animal performance on spear grass based diets. Responses to *ad lib.* molasses feeding were recorded after the early storm rains rather than before as in previous years.

At 'Brian Pastures' Pasture Research Station, Hereford cows grazing at the rate of a beast to 3.2 ha produced more calves with heavier weaning weights than cows grazing at rates of a beast to 2.4 and 1.6 ha. Urea-molasses supplementation of weaner heifers on native pastures reduced overall liveweight losses by 11 kg during winter.

At both Coolum and Kairi Research Stations, *ad lib.* molasses feeding of steers on pasture substantially increased weight gains to result in heavier and fatter carcasses. At Kairi, Friesian steers grazing grass-legume pastures continued to show a marked weight gain advantage over the beef breeds, Brahman cross and Shorthorn.

The performance of Droughtmaster breeders on Mitchell grass downs country in north-west Queensland was again most satisfactory. Final pregnancy rate for the herd was 92.2% in 1973-74 and 88.2% in 1972-73. In this same herd, vaccination against *Leptospira hardjo* reduced foetal and calf losses from 19.5 to 11.8%.

At Brigalow Research Station, grazing evaluation of *Leucaena leucocephala* cv. Peru has shown that the inclusion in the pasture of high protein feed from a legume will sustain positive liveweight gains in a dry winter-spring period. Unfortunately, Peru was unable to contribute for more than 2 months into the winter.

It was also demonstrated at Brigalow Research Station that steers grazing *Lablab purpureus* cv. Highworth during autumn and winter will gain weight at a similar rate to that achieved from forage sorghum. Weight gains of 0.70 kg per head per day have been recorded over a period of 82 days' grazing from March to June.

A trial at Gatton Research Station compared production from tropical pastures from set-stocking and rotational grazing. A grazing rate of five beasts to 1.2 ha was maintained on both the set-stocked and rotationally-grazed areas. Average weight gain of the rotationally-grazed steers was 90 kg during the grazing period from November to May inclusive, while the set-stocked steers gained only 57 kg in the same time.

Another trial at Gatton Research Station is examining the advantages of feeding grain to dairy-beef cross calves grazing a pasture of irrigated temperate species. One group received no grain supplement while two other groups were supplemented at 1 kg and 0.5 kg per day per 45 kg liveweight respectively. By the end of May, average weights of the two supplemented groups were about the same and they were approximately 45 kg heavier than the group on pasture alone.

Methods of using coastal lowlands for beef production are being studied at Coolum Research Station. It has now been demonstrated over a 6-year period that autumn-saved mixed species tropical pasture, nitrogen-fertilized cold-tolerant setaria grass, and nitrogen-fertilized grazing oats are three satisfactory supplements for pangola grass-white clover pasture. Liveweight changes from 180 kg as a weaner to 453 kg as a well-finished steer were achieved in 18 months.

The use of legumes in providing low-cost nitrogen for pastures in the tropics has been given practical impetus by the successful outcome of sod-seeding centro into guinea grass pastures at Utchee Creek. Steadily improving pastures, now 18 months after being sod-seeded, have carried 3.7 fattening steers per hectare between January and June 1975. Liveweight gains of 355 kg per ha were recorded for the 168-day period.

TUBERCULOSIS ERADICATION

The fall in beef prices, which began about October 1973, curtailed tuberculin testing under the National Tuberculosis Eradication Scheme by approximately 30%. The biggest drop occurred in the more remote areas. Since 1970, approximately 5 million cattle have been tested and 16 000 reactors (0.32%) have been destroyed.

This year, 680 000 cattle in 1 683 herds had been tested for tuberculosis up to the end of May, compared with 948 000 tested in 2 064 herds for the same period last year. Reactors in 1974-75 numbered 2 978 (0.44%) compared with 3 223 (0.34%) found in 1973-74.

The increase in the prevalence of reactors is the result of the reduced volume of area surveying within the protected areas, which increases the proportion of cattle tested in infected herds.

A combination of meatworks reporting and area surveying has established that tuberculosis is now restricted to fewer than 2% of herds and that these are predominantly in the more remote areas.

As the level of reactors for all but the far-western portion of the State, that is, the Channel Country west of the dingo barrier fence, is now below the 0.1% level on an area basis, it is proposed to recommend to the National Committee on Tuberculosis and Brucellosis that all but this remote area be classified as 'provisionally free'. This will allow cattle to be moved into comparable areas of other States without restriction, except for infected herds, which will be placed in quarantine.

Before this can be done, it will be necessary to implement on a State-wide basis a method of monitoring at meatworks to permit positive trace-back of slaughter animals to the property of origin. Proposals for methods of identification are under consideration.

BRUCELLOSIS ERADICATION

Keen interest developed in brucellosis surveying in north Queensland, especially north of the Mount Isa railway line. Properties which have been satisfactorily surveyed were able to sell breeding cattle to the Northern Territory and this has stimulated the depressed cattle market. The stage has been reached where consideration can be given to declaring the northern brucellosis control movement area as provisionally free, according to the rules of the National Committee on Tuberculosis and Brucellosis.

Brucellosis field survey units throughout Queensland have functioned efficiently and have received the co-operation of the grazing industry. Nearly 500 000 cattle are expected to be surveyed during the year. Overall, 30% of herds and 1.7% of cattle were found positive to the rose bengal test and 70% of these were confirmed by complement fixation testing.

Survey activities were accelerated during 1974-75 and it is the national aim that Australia should be in a position to declare all beef and dairy areas provisionally free of brucellosis by 1983. This date coincides with the date predicted by U.S.A. authorities for the U.S.A. to attain provisionally free status.

OTHER ANIMAL PESTS AND DISEASES

Another epizootic of ephemeral fever began in the Flinders River Basin in the early summer of 1974. The disease gradually spread through most of Queensland except the eastern Darling Downs and the Burnett. Its prevalence was sporadic and symptoms were mostly mild. There were few deaths.

Osteo-dystrophia-fibrosa continues to be diagnosed in horses over a wide area of Queensland. It is linked with continuous grazing on certain grasses, especially buffel grass, which contain a high oxalate level. This interferes with calcium metabolism and produces a phosphorus-calcium imbalance in affected horses. The condition results in swelling of the facial bones, shifting lameness and wasting, either separately or in combination.

This condition is widespread in horses in the Central Highlands and Dawson Valley, and is also reported from the Arcadia Valley, Roma, Charleville, the Upper Burnett, Hughenden and Cloncurry areas. Buffel grass was the pasture responsible, but other grasses such as *Setaria* can cause the condition.

Equine infectious anaemia has become more prevalent in the past 18 months and is probably associated with the relatively good seasons. This is an arthropod-borne virus disease and causes anaemia, jaundice, loss of condition and ventral oedema in affected horses, a proportion of which die.

Bovine malignant catarrh was diagnosed as the cause of death of two Banteng cattle at the Queensland Agricultural College, Lawes. This usually fatal disease of bovines is rarely recorded in Queensland. It is caused by a virus and spread by sheep, in which it causes an inapparent infection.

Trichomoniasis was diagnosed in animals from five extensive north Queensland properties and from four central-western Queensland properties.

Improved laboratory diagnostic procedures have confirmed the suspicion that swine dysentery is fairly widespread in many south-east Queensland piggeries. It is a cause of important economic loss if sanitation is poor and prophylactic medication is not provided as necessary.

Strangles was reported from widespread areas including Moura, Mackay, Warra, Cunnamulla, Wyandra, Quilpie, Gayndah, Cairns and the Darling Downs.

Local industry reports and field trials indicate that day-old vaccination of chickens using turkey herpes virus vaccine is significantly reducing wastage in the poultry industry from Marek's disease.

More properties in the normally tick-free areas of the Darling Downs and South Burnett are now under quarantine for tick infestation than at this time last year. Properties under quarantine now number 227 against 188 a year ago. However, it is expected that many will be released from quarantine during the coming summer and autumn months.

Depressed beef prices have caused a slackening in cattle tick control because of the cost. In some areas, there has been a swing towards using arsenic in plunge dips, but this is regarded as a retrograde step. Graziers have been encouraged to use crosses between Asian and European cattle as a means of effective biological control of this serious parasite.

LOT FED BEEF

Whatever the future may hold for the feed lot industry, a need exists to explore the use of cheaper sources of high-energy feedstuffs. As bran and pollard are available in reasonable supplies and are cheaper than grain, the value of these by-products was tested in all-concentrate diets.

Local-trade type Hereford steers were compared with heavier-type Hereford x Santa Gertrudis bullocks suitable for beef for export to Japan in feeding trials using diets comprising either 10, 30 or 50% of either bran or pollard and 85, 65 or 45% respectively of rolled sorghum grain. All diets contained 3% tallow and 2% minerals and trace elements. The steers were killed at 420 kg liveweight and the bullocks at 550 kg.

With the exception of the diet containing 50% bran, the liveweight gains and food conversion ratios were comparable on all diets. Thus, about half the grain component of feed lot diets can be substituted by these mill by-products without sacrificing performance.

Food conversion was superior to that obtained in previous experiments using 90% grain diets. The bullocks had a higher rate of gain than the steers without a marked increase in feed conversion. Pollard was superior to bran. There were no obvious differences in carcass parameters within breeds because of diet. The Hereford x Santa Gertrudis bullocks were leaner and higher yielding than the Hereford steers.

MEAT QUALITY

A Regional Meat Area for Maryborough was declared during the year. This takes effect from July 1975 and will result in closure of a number of unsatisfactory slaughterhouses serving the population of Maryborough and the surrounding district.



Consumers are assured of hygienically processed poultry from this recently renovated poultry abattoir. Renovation has brought it into line with the best modern standards.

The boundary of the Metropolitan Public Abattoir area was extended during the year to include the City of Redcliffe, the Shire of Pine Rivers, the Shire of Redland and that part of the Shire of Albert north of the Logan and Albert Rivers.

Investigations have been carried out by the Queensland Meat Industry Authority into the possibility of making the City of Gold Coast a Regional Meat Area but no decision has yet been made. Other places under consideration for Regional Meat Areas are Mt. Isa, Cairns, Innisfail, Gladstone and the South Burnett.

Declaration of these areas would lead to a considerable increase in the amount of fully inspected and hygienically slaughtered meat to the public in Queensland.

Control of the introduction of meat into Queensland from interstate sources continued. Several interstate premises were inspected by the Chief Inspector, and in some cases, it was found necessary to refuse certification because of deficient structural, procedural or sanitary standards. However, the Queensland Meat Industry Authority has granted consents to introduce products in a few instances pending the completion of necessary improvements to premises concerned to enable full certification to be issued.

The promotion of tenderstretch meat continued with variable results. Considerable progress has been achieved in the Brisbane area, but the result has been disappointing in the country centres.

Several trials have taken place with the Australian Meat Board and C.S.I.R.O. to determine the various factors which cause carcass bruising in cattle. A large amount of information on this important cause of loss to the beef cattle industry is being collected.

Several talks have been given to housewives' organizations and consumer groups on meat quality and care of meat in the home using Australian Meat Board films on meat cooking to illustrate the subject. These have been invariably well received.

PLANT BREEDING

The wheat variety Oxley was named and released in 1974 as a result of a joint plant breeding effort of the University of Queensland and this Department. This variety performed impressively again in the 1974 season. Yield figures from the Department's mid season wheat varietal testing programme indicate that Oxley significantly outyielded Festiguay at seven of 12 sites and Tarsa at eight of 12 sites. Oxley was released to replace these two varieties which are now susceptible to the stem rust races found in the field.

Although Oxley's field resistance to stem rust may be short-lived, it has been established beyond doubt that the high yield potential of the Mexican dwarf wheats can be combined with prime hard grain quality characteristics.



Plant breeder Dr. J. Syme, of the University of Queensland (third from left), inspects a crop of Oxley wheat with wheat-grower Mr. T. Elliott (left), Mr. J. Harbison, Queensland Wheat Research Institute, and Mr. R. Rees, Department of Primary Industries.

The maize breeding programme based on Kairi Research Station continues to produce varieties which exhibit superior yielding ability and better resistance to the spectrum of maize diseases found on the Atherton Tableland. A new hybrid resistant to turicum leaf blight and Gibberella stalk

rot was grown commercially for the first time on the Atherton Tableland in the 1974-75 season, and a new head-smut resistant hybrid variety should be available commercially for the 1975-76 season.

The major research effort in the dry tropics of northern Queensland has, in the last few years, been the search for useful pasture legumes. Results are now reaching the stage where one accession, Verano Caribbean stylo (*Stylosanthes hamata*) has been released and several lines of *Stylosanthes scabra* are under consideration for release. This has been an intensive and highly co-operative search with C.S.I.R.O. Division of Tropical Agronomy, Department of Northern Australia, Western Australian Department of Agriculture and Queensland Department of Primary Industries all actively involved.

As well as these lines, a further group of promising lines is in the various stages of testing and it is hoped that, in a few years, a suite of species, not only of the genus *Stylosanthes* but also of other genera will be available to enable improved livestock production to be achieved in the far northern dry tropics zone to which present tropical and subtropical pasture species are not well adapted.

A new fresh market bean variety has been proposed for release to growers. It is an improved selection of the popular variety Redlands Pioneer. The new variety has the advantage of higher yields under cold conditions. It is expected to find a ready place in the fresh bean industry.

'Earlisweet', a new strawberry variety which produces high early yields of sweet fruit, will be seen on the market for the first time this season. It was developed at the Redlands Horticultural Research Station especially for Queensland conditions.

PLANT PEST AND DISEASE CONTROL

Locusts created problems again this year and were active over a much greater area of the State than in previous seasons. Crops threatened included wheat, safflower, grain sorghum, sunflowers, soybeans, navy beans, maize, French white millet, cotton, peanuts, tobacco and sugar-cane. Young plantings of almonds and pecan nuts were also attacked. The major locust species involved were the migratory locust, *Locusta migratoria* (L.), and the spur throated locust, *Austracris guttulosa* (Walker).



Protecting a macadamia nut plantation from locust attack.

In the spring of 1974, migratory locust populations developed in the Central Highlands and the Arcadia Valley. Infestations increased, spreading throughout the whole of the Central Highlands and also into the Taroom-Injune-Surat areas of the near south-western region. Towards the end of the financial year, some swarming was reported in the Condamine and Mundubbera areas. In the absence of fully effective control, the possibility of expansion of the problem into the major agricultural areas of south-eastern Queensland during 1975-76 is possible.

The Department, Local Government authorities, officers of other State Government Departments, industry representatives and farmers all co-operated in an extensive control programme to contain locust populations and minimize damage to agricultural crops. The locust control campaign operated in two phases: an 'off-cultivation' phase and an 'on-cultivation' phase.

The 'off-cultivation' phase was designed to control locusts in non-crop situations as a preventive measure to reduce locust spread and consequent damage to summer crops. The 'on-cultivation' phase was concerned with protecting summer crops and was administered by the Department through District Plague Grasshopper Destruction Committees constituted by Local Government authorities and advised by Local Department extension officers. During the year, the Queensland Government made a direct contribution of \$410 000 to the control programme.



An extensive swarm of migratory locusts near Emerald.

Rust of Noogoora burr (*Xanthium pungens*) was recorded by Departmental plant pathologists for the first time in Australia in February 1975. The causal fungus has been identified as *Puccinia xanthii* and is now well established in coastal districts of south-eastern Queensland. It has also been found on Bathurst burr (*X. spinosum*) and English marigold (*Calendula officinalis*). This rust has potential in the biological control of this important weed and its spread is being closely observed.

BOTANICAL SERVICES

Mention has already been made of contributions of the Botany Branch to various regional surveys.

A grant from the Australian Biological Resources Study Interim Council enabled work to begin on the computerized data bank of botanical information. This data bank will provide rapid access to information on the flora of Queensland which has been accumulated over the last 80 years. This is being continually requested for applied botanical and environmental studies. Already 58 000 entries have been stored and, at the present rate of progress, the project will be completed in 7 years instead of the 11 years originally calculated.

Thirteen species of plants were recorded as growing in Queensland for the first time. Seven of these were the first records for Australia.

Approximately 11 900 plant specimens were identified. In addition, 600 specimens collected by Botany Branch officers were identified. This represents an increase of approximately 30% on the previous year's total.

INNOVATIONS IN HORTICULTURE

Fruit Packaging.—Good packaging is essential to maintain fruit in top quality condition on its journey from the producer to the consumer. Packaging in most crops is a major production cost, and development work is aimed not only at maintaining quality for the consumer but also at minimizing the cost for the producer.

The returnable plastic crate has been a major development in this area, and is now in its final stage of commercial testing. The crate will be suitable for a range of crops, including apples, pears, bananas and citrus. As this is a new concept in fruit and vegetable packaging, it will require the co-operation of all sections of the industry if its full benefits are to be realized.

'Vibra-pack' is a new name in citrus marketing. It is a system of mechanized packing using volume filling and vibration settling. This has been found to give better protection to the product and it also reduces the costs of hand packing. After successful testing 'vibra-pack' has been adopted by a number of citrus packing houses and is being seen more and more on the market.

Apple Productivity.—The form of traditional apple trees could be a thing of the past if trends showing in current trials continue. The trees are being close planted and pruned to form a hedge row. Special rootstocks are used to promote fruiting in the early years and up to five times average yields are being obtained for both Delicious and Granny Smith varieties.

Fruit and Vegetable Quality.—The application of modern technology is helping to improve the quality of fruit and vegetables right up to use by the consumer.

Storage life is increased and fresh product quality is maintained by pre-cooling and marketing under refrigeration. Growers have been quick to extend the use of these techniques. Development of advanced systems, including forced air cooling, is continuing in co-operation with commercial producers.

Severe losses from damage and deterioration often occur in marketing fruit and vegetables. A new marketing extension service has been started to assist in overcoming some of these problems. It is the aim of the service to co-ordinate the use of the latest information available to reduce market losses and bring a top quality product to the consumer.

BUILDINGS AND EQUIPMENT

A new research centre, the J. Bjelke-Petersen Field Station, near Kingaroy, was officially opened in May by the Queensland Governor, His Excellency, Sir Colin Hannah. The centre includes regional offices, laboratories, glasshouse and ancillary buildings and equipment to service the rural community in the South Burnett region.

As part of the general improvement in accommodation and facilities in country areas, a new office and laboratory building at the Hermitage Research Station, near Warwick, was occupied in April.

STAFF TRAINING

In addition to continuing in-service refresher courses and workshops for research and extension officers, the Department provided many opportunities for individual officers to enhance their expertise and experience in various disciplines.

Officers of many branches attended technical conferences and short study courses both in Australia and overseas, and other officers made field studies of specific aspects of agricultural and livestock production.

Among the more important overseas studies concluded or in progress during the year were: simulation and modelling techniques by Dr. J. P. Ebersohn at the Grassland Research Institute and the Hill Farming Research Organization in Great Britain; pasture management in Great Britain and Holland by Mr. J. K. Teitzel under a Churchill Fellowship; pasture research by Mr. D. L. Lloyd on a Howard Memorial

Trust Award; lucerne as a pasture legume by Mr. D. G. Cameron under an Extension Services Grant; dairy science in New Zealand by Mr. G. G. Crittall; dairy food development in Great Britain and Western Europe by Mr. P. Meiklejohn.

Several officers are on full-time study leave and undertaking Ph.D. studies in Australian and overseas Universities. The well-established practice of encouraging advanced training of research officers has demonstrated its value in the highly sophisticated research methods already introduced into the Department's operations.

OVERSEAS ASSISTANCE

The Department continued to make officers available to advise on agricultural improvement in various tropical and subtropical countries.

Mr. G. B. McCormack, of the Division of Dairying, was a member of a team of four Australian experts who visited Afghanistan to report on the feasibility of establishing a dairy industry in and around Kabul. While on this assignment, Mr. McCormack had discussions in Pakistan with clients of the Department's A.I. Service.

The services of Mr. G. G. Crittall, also of the Division of Dairying, were made available to Gunn Rural Management for a feasibility study, in Saudi Arabia and United Arab Emirates, on establishing commercial dairy farms and associated processing plant in these countries.

Dr. L. L. Callow, of the Tick Fever Research Centre, has made several trips to South-east Asia and South America to advise on the control of tick fever diseases.

Mr. S. R. Walsh, of Agriculture Branch, visited Fiji to advise on sorghum production, and Mr. J. K. Teitzel, also of Agriculture Branch, spent a period in Malaysia as a consultant to C.S.I.R.O.

Messrs. E. O. Burns and E. R. G. White were members of the Queensland Trade Mission, led by the Minister for Primary Industries, which visited the Middle East and Far Eastern countries in February and March. Mr. White also assisted the Minister on a separate sugar industry mission to Japan, Korea, Malaysia and Singapore.

STAFF LOSSES

Staff retirements during the year included Messrs. G. R. Sigley, District Adviser and T. W. Smith, Adviser, Dairy Field Services Branch; and Mr. E. T. Hockings, Senior Information Officer, Information and Extension Training Branch.

Australia lost one of its most experienced sorghum breeders when Mr. R. F. Moore died in August 1974. Over a period of 19 years, Mr. Moore welded together a highly competent breeding team which gave Queensland hybrid grain and forage sorghums and lines resistant to the Johnson grass strain of sugarcane mosaic virus.



The Department's research and extension effort has helped turn Queensland from a soybean-importing State into an exporter. This fine crop of rain-grown soybeans is on Mr. Brian B. Bate's property in the West Moreton.

II. Livestock Research and Extension

This section of the report deals with beef cattle, sheep, pigs, poultry and bees. These livestock industries are given particular services by special branches, while several other branches also serve them.

Beef Cattle Husbandry Branch carries out field investigations and gives extension and other services in breeding, feeding and herd management. It operates a cattle field research station 'Swan's Lagoon' on the Upper Burdekin and is involved in beef cattle trials on several other research stations.

Sheep and Wool Branch conducts field investigations on private properties and conducts a fleece testing service for stud and commercial flock owners. It provides an extension service to commercial producers on immediate problems and all aspects of production.

Pig and Poultry Branch deals mainly with supplying an extension service to these two industries but also undertakes some experiments and disease control services.

The three branches of the Animal Research Institute—Biochemistry, Husbandry Research and Pathology—provide research and diagnostic services for all branches of animal industry and conduct pig and poultry testing services. In addition, Husbandry Research Branch is engaged in sheep research at Toorak Sheep Field Research Station near Julia Creek. Veterinary Services Branch has a major responsibility for the health of Queensland's livestock and for brands administration.

Slaughtering and Meat Inspection Branch is concerned with hygiene in producing meat and meat products, including pet foods, and with classifying and grading carcasses.

Various branches of the Divisions of Dairying, Marketing and Plant Industry supply services that have a bearing on animal production. Entomology Branch provides services to beekeepers.

BEEF CATTLE

RESEARCH ACTIVITIES. 'Swan's Lagoon' Cattle Field Research Station.—A well-attended field day was held at 'Swan's Lagoon' in September last year, with an estimated attendance of more than 300 visitors. The theme for the day was a review of the work at the station with an indication of future research programmes. Visitors were welcomed in the morning by the Minister for Primary Industries, the Hon. V. B. Sullivan, M.L.A.

The research programme at 'Swan's Lagoon' is directed at improving the efficiency of reproduction and growth of beef cattle. This has entailed studies of supplementary feeding, pasture improvement and management, breeder management, breeding diseases, breed comparisons, tick control and cattle behaviour. Last year's results in some of the trials are described below.

Sulphur and Molasses.—Both grazing and pen experiments were undertaken to investigate further the role of sulphur when fed with urea, and to find out if it is necessary to add sulphur when feeding less than 240 g of molasses per head per day.

A pen study conducted during the year suggested that 60 g per day may be sufficient molasses to feed with 60 g urea as a supplement to low quality pasture. Responses to adding sulphur to 60 g, 120 g and 240 g of urea were inconsistent. In a later metabolism cage study, the greatest improvement in performance occurred when sulphur was added to 60 g urea alone.

However, under grazing conditions, liveweight gains from April 1974 to April 1975 were highest when 3 g sulphur were added to the standard 240 g molasses-60 g urea mix. Gains were reduced when the molasses level was lowered to 120 g per head per day, but this effect of the lower level of molasses occurred immediately following the first rains in spring, and not during the dry period.

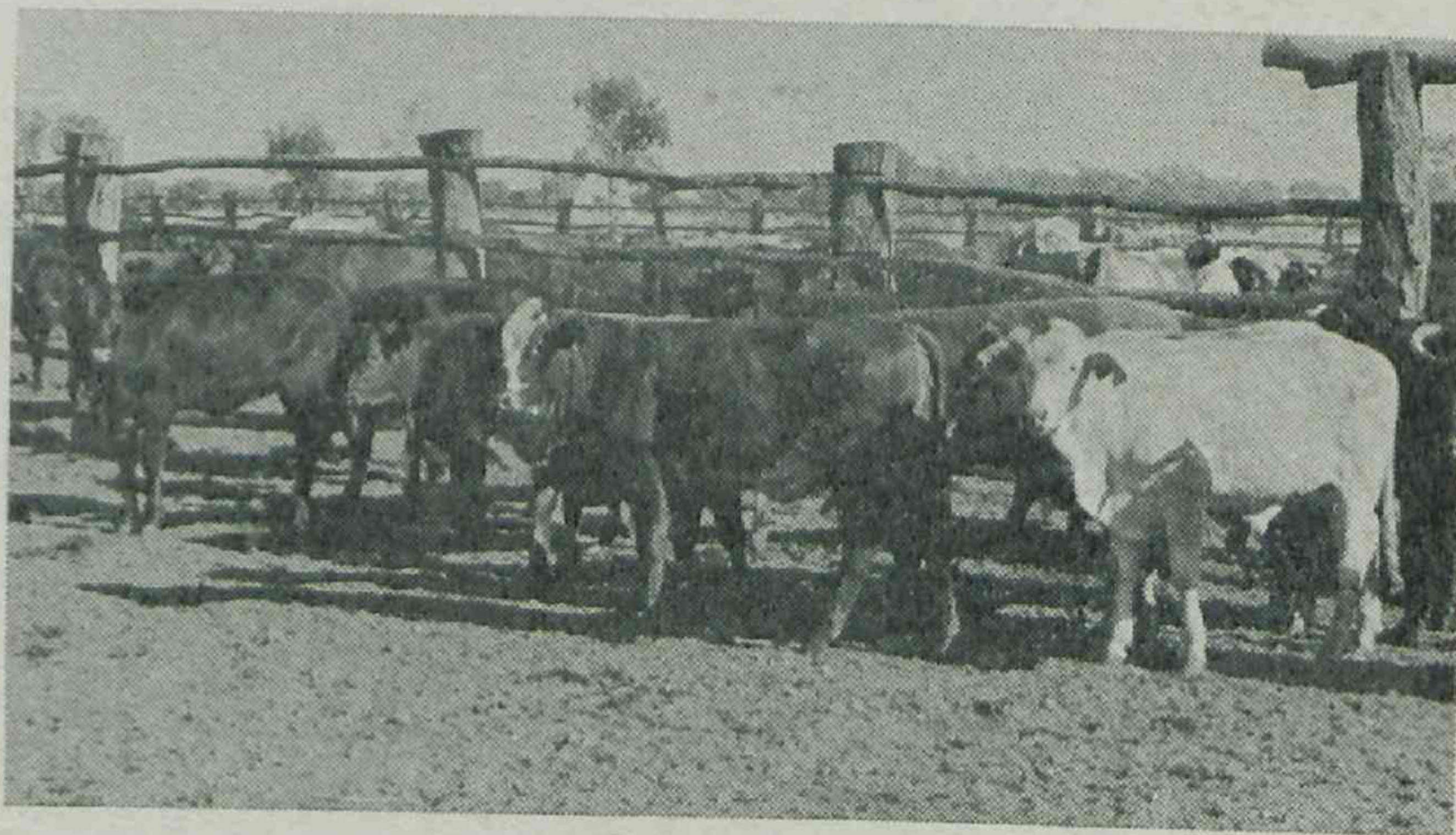
The inclusion of extra sulphur in urea-molasses supplements consistently improved animal performance, and the next step is to determine the effects of different sources of sulphur and the most economic source. The question of reducing molasses levels, and thus freight and feeding costs, has still to be resolved.

Molasses.—An examination of the value of molasses as a source of supplementary energy continued. Before the August rain, crossbred steers receiving *ad lib.* molasses gained 7 kg less than unsupplemented controls. From August to mid November, supplemented steers gained 56.1 kg, twice as much as the unsupplemented steers. During the wet season,

both treatments made identical progress, indicating a complete lack of response to molasses feeding on native pastures at that time.

In previous years, the response to molasses feeding occurred before rather than after the early storms. The 1974-75 result suggests that steers selectively grazed the available green pick, thereby inducing an energy deficiency. Molasses intake varied from 4 to 5 kg per day when weight gains were highest to 1 kg and as low as 0.65 kg per day during the wet season.

Level of Urea.—The early rains in September reduced the period of response to urea-molasses supplements. In 1974, the highest response, 11 to 12 kg, was to 30 g urea rather than 60 g or 90 g urea a day. The response, though small, was retained, there being very little compensatory gain. These results highlight the difficulties of forecasting responses to any level of urea supplementation and the extent of subsequent compensation. At these response levels, urea-molasses feeding is not economic.



Early-weaned beef steers almost ready for market. Early weaning increases reproductive efficiency in beef cattle.

Breeds.—Annual liveweight increments of 168 to 184 kg per head with Brahman cross steers on native pastures stocked at a beast to 2.7 ha are a particularly encouraging indication

of the potential production from northern spear grass pastures. By comparison, Shorthorn steers on the same pastures gained 148 to 156 kg, which is higher than in previous years.

The grading-up programme to pure Sahiwal began in 1968. The performance of the F1 Sahiwal x Shorthorn and F1 Brahman x Shorthorn calves have been comparable, with birth weights of 31 to 34 kg, weaning weights of 156 to 170 kg, corrected to 180 days, and pre-weaning gains of 0.68 to 0.76 kg per day. Liveweight performance after weaning has also been comparable, with 0.40 to 0.48 kg gains per day of age to slaughter.

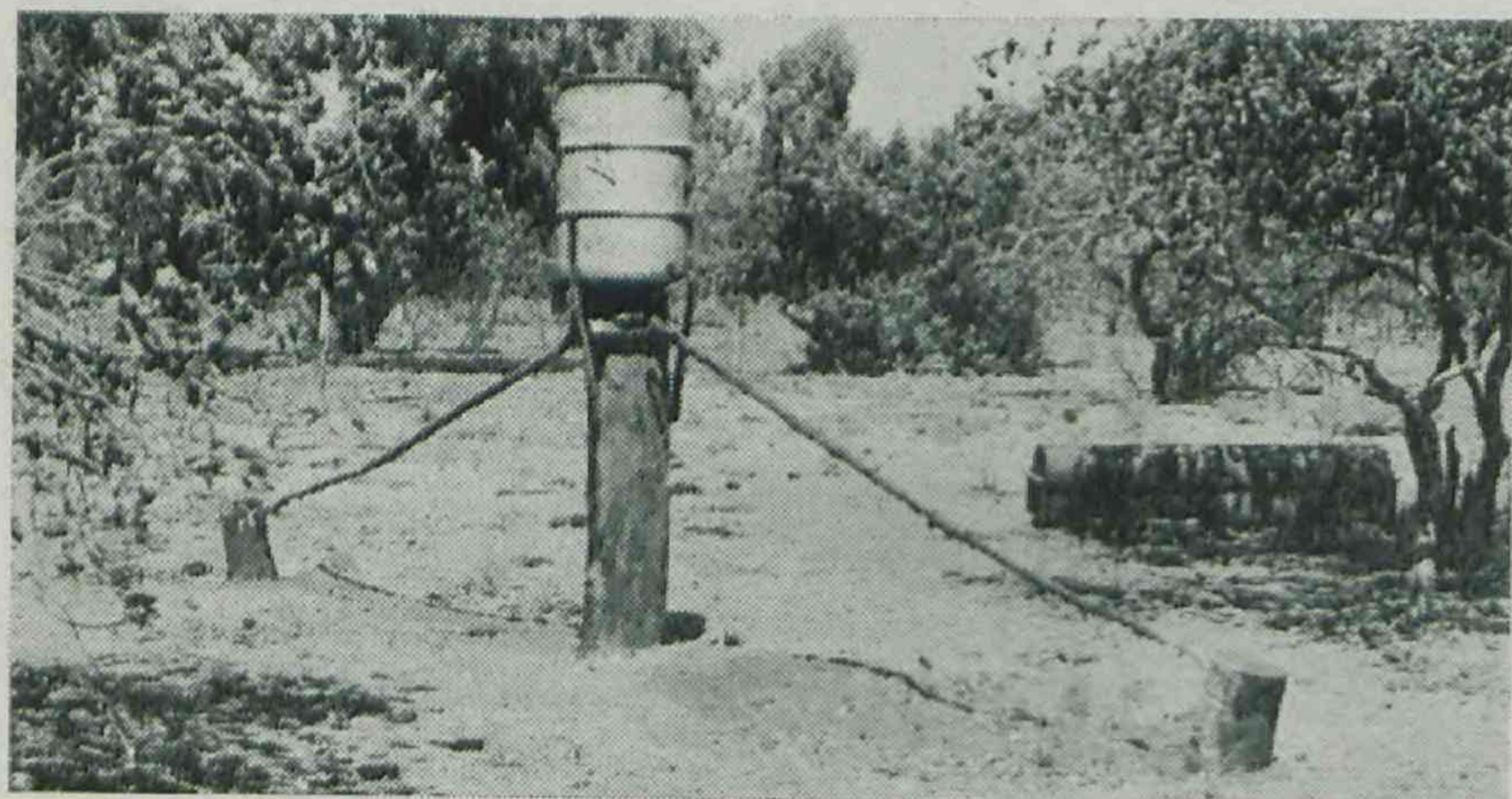
Dressing percentage has consistently favoured the Sahiwal by up to 2.5%, always giving the Sahiwal the heavier carcass. Bone-out data are available for only one year, with yields of 73.8% and 72.6% salable meat for the Brahman and Sahiwal crosses, respectively. The Sahiwal thus seems an acceptable alternative to the Brahman for crossbreeding, at least in the first cross.

A study of the incidence of infectious bovine keratoconjunctivitis (IBK) in Shorthorn and Brahman cross cattle demonstrated a significantly higher incidence in Shorthorns. This applied in both summer and winter in all classes of cattle, except calves.

In winter, the difference between the calves of the two breeds was not statistically significant, although 3.5% of Shorthorn calves were affected compared with only 1.4% of the Brahman crosses. In summer, as many as 50.1% of Shorthorn breeders were affected compared with only 7.5% of Brahman crosses. Brahman crosses were much less susceptible to severe IBK than Shorthorns, particularly in cows and calves. Incidence tended to increase with age in Shorthorn cattle.

Further progress was made in developing two breeds of 50% and 75% Brahman content. The herds are stabilized and numbers are being built up. The Brahman and Africander stud herds have been discontinued, with 'Toorak' Sheep Field Research Station becoming the major centre for the Department's Africander breeding programme.

New Trials.—During the year several new research programmes were begun. Integrated management of varying areas of Townsville stylo and native pastures will be studied. The effects of the cattle tick on the growth and reproductive performance of female Brahman cross cattle and their progeny will be measured, as it is considered that frequency and costs of dipping could be reduced without any loss of production in these cattle. Dry lick supplements, based on urea and salt, will be compared with liquid urea-molasses supplements in another new experiment. Greatly increased labour and freight costs have meant a move by the industry towards dry lick supplementation.



Two views of a self-oiling back-rubber. This simple device is sturdy and reliable and requires refilling only once every 6 to 8 weeks. It controls buffalo flies, which are troublesome on all northern properties. This type of back-rubber was designed by Mr. L. Stalk, manager of 'Escott', Burketown.

Brigalow Research Station.—The main project on the station was the Simmental-Hereford comparison. Also included in the programme was research on dystocia, heifer management, supplementation and production on improved pasture and crops.

Simmental Crossbreds.—Evaluation of the Simmental breed under central Queensland conditions is now in its third year. After two calvings, 210 Simmental x Hereford F1 calves have been born. The first F1 Simmental heifers are scheduled to be mated at 2 years of age in October 1975 while the first steers should be finished for slaughter at this time. The performance of the Simmental crosses is being compared with Herefords run under the same conditions.

Of the Herefords mated to Simmental bulls, 13.2% had calving difficulties compared with only 3.5% for those mated to Hereford bulls. The number of stillbirths was also higher for the Simmentals (10.7% against 7.0%). The incidence of both calving difficulties and stillbirths for Simmental-sired calves was the same as in 1973.

Dystocia incidence was higher in heifers than in mature cows. Only 11.8% of mature cows had calving difficulties compared with 33.4% of the heifers mated to Simmentals as yearlings.

Simmental-sired calves were again heavier at birth, 35.6 kg against 30.5 kg. Pre-weaning daily gains favoured the Simmental cross calves to give them a 200-day weight of 158 kg compared with 140 kg for the Herefords. Weights were similar in 1973-74 at 155 and 140 kg respectively. Post-weaning gains over a 306-day period also favoured the Simmental cross steers (0.46 kg against 0.4 kg per day). This gave the Simmental cross steers a 37.5 kg weight advantage at a mean age of 562 days (347.2 kg against 309.7 kg).

Dystocia.—Mating heifers as yearlings is practised in southern Australia without detrimental effects. It is increasingly being considered by some Queensland beef producers. When Hereford heifers that had been weaned onto buffel grass pastures were mated as yearlings, they did not have any calving difficulties and no calves were stillborn. By comparison, 18.2% of heifers weaned on a forage sorghum crop for the winter had difficulty in calving and 31.8% of calves were stillborn. Furthermore, 13.6% of this group died at calving. There were no deaths among the heifers on grass.

In the previous year, 1973-74, the incidence of dystocia was also highest with the use of crop. The practice of mating yearling heifers off crop does not seem to be worth while because of the substantial losses at calving. Heifers mated at 2 years of age had a 90% calving rate, with 3.7% dystocia and 3.7% stillbirth incidence despite a higher mean birth-weight of 31.2 kg. Calves of yearling mated heifers averaged 27.8 kg.

Supplements.—The use of NPN supplements for improving the performance of weaners during their first winter on improved pasture has been measured over the past 3 years. Between May and September 1974, weaner steers grazing buffel grass and with free access to urea-molasses fed at 110 g urea plus 900 g molasses a day maintained weight. Steers fed 57 g urea and 450 g molasses gained 1 kg, while steers with access to only 450 g molasses a day and no urea lost 12 kg (0.09 kg per day). Unsupplemented steers lost 3 kg.

There was no response to urea feeding until frosting hayed off pastures in mid July. Details of any compensatory growth are not yet available. In the previous year, liveweight responses to urea-molasses supplementation on buffel grass pastures were inconsistent, averaging 10 kg. Both winters have been very mild and, at least in such seasons, urea-molasses supplementation seems to have very limited use on improved brigalow pastures, particularly for growing stock.

'Brian Pastures' Pasture Research Station.—Research on 'Brian Pastures' has been directed at ways of offsetting the drop in production per animal that accompanies an increase in stocking rate. Successfully increasing the stocking rate is one way of increasing the productivity from any unit area of pasture. Mature Hereford cows grazing native spear grass pastures at a beast to 2.4 ha and 1.6 ha produced fewer calves with lighter weaning weights than cows grazing at the lower stocking rates of a beast to 3.6 ha. Weaning weights of their calves were 162.0 kg, 155.5 kg and 215.0 kg respectively.

The low stocking rate cows (1.3.2 ha) also lost 23 kg less weight from precalving to the completion of mating and had the shortest calving to conception intervals. For the high, medium and low stocking rates, their calving to conception intervals were 82 days, 97 days and 75 days, and subsequent pregnancy rates 60%, 58% and 85% respectively. At all three stocking rates, a molasses supplement failed to improve pregnancy rates or weaning weights.

The effect of supplementing weaner heifers with urea-molasses was also studied. Between May and November 1974, supplementation reduced overall liveweight losses by

11 kg (26 kg weight loss against 15 kg loss). The unsupplemented heifers then weighed 167 kg and the supplemented ones 184 kg. This compares with a 9 kg difference in 1973, when the winter was much milder. Three months after feeding, 9.5 kg or 86.3% of the liveweight advantage due to supplementation was retained.

Coolum Research Station.—For producers close to sugar mills along the coast of Queensland, molasses is relatively cheap and in these areas, it could possibly be substituted for grain for finishing cattle. In an attempt to improve rate of gain and to finish cattle grazing pangola grass at high stocking rates, steers given molasses *ad lib.*, 2.2 kg per day, and no molasses, were compared at Coolum Research Station.

From mid December 1974 to the end of March 1975, daily gains were 0.94, 0.87 and 0.69 kg per day for the three groups. Flooding during April then caused weight losses on all treatments, so that overall gains up to May were only 0.65, 0.51 and 0.35 kg per day respectively. Rib fat cover was 7.7, 4.9 and 3.4 mm for the three groups.

A major influence of high level molasses feeding was on carcass fatness. The unsupplemented steers were unfinished at the time of slaughter, whereas those fed *ad lib.* molasses were considered to be in marketable condition.

Kairi Research Station.—At this station, when steers grazing glycine-green panic pastures on basaltic soils were fed *ad lib.* molasses, their mean liveweight gains increased from 166 kg to 230 kg a year, carcass weights from 210.7 kg to 257 kg and rib fat cover from 4.8 mm to 6.8 mm.

On granitic soils with *ad lib.* molasses supplementation, the mean liveweight gain was 222.3 kg and carcass weight 248.7 kg with 5.7 mm fat cover. Without molasses feeding, the performance of steers on basaltic soils was far superior to that on granitic soils at all stocking rates, 3.0, 3.75 and 4.5 steers per hectare. Furthermore, on the granitic soils lack of feed meant that pastures had to be destocked at 3.75 and 4.5 steers per hectare from October and September 1974 respectively to January 1975.

Liveweight gains, slaughter liveweight and carcass weights all decreased with increasing stocking rate, regardless of whether or not animals were fed molasses. *Ad lib.* molasses supplementation meant that the weight of carcass turned off per hectare increased from 832 kg to 1107 kg per hectare on basaltic soils, and reached 1040 kg per hectare on the granitic soils, with 4.5 steers per hectare. Nevertheless, at current beef prices, *ad lib.* molasses feeding would not have been economic.

Again at Kairi Research Station, Friesian steers grazing glycine-green panic pastures at 3.7 steers per hectare grew faster than Brahman cross and Shorthorn steers. As a result, the Friesians were first to reach the slaughter liveweight of 600 kg in late April, at which time the Brahman cross steers weighed 550 kg and the Shorthorns 532 kg.

Compared with the steers slaughtered at approximately 500 kg, the heavier Friesians had a higher dressing percentage (55.2% against 51.6%) and more fat (6.2 mm against 2.0 mm). At 500 kg liveweight, the Friesians had only 2.0 mm fat cover compared with 3.0 mm and 4.2 mm for the Shorthorn and Brahman cross steers, respectively. The Friesians also had the lowest dressing percentage.

Parada Research Station.—Most research on the beef production potential of heavily fertilized pangola grass pastures grown under irrigation has been with fattening steers. At Parada Research Station, the performance of Brahman cross cows and calves is being studied. The effects of stocking rate are now clear. With 500 kg N per hectare, calving rates for 1973–74 fell from 100.0% to 80.0% with an increase from 4.94 to 8.2 breeders per hectare. The decrease was even greater when stocking rates were raised to 6.6 and 9.9 breeders per hectare, falling from 91.7% to 50.0% despite the application of 670 kg N per hectare. There were corresponding increases in the interval between calvings with increasing stocking rate.

Calf weaning weights and their carcass weights, when slaughtered at a mean age of 290 days as vealers, decreased with increasing stocking rate. With 500 kg N per hectare, carcass weights dropped from 116 kg to 91 kg, and with 670 kg N per hectare from 107 kg to 81 kg. In 1974, the highest weight of carcass turned off per hectare was 755 kg with 670 kg N and 9.9 breeders per hectare. The lowest was 509 kg with 500 kg N and only 4.94 breeders per hectare.

Millaroo Research Station.—At this station, the commercial production potential of irrigated pastures with 225 to 670 kg N fertilizer per hectare is being studied. Stocking rates increase from 4 to 13 steers per hectare, but will not reach these levels until the third year. This project began in October 1974.

Field Investigations

Field investigations continue to play an important role in the overall research programme. These investigations complement the more detailed experiments on research stations, investigate local problems and demonstrate ways of improving productivity.

A feature of the field research programme in recent years has been the commencement of large-scale breed evaluation projects, particularly in central Queensland. This trend continued in 1974–75. One new project will evaluate the productive and reproductive performance of Africanders, Hereford and Brahman cattle on the central wet coast. Another will compare the Africander and Brahman x Shorthorn in the dry tropics of north-west Queensland. The performance of Brahman cross cows and calves on irrigated pangola grass pastures, used with native pastures, will be measured on a property near Mareeba.

Since the semen import ban was lifted in 1969, semen from highly-regarded Hereford bulls from overseas became available. The progeny of one such English bull is being compared with the progeny of two Queensland stud bulls through the National Beef Recording Scheme.

On a property in the Dululu district, Brahman x Hereford cows mated to Brahman, Braford and Belmont Red bulls were compared. Pregnancy rates were similar (73 to 75%) for all breeds.

Corrected pre-weaning daily gains varied significantly with both breed and sex of the calf. Pre-weaning gains for the Brahman, Belmont Red and Braford-sired calves were 0.99, 0.96 and 0.96 kg per day for steers and 0.84, 0.89 and 0.85 kg per day for heifers, respectively. The Braford-sired steers were the slowest growers, but the heifers were the fastest to weaning. At 316 days of age, steers of all breeds were gaining faster than heifers, with the Braford-sired ahead of the Brahman and Belmont Red. All cattle grazed native pastures on forest country.

Charolais cross steers, the progeny of F1 Charolais x British breed bulls mated to F1 Charolais x Brahman cows, were compared with Brahman cross steers on a property south of Rockhampton. The Charolais crosses gained 0.70 kg per day before weaning and 0.59 kg per day afterwards, and weighed 359.0 kg 10 months after weaning. By comparison, the high grade Brahman steers gained 0.60 and 0.53 kg per day respectively, and finally reached 339.8 kg.

The performance of Droughtmasters was monitored on a property on the Mitchell grass downs country south-east of Richmond. The high pregnancy rates for Droughtmaster breeders in 1973–74 confirmed the earlier suggestion that this class of country will, with good management, support high reproductive levels, especially in first calf heifers.

With a 3-month control mating period from mid February to late May, pregnancy rates were 94.8% for maiden heifers, 92.3% for first calf heifers and 91.7% for mature cows. The herd average was 92.2%. These rates were higher than in 1972–73, when the herd average was 88.2%. Furthermore, 92.3% of the lactating breeders were again pregnant in July 1974, compared with 77.8% in July 1973. With the exception of lactating pregnant cows at the end of the 1973 dry season, all breeders maintained body condition at forward store or better.

On the same property, from July to October 1973, 16 out of 589 cows (2.7%) either aborted or failed to rear a calf. This, with the presence of positive reactors to *Leptospira hardjo*, initiated a vaccination programme in October 1973. Half the herd was vaccinated once against *L. hardjo*. To July 1974, the incidence of foetal, neo-natal and post-natal calf losses had been reduced from 19.5% to 11.8% by vaccination.

The response to vaccination was most marked in maiden heifers, falling from 24.4% to 13.8%. In an effort to reduce losses further, the vaccination programme will continue, but using a bivalent *L. hardjo-L. pomona* vaccine. No positive reactors to brucellosis have been detected to date in the herd. All cows are routinely vaccinated against vibriosis.

The effect of giving breeders a phosphorus supplement has also been studied on this property.

Pastoral conditions from October 1973 to August 1974 were exceptionally good and the availability of surface water meant a low phosphorus supplement intake of 3.6 g P per day. However, final pregnancy rates continued to favour the supplemented breeders by 2 to 5%. The 1974 pregnancy rates were 94% for supplemented mature cows and 75% for first calf cows, compared with 91% and 73% respectively for unsupplemented breeders.

In both treatments, most of the non-pregnant heifers were animals that had been mated, but failed to conceive in 1973. More supplemented cows (89 against 75%) conceived within the first 4 months of the 6-month control mating period which began in January 1974. The high percentage is

attributed to the very early seasonal break in October 1973, the excellent summer pastoral conditions and resultant improved body condition of all breeders.

The actual weaning weight of 194 kg for calves of the supplemented breeders was 9 kg heavier than that of the unsupplemented calves, probably reflecting their earlier mean calving date. Foetal and calf losses to weaning at 11% for the supplemented group were similar to those of 1973 (12%), whereas in the unsupplemented animals losses were unexpectedly low at 8% (24% in 1973).

As a result of this work and of a phosphorus survey in the Charleville district, a survey based on the Balonne shire at St. George began in October 1974. More frequent monitoring of faecal phosphorus levels than was possible in the Charleville survey should demonstrate whether or not peak wet season levels are a reliable indication of phosphorus sufficiency or deficiency.

A phosphorus survey is also being conducted in the Bowen district on areas with unfertilized and fertilized Townsville stylo pastures, Indian couch pastures and cleared brigalow sown with buffel grass.

In the Maranoa district, 1 000 producers were asked, in a postal survey, to give information on dystocia in their herds. The 500 replies revealed that 73% of producers considered dystocia a problem, with 14% considering it a major problem.

In 1973, the incidence in maiden heifers was 12% for all herds, being highest in Hereford and Poll Hereford herds, though some dystocia was recorded in herds of all the major breeds. Following the postal survey, 100 selected producers were interviewed to see what correlation there might be between the incidence of dystocia and breeding, management, type of herd and other factors. The results have not yet been analysed.

Following the dystocia survey, an experiment was begun to assess the usefulness of the Shaw pelvic measurement as a means of predicting likely dystocia losses. It will be conducted on four properties in the Roma district, three of which are known to have a dystocia problem. In addition, an examination of the relative importance of genetic origin and environmental location on the occurrence of dystocia was begun by arranging a reciprocal movement of heifers between high and low incidence herds in different localities.

Field staff have also co-operated with Slaughtering and Meat Inspection Branch in bruising trials that have demonstrated the detrimental effect of horns.

Rocklea Animal Husbandry Research Farm

Work at Rocklea complemented field research by examining in detail particular problems relating to phosphorus supplementation, the substitution effect in grain supplementation, feedlotting and carcass characteristics of Simmental cross steers.

Continuing pen experiments by the Husbandry Research Branch have failed to explain why crude phosphoric acid fed as a phosphorus supplement in a molasses drum roller lick to grazing weaner cattle in north Queensland gave a negative liveweight response compared with unsupplemented weaners.

Other research on phosphorus was concerned with a method of diagnosing deficiency and the effect of phosphorus deficiency in pregnant cattle.

Rib bone biopsy was tested as a diagnostic aid. Repeat sampling 2 months apart offers a sensitive method of detecting changes in skeletal mineralization due to alteration in dietary phosphorus.

Different groups of pregnant cows were fed either a phosphorus-deficient or phosphorus-adequate diet during the major part of pregnancy. Feed intake was not affected by phosphorus intake during pregnancy but, during lactation, cows on the low phosphorus diet had a lower feed intake than the control cows. Calf birth weights were not affected by the treatments nor were milk yield and milk composition. Uterine involution was similar for both treatments. Post partum anoestrus may have been slightly prolonged in cows on the deficient diet.

In the field, growth responses to supplementary grain by grazing cattle are often small due to the extent to which the grain substitutes for the pasture. In yard feeding experiments, substitution of roughage by grain varied from 15% if the roughage was of good quality to 90% if the roughage was of poor quality. The feed conversion efficiency of the grain varied from 4 to 9 indicating utilization equivalent to that obtained by intensive high grain finishing diets. Molasses instead of grain has been evaluated as an energy source for roughage-fed cattle. Performance of the steers was poorer on both good and poor quality roughage even when the levels of molasses intake were high.

Whatever the future may hold for the feedlot industry, a need exists to explore the use of cheaper sources of high-energy feedstuffs. As bran and pollard are available in reasonable supplies and are cheaper than grain, the value of these by-products was tested in all-concentrate diets.

Local-trade type Hereford steers were compared in feeding trials with heavier-type Hereford x Santa Gertrudis bullocks suitable for beef for export to Japan. Diets comprised either 10, 30 or 50% of either bran or pollard and 85, 65 or 45% respectively of rolled sorghum grain. All diets contained 3% tallow and 2% minerals and trace elements. The steers were killed at 420 kg liveweight and the bullocks at 550 kg.

With the exception of the diet containing 50% bran, the liveweight gains and food conversion ratios were comparable with and, in food conversion, superior to that obtained in previous experiments using 90% grain diets. Thus, about half the grain component of feedlot diets can be substituted by these mill by-products without sacrificing performance.

The bullocks had a higher rate of gain than the steers without a marked increase in feed conversion. Pollard was slightly superior to bran. There was no obvious difference in carcass parameters within breeds because of diet. Despite their heavier weight (550 kg) the Hereford x Santa Gertrudis bullocks were leaner and higher yielding than the Hereford steers (420 kg).

Carcass parameters of Simmental cross steers and Hereford steers were compared. The former had less fat cover and a higher yield of salable meat at similar weights.

To assist in removing impediments to marketing beef, the Biochemistry Branch has continued its investigation on pesticide residues. A measure of the potential of old wheatlands as a source of HCB has been investigated by serial biopsies on animals grazing fallowed cultivations. The practical residue potential of ethion used as an acaricide has been investigated in drafts of cattle with known but differing dipping history.

Extension

By the beginning of 1973, extension staff had put forward a wide variety of projects for incorporation in district programmes. Many of these had to be abandoned in the face of falling prices, particularly those relating to supplementary feeding or intensification through improved pastures. However, there was no let-up in the programmes designed to make people aware of the principles of objective selection of breeding stock. Projects to foster rural science discussion groups have also been maintained and, contrary to expectations, these have continued to attract support.

While cattlemen's thoughts are preoccupied with beef prices, many still show an interest in technical and management problems, even if they have had to suspend some desirable operations through laying off stockmen. However, the level of inquiries relating to management has fallen to a trickle in most offices.

Beef schools and field days have been well attended. All of these have given attention to ways of cutting costs. Such occasions have also been used to explain the reasons why the market has collapsed and why the long term prospects for beef are still good.

Numerous demonstrations of spaying have been organized. On the Downs, small groups of 20 to 30 people have had spaying demonstrated and as a rule three to five of those attending have been given detailed instruction and practice. At a field day at Charters Towers, cattle owners were required to bring a number of their own animals on which to practise. The instructors were local cattlemen. The response was extremely good and the exercise was repeated with the same success at Bowen. A booklet, 'The Way to Spay' was printed for distribution to all offices. Professional spayers often charge only \$1 a head, but the reason for this 'teach yourself to spay' campaign was at least partly because of a lack of sufficient spayers.

Spaying is being advocated as a management tool to allow surplus or over-age breeders to fatten without the risk of unwanted pregnancies. However, the Department has vigorously countered advice, emanating from some industry sources, that all bulls be pulled out and that breeding be suspended entirely until conditions improve. To some extent, this is what is happening in Europe and the U.S.A., and the last thing that Australian cattlemen should do is to get into a cycle of production that is synchronized with these countries.

The opportunity was also taken to start an extension campaign on bruising and dehorning. It is being argued that while the loss of \$2 to \$3 a head may not appear significant when bullocks fetch \$200 a head, it is much more important when the total return is often less than \$50. A start has been made on compiling a script for a film

on preventing bruising. Three meatworks in central Queensland have shown an interest in trying to measure the total cost of bruising caused by horns with a view to setting a premium for polled cattle.

Dehorning field days have been held in several districts. After one such field day, those attending were asked to fill in a questionnaire. The co-operation was good. An interesting result was that many of those attending already practised dehorning but still found the day instructive and useful.

Branch staff participated in a field day held on the National Cattle Breeding Station 'Belmont'. More than 800 people were there. Most of the day's proceedings dealt with the work of C.S.I.R.O. staff on the station but, at the end of the day, Mr. T. H. Rudder, Extension Officer, spoke on the application of their findings to the industry. Co-operation between branch staff and C.S.I.R.O. officers, in both research and extension, has been a feature at Rockhampton.

Last July, a well-attended field day was held at Biloela in a joint venture with 'Amagrazee'. This was a 'hoof and hook' feature, with the emphasis on producing, and being able to recognize the type of carcass that the market needs.

A farm management school at Roma in June was well supported despite the increasing depression among producers. A one-day beef school at Stanthorpe was also well attended.

Two films made by the A.B.C. at 'Swan's Lagoon' and Charters Towers, on the suggestion of branch staff, were borrowed and copied with their permission. These have provided two useful extension films at little cost to ourselves. A start has been made on filming a story based on the work being done at 'Swan's Lagoon' Cattle Field Research Station. The Department purchased and has had copied an instructive series of colour transparencies. These depict the way to select animals with a high meat and low fat yield.

Special branch publications produced during the year included a booklet on 'Swan's Lagoon', a technical bulletin on phosphorus supplementation, a booklet titled 'Performance Recording and the Stock Agent', and 'The Beef Cattle Industry in Queensland'. Technical bulletins on artificial breeding and intensive feeding have been written and are awaiting printing. Ten articles were published in the *Queensland Agricultural Journal*. Progress on the compilation of 'A Manual of Beef Production for Queensland' has been satisfactory.

There are divided opinions on the value of the press for extension purposes. However, some notable contributions to local papers would, one hopes, have had some impact. The *Northern Miner* has run a full page 'Man on the Land' feature every week for which the beef cattle adviser can claim much of the credit. A special two-page feature on beef cattle husbandry was run by the *Balonne Beacon* organized by the local officer. *Queensland Country Life* ran a full page on 'Swan's Lagoon', before the field day in September.

It is generally thought that these feature pages have more impact than a single article or news item: but compilation is a major and time-consuming operation.

Performance Recording

Enrolments in the National Beef Recording Scheme have continued to increase and at present some 260 herds throughout Australia are directly enrolled. Another 1 000 herds are being handled in the Simmental and Limousin Societies' registration and recording schemes.

Queensland has 61 herds enrolled in the N.B.R.S. Outside of this, many other herds are practising performance recording in various forms. While the number of herds enrolled in the National Scheme is not large, there is a new awareness of the need for performance recording and enrolments are expected to increase significantly during the next 12 months.

At present, performance recording herds do not command a premium for recorded stock sold. The immediate gains for these herds are an improvement in the evaluation of replacement stock and a revealing evaluation of sires in use both on the property and available through A.I.

In the medium and long term, the proportion of herds recording will increase and bull buyers will demand objective evaluations. Both influences will accelerate the production of superior stock and disseminate these throughout the whole industry.

To select sires for the Artificial Insemination Centre at Wacol, 18 Brahman bulls were performance tested at the Animal Husbandry Research Farm Rocklea. Over the liveweight range 250 to 350 kg, the average rate of liveweight gain was 0.87 kg per day and the average feed conversion efficiency was 8.32. The two best bulls averaged a liveweight gain of 1.16 kg per day with a feed efficiency ratio of 6.88. Both bulls had the breed resistance for tick infestation.

Pests and Diseases

Tuberculosis and Brucellosis.—The slump in the beef industry has reduced the volume of tuberculin testing of beef cattle by approximately 30%. However, most of the larger pastoral companies in the more remote areas have maintained a tuberculin testing programme under the National Tuberculosis Eradication Scheme, although some modifications have been necessary.

Another reason for the drop in the number of cattle tested, besides the beef slump, is the near completion of area surveying in the protected areas of the Brisbane, Toowoomba, Roma and Maryborough Divisions.

However, fewer than 50% of herds have been surveyed in the Rockhampton Division, where the bulk of testing was carried out this year.

Of the tuberculosis-infected herds which have undertaken eradication programmes, the prevalence level has been reduced from about the 5% level to less than 1% after about 2 years of testing on the basis of retesting at intervals of approximately 6 months. In many herds, the level had dropped below 0.5%. At this level, some owners in the remote areas are reluctant to make cattle available for testing at regular short intervals.

Recent trials using P.P.D. (bovine) tuberculin indicate that there is little prospect of a change of tuberculin having any appreciable benefit in identifying the anergic infected animal in groups of breeding cattle where infection is well established. The main advantage for P.P.D. tuberculin is that it appears to produce fewer reactors with no visible lesions.

Brucellosis surveying continued at a high level in the Northern Brucellosis Controlled-Movement Area. Consideration is being given to declaring the area as provisionally free. Movement controls within and into the area are operating satisfactorily. An early southward extension of this area is planned to incorporate the remaining portion of the Townsville protected area which includes the southern portion of the Dalrymple Shire, Ayr and Bowen Shires.

Brucellosis surveying in other areas has continued on three fronts: field survey, works monitoring, and dairy herd monitoring by milk ring testing.

Dairy herds positive to the bulk milk ring test have been further investigated in the Brisbane, Maryborough and Toowoomba Divisions and vaccination programmes have been reinforced or altered as necessary.

In most Divisions, dairy herds are under regular milk ring test monitoring, and in many areas, the tests are undertaken quarterly.

This programme would not be possible without the close co-operation of the staff of the Field Services Branch of the Division of Dairying. Dairy advisers and technicians employed at factories collect samples and, in some cases, perform the milk ring test.

A modified milk ring test on individual animals, has been evaluated in this regard. The advantages of testing milk rather than blood samples include—

1. Better owner co-operation (especially in town-supply herds).
2. Relative immunity from adverse weather.
3. Dairymen do not have to yard cattle especially for test, therefore tests are not limited to one or two herds a day after morning milking.

The accuracy of the individual milk ring test has compared favourably with that of the Rose Bengal Plate Test when evaluated against the Complement Fixation Test.

The brucellosis field survey continued with a total of eight full-time brucellosis teams (17 men) in the field and other staff contributed as duties permitted. In the first two quarters, 217 094 head from 1 218 herds were tested.

Blood collection at meatworks was performed on cattle in which the property of origin was known, and some 40 000 sera were tested. Further development of meatworks brucellosis monitoring will depend on the introduction of the tail tagging system of animal identification.

In keeping with a reduction in the volume of tuberculosis testing, there has been a similar decline, that is, 30%, in the volume of strain 19 vaccination, principally in beef cattle herds.

However, there has been a marked increase (100 000 doses) in the use of strain 45/20 vaccine.

This can be attributed to the increased demand for the use of strain 45/20 vaccine in the more remote areas and in beef and dairy herds within the areas undergoing surveying. In the latter cases strain 45/20 vaccine is used in herds where an active infection is revealed.

Cattle tick.—Because of good seasonal conditions, cattle tick populations continued to build up in many marginal areas of Queensland, such as the Flinders and Richmond Shires in north Queensland and the Central Highlands. A special effort was put into tick control in the dairy farming area on the Atherton Tableland where nine farmer meetings were convened.

There has been a keen demand for Departmental dip moulds by producers. These enable them to install a good, efficient dipping facility at low cost. During the past year, 74 dips were installed using the moulds.

Scrub tick.—Scrub ticks were again extremely active during spring in favourable areas and caused losses in domestic animals as well as pets. Some producers in the Yarraman and Blackbutt areas claimed to have lost 20 to 40 head of weaners and young growing cattle. A scrub tick spraying trial was carried out at Hampton to compare the protective period gained by each of five chemicals after spraying cattle exposed to attack by scrub ticks. The results clearly showed the superior performance of Taktic and Supona compared with other chemicals under the conditions of the spraying trial. While all chemicals gave an efficient initial kill, these two preparations gave a greater period of protection following spraying.

Buffalo fly.—Buffalo fly (*Haematobia exigua*) activity decreased markedly following the cold weather of June and July 1974. However, some activity was observed towards the end of September in both central and northern Queensland and particularly heavy infestations were reported from the Gulf properties in the early summer. Once again, the buffalo fly over-wintered west of the Dividing Range in central Queensland, so that, during early summer, activity was reported from the Lake Galilee, Winton and Springsure areas.

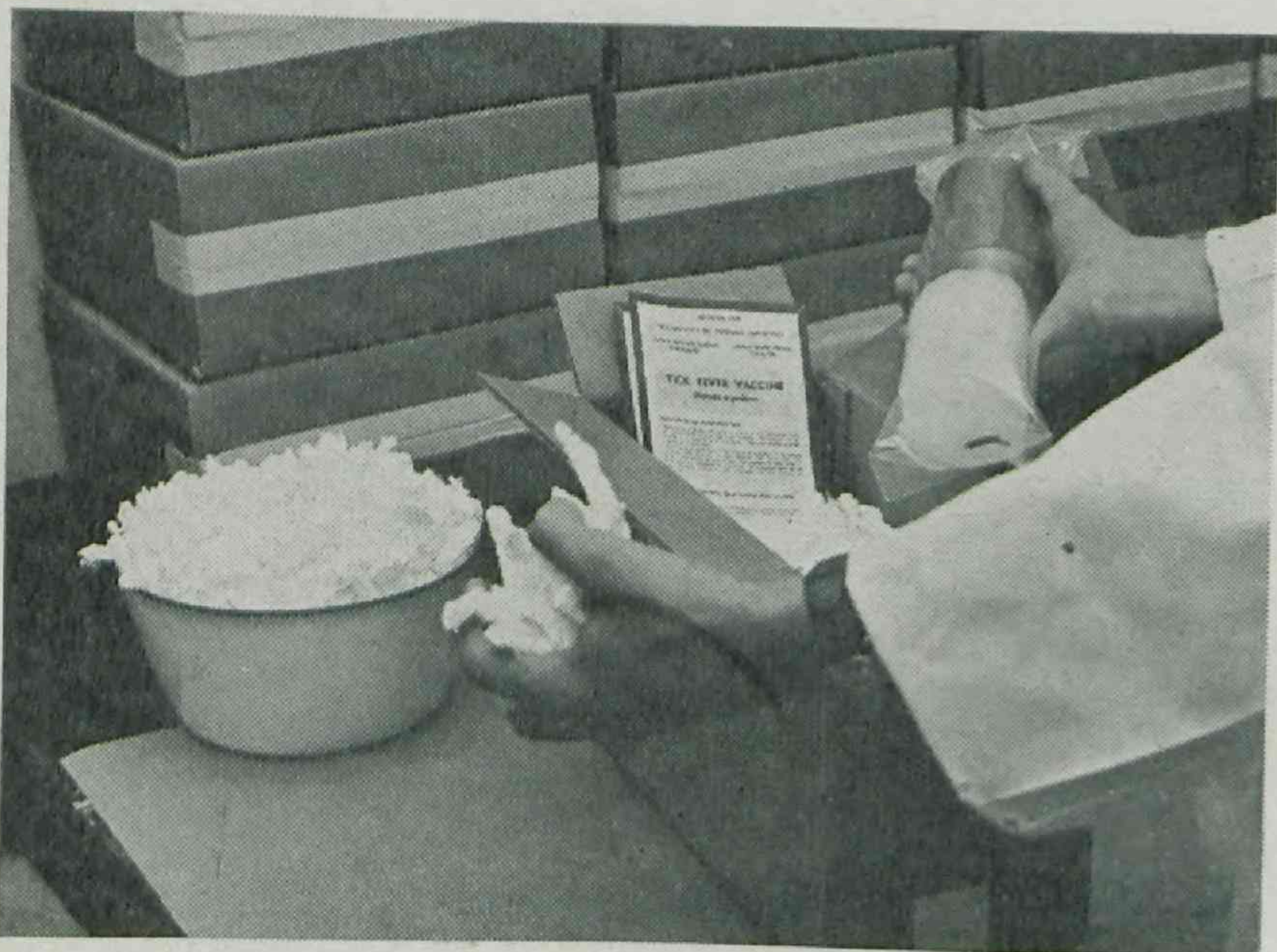
In the Roma Division, buffalo fly was first sighted on a property near Morven during January 1975. Although the fly was reported over a wide area of the Murweh Shire to as far as 80 km south of the western line, infestations were scattered and not general. It was not reported from the Carnarvon area, but was reported from north of Quilpie and Windorah, as well as north of Injune.

Some evidence that dung beetles limited buffalo fly activity when suitable environmental conditions existed emerged from the Townsville district.

The extent of interest in back-rubbers for buffalo fly control is evidenced by approximately 100 back-rubbers being ordered by Ingham U.G.A. members from Q.U.F. in Cairns following a talk and demonstration given at their February meeting. Considerable field experimentation in improving the construction and use of back-rubbers has been undertaken by Departmental officers in the Townsville area.

Trombicula sarcina.—The black earth itch mite was found near Springsure on cattle which exhibited itchiness of the legs. The mite normally worries sheep, dogs and humans, and this is the first occasion on which it has been known to cause worry to cattle.

Tick fever.—Numerous cases of field outbreaks of tick fever caused by *Babesia argentina* were diagnosed. Most involved minor losses, but one property near Julia Creek which had been tick-free since introducing cattle some years ago and which had not carried out vaccination lost 24 out of 350 head before treatment was undertaken. Forty head were also reported to be lost on a property near Belli, in an outbreak investigated by a veterinary practitioner. Cattle tick



Tick fever vaccine being packed in foam for shipment to properties far from the Department's Tick Fever Research Centre at Wacol.

outbreak in clean country near Hughenden caused the death of 14 yearling heifers in one area. In another, 23 were sick out of 230.

Anaplasmosis continues to be an important tick fever in the field and an increasing number of producers are now vaccinating weaners initially with bivalent vaccine.

Babesia bigemina infections were diagnosed mostly from marginal areas such as Kingaroy, Helidon, Wandoan and Toowoomba, except for a serious outbreak near Euramo. In the latter, 44 Santa Gertrudis heifers had been introduced from a tick free area. They had been vaccinated with *B. argentina* blood before introduction. Nine died over 3 days and a further six were noticed depressed with elevated temperatures. *B. bigemina* was found in smears from six animals. No further deaths occurred following Imizol treatment, although one heifer aborted.

Haemolytic anaemia.—Haemolytic anaemia was confirmed on only two properties, namely the Coolum Research Station where six calves died and a property at Laidley where four died. The reduced incidence of this condition as compared with several years ago can probably be attributed to the reduced vaccination of breeders and improvements in the vaccine.

Ephemeral fever.—This disease was quiescent after the winter months until August–September when sentinel herd animals in a combined Departmental–C.S.I.R.O. project in the Flinders River Basin recorded some sero-conversions from negative to positive titres.

Subsequent field reports associated with positive serological evidence of recent infections were reported simultaneously at Charters Towers and Nebo during December. Suspected clinical cases had been reported from Nelia and Cloncurry during October–November and similarly from Charleville and Cadarga during December.

The disease was reported in the Townsville, Cairns, Mt. Isa, Rockhampton, and Roma Divisions. No confirmed cases were reported from the eastern Darling Downs or Maryborough Divisions.

Ephemeral fever occurred during March in the Brisbane Division. Cases were sporadic and there was none in some stock districts. Beaudesert reported a 1% prevalence and some deaths.

Some difficulties were detected in gaining information on the occurrence of the disease. This is because farmers are seeking less veterinary advice on sick animals due to economic conditions, only a small percentage of young animals were being affected, and farmers have become familiar with the disease.

Chemical poisoning.—Arsenic and lead were the most important poisons causing stock losses. There were 20 confirmed outbreaks of arsenical poisoning. On one occasion, 51 head of cattle died as a result of power spraying with arsenic for tick control. Common sources of arsenic included weedkiller, tree killer, dumps, sheep dip, cattle dip, and contaminated water and pasture.

There were 10 confirmed instances of lead poisoning. In contrast to arsenical poisoning, mostly calves were affected by lead poisoning.

One farmer at Mungar lost four animals dead and had 35 sick following spraying with a mixture of Prolate and diesolene for tick control. On another property, 10 thirsty animals died after drinking dipping fluid.

Thirty-six cattle and 10 goats died on a Mareeba farm after gaining access to sodium nitrate, which is used as a fertilizer applied as side-dressings in tobacco growing.

Plant poisoning.—A wide range of toxic plants was associated with losses and sickness throughout Queensland. Some of the more important losses are listed.

Pimelea poisoning, commonly known as St. George disease, was reported from at least 30 properties in the Roma–Surat–Mitchell areas, while it was also diagnosed in the Murweh Shire. Losses varied from property to property, being highest on those north of Surat and south of Mitchell. Even when actual losses of animals has not been high, productive capacity of affected cattle has been severely impaired. Six animals died and 30 others showed symptoms typical of St. George disease on a property near Blackbutt. *Pimelea altiof* was found to be present on the property and feeding trials with the plant have been undertaken at the Animal Research Institute.

Noogoora burr caused a number of stock losses in the Burnett area. Eleven head were lost on a property at Gayndah and losses were also reported from Bundaberg, Coalstoun Lakes and Maryborough. Bracken fern poisoning caused losses in cattle at Mt. Mee, Withcott, Caboolture, Southport and Beaudesert.

Hoya vine was suspected of killing 22 weaners, 5 to 6 months old, at Mundubbera. The symptoms were those of accelerated heart rate, weakness, prostration and muscle tremor. Post mortem examination revealed lesions similar to those seen in previous experimental hoya vine toxicity. As a result of the diagnosis, the owner bulldozed the scrub containing hoya vine.

Bovine enzootic haematuria was diagnosed in cattle at Taroom, Plainland, Fernvale and Mundubbera. Rock fern, known to be present on some of these properties, is suspected as a possible cause.

Thirty-four animals died and six were sick with similar symptoms on two properties in the Richmond district. On one property, it was suspected that grazing black wattle suckers (*Acacia stenophylla*) may be involved.

Mycotoxicosis.—Fourteen cattle died in the feedlot in Chinchilla from suspect aflatoxicosis. The animals had been fed a ration of wheat and mouldy peanut hay. Thirty also died in a feedlot near Springsure and, on post mortem, displayed severe toxic hepatitis. It was thought that the losses were possibly associated with a fungal toxicosis caused by mould development in the grain supply. Almost an entire dairy herd at Samsonvale developed straining, with the passage of red urine and whole blood for several days. Fungal poisoning associated with brewer's grain and pineapple pulp was suspected. *Myco* sp. and *Sacchoromyces* sp. were isolated from feed samples.

Blackleg.—It was estimated that approximately 100 weaners were lost in the Alpha district from outbreaks of blackleg. The chief age group affected was 8 to 14 months and a vaccination programme was immediately implemented. Other losses were reported from Julatten, Kingaroy, Kilcoy, Dayboro and Taroom.

Leucosis was again reported from a number of herds at Toogoolawah, Kilcoy, Innisplain, Woodhill and Kerry. Two herds in the Beaudesert area are being sampled regularly with a view to eradicating this disease.

Mucosal disease was suspected of causing abortions in a herd at Toogoolawah. It was also confirmed as the cause of the loss of three head and sickness in others at Kingsthorpe. The disease was also confirmed in herds at Springbrook and Lowood, where affected animals were scouring and wasting.

Samples from 180 bulls from a property in central-western Queensland revealed 17 (9.4%) to be infected with *Trichomonas foetus* var. Brisbane. Bulls over 4 years of age had an infection rate of 15.3%. The disease was also confirmed in the Mt. Isa Division, three positive properties were located in the Townsville Division, and three in central-western Queensland.

Abortions caused by *Leptospira pomona* were reported from several areas, and *L. hardjo* was incriminated as the cause of abortions in cattle at Dartmouth.

Infectious bovine rhinotracheitis was confirmed in a dairy herd at Upper Coomera. Twenty animals died on this property during the past 18 months and some association with I.B.R. is suspected. Symptoms have included a moderate rhinitis, mild ocular lesions and mild vaginitis.

Sporadic bovine encephalitis was confirmed as the cause of lesions in 5-month-old calves at Richmond. Similar symptoms appeared in animals on adjoining properties, and also at Mt. Mee and Goondiwindi.

SHEEP

Most of the sheep areas were dry in the first half of the year. In November and December 1974, serious fires occurred in the far-west, north-west, central-west and south-west. At Winton, approximately 2.6 million ha of Mitchell grass pasture were destroyed with a reported loss of 9 000 sheep. Properties at Barcaldine and Quilpie reported losses varying from 700 to 2 500 sheep.

Widespread rain ranging from 48 to 62 mm in the west during March gave Mitchell grass and mulga a boost in most districts. Run-off was negligible and surface water supplies received little benefit. Falls of 44 to 137 mm in the south-eastern districts eased dry conditions at St. George, Roma, Goondiwindi and Warwick. West of Dalby a 0.5 million ha drought pocket persisted in the Glenmorgan-Tara area.

Rain during April and May was light and surface water continued to diminish in all districts. The year ended with a need for general soaking rain to improve dry native grass, and to replenish surface water supplies.

A preliminary estimate of sheep numbers at March 1975 is 14.0 million, an increase of 7% over last year's total.

The amount of Brisbane wool sold at auction increased by 10% to 58.2 m. kg. The value decreased by 20% to \$74.26 m. Average price per kg. was 127.54c

compared with 175.70c in 1973-74. Average price per bale was \$190.00 for 391 000 bales sold. In 1973-74 the average price was \$263.84 for 351 000 bales.

The percentage of wool sold by sample and reduced-showing increased from 34.1% last year to 50.7%.

Spring and autumn lambings were variable throughout the pastoral zone. In the north-west, lambings ranged from 30 to 40%. Loss of lambs was attributed to severe predation by wild pigs and foxes in the Winton-Boulia-Julia Creek-Richmond districts.

In the south-west mulga zone, percentages ranged from 55 to 60% at Windorah, 65 to 100% at Quilpie. Lower lambings occurred on the frontage properties where wild pigs were extremely numerous. Lambings in the Warrego, Langlo, Ward River district varied from 33 to 80%.

At Roma, lambings ranged from 58 to 109%, and at Tara and Warwick from 65 to 70%.

A severe blowfly wave occurred in the central-west, south-west, and south-eastern districts in January and February 1975, resulting in both body and head strike in some flocks, especially in the Balonne district.

Mulesing at lamb marking increased in all districts. At Longreach, it was shown that radical mulesed lambs recorded no strike compared with 50% in those unmulesed to 18 months of age. Mulesing at marking did not reduce adult body-weight or wool production. Results obtained from this trial show that the adoption of mulesing would benefit sheep owners in the central and northern regions.

Barber's pole (*Haemonchus contortus*), black scour (*Trichostrongylus*), and nodule (*Oesophagostomum columbianum*) worm infestations were detected in south-western flocks during the first half of the year. Light burdens of barber's pole worm infested sheep in the far-west, central-west, and south-eastern districts throughout the year.

The body louse (*Damalimia ovis*) continued to infest flocks in the far-west, central-west, and south-west during the year. Shortage of experienced station staff, failure to obtain clean musters, and inefficient dipping measures have contributed to the build up on many western properties.

Anaemia and ill-thrift of young sheep occurred on a number of western properties during the September-October period 1974, and January-February period 1975. Eperythrozoonosis infection was diagnosed on many of these properties. This condition was widespread on Charleville-Quilpie river frontages.



Research workers performing a pregnancy diagnosis test on a ewe. A new, rapid test developed by the Department's sheep scientists is an aid in managing commercial flocks.

Infection by tetanus (*Clostridium tetani*) following a mulesing operation accounted for a 40% loss in sheep at Winton during January 1975.

Branch officers continued to provide technical advice to sheep owners. With decreasing rural labour, attention has been given to techniques that enable producers to run larger numbers of sheep with reduced labour. Alternative enterprises that may require less labour are being examined by a number of producers in co-operation with field officers.

Field officers gave demonstrations, ran field days or provided advice on 2 254 occasions. These were sheep breeding and selection 44.5%, sheep feeding 10.2%, and property improvements 7.9%.

With the advent of sale by objective measurement, there has been a continued interest in the measurement of wool. The number of samples tested increased by 8%. Eleven mohair samples were also measured.

Field officers continued to conduct mulesing demonstration trials. Some attempts have been made to mules chemically the pizzle area of wethers to prevent flystrike in this region. Little success has been obtained as yet.

Research station trials have demonstrated the benefit of feeding potassium iodide to ewes in the latter part of pregnancy. Investigations to determine whether these responses can be obtained under field conditions have begun in the Longreach area.

A survey is being conducted on a number of properties in the tropical sheep areas to determine the period of reproductive wastage in commercial flocks. Once this is determined, investigations into the causes of these losses and the possible reduction in their effect is programmed.

The stocking rate trial at Blackall has demonstrated a safe stocking rate of sheep on buffel grass for that area.

Chemical shearing has proved to be unsuitable in Queensland for a number of reasons, one of which is sunburn. Rugging of sheep is one method of overcoming this problem. Field officers in co-operation with the C.S.I.R.O. have been testing a number of materials that may be suitable for sheep rugs.

The branch actively promotes wether production competitions which are run by a number of show societies. These competitions enable a comparison of sheep from various properties in a district when they are run under the same conditions. The value of their wool is assessed using objective measurement.

While the floor price for wool guarantees a basic price, increasing costs of production continue to reduce the profitability of the sheep industry. Because of the high cost of labour, the industry has reduced the number of employees to a minimum.

A shortage of shearers, particularly in the more hostile environments, is likely to occur soon as older shearers retire and are not replaced by younger men. This will result in a reduction of wool harvested unless alternative methods of wool harvesting are developed. Station labour shortage will make mustering and sheep husbandry more difficult.

Unless there is more profit in the industry, no great increase in sheep numbers appears likely although there may be a gradual increase during the next few years. In the longer term, a static situation in sheep numbers slightly above present numbers followed by a gradual reduction appears likely.

The Sheep and Wool Branch gives service to commercial sheep producers for their immediate problems and information on all aspects of production so that producers can make their own decisions. Extra effort is made to make producers aware of specific aspects of the industry which branch officers see as important in making local decisions.

Sheep Diseases.—Rams displaying testicular lesions on examination in two flocks with low lambing percentages revealed a high percentage of *Brucella ovis* infection in clinically abnormal rams. Positive serological results were also obtained from rams bled at Ilfracombe, Mungallala, and Blackall.

Polio-encephalomalacia was diagnosed in 2-year-old Merino rams at Texas; four died and three were sick. After being housed and hand fed, they developed inco-ordinations, with the head held forward and to the side and the legs outstretched. This condition also caused the death of 12 goats on a property near Gympie.

Humpy back was suspected on properties at Augathella and Quilpie, and crown beard (*Verbesina encelioides*) caused the loss of 70 out of a flock of 500 sheep at Hannaford.

Approximately 700 weaner ewes from a mob of 2 800 at Morella died with symptoms suggestive of hypocalcaemia or pregnancy toxæmia. They had been in hand for several days and were hit by a heavy storm and hail just before the symptoms were observed.

Ways to improve pregnancy rates in a hot environment have been investigated at Toorak Research Station.

Sheep Husbandry

Animal-house studies showed that heat stress of ewes during the first week but not the second and third weeks after mating reduced pregnancy rates. Hormone treatment with thyroxine resulted in pregnancy rates equivalent to unheated ewes and treatment with iodine improved the pregnancy rates of heat stressed ewes.

In an October mating, ewes not receiving iodine and mated in paddocks without shade had 9% lower pregnancy rate than ewes supplemented with iodine and mated at the same time in paddocks with shade. With similar treatments in a November–December joining, the pregnancy rate was improved by 17%. The treated group had a pregnancy rate of 73%. Ram infertility was not an important element.

By mating later in the year, lambing is later in the autumn, avoiding the impact of environmental heat stress.

Low lamb marking percentages are a major barrier to improving the efficiency of production of sheep flocks in north-west Queensland. It is generally not possible for graziers to know whether the low percentages are due to ewe infertility or neo-natal lamb losses. Toorak staff have developed a rapid method of pregnancy diagnosis of the ewe by palpation of the abdomen. When lamb marking is done, the grazier will know at what stage lamb losses occurred and this will enable him to plan remedial management strategy.

Any improvement in the low reproductive performance of maiden ewes in north-west Queensland would enhance their lifetime performance. Low dose rates of oestrogen costing 1c per head not only brought maiden ewes into oestrus earlier than normal but also led to an acceptable level of fertility.

Previous reports have described the improved production coming from supplementation of mulga-fed sheep with as little as 50 g of molasses a day. The treatments caused a marked increase in the intake of mulga. Continuing experiments suggest that the effect is due to the mineral fraction of the molasses, particularly the sulphur.

In an endeavour to develop a mini-care, dual purpose sheep, a breeding flock based on Merino and Wiltshire Horn is being developed at the Hermitage Research Station.

PIGS

Pigmeat production declined by 23% in the 10 months ended April 1975, partly due to reduced pig numbers and partly to a large reduction in the number of pigs imported from New South Wales for slaughter.

A general shortage of pigs persisted throughout the year. Towards the end of the year, some producers returned to pig raising and small increases in breeding stock occurred on many properties. This caused a small increase in production, but it will be a few months before this is reflected in monthly pig slaughterings. Producers are adopting a cautious approach towards expansion.

The trend for small producers to quit pig raising eased and, by the end of the year, there was evidence of a few smaller piggeries resuming production. However, approximately 40% of the sows in Queensland were on about 5% of the properties running pigs.

Some producers, seeking to increase returns, changed from selling pigs as baconers to supplying pork markets. This was particularly evident in the Monto and Rockhampton–Biloela districts, where a lucrative market for porkers developed.

During the year, there was an increasing trend for processors to accept pigs at heavier weights, provided they met required specifications. One firm notified suppliers of payment according to grade on carcasses up to 83 kg dressed weight maximum. Acceptance of young boars for slaughter also increased with most processors now paying normal baconer prices for boars according to grade, provided weights are within the ranges specified, and no evidence of 'boar taint' shows after slaughter.

On-farm performance testing, the research project funded by an A.P.I.R.C. grant, was maintained during the year by one Husbandry Officer. Co-operating herds on the Darling Downs and in the Burnett district were visited at regular intervals. Boars and gilts were performance-tested in both stud and commercial herds. Progressive commercial breeders now seek tested animals to replace culled breeders.

A similar but smaller scheme is operating in north Queensland. Interest is growing in other districts to the extent where a number of piggeries which can be accepted for 'testing' will be limited by the time available to district staff to carry out the necessary ultrasonic measurements on fat thickness.

Breeding performance evaluation based on litter recording is encouraged in all districts. As soon as co-operators become proficient in keeping and applying these records, new members are introduced to the programme. The long-term aim of this breeding performance testing is to increase efficiency of production by making improvements in those areas which emerge as unsatisfactory.

In 1973-74, 52 herds were recording and 6 036 litters were farrowed. The average weaning age was 33 days, and the average number weaned was 8.03 pigs per litter.

Ration formulation inquiries were in the main for a good quality ration at as low a cost as possible. These often included feedstuffs which had become readily available at prices competitive with those normally used.

Least-cost rations to cover individual district situations have been prepared and forwarded to district officers. These rations show that substantial savings can be made by on-farm feed mixing instead of buying ready mixed feeds, while maintaining control over feed quality.

All district officers have participated in Regional and District Extension Committee activities, and several acted as secretary of a district committee. Planned extension programmes, both short and long-term projects, were submitted, and put into practice.

The Agricultural Engineer attached to the Pig and Poultry Branch co-operated with Pig Section officers during the year in investigations into requirements of piggery building design. Results of these investigations were passed on to officers, and were incorporated in a leaflet on housing for sows and litters prepared jointly.

District officers introduced several methods by which farmers could determine the economical position of their pig raising. These included Continuous Performance Recording, Gross Margin Analysis, and Margin Over Feed Cost projects. The aim has been to provide farmers with a means of assessing the profitability of their projects, and taking measures to correct any sections needing improvement.

Trials were conducted in all districts to test the efficiency of a properly conducted programme for mange control. The trials were supervised by Veterinary Services Branch staff. They showed that sarcoptic mange could be controlled by adhering to the control methods laid down.

Swine Diseases

Swine Dysentery.—Swine dysentery is common in the south-east corner of the State and was confirmed by laboratory examination of pigs and specimens forwarded from piggeries in south-eastern Queensland. However, routine usage of arsanilic acid in the feed camouflages the true disease situation. Excessive arsanilic acid treatment has on occasions caused posterior inco-ordination in pigs. On one Downs unit, 12 sows in a 40-sow unit became blind and this was linked with heavy feeding of arsanilic acid for 18 to 24 months.

Arthritis.—The average condemnation for arthritis in Queensland is 0.12% of total condemnations and 0.25% of partial condemnations. Most arthritis condemnations occur in pigs from small units. However, some large intensive units have high arthritis condemnation rates.

Leptospirosis.—In the spring of 1974, a severe shortage of leptospirosis vaccine occurred and some herds were unable to maintain their vaccination programmes. Leptospirosis outbreaks occurred. However, on some piggeries where leptospirosis vaccination is routinely carried out, breakdowns have occurred. This problem has been contained on some piggeries by feeding an antibiotic at high level for 14 days every 3 months.

A survey in north Queensland has shown evidence of *Leptospira pomona* and swine brucellosis in feral pigs. Of 16 feral pigs tested for leptospirosis in the Roma Division, 14 were positive to *L. pomona* and one suspicious. At Townsville, 12 positives were obtained from 60 samples. This suggests that feral pigs are a potential significant source of the spread of leptospirosis.

Perineal hernia.—Approximately 20 out of 350 sows on a Downs piggery suffered from this apparently previously undocumented condition. Either intestines, bladder or gravid uterus herniated through ruptured coccygeal muscles and the presenting feature was a swelling lateral to the anus and the vulva. The stock have a common genetic origin, but an interesting feature of this condition is that a high proportion of sows 'dog-sit'. This is probably linked with the positioning of the water troughs.

Central Boar Performance Testing

To coincide with the re-opening of the Performance Test Station in September, Husbandry Research Branch made improvements in the testing procedure. Soybean meal is now the protein source in the feed, feed intakes have been raised and the piglets begin testing at a heavier liveweight of 36 kg to give a better settling-in period.

More importantly, a system of co-operating herds has been introduced. Under this system, approximately 80% of the testing facilities are allocated to co-operating breeders who meet the following requirements:—

1. All breeding boars and sows must have pedigree registration.
2. At least five working boars must be in use in the herd.
3. Within the first 3 years, all working boars must have been replaced by boars scoring 130 points or more in the test.
4. For every six sows in the herd, at least one litter pair of boars is to be tested each year.

With this scheme, the maximum benefit from the station is passed on through the co-operating herds to the whole pig industry.

From the re-opening until 30 June 1975, 60 Large White and 48 Landrace boars were tested. Of these, 25 Large White and 24 Landrace were approved and the remainder, including 10 which did not complete testing, were slaughtered.

Of 18 sons of tested boars, eight (44%) passed the test, while, of 16 sons of imported boars, eight (50%) passed. This compared with a pass rate of 33 out of 74 (44%) for the sons of boars that had not been tested at the station. The small numbers involved in some of these groups could have affected the accuracy with which the pass rate has been able to be estimated.

Improvement in economic traits is still being made in the selection herd at Hermitage Research Station. Boars from this herd are still in high demand by the industry.

Feed Trial

In comparison trials with wheat, barley and sorghum, wheat consistently gave better feed conversion ratios and average daily gains than sorghum. Barley gave results intermediate between wheat and sorghum. Supplementation with lysine and methionine did not produce a significant growth response or significant interaction with grain type. The observed differences are due to both the available energy supplied by the different grains and to levels of amino acids supplied other than lysine and methionine.

The nutritive value of Mexican dwarf soft wheat (Pitic) was equivalent to a prime hard wheat (Timgalen) in digestibility of dry matter, protein or energy content.

POULTRY

Egg Production and Associated Problems.—Egg producers began the year with expectations that a period of prosperity and stability lay ahead. This encouraged them to retain 'over-quota' hens until the hen-quotas became operative on 1 January, 1975.

An unusually high rate of lay during 1974 and early 1975 further increased egg production.

The collapse of red meat prices affected the demand for eggs. Increased egg production and falling demand combined to produce a severe surplus and net returns to producers fell sharply. Early in 1975 many producers were producing eggs at a loss.

Hen quotas reduced production towards the end of the year and producers' net returns are expected to rise.

Egg production for the State in 1974-75 increased by an estimated 8% compared with the previous year.

Pale yolks and 'apricot' hues caused serious financial loss to many egg producers during the latter part of 1974. Consignments of eggs which fail to meet the Egg Board standards for yolk colour do not attract the 5c per dozen yolk colour bonus. Research work carried out in collaboration with Husbandry Research Branch established that the basic cause was a change in formulation by a company manufacturing synthetic pigments.

Egg washing machines which use sanitizer sprays and revolving brushes to clean eggs are becoming more popular with Queensland egg producers.

Reports of black rots in washed eggs were received from several areas during the year. Inquiries showed that, in at least three cases, the eggs had been washed with in-line brush-type machines. All machines in use were checked. It was found that some washing procedures used would very likely lead to the production of black rots in eggs stored at room temperature.

The U.S. manufacturer of the machines could not provide adequate recommendations for water temperature, sanitizer type and concentration and usage rates. The Poultry Section, therefore, in co-operation with the Microbiology Section, has begun trials on two farms to assess the effectiveness of the egg washing procedures in use.

Broiler Production.—The slump in red meat prices also affected the demand for chicken meat. Processors first began to cut production in September 1974 by giving growers longer

'breaks' between batches of chickens, closing down their own broiler farms and reducing chicken meat imports from N.S.W. The position improved in March when most growers returned to near normal production levels. Overall production for the year is expected to be about 5% below that for 1973-74.

Feed Costs and Ration Formulation Service.—Prices of ready mixed poultry feeds increased sharply in 1974 and prices remained high. Egg producers showed increased interest in mixing their own poultry feed. This was mainly because of the need to reduce egg production costs in the face of falling net returns for eggs.

A survey of poultry farmers mixing their own feed established the need for a Least Cost Ration formulation service to assist producers to make best use of available feed ingredients. This service uses a commercially available computer programme and producers pay a fee to cover computing costs.

Besides providing least cost rations for individual producers, the Poultry Section also furnishes least cost rations based on the availability and average price of feed ingredients in each major poultry producing area.

Major Field Activities.—Since 1969, co-operating producers have provided physical and financial information obtained in rearing more than 500 000 pullets. Report No. 7 released early in 1975 showed that variable rearing costs increased by 8% over 1973 figures. These costs averaged 110.43c per bird reared in 1974 and 101.97c in 1973.

Major factors increasing costs were day-old chicken prices and medication costs. The average price of feed rose by \$12 per tonne over the 1973 figure, but the actual cost of feed per bird reared was reduced by nearly 3% through the use of restricted feeding techniques.

A study of body weight of pullets and layers showed that full-fed birds are more prone to obesity than restricted-fed birds. Obesity reduces laying performance, longevity and efficiency of conversion of feed into eggs.

The Branch Agricultural Engineer worked with a co-operating farmer at Boodua to develop a machine for on-farm heat treatment of soybean.

A satisfactory machine was developed which treats 65 kg of beans per hour for a gas cost of \$5 per tonne of beans. The cost to build the machine is estimated to be about \$1 200. Heat treatment of home-grown soybeans with this equipment can be justified economically, as full-fat soybean meal usually costs from \$50 to \$80 per tonne more than the price at the farm of whole beans.

Operation of the machine at 65 kg per hour for 40 hours a week is sufficient to meet the needs of a 30 000 bird laying flock.

Best Attended Information Exchange to Date.—The fifth Poultry Information Exchange held at Broadbeach in April 1975 was attended by 200 people from all sections of the industry. One of the highlights of the two-day Exchange was a discussion on the Australian Government's Green Paper on Rural Policy in Australia. The Exchange was organized and conducted by a joint committee of Poultry Section staff and industry members.

Poultry Industry Acts.—Poultry Section staff were active in following up complaints involving breaches of the Egg Marking and Grading Regulations. Producers who supplied sub-standard eggs were visited and advised of the problem and ways of correcting it. This procedure has resulted in satisfactory compliance with the Regulations.

Thirty-one licences were issued during the year for egg pulp manufacture and three for pasteurization of egg pulp. One licensee was prosecuted for failure to comply with the Regulations.

Sampling of raw and pasteurized pulp during the year showed that the bacteriological and moisture standards required by the Regulations are being maintained.

Three meetings of the Poultry Advisory Board were held during the year. Major items discussed were proposals for amendment of the Poultry Industry Act, financing the Poultry Industry Fund and the Department's Poultry Extension and Research Activities.

The term of the Board expired on 30 June 1975 and a new Board was constituted early in July.

Poultry Diseases.—Marek's disease, a lymphoid leucosis complex, is widespread in poultry throughout Queensland. However, local industry reports on the value of Marek's disease vaccine (H.V.T.), as well as field trials, suggest that, under average field conditions, vaccination at day-old enables more pullets to be put into laying accommodation. In some environments, the difference is up to 200 additional in every 1 000 purchased.

Several outbreaks of avian encephalomyelitis were recorded in young chickens. Several had their source in a local hatchery while one occurred in meat breeder stock originating from a New South Wales hatchery.

The virus of infectious laryngo-tracheitis was isolated on two occasions at Toowoomba and Capalaba. One infection in a broiler flock was suspected to have spread from another broiler flock across the road. Reports indicate that breeding flocks of some integrators have been similarly affected.

Leg weakness diagnosed as caged layer fatigue, occurred in one caged plant at Moggill of some 70 000 birds as the result of feeding a ration deficient in calcium. The same condition was also diagnosed on a poultry farm at Beerwah, where serum levels of alkaline phosphatase of birds was found to be up to four times normal.

Collaborative investigations between Husbandry Research and Biochemistry Branch have continued to serve the poultry industry. The problem of 'apricot yolks' in eggs was shown to be due to an imbalance in the ratio of xanthophyll pigments in the affected yolks.

Studies on the causes of leg weakness and fatty liver in laying hens are in progress.

Investigation of the relationships between the protein and amino acid content of summer grains has enabled a prediction of the amino acid content of these grains from a simple nitrogen determination.

Investigations by Husbandry Research Branch on poultry problems have been principally directed in two fields: evaluation of techniques to improve the efficiency of egg production, and definition of the amino acid requirements of the broiler.

MEAT INSPECTION

Inspection of stock and poultry slaughtered for domestic consumption, both from the viewpoint of disease and to ensure that as high a standard of hygiene as possible is maintained during processing, was the main activity of Slaughtering and Meat Inspection Branch. Besides these, regular structural and hygiene inspections were undertaken at all premises licensed under the Meat Industry Act and the Regulations made under the Act.

Grading and classification of carcasses were carried out at meatworks where full-time inspection was provided. In its concern for meat quality, the branch's activities included the promotion of tenderstretch meat, investigations into beef carcass parameters and their influence on price at Cannon Hill, carcass appraisal and bruising trials.

Disease recording at meatworks continued with emphasis on tuberculosis and brucellosis. Monitoring of bovine lungs for suspect cases of bovine contagious pleuropneumonia continued.

Policing of franchise provisions of the Meat Industry Act in relation to abattoir areas revealed a number of breaches which were referred to the Queensland Meat Industry Authority for its consideration.

The construction of the new Metropolitan Public Abattoir at Cannon Hill is nearing completion. The completion date has been delayed through labour and material shortages. Improvements are constantly being undertaken at practically all abattoirs.

A serious and widespread industrial dispute affecting all meatworks using A.M.I.E.U. labour occurred in July and August 1974. The dispute closed most Queensland meatworks but little interference with supplies for the domestic markets was experienced. This was because large quantities of frozen meat were available for distribution due to the present depressed export situation. The strike had little effect on meat supplies entering Queensland from the southern States. Some shortages in the supply of pork, mutton and veal and in the supply of beef fancy meats occurred, however.

Slaughtering procedures have generally been satisfactory. There is no doubt that a very high standard of meat presentation, in the interests of public health, exists in all declared abattoir and Regional Meat Areas, equal to any in Australia. All meat supplied in these areas is derived from abattoir sources, hygienically slaughtered and fully inspected. However, the same cannot be said for meat supplies from slaughterhouses, which operate outside these declared areas.

During the year, continuing advice and assistance has been given by officers to licensees of country slaughterhouses concerning the interpretation of the requirements of the Meat Industry Regulations 1973. The Queensland Meat Industry Authority has made a condition of renewal of slaughterhouse licences that licensees submit a programme for upgrading their premises to the required standard by a certain specified time.

Some licensees have submitted a programme that has been approved by the Authority; others have submitted programmes that have not as yet been approved and others have not submitted programmes.

No closure of a slaughter-house has caused any interference in meat supply to the public, as alternative viable sources have been available, either by the butcher killing his stock elsewhere or buying carcass meat from an approved source.

During the year, a decision was made by the Queensland Meat Industry Authority to establish a regional meat area at Maryborough, to commence on 1 July 1975. From this date, 11 slaughter-houses in the Maryborough area will cease operating.

The Authority also extended the boundary of the Metropolitan Public Abattoir area to include the City of Redcliffe, the Shire of Pine Rivers, the Shire of Redland and that part of the Shire of Albert north of the Logan and Albert Rivers. Investigations have also been carried out by the Authority into the possibility of a Regional Meat Area to include the City of Gold Coast and the implications of centralized killing in the Cairns area.

The decision by the Australian Agricultural Council to ban the feeding of garbage to pigs has caused concern to the producers involved. Some local authorities have also indicated they will have difficulties in disposing of the material. The date of implementation of the ban has been postponed to 1 October 1975 to enable problems to be overcome. It must be recognized that the risks in feeding untreated garbage far outweigh any other consideration.

Australian Department of Agriculture and State staff worked together harmoniously to inspect all meat processed at those export meatworks where State inspectors are located. Commonwealth inspectors undertook the inspection of meat for domestic consumption at abattoirs where no State officers are stationed. State staff assisted in the Commonwealth veterinary officer training programme with talks on meat quality and screening films and slides on sanitation and sanitary dressing procedures.

In accordance with the provisions of Section 102 of the *Meat Industry Act 1965-1973*, action was taken on the certification of interstate premises supplying meat to Queensland. Certification was issued, on application, to those premises that have an export registration with approval to send produce to the U.S.A. In all other instances, inspection has been requested. The Director carried out 25 inspections in New South Wales, Victoria, Western Australia and the Northern Territory.

The Queensland Meat Industry Authority gave consent to some premises to continue to send produce into Queensland subject to their compliance by a specified time. Some of these consents were subsequently withdrawn because of continued failure to comply. Others lapsed when certification was issued. One premises only operated on consent at the end of the year.

For butchers' shops and smallgoods establishments, the insistence on high standards of construction and appliances in new premises has been maintained during the year. Detailed plans are submitted for approval before construction starts. Excellent co-operation has been forthcoming and some very high standard premises have been constructed, mainly associated with supermarkets.

Reasonable standards in older premises are being maintained. Many of these older premises with unsatisfactory timber floors have had them replaced with concrete floors properly graded and drained. The ban on the use of sawdust in butchers' shops revealed many floor deficiencies. These are being gradually remedied. Sawdust has now been virtually eliminated from butchers' shops in Queensland.

The use of newspaper as a wrapping for meat has now been eliminated in Queensland but, unfortunately, it was necessary to have several prosecutions of persistent offenders before such was achieved.

Considerable progress has been made in the upgrading of poultry slaughterhouses to the standards specified in the *Meat Industry Regulations 1973*. Existing licences have been renewed provided licensees carry out an approved upgrading programme.

During the year, a Working Party on Poultry Meat Inspection (under the Animal Health Committee) composed of representatives from the eastern States and an Australian Department of Agriculture representative visited Queensland to inspect poultry slaughtering establishments and to hold an initial meeting to discuss poultry meat inspection.

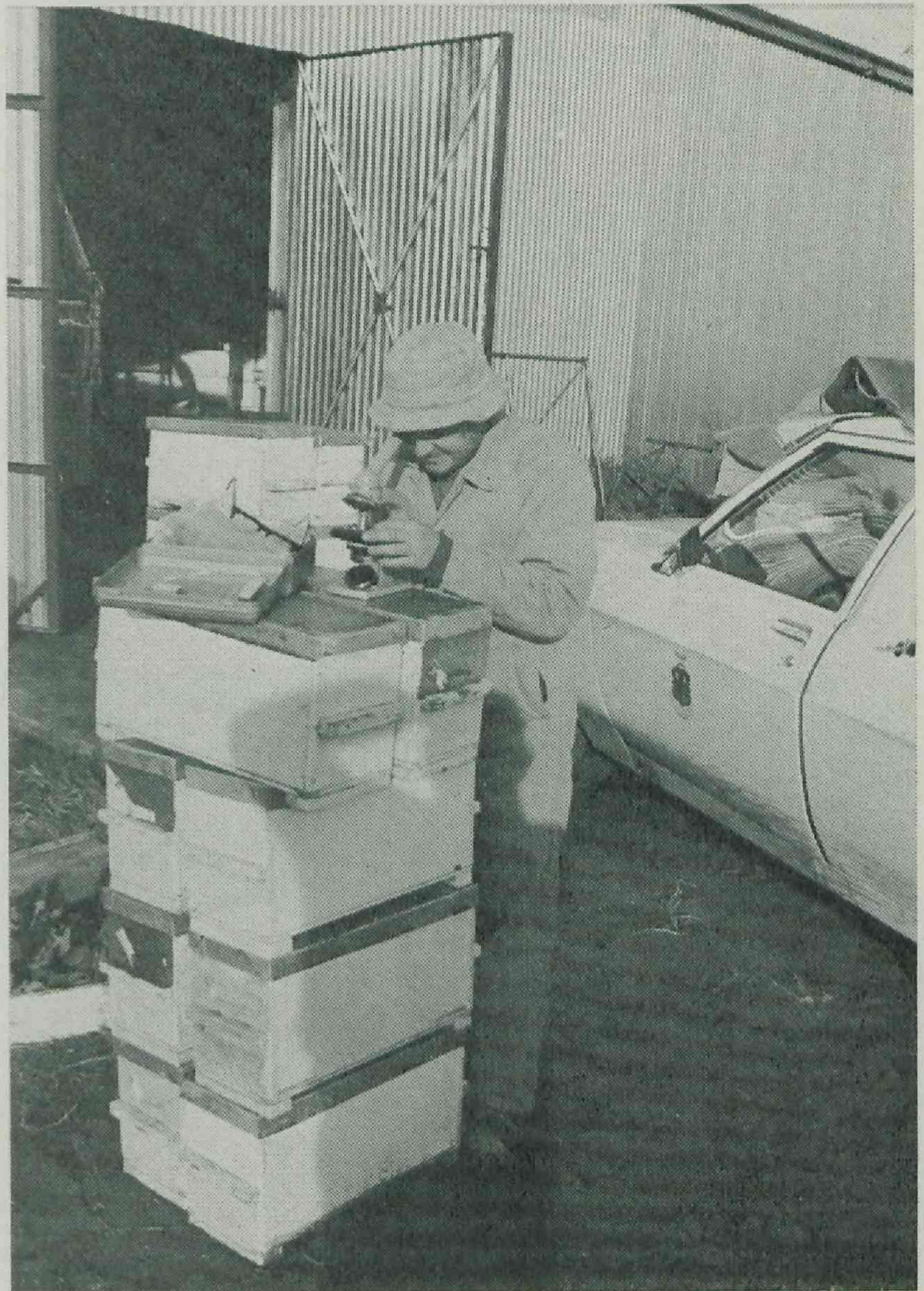
Carcass weight gain tests were carried out during the year at the larger poultry slaughtering establishments using spin chilling equipment. One result over 8%, the legal limit, was obtained but a repeat test was satisfactory.

Approval was granted to introduce a modified grading and classification scheme for beef which will continue to be voluntary. A delay in its implementation has occurred awaiting trial of a prototype brand and then production of the final article. Meanwhile, voluntary grading and classification of hot carcasses has continued to increase, following the mass withdrawal of operators from grading early in 1974.

The advantages of tenderstretch have been explained to consumers in the course of numerous talks given to housewives and consumers organizations. This product appears to be in greater demand, particularly in the Brisbane area. In country centres demand is disappointing as butchers and meatworks' managements do not seem interested.

Numerous talks on meat quality and the care of meat generally have been given to housewife organizations. Supporting films obtained from the Australian Meat Board have been appreciated by the organizations.

Investigations have been carried out during the year into the possibility of introducing an Australia-wide National Pig Carcass Measurement and Information Service. The Project Co-ordinator is Dr. Bryson Wilson, Agricultural Research Centre, Wollongbar, New South Wales. Preliminary trials have been carried out in various States and further trials are contemplated.



Disease inspection in the field is a service provided for beekeepers by the Department. The picture shows a beekeeping officer using a microscope under field conditions to examine adult honeybees.



Queensland Department of Primary Industries beekeeping officers and apiary owners carry out a 10% disease inspection at the Paroo River.

During the year, three large-scale bruising trials were carried out on cattle from properties in north and south-west Queensland. These, run in conjunction with the Australian Meat Board and C.S.I.R.O. Meat Research Laboratory, were further trials in the series of horned versus hornless cattle. Results to date largely support the theory that horned cattle will be more bruised at slaughter than hornless cattle when travelled under the same conditions.

Further work in bruising has been proposed with full and empty cattle, fast and slow transport, different sexes, and types of road transports.

With TB-brucellosis officers now in most export works, a more efficient monthly tuberculosis return is being received. These officers are also submitting quarterly disease statistical reports.

As part of their duties, TB-brucellosis officers have been instructed to check permits and waybills of all cattle slaughtered. Noticeable improvements have been made at most works where previously there was only A.D.A. inspection staff.

Samples for examination for trichomoniasis continue to be collected at four works in the State. The emphasis is now on preputial samples from identifiable bulls.

Three officers were appointed under the N.C.P.P. Fund during the year. These officers carried out lung palpation at Q.M.E. Townsville, Tancreds Cape River and Borthwicks, Merinda. Lung lesions suspected to be pleuropneumonia are still being forwarded for laboratory diagnosis. None has been confirmed.

Surveys still indicate that inspection of introduced meats is necessary. Considerable contamination can and does occur during transit and this often necessitates considerable trimming before the carcasses can be passed for human consumption.

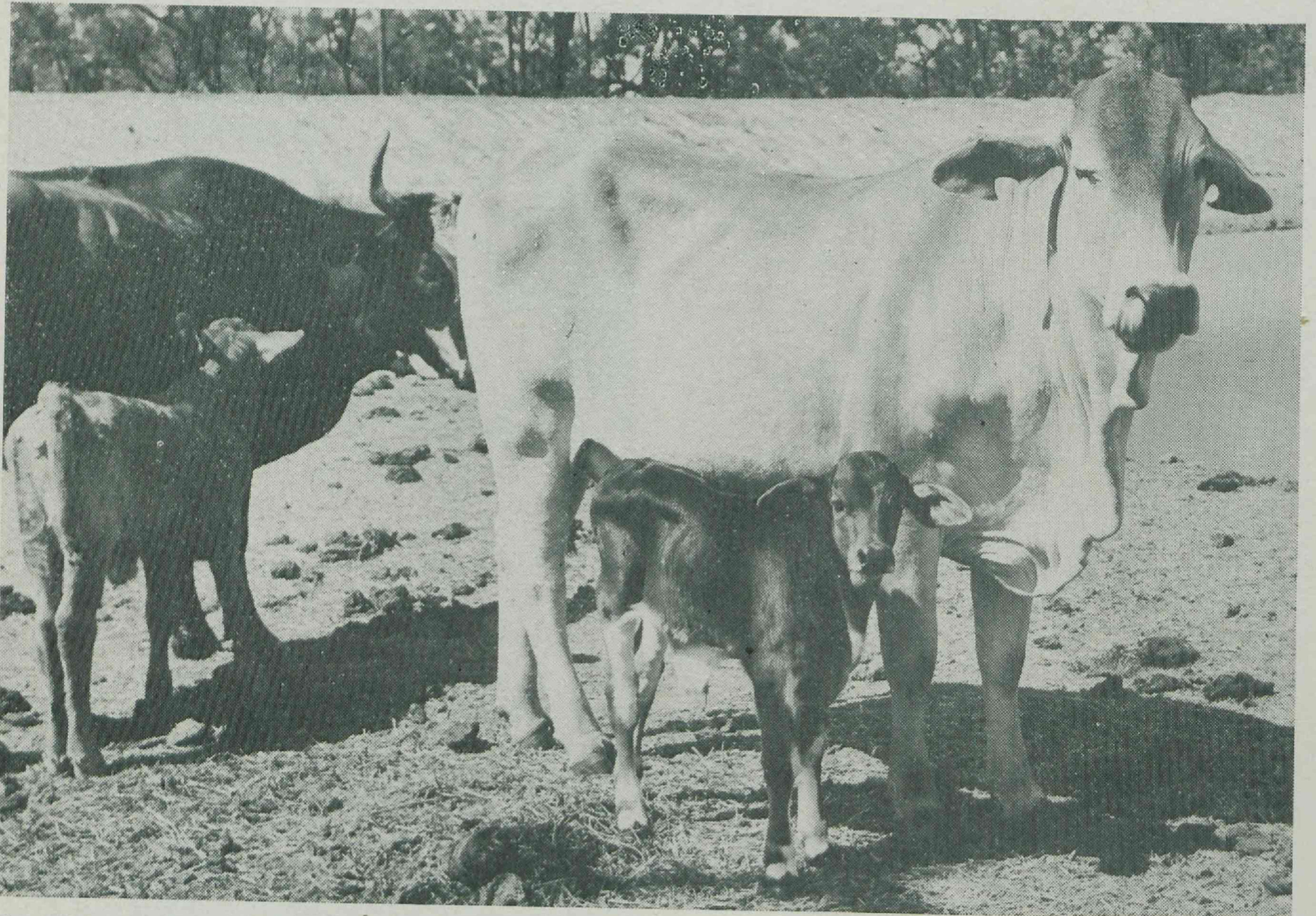
BEEKEEPING

Honey production has been patchy. Expert migratory beekeepers obtained light crops of honey from a yellow box and brush box in south-eastern Queensland and in central Queensland (based from Rockhampton) local beekeepers took advantage of broad-leaved (Serpentine) ironbark and brush box. The honey crop was poor in north Queensland. Probably the best production was obtained from yapunyah in the Paroo beekeeping district.

Information for north Queensland beekeepers about potential honey flora of the Cooktown region in the form of an initial flora inventory has been completed. Assisted by this information, some development towards migratory beekeeping has already taken place between the Atherton Tableland and Cooktown and will increase as roads improve.

Owing to serious outbreaks of American foulbrood (*Bacillus larvae* White) on the Darling Downs in February 1974, during 1974-75 all Department beekeeping officers and some staff and students from the Queensland Agricultural College, Lawes, have been involved in major extension and regulatory activities as far west as Eulo and Thargomindah. Since 1 September 1974, 67 beekeepers, involving 242 apiaries and 16 816 hives have been given attention, and eight hives have been destroyed by burning.

A Nosema disease survey has begun. This involves a random sample of adult honeybees being taken from above brood in hives within each apiary visited. The samples are then examined microscopically for the presence of spores of *Nosema apis*. In 29 examinations made to date, 11 samples have shown: two light; six moderate; and three moderate to heavy infections. The purpose of this pilot study is to determine the significance of the disease.



The effects of the cattle tick on the growth and reproductive performance of female Brahman cross cattle and their progeny is being measured at 'Swan's Lagoon' Cattle Field Research Station. It is considered that, by using these cattle, the frequency and costs of dipping may be reduced without any loss of production.

III. Dairy Research and Extension

Most branches in all divisions of the Department service the dairying industry in one way or another.

The three branches of the Division of Dairying (Dairy Cattle Husbandry, Dairy Field Services and Dairy Research) are concerned specifically with feeding and herd management, herd recording, artificial insemination, the hygienic production, handling and manufacture of milk and milk products, and utilization research. The Agriculture, Agricultural Chemistry, Entomology, Plant Pathology and Botany Branches are involved in pasture and fodder matters. The Veterinary Services and Pathology Branches cover animal health problems. Marketing Services, Economic Services, Standards and Information and Extension Training Branches also have responsibilities to the dairy industry.

FIELD SERVICES

The Dairy Field Services Branch continues to aid the dairy industry in the areas of dairy buildings, milking machines and equipment, milking methods, with quality control, dairy cattle feeding and management, herd improvement, Dairy Pasture Subsidy Scheme, product processing and the supervision of milk vending and licensing.

With the emphasis being given to the detection and control of mastitis, a continuing service on examination of milking machine operation was provided. Altogether 755 examinations were undertaken, and this represents 16% of all machines in use. During the year, officers were supplied with pulsograph units to permit pulsation testing and milking characteristics.

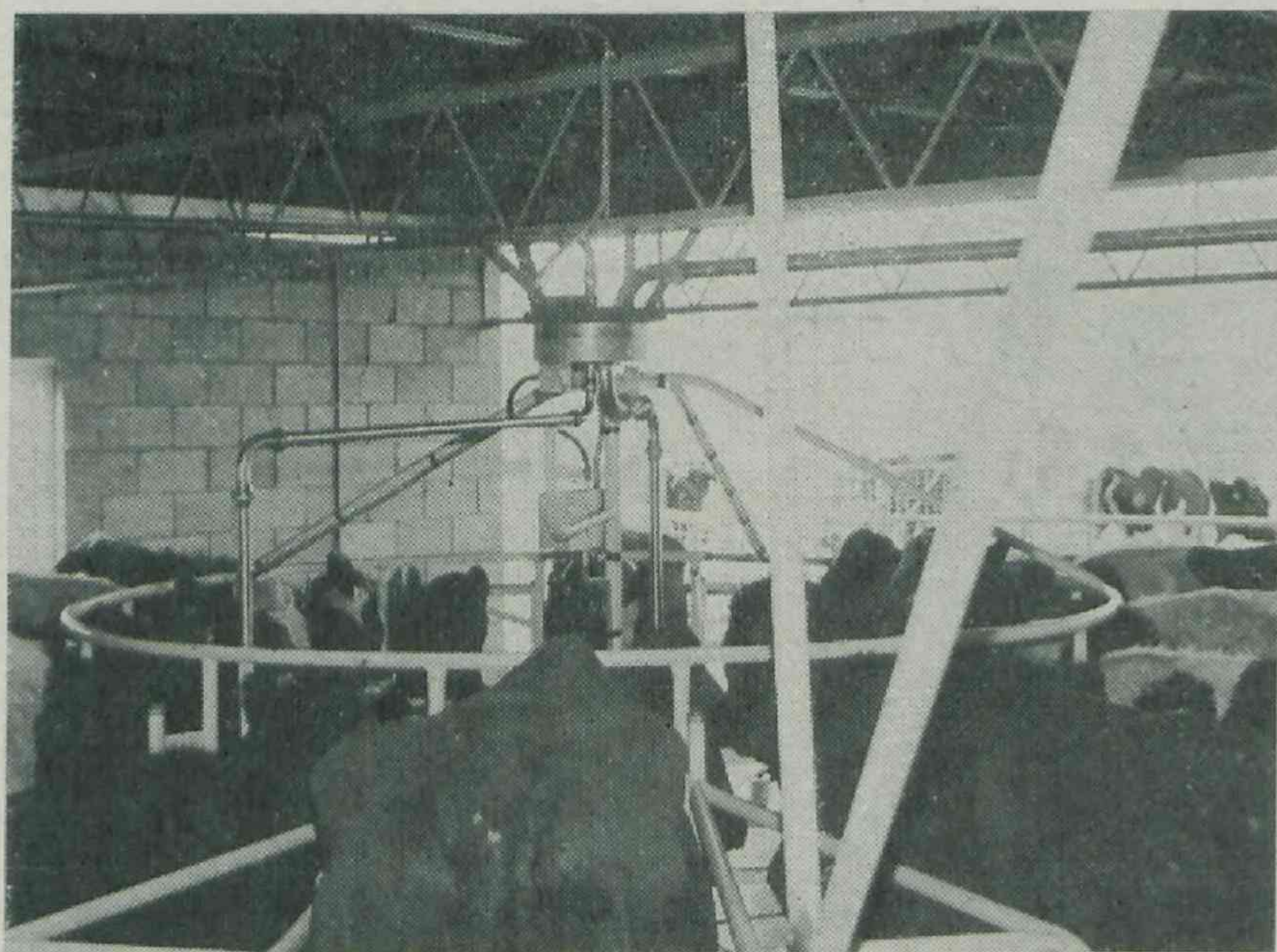
Servicing of the Dairy Pasture Subsidy Scheme continued for the ninth year. Activity is decreasing, with a total of 1 229 applications received for approval. The scheme still has much to offer those producers who have not yet provided an adequate feed-year supply for their cattle.

As in previous years, a continuing call for advice on dairy buildings has been associated with bulk milk conversion. A total of 289 new vats was installed.

The responsibility for milk licensing required constant supervision by field staff. A second special officer was appointed during the year to assist in the large country cities. The changes in structural requirements for retail vendors' vehicles in June 1975 will require attention by inspectors in the coming year. Specialist advisory staff undertook 165 surveys and 1 582 visits to processing plants to advise on manufacturing techniques and quality control.

Officers continue to participate in meetings with special industry liaison committees which provide a complementary function to the Departmental extension committees.

An exhibit, at which selected breeds were displayed, was presented and staffed in 24 centres during the year. In addition, one specialist officer maintained increased contact with the large number of inseminating groups operating in the State. During the latter part of the year, these groups were in financial difficulties through a decrease in the number of members and lowered use of semen.



A new development in mechanized milking is this 16-unit, turnstyle, rotary milking platform. It allows increased labour efficiency when milking.

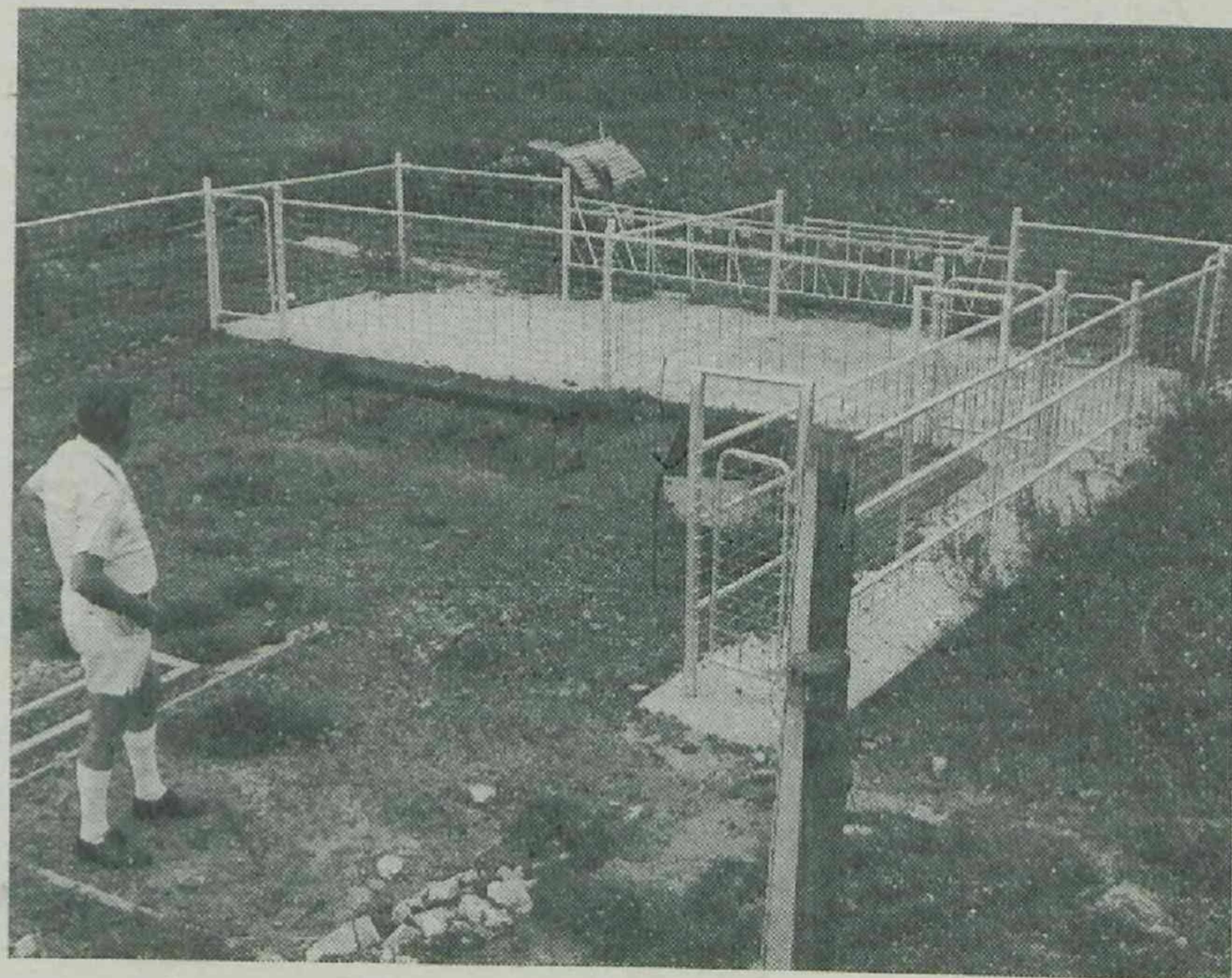
There is not a great demand from producers for advice on cow production recording information although there is much expectation on expanded terms of recording to be introduced during 1975-76.

A major branch programme on mastitis control has required considerable attention by field staff. The regular monthly sampling and testing and return of results to producers has continued in 31 centres embracing 3 413 producers. Increased activity among producers through farm visits and with group meetings has been undertaken and an increased awareness and understanding of the disease has developed among producers.

During the year, facilities for simple laboratory techniques were provided at Wacol. Analyses of mastitis milk samples, operation of a new foods test kitchen, and routine testing of milking machine parts were undertaken. This has permitted closure of facilities in the Newstead office.

A major effort to stimulate increased use of artificial breeding was mounted by staff in the face of economic pressures during this year. This programme has established a close liaison between staff and industry groups distributing semen supplies.

The importance of sound, economical calf rearing procedures is being seen as relevant by an increasing number of farmers. As a result, specific calf rearing extension programmes were initiated. At the request of the North Queensland Dairy Extension Advisory Committee this programme has been given top priority on the Atherton Tableland.



A neatly-constructed, modern set of calf-rearing pens constructed under the Department's supervision and guidance.

To meet one of the needs of these district programmes, structured group discussion material entitled 'Project CR' (Discussing Calf Rearing) has been produced. The project has been introduced into north Queensland programmes and is expected to be introduced into other districts during 1975-76.

To gain a better understanding of the State-wide situation, a survey of 10% of dairy farmers was conducted. This survey was designed to provide information on calf losses and rearing practices. Preliminary analysis shows a significantly high percentage of losses at birth and generally high costs of rearing.

A series of 12 property demonstrations of once-a-day feeding and early weaning are being serviced by field staff. These have proved of considerable value to local producers and created an increased awareness of correct rearing practices.

As in earlier years, farm development demonstrations have provided an excellent avenue for group extension activities in a situation where well-documented records and achievements are available. Seven properties continue to operate effectively and attract local interest. It is disappointing, however, that the programme has not attracted wider support in other dairying districts in the light of the obvious success of the present participating producers.

In late 1974, the Marginal Dairy Farm Reconstruction Scheme established jointly by the Commonwealth and State Government in 1970 was expanded to provide additional assistance until June 1976. Officers of the Branch are required to provide certification on all bulk milk installations to the Lands Department administering the scheme. This has required considerable involvement in those areas still changing from farm supply of cream to milk. Since the expansion of the scheme, 261 applications have been approved under the Commonwealth scheme involving expenditure of \$2 240 000. Approvals under the State scheme totalled 76 (\$519 400).

The programme of monitoring levels of pesticide residues in dairy products continued during the year. The results of Commonwealth Government analyses of factory butter and cheese samples are listed below.

PERCENTAGE OF SAMPLES FOUND TO CONTAIN PESTICIDE RESIDUES ABOVE TOLERANCE

Year	Chlorinated Hydrocarbons						Organo-phosphates		
	DDT	Dieldrin	Aldrin	Lindane	BHC	HCB	Ethion	Dursban	Nexagan
1970	5.7	0.4	0.1	0.2	0.8	5.1	10.8	3.0	Nil
1971	3.2	3.7	Nil	0.1	1.8	6.3	9.8	0.2	Nil
1972	0.6	2.4	Nil	Nil	1.6	3.2	11.4	Nil	Nil
1973	1.5	0.9	Nil	Nil	Nil	1.2	7.6	1.3	Nil
1974	0.9	2.2	Nil	0.1	Nil	1.5	*	1.5	Nil

* Tolerance level for ethion was changed during 1974 from zero to 0.5 p.p.m.

These results indicate a situation demanding constant attention, with dieldrin residues posing a problem at present. In association with the product analysis, 918 individual farm milks and creams were analysed. Farm follow-up visits were made where necessary, but little success was achieved in identifying causal factors for dieldrin residues.

Collection of relevant analytical results from one commercial plant at Booval continued during the year. Results of the survey are now being collected and estimates of the effect of modified procedures on individual incomes will be prepared. Preliminary analysis indicated payment based on fat and protein content eliminated all but a very small percentage of errors.

Consistent with the need for continued quality assurance in processed products, attention was given during the year to providing training to staff of dairy factories in several subject-matter areas. A residential school for 1 week and several regional short-term courses were presented by

specialist staff. This programme was welcomed by industry and coincides with the present programmes of the National Dairy Industry Processing Training Committee.

A comprehensive report on the Queensland dairy industry was prepared for submission to the Industries Assistance Commission. This forms portion of the Australia-wide investigation being conducted by the Commission. The specific problems of climate, distance, and economic disability were highlighted in the document. In addition, the benefits from financial aid towards amalgamation, diversification and modernization of processing plants was emphasized. The major recommendations were related to direct and indirect farm and factory assistance.

With the Commonwealth Government, the Division of Dairying has played a major part in training officers from developing countries in Africa, Asia and the South Pacific Islands in dairy husbandry and artificial breeding. The objective of these courses is to provide knowledge and develop skills which will enable participants to perform an effective role in dairy husbandry and herd improvement programmes in their own countries.

Nineteen officers from 13 countries took part in the course in dairy husbandry and 14 officers from 10 developing countries attended the artificial breeding in herd improvement programme.

BREEDING

The 1974-75 year saw a slight reduction in the number of cows being offered for bull proving. This was brought about in part by a reduction in the number of dairy farms in the State, some of the larger herds being dispersed. Five bulls were used in both the Jersey and A.I.S. teams. The Friesian team was expanded to six bulls, this being the first occasion that six bulls have been used in the one team.

Once again, the Friesian breed provided the greatest number of cows for proving. There was a reduction in the number of cows of the other breeds nominated, Jerseys being 21% fewer than in the previous year. Each year it becomes more difficult to obtain sufficient cows of this breed for proving as many farmers have changed from Jerseys to Friesian.

Numbers of cows mated for bull proving in 1974 were: Friesian 1 987 in 79 herds; A.I.S. 1 559 in 71 herds; Jersey 1 036 in 46 herds.



Training programmes are provided in animal nutrition and breeding for officers from overseas countries in association with the Australian Development Assistance Agency.

Scheme	No. of Herds	No. of Cows	Average Milk Yield/Cow (kg)	Average Butterfat Test (%)	Average Butterfat Yield/Cow (kg)	Average Lactation Period (days)
Pure Bred	158	4 889	3 308	4.1	135	264
Group	717	38 280	2 617	4.0	105	259
Alternate	27	1 251	2 238	4.2	94	259

The number of herds recorded under these schemes was similar to last year. For comparison, 154 pure bred herds, 708 in the group scheme and 39 in the alternate monthly scheme were recorded last year. The number of cows tested declined from 46 154 to 44 420, approximately 10%. Approximately 18% of Queensland dairymen production-recorded their herds during the year.

Production recording of goats continued where it was possible to record does in conjunction with dairy herds in the same localities. During the year, 67 does completed lactations with average production of 839 kg milk, 3.7% fat, 30 kg fat in 275 days. Goat herds in the Brisbane suburbs can now be recorded under supervision if several owners are prepared to bring their does to a central point each month. This method has worked most satisfactorily at Park Ridge where six goat owners bring their does to one property for recording.

Alternative recording procedures are being considered to enable the dairy farmer to select the service that best suits his needs. In addition to the present service, farmers may have the option of themselves doing the recording of milk weights and taking of samples for testing from their herds; having recording and sampling performed at one milking only on each occasion, rather than at two consecutive milkings; or having estimates of lactation performance suitable for culling and selection prepared from only four recordings per year.

During the year, development of the herd recording data processing system has continued. A system flow chart has been drawn for weekly programming runs and three of the programmes have been written. It is expected that all of these programmes will be tested successfully during the next 6 months.

The change from on-farm testing using the Babcock method to testing at a central testing laboratory is almost completed. The only district where testing is still being done on the farm is Rockhampton, and milk samples from Rockhampton should begin arriving at Wacol in September. Milk samples tested each month have increased from 8 000 to 40 000.

Eighteen breeds of dairy and beef cattle are kept at the Wacol A.I. Centre to meet the needs of cattlemen. To assess the fertility of bulls before commercial release of their semen, limited quantities were supplied free of charge to co-operators for trial. In most instances, 60 to 90-day non-return rates ranged from 69.8% to 87.5%.

A semen and liquid nitrogen delivery service for south-east Queensland was introduced during the year. The service operates in conjunction with the transport of milk samples for centralized testing and is proving to be a valuable aid to clients.

Total dairy semen sales (41 859 doses) this year showed a reduction of only 7.4% on last year's semen sales, but beef semen sales (28 586 doses) declined by 35.4% on last year. The demand for proven dairy sires remained about the same as for last year. A total of 214 000 doses of semen was processed in Cassou straws. Conversion from 0.5 to 0.25 ml packaging was completed in November and 120 000 doses were processed using the new technique. The most important advantage of the ministraws is that the semen storage capacity of most liquid nitrogen units is doubled.

Fifteen privately-owned bulls passed through the Centre with five still located at Wacol on 31 May 1975. Of 141 collections, 96 were processed to place 20 000 doses in storage.

The Centre's facilities, in addition to being open for public inspection at all times, were used for several open-days during the year. A beef producers' function in July 1974 attracted 120 farmers; 42 members of the Friesian Cattle Club attended a similar function arranged around the Centre's Friesian bulls and 31 members of the Jersey Cattle Club attended a function arranged for their specific interest. Visiting groups from overseas included Indonesians, Chinese, Nigerians and Malaysians.

The Annual Artificial Breeding Refresher Course attracted 36 technicians for the one-day course in August. During the year, 82 persons were examined for the A.I. Certificate; 75 of these passed. The Wacol staff trained 58 of these people. Exports of semen to 11 countries took place from the Redlands Semen Export Centre.

A total of 19 951 dairy and 4 881 beef semen doses was exported. The Centre is producing semen available for export to all countries of the world. A comprehensive health testing programme has been maintained.

During the year, 126 semen collections were sent in by veterinary practitioners. Of these, 87 collections were successfully processed. Processing of this semen is now being carried out in the new laboratories and has been very satisfactory: 16 374 straws were stored giving a success rate of 89%.

In the chromosomal study, cattle at the Wacol A.I. Centre, C.S.I.R.O., Belmont, and H.M. Prison Farm, Wacol, have been studied.

The main project at present involves bulls at C.S.I.R.O., Belmont, Rockhampton. So far, satisfactory chromosome spreads from 41 bulls have been prepared and await study. Approximately nine more bulls remain to be bled before the first part of this 3-year project is completed. Breeds involved are: Grade Africander (GA), Grade Brahman (GB), Africander-Brahman Cross (AxBx) and Brahman-Africander Cross (BxAx) bulls. Chromosome spreads from approximately 30 bulls at the Wacol A.I. Centre have been prepared and are awaiting study.

General sampling of boars at Rocklea has been in progress and a bank of slides of chromosome spreads has been compiled. Detailed study of these will continue.

Semen processing studies will be continued to develop a satisfactory procedure for swine A.I. Work on artificial breeding in horses and goats is also in progress.

The study of the effects of ephemeral fever on bull fertility was continued. The effects in the 1968, 1971 and 1973 outbreaks have been observed on 110 bulls at the Wacol A.I. Centre. Twelve bulls were observed in 1974. No abnormality that could be related specifically to ephemeral fever has been observed in the cases studied at the Centre.

NUTRITION

An experiment at Ayr Research Station studied milk production from irrigated nitrogen-fertilized pangola grass. This project compared milk production from Jersey and Friesian cows each grazed at two stocking rates. A supplement of 3.6 kg a head per day of molasses-urea-M.A.P. (97:2:1) was also evaluated.

The molasses-based supplement was highly effective in raising both milk and fat production. On average, Friesians gave 0.8 kg milk per kg of supplement, and the Jerseys 0.4 kg. Supplement feeding increased production per cow, lactation length and generally reduced the butterfat percentage of the milk. Milk quality with Friesians was a problem. A new project is examining the effect of the level of molasses on the milk production of Friesian cows grazing irrigated, nitrogen-fertilized pangola grass.

An assessment was made of the feedlot performance of dairy males as influenced by level of substitution of molasses for grain, breed, feeding frequency, weaning weight and sexual status. The animals were pen fed concentrate at 1½% liveweight (grain or grain-molasses-urea) plus *ad lib.* lucerne hay from weaning at 40 to 60 kg until they reached 270 kg liveweight.

Daily liveweight gains ranged from 0.62 kg to 0.79 kg per head. Sexual status had the greatest effect on liveweight gain with entires growing 15 to 18% faster than castrates. Although there was no visual difference in carcass quality due to breed or sex, there was butcher resistance to entires.

During the two years 1973 and 1974, the effect of nitrogen applied in autumn to a green panic (*Panicum maximum* var. *trichoglume*)—glycine (*Glycine wightii* cv. Tinaroo) pasture has been measured from recorded pasture changes and milk yields at Kairi Research Station. Milk yield per cow and per hectare were markedly increased by nitrogen fertilization at 1.9 and 2.5 cows per ha. At 1.3 and 1.6 cows per ha, the response was negligible and nitrogen fertilization was uneconomic at local prices. Solids-not-fat content of milk was increased by nitrogen fertilization at the higher stocking rates.

The production potential of Friesian and Australian Friesian Sahiwal cows was assessed at Kairi. Twelve cows of each breed were fed 1.5 tonnes of maize meal over a 300-day lactation. Feeding rates commenced at 8 kg a day for the first month of lactation and decreased by 1 kg a day in each succeeding month. The cows were grazed on a glycine-green panic pasture which was irrigated during the dry season. The A.F.S. cows averaged 70% of the milk and 88% of the fat yields of the Friesians.

The milk yield of cows grazing a green panic-glycine paddock as a whole or in 10 equal strips was the subject of another study at Kairi Research Station. A group of cows was allowed free access to paddocks (2.8 ha) and another grazed paddocks in strips (10% per day). These systems were compared over 30 days in June-July. It was concluded that the extra selection allowed free-access cows to select a diet of higher quality than that selected by strip-grazed cows.

During both 1973 and 1974, the helminth burden and growth rates of weaners were studied. Groups of calves were run on either continuous or 3-week rotationally grazed glycine-green panic pastures. The trial was designed so that differences between male and female, and Friesian and Sahiwal x Friesian calves could be assessed.

Because of the large variations between animals when monthly faecal egg counts were made, no correlations were observed between worm burden and growth rate. All groups of calves grew at a similar rate (0.6 kg per day) from weaning at 8 weeks to 140 kg liveweight.

A comparison of bucket and multiple suckling systems for rearing calves was undertaken at Kairi over 2 years. Some calves were fed by bucket using a commercial milk replacer, some were multiple suckled (four per cow), and some had only limited access to a cow (two in the morning, two in the afternoon).

Growth rates were between 0.35 to 0.45 kg per calf per day in year 1 (multiple suckling) and 0.35 to 0.33 kg per calf per day in year 2 (bucket feeding). The better growth rates and reduced labour requirements make multiple suckling an attractive method of calf rearing when over-quota milk can be utilized.

At Biloela Research Station, a comparison of dairy and multiple suckling calf production is in its third season. The study is defining the technology of the multiple suckling method of calf rearing in terms of various production systems and suckling intensities. More than 600 calves have been reared.

This work has demonstrated that multiple suckling is interchangeable with machine milking at any stage of lactation as a means of milk extraction, given proper restraint of calf rejection by the cow. Cow fertility was unaffected by high intensity multiple suckling twice a day in stalls (88 calving percentage over a 72-day insemination period) and unaffected under free access conditions in the presence of sexually competent, vasectomized teaser bulls (86 calving percentage). The work has confirmed the New Zealand results that there is a marked yield stimulus from suckling during the first 6 months of lactation, estimated at approximately 20 to 25%.

This means that calves can be reared to 8 to 10 weeks of age at a negligible cost in terms of milk forgone. Suckled cows will yield at a higher level than cows continually machine milked.

At Kairi and Ayr Research Stations, Dairy Cattle Husbandry Branch is directing a major effort into rearing and testing A.F.S. dairy cattle. This crossbreeding programme is designed to produce tick-resistant, tropically-adapted dairy animals capable of acceptable milk yields under Queensland conditions.

Lactation productions of 3 250 kg of milk and 143 kg of fat in 300 days by grain-fed A.F.S. were recorded at Kairi last year. Some outstanding cows produced more than 4 000 kg of milk and 175 kg of fat.

Although the number of ticks carried by individual A.F.S. cattle varies considerably, about 75% are more resistant than contemporary Friesians, and 50% of these rarely carry any ticks. A programme of tick resistance testing of young bulls has just begun, with three yearling bulls under test.

A joint project was undertaken in south-east Queensland by the Dairy Cattle Husbandry and Husbandry Research Branches to investigate hindleg lameness in dairy cows. This pilot project aimed at elucidating the pathways by which phosphorus supplementation both prevented the problem developing and often reversed the condition, even in badly affected animals.

The technical base for extension information remains largely unaltered. Large doses of phosphorus, initially, for affected animals will give good results; 30 g of P daily is suggested.

A joint project of the Dairy Cattle Husbandry and Agricultural Chemistry Branches is investigating soil fertility on the Beechmont Plateau where interest in the use of elemental nitrogen on pure stands of kikuyu is great. Indications in these situations are that the uptake of phosphorus by the plant can be increased, and levels of phosphorus suggested as necessary for higher milk production are approached. If correct, this makes the plant even more attractive than previously thought.

A survey into abnormal milk composition in south-east Queensland concerns the rising number of suppliers who fail to meet the solids-not-fat standard of 8.5%. Upwards of 30% of suppliers can be involved at times. Those properties which showed a solids-not-fat level below 8.4% through the winter-spring of 1974 were visited.

Preliminary investigations have been made into the problem of oxalate toxicity with setaria. Aspects of pasture management and calcium balance in the dairy cow appear important, and a project covering this work will shortly begin in co-operation with Agriculture and Biochemistry Branches.

The principles supporting the management and utilization of improved tropical grass-legume pastures have already been published. Efforts to date have continued to demonstrate the overall usefulness and workability of the system to Departmental personnel. One farm at Eumundi and another at Rosewood have so far been selected. Others are expected in other districts. Farm walks by Departmental workers and farmers have been extremely successful.

A study in the widespread area examined supplementation with molasses and phosphorus of cows grazing improved pasture as a means of increasing pre-calving condition. Apparent differences between the two groups of cattle in body condition were extremely modest and in some cases negligible. Most cows calved in 'store' or possibly 'forward store' condition.

This investigation will continue with an additional supplement of N.P.N. The trial has emphasized the importance of adequate post-calving feeding, otherwise the benefit of an improved pre-calving feeding programme can be lost.

A trial in the Brisbane Valley is comparing permanent pangola pastures with a mixture of annual crops and pastures of limited life grazed by dairy cows. The higher fertilizer cost of pangola is being compared with annual planting costs and the expense of planting, maintaining and replanting pasture with a limited life.

The first year's results show that direct costs per cow and per kg of milk produced were higher for cows grazing pangola grass than for cows on other dryland pastures. The higher carrying capacity of irrigated pangola (4.75 cows per ha) would be more beneficial in a dry season. The trial will be continued to test a variety of seasonal conditions.

A project on a co-operator's farm at Grantham compares dairy production from irrigated kikuyu with the routine pasture-crop system on the same property. During the last year, the cost per cow of producing feed from irrigated kikuyu was \$58.20. This compared unfavourably with \$31.20 per cow for the remainder of the farm grazed by the control herd. Fertilizer was the highest single-cost item.

Carrying capacity was 4.2 cows per hectare on the trial kikuyu compared with 1.8 cows per hectare for the control herd. Return per hectare (the margin of gross income over variable growing costs of pasture) was \$585 from the trial pasture compared with \$247 from the remainder of the farm. Extension of this trial to assess different seasonal conditions will give a truer indication of the role of irrigated kikuyu on dairy farms in the West Moreton.

Milk and butterfat production from a commercial dairy herd were recorded from cows grazing an irrigated ryegrass pasture on a co-operator's farm in the Burnett district. For the 206-day trial, milk production of 13.5 litres per cow and butterfat production of 0.5 kg per cow per day were achieved. This represents a return of approximately \$1 190 per hectare.

The trial indicated an advantage in carrying capacity, rather than production per cow, from this pasture. This system of winter grazing has application in south-east Queensland for farmers who are producing quota milk and whose alternative is to buy expensive supplementary feed.

The Australian conference on tropical pastures was held at James Cook University in May. Two papers were presented. They outlined in greater depth than in previous publications the reasoning behind the pasture management-utilization procedures being so successfully demonstrated in the commercial situation.

DAIRY ECONOMICS

A decline in the number of dairy farmers continued with falls of 10 and 12% being recorded in Gympie and South Burnett regions respectively. This trend was common in all dairying districts except the Atherton Tableland.

Predictably, the decline has occurred mainly in the manufacturing sector, with the higher priced wholemilk sector in a better position to withstand cost pressure.

A milk price index was established at the request of the Brisbane Milk Board to assist in price determination for the Brisbane milk district.

Economic advice to dairy farmers has been intensified over the past 2 years. Discussion groups, dairy demonstration farm projects and recording schemes are conducted highlighting the economics of management strategies available to producers wishing to remain in the industry.

In the Gympie region, a unified extension approach has been adopted to encourage greater production to benefit dairy farmers and the community. Assistance was given to local producers who engaged a private farm management consultant to present evidence on their behalf to the Industries Assistance Commission for retention of the bounty on superphosphate.

In West Moreton, a uniform system for collecting costs and returns from a group of farmers was developed. A similar scheme was begun in the South Burnett with emphasis on variable costs to establish some measure of response from improved feeding practices.

PRODUCTS RESEARCH

The Dairy Research Branch directs its activities towards applied research aimed at new developments to increase the use of dairy products, increasing the efficiency of processing methods, and improving quality. The achievements reported

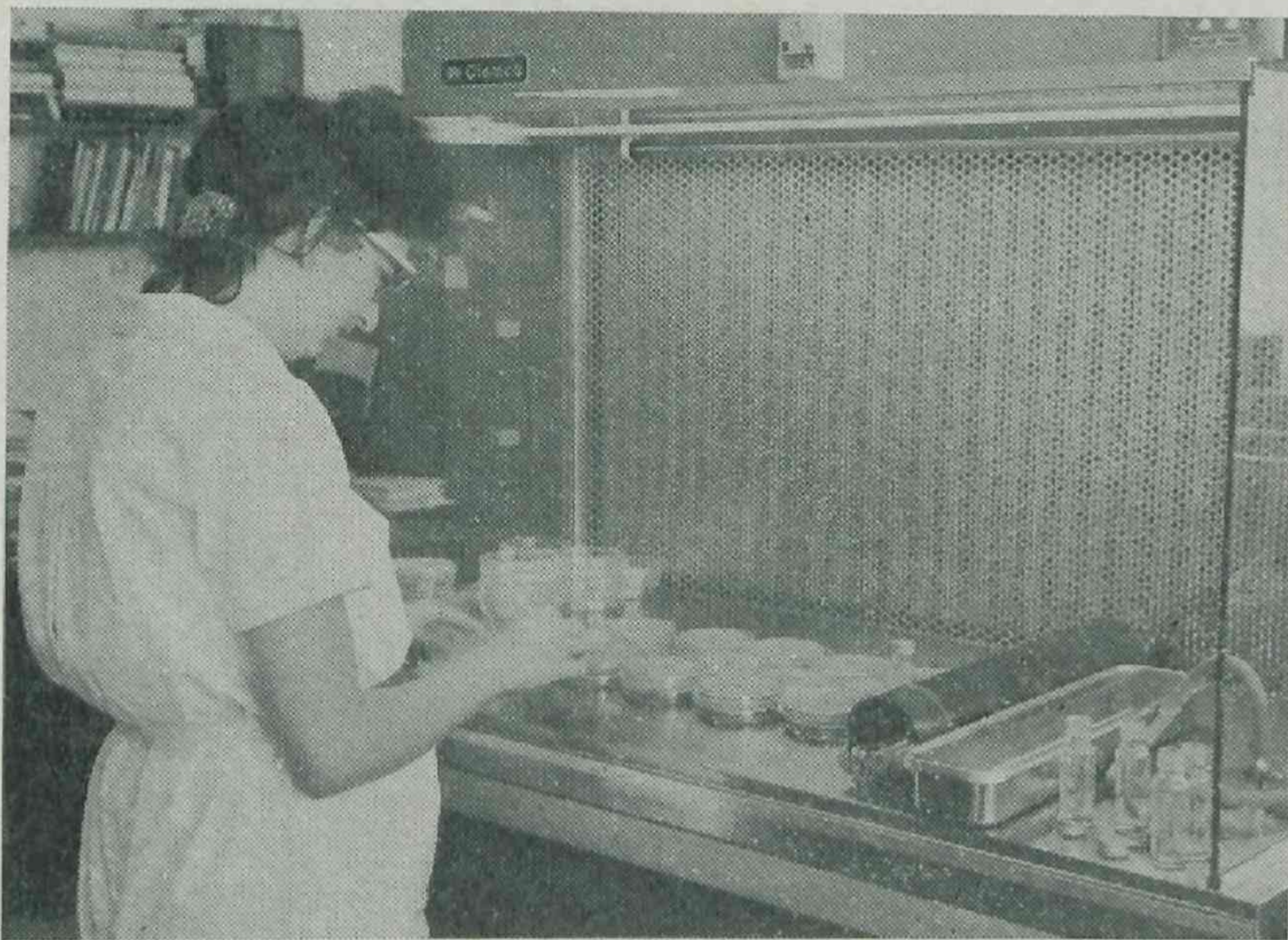
here are, in the main, the results of a co-operative effort by the three sections of the branch—technological, bacteriological and chemical.

Cheese Manufacture.—During the year, 236 vats of cheddar and fancy cheese were manufactured. These were made up of 82 cheese ripening enzymology trials, 80 coliform trials, 16 cold ripening trials, 46 fat fractionation and 8 lipase activation trials, and 4 fancy cheese experiments.

Butter Manufacture.—Butter was manufactured from Booval and Beaudesert cream to yield 29 tonnes of product. This work was undertaken for research projects 'Milk Lipase Activation' and 'Dairy Blend', and it also facilitated experimentation with fractionated fat.

Dairy Blend Manufacture.—Trials were undertaken to manufacture Dairy Blend using various levels of sunflower oil within the range 15 to 25%. This project was undertaken to provide information for the industry. Because of the complexity of the processing operations, trials were restricted to seven variables to ensure the supply of critical data to industry.

Whipped Butter.—A method for continuous production of flavoured butter spreads was investigated. Flavour ingredients, together with nitrogen, were introduced in line before the mixing head of a research model 4M Oakes Mixer. Sunflower oil proved to be a suitable vehicle for introducing flavouring materials. The vegetable oil was of further advantage in influencing the softness of the final product. The process yielded 100% over-run.



Modern laboratory equipment allows technicians to examine dairy products for quality control more efficiently.

Fat Fractionation.—Efficiency of operation of the relatively simple fat fractionation process used by the Otto Madsen Dairy Research Laboratory was improved. Over 5 tonnes of anhydrous milk fat were fractionated during the year. The hard milk fat was used in experimental trials for manufacturing cheese and butter. The soft milk fat was used in butter experiments.

Use of Butterfat Fractions for Buttermaking.—Progress here was outstanding. Incorporation of soft milk fat fraction in cream for buttermaking produced very desirable butters (grades to 94 points). The 19 experimental vats of cream manufactured contained S.M.F. within the range of 10 to 30%. Butters were also produced by using hard milk fat and vegetable oil. Although the flavour of these blends was inferior to that of normal butter, physical properties which characterize spreadability and resistance to undue softening at elevated temperatures indicate the advantages of using these types of materials in formulating new dairy blends in the future.

Whipping Cream.—Investigations with natural market cream are focused on determining the most favourable conditions for whipping cream under pressure. This work is continuing.

Recombined Cream.—Recombined creams were prepared using various percentages of hard and normal milk fat together with buttermilk powder and water. They were subjected to a homogenization at selected pressures followed by pasteurization. As the percentage of hard milk fraction is increased, results reveal enhanced whipping properties, increased viscosity and also a marked improvement in the ability of the cream to stand up and maintain form. However, there is a parallel decline in attractiveness of flavour of the recombined product.

Consequently, in selecting the raw materials for recombined cream, it is necessary to compromise between taste and whipability. From taste panel assessment, it is considered that substitution of 30 to 40% normal fat by hard milk fat is warranted.

Equipment for Whipping and Dispensing Cream.—This project was undertaken following a request for assistance from industry. Progress has involved: development of a pressure vessel to whip cream; modification of the equipment for controlled operation; specification of cream and refrigeration requirements; modification of equipment for dispensing cream from seven outlets simultaneously; installation of equipment (prototype I) for commercial trials at Sunshine Plantation, Nambour; provision of working specifications for raw materials, process control, equipment cleaning and sanitation; and preparation of plans for prototype II.

Quarg Spreads.—Basic work designed towards refining the quarg-making process resulted in a reasonably straightforward procedure for the manufacture of quarg base. Quarg spreads flavoured with blue vein cheese together with other condiments were then produced. One of these products, 'Danish Dairy Spread', was developed for consumer assessment and market research. Field Services Branch co-operated in the market research aspects.

Dairy Confection.—A variety of chocolate flavoured confections incorporating up to 45% cheese was produced. Experimental work was concentrated on improving flavour, texture and keeping quality. Addition of coconut, nuts, raisins and sultanas enhanced flavour and improved acceptability.

Recombined Yoghurts.—There is considerable scope for development of recombined yoghurts in South-east Asia and in areas of Australia where fresh milk is not readily available. However, lowered viscosity and excessive weeping during storage have resulted in poor consumer acceptance. During the initial stages of this project, the characteristics and quality of yoghurts manufactured by recombining specific milk powders were compared with those of control products. Recent results reveal improved viscosity for the control and medium heat powder yoghurts and no significant difference for organoleptic grading.

Whey Concentrate.—In response to an industry request for the production of whey concentrate suitable for supplementing ice cream mixes and confectionery, cheese whey was separated to remove curd particles and fat, preheated to 86°C to precipitate protein, and concentrated at 60°C. Further research hinges on the assessment of the initial product by the factory concerned.

Orange Milk.—Work on this project was superimposed on the planned pilot plant programme to yield results promptly for the Dairy Research Committee marketing project. However, because the product does not store well, further development work is necessary before beginning market research.

Dairy Snacks.—Savoury flavoured samples of high protein dairy snacks were prepared for evaluation by the Dairy Research Committee.

IV. Pasture Research and Extension

Agriculture Branch carries the main responsibility for pasture research and development. However, other branches have in progress pasture production, management and evaluation projects of various kinds. Branches with these projects are Agricultural Chemistry, Beef Cattle Husbandry, Dairy Cattle Husbandry, Dairy Field Services, Sheep and Wool, Husbandry Research, Biochemistry, Economic Services, Standards, Botany, Entomology and Plant Pathology.

Pasture research is carried on at major research stations as well as numerous country centres.

The principal centres are the research centres at Walkamin, Kairi, South Johnstone, Ayr, Biloela, Theodore (Brigalow) and Coolum. Other stations are the 'Swan's Lagoon' Cattle Field Research Station, 'Brian Pastures' Pasture Research Station, the Charleville Pastoral Laboratory, the Queensland Wheat Research Institute (Toowoomba) and the Animal Research Institute (Yeerongpilly).

Pasture extension work is carried out in all the main grazing and dairying areas, chiefly by officers of Agriculture Branch.

The Dairy Pasture Subsidy Scheme (reported in section III of this report) is administered by a committee made up of representatives of the various divisions and the Queensland Dairymen's State Council.

PASTURE SPECIES EVALUATION

The Dry Tropics.—The widespread testing of legumes that has been in progress in the dry tropics in recent years is beginning to show promise of providing a range of new pasture cultivars. Verano Caribbean stylo (*Stylosanthes hamata*) has been released from the co-operative programme with C.S.I.R.O. and other *Stylosanthes* species are showing great promise, especially *S. scabra* and *S. viscosa*. In the more favourable areas *S. guyanensis* also appears likely to provide useful new cultivars.



A vigorous pasture of Archer axillaris and green panic (*Panicum maximum* var. *trichoglume* cv. Petrie) at Mt. Mee in south-eastern Queensland.

As yet, the reaction of these species to grazing is little known, but early evaluations have been successful. On the Mt. Surprise basalt country, seven *Stylosanthes* introductions were established into burnt woodland with 120 kg per ha superphosphate during 1974. They are now undergoing the first extended grazing that any of these lines, except Verano, has experienced to date. They have established well and, since early September 1974, have been grazed at a weaner to 1.5 ha. The lines are *S. scabra* CPI-34925, CPI-40292, and CPI-40205, *S. viscosa* CPI-34904, CPI-40264, *S. guyanensis* CPI-40255 and CPI-40292 and *S. fruticosa* CPI-41219.

In the Peninsula area, testing a range of legumes has continued with *S. scabra* providing outstanding material.

In the Normanton area of the Gulf, flooding in January–March 1974 destroyed some trials. Elsewhere, progress has been maintained and Verano stylo and two *S. scabra* lines have continued to outyield Townsville stylo beyond the establishment year.

The potential role of the newer *Stylosanthes* in central Queensland is not known. Townsville stylo is already widely used in this area and several trials are in progress examining a range of new *Stylosanthes* species.

Key trials established during 1973 in the Mackay–Rockhampton area have shown excellent first-year performance of Verano. The *S. scabra* lines, while slow in the establishment year, are showing outstanding second-season performance with yields in the vicinity of 10 000 to 11 000 kg/ha. The *Stylosanthes* are showing good frost tolerance in comparison with Siratro.

The improved line of leucaena (line 3) from C.S.I.R.O. is under comparison with Peru leucaena at Walkamin Research Station and at this stage has shown superior dry matter yield and greater plant height.

The Wet Tropics.—On the wet tropical coast, productive pastures can now be established on most lands and a range of pasture cultivars is available. Two large grazing trials, at Utchee Creek and Tully River Station, have been begun. At Utchee Creek, pastures of Belalto or common centro and Makueni or common guinea, with and without areas of pure Basilisk signal grass fertilized with nitrogen, are being compared to assess the productivity of the newer species. At Tully River Station, six different production systems are to be compared. These incorporate pasture type, fertilizer application and energy supplementation. Initially, a stocking rate of 2.47 beasts per ha is being used at both sites.

Over the last 3 years, the popularity of pangola grass has declined markedly because of attacks of rust and an aphid. Basilisk signal grass has been available as an alternative, but this also has recently been attacked by nematodes. New material under test includes a range of *Digitaria* spp. of which CQ911 is outstanding at this stage. This is pest and disease resistant and high yielding.

The Central Brigalow.—The search for suitable legumes for the brigalow areas now includes the *Medicago* species with annual medics being brought under study and work on lucerne continuing in the Dawson–Callide region.

Two medic trials established at Biloela and Brigalow Research Stations in 1973 seeded down well. In the drier 1974 winter, growth was much poorer, but snail medic and *M. truncatula* lines Jemalong and SA2031 have been consistently good. Long term persistence is vital.

No lucerne lines superior to Siro Peruvian and Hunter River have been identified. Two lines of creeping rooted lucerne under development by C.S.I.R.O. are being compared under regular grazing with Hunter River and Siro Peruvian.

Siro Peruvian has given inferior persistence over 4 years to that of Hunter River but cultivar and planting rate (1.1 or 4.4 kg/ha) had only minor effects on lucerne yield. Buffel grass has accentuated the rate of lucerne stand decline at both seeding rates. Stand decline was rapid under all treatments and it is considered that the presence of the disease *Colletotrichum trifolii*, which was widespread, was the overriding factor in this trial.

Semi-arid Regions.—In western Queensland, the programme aims at selecting pasture grasses and legumes capable of establishing, persisting and producing under the semi-arid conditions. Though broad area establishment is unlikely in mulga and Mitchell grass lands, it is recognized that favourable microhabitats will exist. The programme aims at filling these with useful rather than undesirable species.



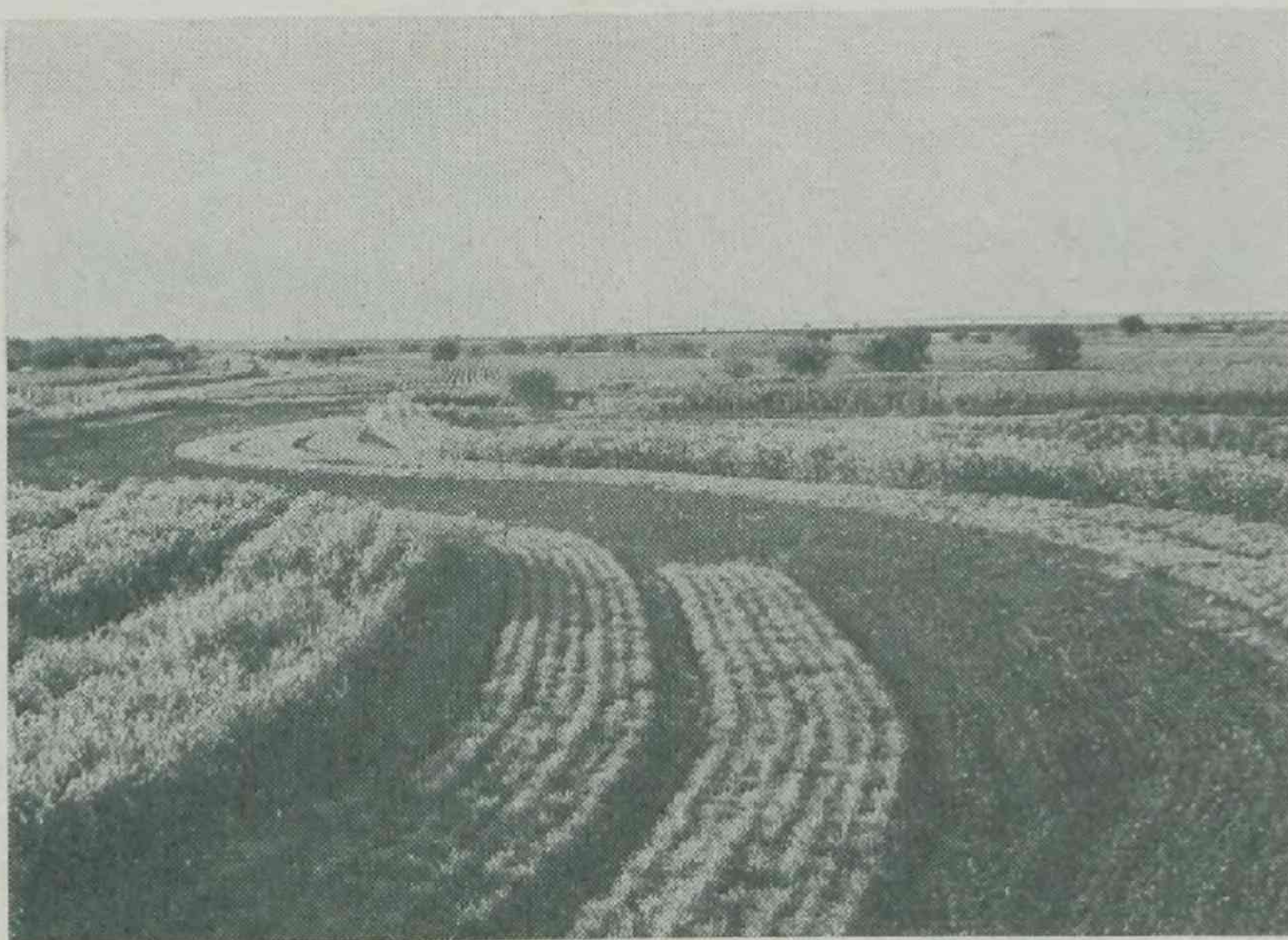
In recent years, Cloncurry buffel grass has spread from the fertile river frontages to the poor stony hillsides between Cloncurry and Mt. Isa.

The most promising perennial species are in the genera *Schmidia*, *Antheplora*, *Eragrostis*, *Cenchrus* and *Stylosanthes*. Possible annuals appear confined to the *Dactyloctenium* species. *Eragrostis curvula*, *Schmidia bulbosa*, two *Cenchrus ciliaris* introductions and the legume *Stylosanthes mucronata* have continued to spread slowly under unfertilized conditions at three sites in the south-western mulga lands. *E. curvula* was most impressive in 1974.

The grasses have consistently outyielded the native mulga species with *Themeda australis* the only grass from the latter group to produce a comparable yield. *C. ciliaris* Q10087 and 10077 have outyielded the two commercial cultivars American and Gayndah.

The advantages of establishing higher producing pasture species in semi-arid lands are clear. However, testing the introductions has not advanced sufficiently to recommend the release of any for use.

Dairy Pastures.—These investigations have been concentrated in four main dairying areas: Atherton Tableland, Wide Bay, East Moreton and West Moreton. Legume and grass introductions are being continually screened. Out of



At Richmond, fodder crops planted in the bed of the dam (ponded area) as the water recedes provide a useful bonus to the shallow storage irrigation scheme.

the many hundreds of tropical species screened, some 25 grasses and 20 legumes are now in commercial use. Basilisk signal grass has given high autumn yields in the Mt. Mee nursery. At Dayboro, Basilisk-based pastures with tropical legumes established well and controlled weeds better than pastures based on *Kazungula setaria* and *Petrie panic*.

In high rainfall areas (up to 2 000 mm a year) on the Atherton Tableland, *Glycine wightii* cv. Malawi has emerged after 10 years' evaluation as well suited to soils of lower fertility. Malawi has outyielded the commercial strains of glycine. It has similar carrying capacity to *Desmodium intortum* cv. Greenleaf, but this latter legume is much more susceptible to webworms (*Oncopera* sp.) and the rough brown weevil (*Leptopius corrugatus*). Another glycine, CPI25920, is persistent and shows promise in south-eastern Queensland.

In seeking and assessing species, special attributes such as longer season growth are sought. One species released this year after evaluation in north Queensland is *Panicum maximum* cv. Makueni (CPI37910). Its main advantage over other *Panicum maximum* cultivars has been greater cool season growth. This cultivar is now being assessed in south-east Queensland. Other good cool season producers include kikuyu grass and Narok setaria. Elephant grass has been particularly good in the warmer but dry winters on the Atherton Tableland.

Kikuyu is one of the main dairying grasses in Queensland. Investigations are continuing at sites in south-eastern Queensland into the merits of the two seeding strains of kikuyu, cv. Whittet and cv. Breakwell. Both are slow to establish in comparison with common kikuyu, but seed is becoming much cheaper and higher seeding rates will speed establishment. A disease which is being watched with interest was recently recorded on Whittet. It is *Pyricularia* and it has not yet been recorded on common kikuyu.



A 6-year-old pasture of kikuyu grass and Greenleaf desmodium at Millaa Millaa. Proper grazing management has enabled the legume to persist.

Trifolium semipilosum cv. Safari (Kenya white clover) is being widely tested in coastal dairying districts. Although a tropical legume, it has the great attribute of frost tolerance. It is being evaluated against temperate strains of white clover (*Trifolium repens*). Being a tropical legume, its greatest productivity occurs during the warmer months and, once established, it can compete with summer-growing grasses.

All plantings of Safari have been badly damaged at various early stages with rugose leaf curl virus. However, the stands have generally recovered.

In all districts, Haifa white clover has exhibited rapid germination, quick establishment and vigorous winter-early spring growth compared with other cultivars of white clover. It is a prolific seeder, and spreads rapidly. Ladino outyields Haifa in the summer.

A critical feed shortage in the cool season has long been recognized and, in Queensland, the traditional approach to this has been to rely heavily on standover summer forage. While a useful source of roughage, this feed is of inadequate quality for dairy cattle. Approaches to this problem have included testing temperate legumes and grasses for suitability to the sub-tropical environment, and selecting from within the tropical species those with superior cool season performance.

At the Coolool Research Station on low heath soils *Phalaris tuberosa* cv. Australian, *Bromus unioloides* (Priebe perennial prairie) and five commercial ryegrasses, all well

fertilized with nitrogen, yielded 4 000 to 5 000 kg/ha oven dry matter in the 1973 season. Cold, dry conditions and flooding after sowing reduced yields substantially in 1974.

Sirocco phalaris at Gatton Research Station remains the highest dry matter yielder of any temperate grass with Whittet kikuyu the highest producer of the tropical species in the same experiment. Over an 18-month period, fescue and phalaris cultivars and Priebe prairie grass were more productive and persistent than ryegrass and cocksfoot cultivars.

Experiments have shown that annual medics are of little value in the Gympie region. However, at Gatton Research Station, they do make a significant contribution to the production of annual pastures. Jemalong and snail medics were grown under irrigation with oats and ryegrass and the mixtures gave similar total dry matter yields to the oats or the ryegrass alone but fertilized with nitrogen.

Several lucerne strains are being evaluated at Goomong on the Mary River where poor persistence of lucerne stands is a major problem. The commercial cultivar Hunter River is the most persistent and disease tolerant. All other strains were overcome readily by one or more of the following diseases: Fusarium wilt, Colletotrichum crown rot (*Colletotrichum trifolii*), Phytophthora root rot (*Phytophthora megasperma* var. *sojae*), Stagnospora crown rot (*Stagnospora meliloti*) and bacterial leaf spot.

Irrigated Pastures.—Irrigated pastures involve a high cost input and require considerable labour to maintain. In southern Queensland, the high cost of irrigable land and limited area and water supply have necessitated increased productivity of irrigated pastures. Irrigated pastures in Queensland have been mainly based on temperate species. These pastures are incapable of high production during summer and one method of overcoming this shortage is to plant some tropical species in the temperate mixtures.

An experiment at Gatton investigated planting times of temperate-tropical mixtures under irrigation. Results in three separate years indicate that April and May plantings give the best balance of temperate and tropical species.

At Gatton Research Station, the persistence and production of grasses are being examined under high and low irrigation frequencies. Productivity has been highest under the more frequent irrigation schedule, but frequency has not changed the ranking of the highest producing species.

Because of the high cost of irrigation, research to maintain profitability of irrigated pastures has to concentrate on reducing costs rather than increasing yields. Research workers are looking at such things as low water requirements, less frequent watering, less cultivation and a lower demand for other managerial requirements.

Seed Production Studies.—Work on seed production of grasses has been expanded to south Queensland with new work on Callide Rhodes grass and Narok setaria.

At a trial site near Gympie, maximum seed yield of Callide Rhodes was achieved at fertilizer levels between 100 and 200 kg N/ha per seed crop.

Maximum yields of pure standing seed on a 4-year-old stand of Narok setaria resulted from 150 to 200 kg N/ha per seed crop. Increases up to this level were almost entirely due to increases in inflorescence density. Compared with the other setarias, Narok has a low inflorescence density with high variability between plants.

Urochloa mosambicensis is a promising grass for the dry tropics but problems of severe seed dormancy occur. This appears to be unaffected by the age of the inflorescence at harvest. At 12 months after harvest, germination was only 0.4%. After 22 months, germination had risen to 11% in water and 30% with gibberellins.

The paint by-product PTSB, which has been used to improve seed retention in *Phalaris* spp., was tested on a range of tropical grass seed crops at Kairi Research Station without showing any promise. The different spikelet structure of the tropical grasses requires a much stronger lacquer than is the case for the persistent glumes and shattering floret of phalaris.

Accumulation of records over four seasons on the Atherton Tableland has enabled harvest ripeness to be recognized with greater accuracy on a range of tropical grasses. In crops with a broad plateau of harvest ripeness, for example, Narok setaria, a loss of about 5% standing seed a day occurs. With Gatton panic, which has a sharper peak, this is about 8% per day. Losses of up to 60% a day have been recorded under heavy rain and high winds. The decision on when to harvest is important.

Machine harvesting (direct heading) of grasses has been found to be an inefficient method. Recovery of the pure standing seed crop ranges from as low as 30% to 60% with small-seeded species (panics and setarias) to about 50% to 80% with large-seeded ones (signal grass). Seed

weight and viability showed no superiority over hand-harvested seed although some improvement was achieved with signal grass.

Seed production from the Beerburrum Unit has maintained the major emphasis on *Stylosanthes* species. Excessively wet weather severely interrupted operations but seed harvests of 31 *Stylosanthes* from a total planting of 49 lines were obtained.

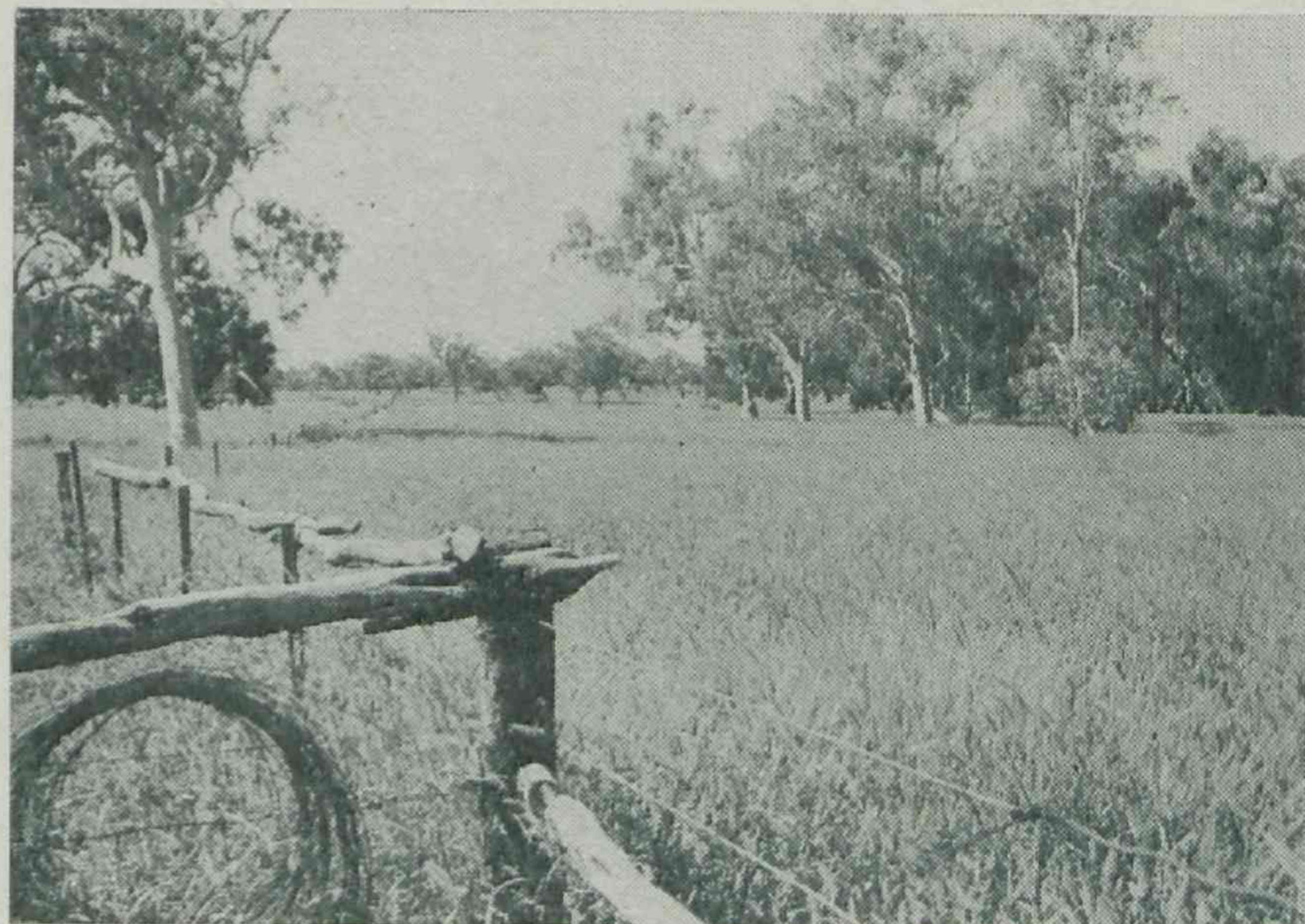
PASTURE ESTABLISHMENT

To be of value in the dry tropics, plants have to be readily established and spread well from the establishment centres. On the Mt. Surprise basalts, a range of plantings has now been carried out in the undisturbed forest land using no seedbed preparation but superphosphate topdressing. From the initial planting (1972–73), *Stylosanthes* spp. establishment was 13% of seed sown while other species gave only 4%. Archer axillare was the best of the twining types of legumes. In 1973–74 season, 9% overall establishment was achieved but flooding halved establishment in one planting. No spreading has yet been recorded.

One introduced plant to find a role in the very dry tropics has been Cloncurry buffel grass which is widely spread along the more fertile river flood plains. It is also beginning to spread away from these with recent wet summers and has been noted as colonizing under various eucalypts. Buffel yields, litter and plant numbers were recorded this year at four sites around Cloncurry and soil characters measured. The plant features measured were highest at the base of the trees, intermediate at the edge of a canopy and lowest in the inter-tree spaces as also were soil phosphorus, potassium, pH and nitrate nitrogen. Soil moisture levels, on the other hand, increased with depth and were highest in the inter-tree zones and lowest at the base of the trees.



Establishing buffel grass on a small, hard claypan at "Clonagh" Station, 80 km north of Cloncurry. Few pasture plants survived until the second year.



Cloncurry buffel grass growing on the frontage to the Corella River between Cloncurry and Quamby.

At Charleville, the place of phosphorus and nitrogen in establishing and in the seedling growth of buffel grass is being studied. This has been extended to similar studies on native mulga species. The programme has added to earlier work on the influence of box tree (*Eucalyptus populnea*) on buffel grass establishment and growth. Two methods of treating mixed box communities for buffel establishment have been compared: live box trees with mulga cleared; and all timber windrowed and burnt.

The burnt windrows carried a pure stand of buffel with a basal area of 4.2% whereas basal area in the inter-row areas was 2.0% and botanical composition was 64% buffel, 27% *Aristida* spp. and 9% various forbs.

Establishment on both treatments occurred in micro-habitats having higher soil phosphorus contents than the general concentration in the ecosystem, that is beneath tree canopies and under the burnt windrow. This now suggests that, when clearing mulga lands, as previously suggested in strips, some mature box trees should be retained to promote buffel grass establishment. Buffel grass cannot yet be established and maintained successfully on a broad area basis in cleared mulga lands.

PASTURE NUTRITION

In the brigalow areas, soil nitrogen levels are initially high after pulling and burning but little is known of the rate of run-down of nitrogen fertility. On the brigalow-Dawson gum soils of central Queensland the fertility of virgin soil has been compared with that of an adjacent developed area at 18 locations.

Only 55% of the sites have a significant decline in total soil nitrogen percentage. These sites fell into two categories, one with relatively low rates of decline (1% reduction in total N%/annum, half-life = 70 years); and the other with relatively rapid decline (4% reduction in total N%/annum, half-life = 17 years). The highest rates of rundown have been linked with a short history of development, shallower A horizons, the use of heavy machinery for clearing and severe initial fires.

The role of nitrogen in forage production on these soils is being examined in more detail. Several trials are in progress and in one of these, on a softwood scrub soil at Brigalow Research Station, nitrogen at 0, 26, 52, 112 and 224 kg/ha was applied to 3-year-old pastures and gave linear responses in dry matter with 35, 32, 19 and 12 kg DM/kgN for Gatton panic, Petrie panic, Molopo buffel and *P. maximum* Q14734 respectively. Crude protein 2 months after fertilizing also rose linearly with around 0.03 to 0.04% CP/kgN. By spring, this effect was apparent only at the highest nitrogen rate.

Productive pastures can be established on most land forms on the wet coast and emphasis has moved to monitoring pasture stability and assessing maintenance fertilizer needs. The objective is a base for sound recommendations for maintenance fertilizing. Fifty-four commercial pastures have been selected representing three soil types (dry Ingham granites, wet Tully granites and Innisfail metamorphics), three natural fertility situations and two pasture types (grass/N and grass/legumes).

The role of phosphate in pasture establishment is under investigation in the Ipswich and Brisbane districts. At Malanda in north Queensland, the value of nitrogen in establishing Tinaroo glycine is being investigated. This legume is slow to establish because of its slowness in developing nodules. Thus nitrogen fixation in its establishment phases is generally poor. The newly-released Malawi glycine is included for comparison. Early results indicate no improvement in glycine establishment through using nitrogen.

Work with molybdenum is being carried out in a joint C.S.I.R.O.-D.P.I. project at Ipswich, Brisbane, Cooroy and Gympie. Using a variety of test legumes, these experiments investigate the residual value of molybdenum on a range of molybdenum-deficient soils. Large species response differences are apparent, with Tinaroo glycine and lucerne the most responsive, Cook stylo the least responsive, and Siratro, Greenleaf desmodium and lotononis intermediate.

Two experiments at Mt. Mee are concerned with the role of nitrogen fertilizer on extending the growth period. One experiment involves Narok setaria, and the other a range of grasses. Positive dry matter responses were obtained with all grasses to increasing nitrogen levels but digestibility responses varied. In the Narok setaria experiment, it was shown that a March closure of a Narok pasture gave a substantially greater winter standover than a later closure.

In the Gympie district, a survey has been completed to ascertain the soil potassium status at a number of commercial pasture sites. Acting on these results, plots were laid down on a red podzolic and on a soloth soil to investigate the residual values of phosphorus and potassium in these soil types which comprise a large portion of the Gympie district.

NATIVE VEGETATION

Most of the work on native vegetation is concentrated in western Queensland, principally between the 360 and 500 mm isohyets.

The area, which supports two-thirds of the State's sheep and one-fifth of the cattle, includes the following major vegetation soil groupings: 1. Mulga lands of the far south-west on red earth soils. 2. Mitchell grass grasslands in south, central and north-western Queensland on grey and brown cracking clays. 3. Open eucalypt woodlands in the central-west on red earth soils. 4. Gidyea scrub lands of the central-west. 5. Frontage country adjacent to the water courses and drainage lines throughout.

The major effort to date has been in the first two groupings. The overall aim is to gain a better understanding of the soil-water-plant-animal relationships in the semi-arid, sheep-raising and wool-growing areas of the State. The objective is to develop management practices and techniques which will maintain productivity and stability of these western rangelands with stabilization of animal productivity.

Four different facets are being investigated. Long-term botanical changes in pastoral communities are being followed. The density of both desirable and undesirable community components under protected and normally grazed conditions is monitored to see what changes occur and how rapidly change takes place.

Herbage Production from Mulga Communities.—This is being studied with the aim of maximizing ground forage production by strategic thinning of mulga trees while still maintaining an adequate reserve of mulga which can be used to maintain flocks during drought.

Net primary production of native and introduced plant communities is another facet of the study.

In the semi-arid environment, animal numbers should be closely correlated with plant production which, in turn, is closely correlated with rainfall. Development of a simple model to predict safe stocking rates based on forage availability is necessary.

In the *condition assessments for range grasslands* study during the last 12 months, the concept that basal area of vegetation could be used as an index of range condition has been investigated. Range condition can indicate potential forage production and hence the stock carrying capacity to be adopted if resource stability is to be maintained.

FODDER CROPS

At the Brigalow Research Station, rotational grazing (2 weeks on and 2 weeks off) of Zulu forage sorghum gave a minor increase in animal performance compared with continuous grazing at the low stocking rate in 1972. But, in 1973 and 1974, increases were recorded at all three stocking rates. Weight gains of cattle (1 kg/head/day) on a range of winter forage crops differed little in 1972 and 1974 between several oats and barley cultivars. Rape and safflower gave lower weight gains (0.5 to 0.7 kg/head/day) but initial problems with acceptance were noted.

Irrigated Cropping.—The shallow storage dam at Richmond which was lost in the 1974 flood has been rebuilt and a full programme is in progress.

The principles of shallow storage and irrigation to give extended growing seasons have been well established. A successful field day in June 1975 presented these findings, and future effort will be directed at long-term reliability analyses from the data now held.

PASTURE MANAGEMENT AND USE

At the Isis Experimental Site, the pasture has been established. Grazing began in July 1974 with 30 'in calf' cows which began calving in October. The performance of the cows and their progeny will be followed under commercial management conditions on the standard Bryan plicatum, Narok setaria, Siratro and Miles lotononis pastures. The growing animals, once weaned, will be run at three stocking rates 1 to 0.6, 1 to 0.8 and 1 to 1.0 ha. The breeders are being run at 1 to 1.1 ha.

At Brian Pastures, supplying additional energy as molasses (2.27 kg/head/day) for breeders on natural spear grass pastures supplemented with nitrogen over winter did not influence calving percentage, calf weaning weights or breeder body-weight. On the other hand, increasing the breeder stocking rate of 0.31 breeders per ha to 0.42 and 0.62 breeders per ha reduced the calving percentage from 80% to 55% and lowered calf weight from 215 to 155 kg.

The steers from the breeders grazed on native pastures over the winter, with and without supplements of peanut meal and leucaena. In the summer, they went on to green panic fertilized with nitrogen and then returned to the winter rations. The best results from this feed sequence was a

gain of 235.5 kg per head in the 12 months after weaning. This came from the group supplemented in the winter with peanut meal or leucaena.

Productivity measurements of sheep grazing a buffel grass pasture near Blackall have now been continued for 7 years. The basal area of buffel grass in the 2.5 and 5.0 sheep per ha treatments increased from 5.87% in 1973 to 6.40% and 6.02% respectively in 1974. At 1.25 sheep per ha basal area decreased from 8.05% in 1973 to 66.6% in 1974. The highest forage yield so far recorded in the trial was 8 400 kg/ha in the 1.25 sheep/ha treatment. At the 1974 shearing, mean fleece weights from all three treatments were the same at 4.6 kg.

To date, the work has indicated that productive buffel grass pastures in cleared gidgea scrub land are under-utilized when continuously stocked at 1.25 sheep per ha, which is approximately double the recommended stocking rate on neighbouring Mitchell grass pastures. Doubling of this rate to 2.5 sheep/ha, although reducing forage availability, has not resulted in pasture deterioration or a decline in wool production.

Cattle numbers are increasing in the Mitchell grass areas of the State which, until now, have traditionally been regarded as sheep country. An exploratory trial at Toorak was begun to determine the effect of cattle grazing on Mitchell grass. It was designed to impose a set of conditions which would stress the Mitchell grass.

Rotational, as opposed to continuous grazing, is still an unresolved question. Although some grazing studies have been conducted in temperate regions, very little investigation has occurred in the tropics. However, a project is under way at Gatton Research Station. Animal productivity is being assessed from rotationally and continuously grazed pastures containing Narok setaria and the legumes Siratro, Tinaroo glycine and Hunter River lucerne.

When grazed at four beasts per ha, dry matter on offer was similar at the beginning and completion of the second grazing season in the rotationally grazed area (2 070 compared with 2 250 kg/ha). By comparison, the amount on offer in the continuously grazed area (stocked at the same rate) fell from 967 to 389 kg/ha.

Extension.—Sown pastures continue to have an impact on beef production. However, development programmes have been curtailed or abandoned in the present beef slump. Only a small area has been sown to improved pastures in the beef areas in the past year.

The extension emphasis has changed to management strategies which cost as little as possible. In particular, fertilizer costs have soared during the slump in beef prices and fertilizer applications have been drastically reduced or eliminated. Extension officers have assisted graziers to make decisions on reducing costs. Extension officers in the declared areas of erosion hazard have been involved in extension activities aimed at delineating feed year programmes.

A feature of extension activities oriented towards the dairying industry has been the widespread adoption of nitrogen fertilizers on ryegrass for winter production in the Gympie-Cooroy districts.

LEGUME BACTERIOLOGY

During the year, 168 cultures were supplied by the Plant Pathology Branch to farmers and agrostologists for 13 different legumes for which there are no commercial inoculants available.

Alternative methods of inoculating large areas of soybeans showed that injecting the inoculant with water into the planting furrow was as good as the present cumbersome method. The soybean inoculant strain introduced 10 years ago is still performing well. Unreliable nodulation of navy bean was evident in some districts.

PASTURE DISEASES

Research work is aimed at finding lucerne cultivars possessing high disease resistance, particularly to anthracnose (*Colletotrichum trifolii*) and root rot (*Phytophthora megasperma* var. *sojae*). One hundred plants of each of the commercial cultivars Hunter River and Siro Peruvian have been selected for resistance to anthracnose and crossing work to stabilize this resistance is continuing in co-operation with plant breeders of the C.S.I.R.O. One hundred plants of Hunter River have been selected as resistant to *Phytophthora* root rot representing 1% of the plants of the original commercial line. Crossing work is continuing with this material also.

Root and stolon rots caused a serious decline in plantings of white clover during the summer. In a trial at Beerwah conducted in co-operation with agrostologists of the C.S.I.R.O., captafol, when applied at monthly intervals as a soil drench, controlled the disease.

Anthracnose (*Colletotrichum gloeosporioides*) remains a serious problem in *Stylosanthes* species, particularly on seed crops in northern Queensland. Leaf spot (*Pyricularia pennisi*) was recorded for the first time in Australia on kikuyu grass. Its importance is being investigated.



The response of Townsville stylo to superphosphate fertilizer (right) is clear from this picture at 'Swan's Lagoon' Cattle Field Research Station. New *Stylosanthes* species now under test by the Department promise superior performance to Townsville stylo.

V. Field Crop Research and Extension

Agriculture Branch has the major responsibility in research and extension on field crops, that is, all crops except fruit, most vegetables and ginger. However, other branches are engaged to a lesser extent on various aspects of production and marketing. These branches are: Agricultural Chemistry, Botany, Entomology, Plant Pathology, Economic Services, Marketing Services, Standards, Soil Conservation, Development Planning, Beef Cattle Husbandry, Sheep and Wool, Pig and Poultry, Husbandry Research, Biochemistry, Biometry and Research Stations.

Field crop research is conducted at numerous field investigation centres as well as the following research stations: Southedge, Walkamin, Kairi, South Johnstone, Millaroo, Biloela, Theodore, Gatton and Hermitage. Wheat research is centred on the Queensland Wheat Research Institute at Toowoomba, built and supported financially largely by the Queensland Wheat Research Committee and staffed mainly by the Department. Sugar-cane production research and extension are conducted by the Bureau of Sugar Experiment Stations, which is controlled by the sugar industry.

WHEAT

Oxley performed impressively in the Department's 1974 mid season varietal testing programme. This variety (3.52 t/ha), released jointly by the Department and the University of Queensland from the Queensland Wheat Research Institute in 1974, significantly outyielded Festiguay (3.06 t) at seven of 12 sites and Tarsa (3.01 t) at eight of 12 sites.

Oxley's field resistance to stem rust is being improved by further breeding. If its yielding ability and quality can be maintained with enhanced rust resistance, a major contribution has been made to wheat production in the more favoured areas of the State's grain belt.

Kite performed impressively in the Department's regional varietal testing programme in 1974. Over 23 sites, Kite averaged 2.30 t/ha and was markedly superior to the commercial varieties tested: Gatcher (1.96 t), Gamut (1.94 t), Timgalen (1.87 t), Mendos (1.85 t), and Spica (1.82 t). In

the past three seasons, Kite has been tested in 69 trials and on average outyielded the best commercial variety Gatcher by a margin of 14%.

Kite yields well over a wide range of growing conditions although it tends to perform best at high-yielding sites. Its heads are virtually awnless, which is important when crops are grazed after heading. This variety, released by the N.S.W. Department of Agriculture, has many good features but the grain is excessively hard. For this reason, Kite has been accepted for only 'Hard 1' classification by the State Wheat Board.

A major soil fertility programme by the Queensland Wheat Research Institute, local Departmental and Consolidated Fertilizers' Pty. Ltd. officers was begun on the Central Queensland Highlands in 1974. In a season that favoured responses to fertilizer, significant grain yield responses to 80 kg/ha of added nitrogen were recorded in eight of 17 trials. In six trials, the increase in yield was clearly profitable. Significant grain yield responses to added phosphorus (50 kg/ha) were recorded in only three trials. The programme is being continued on the Central Highlands in 1975 and is being extended as well to the western Darling Downs.

Light to moderate levels of leaf rust (*Puccinia recondita* f. sp. *tritici*) developed in late crops but stem rust (*Puccinia graminis* f. sp. *tritici*) was not troublesome. The damp spring, however, favoured yellow spot (*Pyrenophora tritici-repentis*). Premature defoliation and reduced yields occurred in some crops.

Common root rot (*Cochliobolus sativus*) was the most widespread root rot disease on wheat occurring in all districts. Crown rot (*Gibberella zeae*), on the other hand, was not as widespread and seldom caused obvious losses in excess of 1%. Further progress in the breeding programmes is aimed at intensifying resistance to both common rot and crown rot.

BARLEY

Clipper has been the only malting variety of barley accepted by the Barley Marketing Board since 1972. It has provided maltsters with grain of even germination, minimum dormancy, low protein and high and acceptable malt extract. As a malting variety with these characteristics, Clipper naturally attracts a premium price.

However, in yield, Clipper has proved inferior in Departmental trials to the Victorian variety, Lara, and the Waite Institute line, W.I. 2355. In 30 trial comparisons from 1971 to 1974, Lara and W.I. 2355 have outyielded Clipper by 17.2% and 16.6% respectively.

Neither Lara nor W.I. 2355 can qualify as malting varieties but detailed studies are being made on them to determine their suitability for use as human or animal food.

Changes in technology in both industries, for example, grain flaking or slicing in the food industry and grain rolling in the stock feed industry, are challenging agriculturalists to produce barley grain with specific characteristics which can fit these technological changes effectively.

Powdery mildew (*Erysiphe graminis*) again severely attacked the cultivar Clipper. The recent introduction from South Australia, WI2355, at present being field evaluated, has shown only slight mildew susceptibility.



Heads of Oxley wheat, a new release made in 1974 by the Department of Primary Industries and the University of Queensland.

SORGHUM

The number of companies providing grain sorghum hybrids for testing has increased from four to eight in the past 2 years. Several of the newer companies' hybrids are performing well. A Pacific Seeds entry, Goldrush (6.04 t/ha), gave the best performance of early maturing hybrids tested in the 1973-74 Regional Varietal Trials conducted at Hermitage and Biloela Research Stations and at Kingaroy. It yielded marginally better than Asgrow Dorado (5.95 t), a Pacific experimental hybrid (5.80 t), Pacific Goldfinger (5.69 t) and Yates NK233 (5.59 t). By comparison an older variety, Pacific 007, yielded only 4.77 t.

Of 23 mid season varieties tested at the same centres, two Hylan Seed Co. experimental hybrids (5.10 and 4.98 t respectively) gained first and third places while Asgrow Dorado (5.10 t) and an unreleased Departmental hybrid (4.97 t) filled second and fourth places respectively. The only open-pollinated variety grown, Alpha, yielded lowest (3.45 t) or some 43% below the best entry.

DeKalb E57 (5.28 t) produced the best average yield of five late maturing hybrids tested at the three sites. The other hybrids in order of merit were a Hylan experimental hybrid (4.96 t), DeKalb E55 (4.85 t), Nanha N370 (4.76 t) and Taylor Evans Tell (4.57 t).

Establishment problems, often involving the fungus *Fusarium moniliforme*, were general in the main sorghum-growing areas and replanting was sometimes necessary. This is a complex problem and its possible association with subsequent stalk rot is now being investigated intensively.

Head smut (*Sphacelotheca reiliana*) was recorded over a wide area. The incidence was low, however, and field evidence suggests that only race 1 of the causal fungus is present. Testing material from the sugarcane mosaic virus (SCMV) resistance programme continued this year in co-operation with the Agriculture Branch. Q5161 and Texas 610 with the 'Krish' type resistance are now being field tested.

MAIZE

A new hybrid, QK231, released from the maize breeding programme at Kairi Research Station, was grown commercially on the Atherton Tableland for the first time in 1975. Observations indicated that it will be a commercial success and complement QK217 recently released and now widely grown on the Tableland. In 3 years of testing before its release, QK231 outyielded QK217 by 30%. In addition, QK231 has greater resistance to turicum leaf blight and gibberella stalk rot than QK217.

In south Queensland, the highly respected commercial hybrid Dekalb XL81 again performed well in regional maize trials conducted at Gatton Research Station and at Kingaroy. X181 (7.26 t/ha) and two experimental hybrids, one a DeKalb line (7.14 t) and the other a Queensland Agricultural College line (6.84 t), were clear leaders.

Two Queensland Agricultural College experimental hybrids (7.44 and 7.28 t/ha) yielded best in mid and late season trials conducted at the same sites.

The beneficial effect of pasture rotation on crop yield continues to be demonstrated at Kairi Research Station. In one study, the 5-year average yield for maize grown in the first season after pasture was 4.88 t/ha while the averages for second, third and fourth year after pasture were 4.91, 4.48 and 4.03 t/ha respectively. Continuous maize yielded only 2.56 t/ha. In another study, the effect of pasture on yield was still obvious after 5 years of cropping.

These results explain the transformation that has taken place in the fertility and stability of Atherton Tableland soils under the influence of guinea grass-glycine pastures.

The incidence of head smut (*Sphacelotheca reiliana*) is continuing to increase and cause concern on the Atherton Tableland. Plant pathologists in north Queensland are co-operating with the plant breeder in attempts to develop resistant hybrids.

Maydis leaf blight (*Drechslera maydis*) was widespread in north Queensland but caused little economic loss. The successful control of this disease by the quick withdrawal of hybrids based on Texas cytoplasm is a notable achievement by Departmental plant pathologists and plant breeders. Likewise, the almost complete control of root and stalk rot (*Marasmius sacchari* var. *hawaiiensis*) by the use of hybrids bred by Departmental plant breeders in co-operation with plant pathologists has been of great importance to the industry in north Queensland.

The *Gibberella* root and stalk rot complex, however, still reduces yield through root and stalk lodging. Intensive investigation work is continuing.

It is clear from ratings of regional maize trials that commercial seed producers have arrived at a satisfactory level of resistance to sugarcane mosaic virus (SCMV).

SOYBEAN

The Department's soybean breeding programme centred at Hermitage Research Station near Warwick provides lines for testing in south Queensland. In addition, later maturing lines are produced for central and north Queensland. Two promising lines from the programme are HR1 and 70/50. A variety 49/38 has been produced by the University of Queensland soybean breeding programme. The Department also assists the Soybean Pure Seed Production Industry Committee by supplying mother seed of commercial varieties and by giving technical advice as required.

The regional varietal testing programme has been continued. The best yields in a rain-grown trial on the Darling Downs in 1974-75 came from Bragg (1 790 kg/ha), 70/50 (1 779) and Wills (1 745). In the West Moreton, the best average yields from two trials were 70/50 (3 300), Wills (3 231) and Davis (3 190). In the Mareeba district, the best yields were from 49/38 (2 256), Chung Hsien No. 2 (2 220) and 70/39 (2 079). The best average yields from two trials on the wet tropical coast were from Davis (1 045), Gilbert (958) and Bragg (822). Unfortunately, 70/39 is susceptible to bacterial pustule and is not being considered for release.



Davis and Wills varieties of soybeans. These were two of the best varieties in the 1974-75 season trials at Kingaroy.

In a trial on the Darling Downs to examine the interaction of variety, plant population and row spacing, the variety Davis significantly outyielded the earlier maturing varieties Bethel and Hill and the later maturing variety Semstar.

In a similar trial at Gatton, neither inter-row spacing (50, 75 or 100 cm) nor plant population (250 000 and 500 000 plants per hectare) had any effect on yield.

The effects of planting depth on large and small sized seed of the Gilbert and Davis varieties were studied at Emerald. Little effect occurred until planting depth exceeded 9 cm. At greater depths, emergence of Davis fell off rapidly, the bigger seed being more affected. The emergence of Gilbert fell off when the planting depth reached 12 cm and again the bigger seed was more affected.

In a study of the effects of green vegetable bug (*Nezara viridula*) on soybeans, variable populations of the pests made it impossible to determine the population levels at which control becomes economic. Nevertheless, the presence of green vegetable bug in the developing crop did reduce yield, seed size and oil content of the seed.

Poor emergence in several areas of Queensland was linked with fungi associated with the seed. These were more prevalent in damaged seed or if the seed had been stored under conditions of high humidity. The industry is being encouraged to pay particular attention to seed quality and storage.

Rust (*Phakopsora pachyrhizi*) appeared in most of the soybean areas late in the season and caused little economic loss except on the Atherton Tableland. Studies are under way on the environmental requirements for this rust in an attempt to forecast whether the disease will be an increasing problem.

SUNFLOWERS

Varietal testing is in progress in the major sunflower growing areas. No difference in yield potential has appeared between the hybrid and open pollinated types within equivalent maturity groupings. This has applied to both oil and

bird seed types. However, in a trial on the Darling Downs, the hybrid Hysum 30 remained about 3 weeks longer in the vegetative stage than other cultivars, had larger heads, more seeds per head, and outyielded the other cultivars in both rain-grown and irrigated crops. In the late plantings, when the incidence of rust is likely, considerable advantage is derived from planting hybrids which have shown resistance to the disease.

A pilot study to examine the use of systems analysis was continued during the 1974-75 season. The project was based at sites on the Darling Downs and at Biloela Research Station. The data obtained will be used to simulate plant development, water usage, grain yield and oil quality in varying weather conditions, seeding times and rust levels.

Time-of-planting trials at Emerald showed that oil quality is closely related to the mean temperature in the period after flowering. Relationships have been obtained from this work which enable the quality of the oil from sunflower crops to be predicted for any planting time.

Pollination studies on the Darling Downs have shown that bees are the only insects that play a significant role in pollinating sunflowers. The population of wild bees on the Darling Downs is sufficient to ensure good pollination.

Fertilizer studies on the Darling Downs have confirmed that earlier flowering and maturity and increased yields are promoted by balanced nitrogen and phosphorus fertilization.

Rust (*Puccinia helianthi*) was widespread but not as serious as in some recent years except on the Central Highlands. A resistant line being screened is of obvious value as a parent in the Departmental and other breeding programmes.

Alternaria helianthi caused severe leaf, stem and head spotting in crops in the Darling Downs and South Burnett areas. Screening of cultivars for resistance is being planned.

PEANUT

In variety trials with Virginia Bunch types in the South Burnett district on a red forest soil and a red volcanic scrub soil, D.P.I. VB Bulk gave the highest yield on the forest soil (3 012 kg/ha) PMB Bulk A gave the best yield (2 639 kg/ha) on the scrub soil. The lines D.P.I. VB Bulk, PMB VB69/2 and D.P.I. Bulk 73 performed well on both soil types.

Variety trials with Red Spanish types show that the lines RS69/1, RS7, RS16 and RS64/2 provide better returns of nut-in-shell, edible kernel and oil kernel than the commercially grown variety RS Bulk.

A fertilizer trial showed that peanut yields are not reduced by phosphorus deficiency unless soil phosphorus levels are below 20 p.p.m. (acid extraction). Such levels are considerably less than the threshold levels for other major crop plants.

The appearance of peanut rust in north Queensland in 1973 prompted a search for sources of resistance for use in breeding commercial varieties. Sixteen lines have been imported from the U.S.A. and Puerto Rico. In the meantime, control of rust is being achieved by the use of fungicide sprays.

Rust (*Puccinia arachidis*) and leaf spot (*Cercospora personata*) were again widespread on the Atherton Tableland. Experimental work has confirmed the value of both fentin and chlorothalonil for the control of both diseases but spray programmes must be varied according to weather conditions if the best results are to be achieved.

Rugose leaf curl is a disease affecting white and red clovers, *Trifolium semipilosum* and, occasionally, peanuts and lucerne. It has been reported as the cause of seedling stand failures in plantings of *T. semipilosum*. The disease has been assumed to be caused by a virus. Recent experiments with penicillin treatment and electron microscopy suggest a different causal agent. This finding could be of some significance in developing control measures.

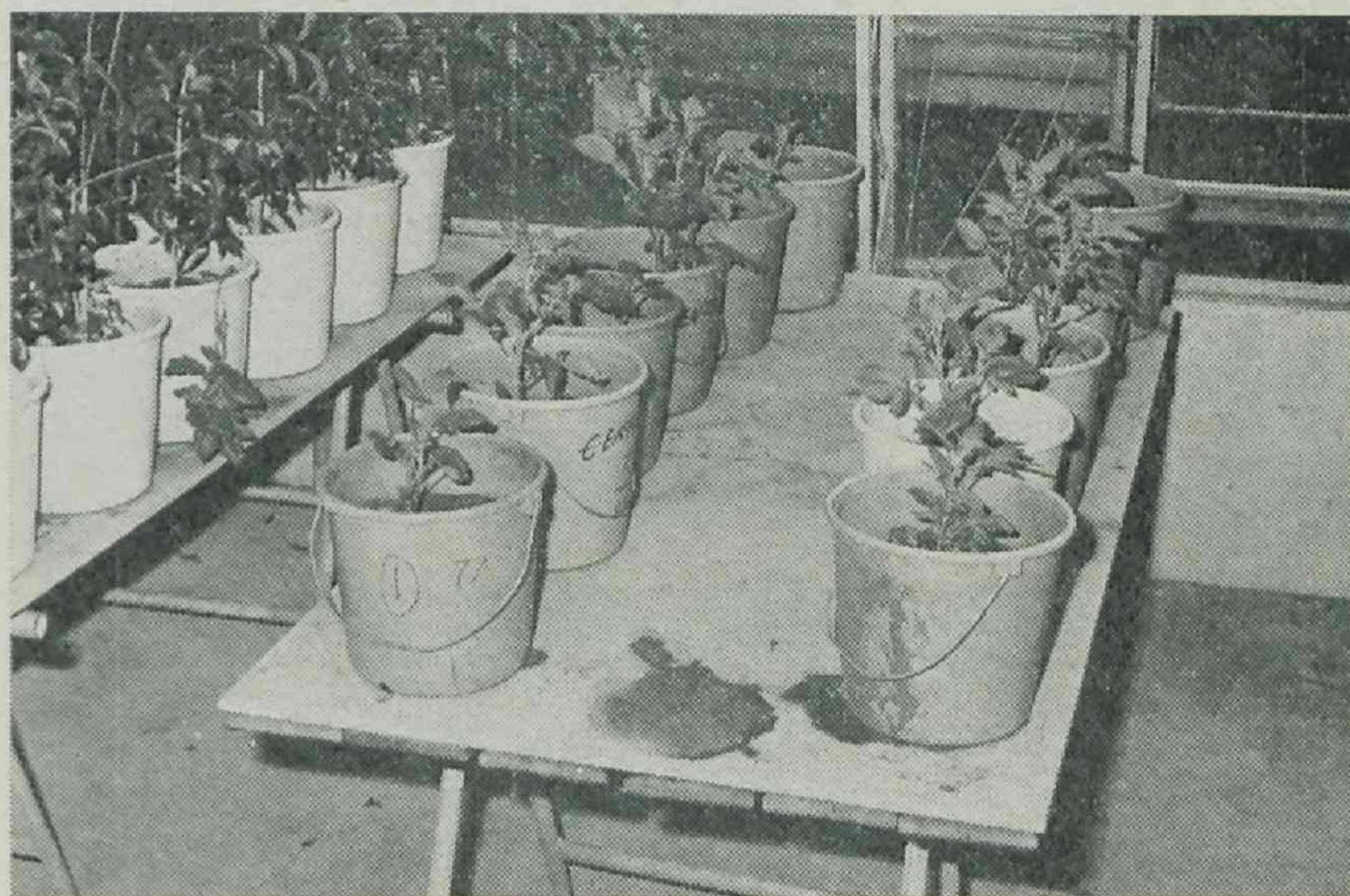
POTATO

Under the potato evaluation programme, now in its fifth year, 227 varieties and seedlings have been evaluated. Some of these are capable of producing yields 50% greater than that of Sebago which has been the main commercial variety for at least 20 years.

A search is being made for specific varieties for autumn and winter plantings and for canning. The varieties B5132-3, Wauseon, Sutton Foremost and Tasman show promise for production in Queensland. Tasman is a red-skinned variety recently released in Victoria and Tasmania.

A programme has been in operation for 3 years to produce seed potatoes in Queensland and trial results indicate strongly that good quality seed potatoes can be grown in certain areas. Four out of eight stages of a pilot scheme for seed potato production have been completed successfully and a commercial quantity of seed potatoes should be available in 1976.

The disease-free pilot seed scheme is progressing well with field multiplication under way. The once-serious powdery scab (*Spongospora subterranea*) is now of little significance because growers have changed from Sequoia to the resistant Kurrel and Exton cultivars. This followed an extension programme by Departmental officers.



Potato trials in the glasshouse at the Gatton Research Station.

ONION

Onion plant spacing studies confirmed previous results that planting rate can be increased to approximately 4.5 kg/ha and row width reduced from 36 cm to 20 cm. Yield is increased and an improved bulb shape is obtained in most plantings. Each of these changes in production techniques, however, increases the susceptibility of the onions to downy mildew. In March plantings, the incidence of downy mildew is generally lower and the use of higher seeding rates and reduced row widths is certainly warranted. In practice, however, it is difficult to obtain the desired plant populations in these plantings.

The demand for onions for specific purposes, such as dehydration and export, has prompted studies of varieties and planting times. Three seasons' testing have confirmed eight varieties as suitable for specific purposes: late February-early March, Early Lockyer Brown and Early Lockyer White (local strains); late March-April, Early Lockyer Brown and Early Lockyer White (commercial strains), Lockrose White; May, June, July, Gladalan Brown and Gladalan White, W100 (these varieties show a greater resistance to downy mildew).

Downy mildew (*Peronospora destructor*) caused more damage than usual. Because of uncertain markets prospects growers generally neglected their protective spray programme.

TOBACCO

The Department's plant breeding programme is developing varieties incorporating tolerance to the main tobacco diseases in Queensland. The strain of blue mould prevalent in south Queensland (APT2) has now spread to north Queensland and the need for a tobacco variety resistant to this strain as well as to Strain APT1 is obvious. State-wide testing of lines with some tolerance will be carried out in the 1975-76 season and it is expected that a new variety will be released for commercial plantings in 1977. After the decision of C.S.I.R.O. to cease tobacco research takes effect at the end of June 1975, the Department will be responsible for the entire tobacco plant breeding programme.

An assessment of cropping sequences involving tobacco, legumes, weeds and grasses has been in progress in the Mareeba district for 3 years to evaluate rotation effects on tobacco yield and quality. No marked differences have yet shown up between continuous tobacco crops and tobacco crops rotated with a grass phase.

A recent development in the tobacco industry has been the introduction from North America of a tobacco mechanical harvester. Departmental staff have assisted in preliminary trials with the harvester and the co-operation of the manufacturers is being sought because mechanically harvested leaf is sold in a non-aligned condition.

Blue mould (*Peronospora hyoscyami*) was severe in northern tobacco districts until the end of August, but change in the weather prevented serious losses in maturing crops. The new strain (*P. hyoscyami* f. sp. *hybrida*) was present for the third successive season. Isolates of this strain from both northern and southern Queensland were compared. The southern isolates were more aggressive than the northern one so precautions should still be taken to prevent an interchange of material between the two areas.

The soil-borne diseases, black shank (*Phytophthora nicotianae* var. *nicotianae*) and bacterial wilt (*Pseudomonas solanacearum*), caused severe losses in only a few crops. Bacterial barn rot (*Erwinia aroideae*) on the other hand was widespread.

Twenty-five candidate tobacco lines from the Department's plant breeding programme were screened for resistance to blue mould, black shank, bacterial wilt and frog-eye leaf spot. This programme is aimed at ensuring that highly susceptible cultivars are not released.

NAVY BEAN

The varietal testing programme is conducted at Kingaroy and on the Darling Downs. The best yields from one trial at Kingaroy were Kerman (1 527 kg/ha), Selection 45 (1 399) and Selection 36 (1 382), while the best average yields from six trials on the Darling Downs were Selection 46 (2 012 kg/ha), Selection 51 (1 727) and Selection 44 (1 529).

The navy bean breeding programme is aimed at producing high-yielding varieties with resistance to peanut mottle virus. Resistant red kidney beans have been crossed with navy bean varieties and the progeny advanced to the F₄ generation. Selections are being made and tested by pathologists for resistance.

In fertilizer trials at Kingaroy, it has been found that nodulation levels resulting from seed inoculation vary with soil and season. As yet, there has been no yield response to nodulation. In other trials, there have been significant yield responses to both phosphorus and potassium fertilizers. On the Darling Downs, there has been a big yield response to applied zinc fertilizer.

Peanut mottle virus, so serious in crops in the South Burnett in recent years, has not yet been recorded on the Darling Downs.

COTTON

The principal emphasis in the cotton breeding programme at present is on insect resistance, particularly to *Heliothis* spp. It has been demonstrated that the nectariless character is effective in reducing insect damage while there is a suggestion that the glabrous character is also important in the field situation. In breeding for yield improvement, the okra leaf character allows better light penetration through the bush. This can be particularly important in a cloudy season. The more open bush also allows easier penetration of insecticide sprays.

An entomological research programme also investigating the problems caused by *Heliothis* spp. has continued.

Alternative methods of controlling *Heliothis* are being investigated. The release of egg parasites, a technique of biological control which has proved successful in controlling *Heliothis* spp. overseas, has been tested in Queensland during the last year. The egg parasite, *Trichogramma pretiosum* Riley, was imported from California and released in a trial area of cotton in the St. George irrigation area. Some success was achieved when pest activity was low.

MISCELLANEOUS CROPS

A series of time-of-planting trials on safflower at Biloela Research Station has shown that the mid May to mid June planting period produces higher yields than later plantings. A large percentage of the 1974 safflower crop in central Queensland was planted on the basis of these findings and a record production of 26 500 tonnes was obtained from 29 000 hectares sown, giving an average yield of 914 kg/ha. This is more than twice the average yield for the last five seasons (438 kg/ha).

The safflower industry in Queensland is based on one variety, Gila. Varietal testing with a small number of introductions from the U.S.A. and a number of selections from the Gila variety has been carried out at Biloela Research Station and at Emerald. In 1974, this programme was extended to include a site at Brigalow Research Station.

The cultivar Biggs was found to be resistant to Queensland isolates of *Phytophthora drechsleri*. The organism causes a severe root rot and limits production in many areas.

Leaf blight (*Alternaria carthami*) caused very severe losses in trial plots. It has the potential for causing devastating losses. One cultivar, Akilou, is tolerant to the disease both in the field and in the glasshouse.

Research on rice variety testing, seed improvement and milling is centred at Millaroo Research Station. The areas growing commercial rice crops have been static in the Lower Burdekin and are expected to decline because of sugar-cane expansion taking over both land and irrigation water previously used for rice.

A build-up of off-type rice grain has been observed in the harvested grain from the continuous rice demonstration area. These off-type grains are shorter than those of Blue-bonnet and have a red seed coat. A pure seed scheme and fallowing have been introduced to overcome this problem.

In linseed varietal and strain trials, no difference in yield showed up between Glenelg and Bonnydoon. Glenelg was reputed to have field tolerance to Pasm disease but this was not found to be so in Queensland.

The breeding programme based on Hermitage Research Station has produced some crosses which are outyielding Glenelg and Bonnydoon. One hundred of these have been set aside for testing in 1975.

Observation plots of lupins were planted on various soil types on the Darling Downs and the variety Unicrop produced a yield of 1 905 kg/ha on a soil with a pH of 9.0. As lupins are reputed to be unsuited to alkaline soils further trials are proposed on this soil type.

Studies of variety, plant population and time-of-planting were undertaken on the Darling Downs. It now appears that lupins should not be planted in a frost-prone area before early May. The variety Uniharvest produced the highest yield of 2 722 kg/ha. Observation plots on granite soils in the Stanthorpe area yielded up to 4 068 kg/ha.

In a rain-grown variety trial at Biloela Research Station, the varieties Uniharvest and Unicrop succumbed to Rhizoctonia root rot, cucumber mosaic virus and powdery mildew. This crop, which has been domesticated by breeding efforts in Western Australia, is showing very encouraging potential in Queensland.

Preliminary trials with sesame at Biloela and Gatton Research Stations suggest that economic yields are possible. Average yields of 900 to 1 000 kg/ha were harvested from the varieties Kubanec W.37 and C.P.I. 26601. All the varieties tested, excepting Palmetto, are prone to shattering, and this presents harvesting problems.

Adzuki bean lines were tested in a trial at Hermitage Research Station. Growth was not very vigorous, but the average yield of 532 kg/ha was promising. The highest yield of 736 kg/ha was obtained from strain 13.

In a trial to compare varieties of mung bean at Roma, no significant differences were obtained between yields of varieties. The average yield was 633 kg/ha. Berken and Q10599 carried some of their pods much closer to the ground than Celera but they were easier to thresh.

IRRIGATION PROJECTS

Emerald.—The irrigation programme has sought to define irrigation technology and crop performance levels for some summer and winter grain and oilseed crops. The yield potential of irrigated wheat is about 5 000 kg/ha with the high yielding varieties Oxley and Egret. Barley yields have ranged from 3 000 to 3 400 kg/ha, and linseed yields are expected to reach 1 500 kg/ha. Soybean performance has been extremely good with semi-commercial areas producing yields in excess of 3 000 kg/ha.

Burdekin.—Irrigated cropping investigations on the flooded plain soils of the Lower Burdekin have continued at Millaroo Research Station. In addition, land has been leased and irrigation facilities developed to expand work on to the Dalrymple and Koberinga soil types on the south bank of the Burdekin River in the vicinity of Leichhardt Lagoon.

Results on the Barratta soils have shown that crops of rice (5.3 and 3.4 t/ha for the wet and dry season crops respectively), maize (average of 5.6 t/ha for the dry season crops) and soybeans (average of about 2.2 t/ha) can be grown. Yields of sunflower (1.3 t/ha average) and grain sorghum (4.4 t/ha), however, were again not promising.

Inglewood.—A major investigation at Inglewood is seeking improved irrigation methods for irrigated crops on the fine, silty clay loams along the Macintyre Brook. A range of furrow geometry is being evaluated. Pastures can be established, and these improved soil structure and infiltration of irrigation water markedly. A rotation trial on Inglewood Field Station found the first crop of soybeans to give a yield increase of 17, 51, 50, 46 and 33% respectively following the 4-year treatments lucerne, Rhodes grass, prairie-ryegrass, panic-medic, and sorghum-medic-ryegrass over the yield of the reference treatment of grain sorghum-oats, double cropped.

WEED CONTROL

Some troublesome weeds of soybeans are not controlled by pre-emergence herbicides and the post-emergence herbicides chloroxuron, phenmedipham, bentazon, benazolin and 2,4-DB were studied further. Three weeds are of commercial significance: thornapples (*Datura* spp.), Noogoora burr (*Xanthium pungens*) and bell-vine (*Ipomoea plebeia*). Herbicide trials are in progress.

The wild oat winter management programme on the Darling Downs has been concluded after 4 years. The use of triallate has reduced wild oat populations from 217 plants per m² to 32 plants per m² after the first year, and to 4 plants per m² after the third and fourth years. It must be recognized that even this low population of wild oat plants will produce a significant number of seeds. Continued use of triallate may contain, but will not eradicate, wild oats under a winter cropping system.

Results of the 2,4-D tolerance trial on grain sorghum at Gatton Research Station in 1973-4 did not agree with the results obtained from a similar trial carried out at Biloela Research Station the previous season. This seems to indicate that factors other than the plant development phase exert a strong influence on grain sorghum tolerance to 2,4-D.

Nut grass (*Cyperus rotundus*) and Johnson grass (*Sorghum halepense*) are two troublesome weeds that are difficult to control with herbicides in growing crops. In one nut grass trial, two applications of glyphosate at 1 kg a.i. per ha in February and April resulted in a 98% reduction in shoot numbers by the following November. If glyphosate continues to be effective, it could be useful in reducing nut grass competition in crops.

Glyphosate also reduces both rhizome and shoot growth of Johnson grass on roadsides. It is, however, toxic to other potential grass competitors of Johnson grass and is therefore unlikely to find a use in controlling Johnson grass on roadsides.

Trials to measure the effect of competition between wild hops (*Nicandra physalodes*) and maize have been carried out for two seasons. The first trial indicated that as few as 4.7 wild hops plants per m², caused a significant reduction (30%) in maize yields. In the second trial, however, in which the maize was planted earlier, the wild hops grew slowly and provided only poor competition in the early growth stages of the crops. Wild hops is likely to reduce maize yields significantly in late-planted crops only.

EXTENSION

The role of the extension worker continued to develop and broaden. Farmers, primary producer organizations and local authorities are demanding not only technical information but also managerial advice on crop and pasture production, soil and farm management. The extension officer is becoming more and more an educator in rural communities.

Extension officers in all districts of the State have been heavily involved in a programme to reduce the impact of the locust plagues which ravaged all farming areas from Ingham to the New South Wales border. The efforts of extension officers, working together with local authorities, chemical companies, aerial operators and primary producers did enable the State's crops to be harvested.

A major extension programme on the control of insect pests in stored grain was extremely successful. All Departmental extension officers were involved, but the major activities were undertaken by Agriculture Branch officers. This programme was directed at all primary producers who grow, store or feed grain. It was mounted in an attempt to lower the level of insect infestations on farms thereby reducing the infestations in grain delivered to marketing authorities.

The programme received excellent support from all involved in the grain industry and made a significant impact. The standard of farm hygiene and methods of controlling grain insects improved remarkably. There is, however, room for further improvement and the programme will be repeated in the coming year.

Another extension effort was property diversification. Wherever possible, beef producers have diversified into grain growing. Beef properties are now producing grain sorghum, sunflowers, soybeans, wheat and barley. This has usually

been achieved with limited on-farm machinery and grain handling facilities, and has called for considerable ingenuity from both the grazier and the extension officers.

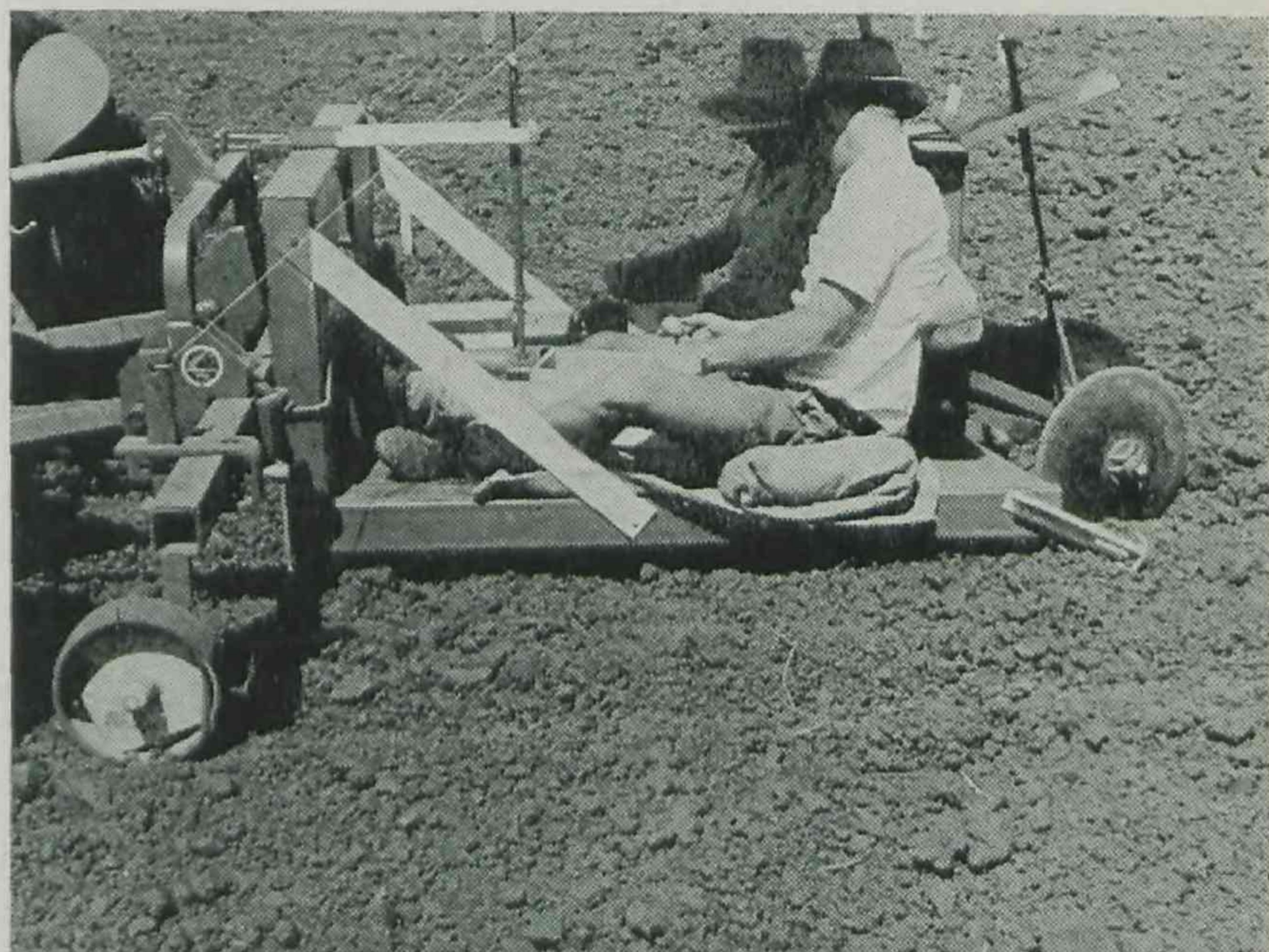
Diversification has continued in the traditional grain-growing areas. On the Darling Downs, grain growers have diversified into summer crops such as grain sorghum, sunflowers, soybeans, millets and maize.

More farmers are now using planting equipment with press wheels and moisture-seeking tines. This equipment, which enables farmers to sow their crops over an extended period, is gaining favour in the farming community. Extension officers have continued to advocate the use of cultivating machinery which can work in crop stubbles. Farmers have been assisted in modifying their existing machinery and have been advised when buying new equipment.

Extension officers, working closely with research officers and seed producers, have provided recommendations on crop varieties and production technology. This service covers wheat, barley, oats, grain sorghum, maize and soybeans.

AGRICULTURAL ENGINEERING

The labour shortage in rural areas and the increasing cost of farm labour have increased the interest of rural producers in farm mechanization generally. The engineering group at Toowoomba is helping to assess a tobacco harvester imported from North America. Curing methods for flue-cured tobacco are being studied to find out whether the current tobacco barns can be modified to give more efficient and more effective operation. Problems of harvesting sesame are being examined and an experimental maize plot harvester is being built to speed up the maize breeding and varietal testing programme.



A precision potato planter made at the Gatton Research Station. It ensures even spacing of the seed.

Pasture research programmes are being assisted by the development of a root washer, an inclined point quadrat and a herbage separator.

Grain growers are showing a great deal of interest in grain drying and grain storage on the farm. Commercial grain driers are available locally and a publication is planned to give advice on selecting and operating this equipment. A need also exists for machinery that will enable better farm hygiene to combat grain storage pests. This need is being examined in the hope of modifying machinery and silo designs.

VI. Horticultural Research and Extension

Responsibility for horticultural research and extension rests mainly with Horticulture Branch, which is concerned with production, post-harvest handling and processing of fruits and vegetables. Cultural research is centred at five horticultural research stations at Applethorpe (Granite Belt), Ormiston (Redlands), Nambour (Maroochy), Cairns (Kamerunga) and Bowen, supplemented by field trials in the main producing districts. Post-harvest and processing research is carried out at the Sandy Trout Food Preservation Research Laboratory, Hamilton. The branch provides extension services in all fruit and vegetable growing districts.

Liaison with industry is maintained through horticultural advisory committees. Within the branch, informed research-extension committees are responsible for defining problems in production and handling, and assist in co-ordinating research and extension activities. Horticultural advisory activities are integrated on a regional basis under the Extension Services Section.

Other branches of the Department involved in horticultural research and extension are Entomology and Plant Pathology Branches, which are concerned with pest and disease control, and Agriculture Branch, which handles the production side of some heavy vegetables such as pumpkins, marrows, potatoes and onions.

Marketing Services, Economic Services and Standards Branches are concerned with such aspects of horticultural production as marketing, economic surveys, farm management accounting and seed certification.

DECIDUOUS FRUIT

After the poor crop last year, apple production increased to an estimated 2 250 000 packages. A cool spring delayed development, and maturity was delayed about 2 weeks. However, the successful controlled-atmosphere storage of the previous crop meant that good quality fruit was available on the market until the new season crop was ready.

Investigations have identified several factors which can contribute to lower yields in these crops and techniques have been developed to overcome them. These include close planting, irrigation, chemical weed control and use of virus-free planting material. A major programme is in progress to assist growers to use these improved methods of production.

Lack of water is also known to cause large crop reduction and studies have shown how and when to apply irrigation to overcome this.

The close planting trials, now in their fourth year, have again demonstrated the benefits that can be expected from this system. The closest intra-row spacing of 0.9 m is giving the best results but it is expected that overcrowding effects at this spacing will become obvious in the future. The best treatment is Granny Smith on the MM106 rootstock at a spacing of 0.9 m and with delayed open centre training. This produced a yield in excess of 78 tonnes per ha compared with the district average of 7 to 10 tonnes per ha.



Taking off the pear crop on the Granite Belt. A better rootstock for pears is undergoing Departmental trials in this district.

Several trial plots have been established to demonstrate the effectiveness of weedkillers in commercial orchards. The results have shown several treatments to be effective. These will reduce the need for cultivation which is now known to cut roots and cause growth reduction.



Inspecting wine-making grape varieties at a Granite Belt vineyard. Wine-making is an expanding industry in Queensland.

The wine industry is continuing to develop, but progress is limited by the quantities of wine grapes in production. One grower won two bronze medal awards at the Brisbane R.N.A. with wines made from Shiraz and Cabernet Sauvignon. This was the first time that wines from the district had been entered. The success was in competition with a distinguished list of exhibitors, and demonstrates that quality wines can be produced on the Granite Belt.

Apple scab (*Venturia inaequalis*) and pear scab (*V. pirina*), although widespread, were generally kept under good control by the recommended spray schedule allied to the warning service given by the Department. Some further follow-up radio advice may be required in future years to minimize problems arising from secondary summer infections which caused some problems this year.

Further spray trials have confirmed that growers have a wide choice of effective materials, for both protection and eradication, to combat these important pathogens.

Dieback in apples, arising from the infection of large pruning wounds by higher fungi, is a serious problem now being investigated by the Department's plant pathologists. Chemical treatments of pruning wounds are being compared in what must, of necessity, be a long-term programme.

The widespread use of the systemic benzimidazole fungicides in pre and post-harvest schedules, following Departmental trials and recommendations, has markedly reduced the incidence of brown rot (*Sclerotinia fructicola*) in stone fruit.

Yields of own-rooted Wilson plums at Cottonvale were increased by soil treatment with the nematocide phenamiphos.

PINEAPPLE

Growing conditions for pineapples were good all through the year. The lack of heavy rain has meant a reduction of top and root rot problems and new plantings are in good condition.

Further investigations with flower inductants have found that the addition of urea to ethrel flower induction solutions allows the amount of ethrel to be reduced by one-quarter. This is considered to result from the ability of the urea to hasten the release of ethylene from the solution and its entry into the plant. Flower induction in February-March, which is difficult, has been greatly assisted by using double ANA sprays applied 14 to 21 days apart.

The extension of shelf-life of fresh market pineapples has been the subject of a series of investigations. It has been found that cool storage does improve shelf-life but, at temperatures of 12°C and below, chilling injury occurs. Alphanaphthalene acetic acid dips have also been used in these tests and results indicate that an extension of shelf-life of up to 10 days can be obtained. Further work is in progress to define commercial recommendations for these treatments.

The severe economic effect of root rot (*Phytophthora cinnamomi*), which occurred during the wet autumn of 1974, was evident this year. Sulphur continued to give outstanding control of both root rot and heart rot caused by *P. cinnamomi*. Detailed work to determine correct levels under a variety of conditions is continuing. It appears that soil dressings with sulphur will be of considerable value, particularly on light soils with low base status.

BANANA

Little change has occurred in the total area of banana production in north Queensland. Although market prices have been consistently good, many growers appear hesitant to expand because of the shortage of labour. This indicates the need for mechanization in the labour-intensive operations of the industry such as harvesting, dehanding and packing.

A prototype banana packing system has been developed and a demonstration unit built. This could offer a solution to the high labour component in the industry. The system makes use of the volume filling and vibration settling of single fruit. This system has been shown at several field days, and grower interest is apparent.

Pre-cooling bananas grown in north Queensland and shipped to southern markets advanced considerably during the year. A commercial cooling facility was built at Tully and, at its opening, a field day was conducted to introduce growers to the idea of pre-cooling bananas. Growers, while paying extra for this service, have been able to cut summer fruit at a later stage of maturity and yet largely avoid mixed ripe and 'heat-affected' problems.

Maturity bronzing has continued to be a major problem to north Queensland growers. This disorder, which results in a severe skin blemish, appears to be most prevalent when hot humid conditions occur and soil moisture is high.

A programme to encourage growers to use hot-water-treated planting material has been carried out in the major growing areas. This technique controls nematodes, which are a major factor limiting production. Demonstration equipment has been supplied and most planting material is now hot-water-treated.

Banana weevil borers, *Cosmopolites sordidus* Gerner, taken from a banana plantation at Currumbin near the border with New South Wales were found to have a measure of resistance to the insecticide dieldrin. Widespread resistance

to dieldrin has already been observed in New South Wales and therefore the situation at Currumbin is being kept under close observation.

In north Queensland, the control of leaf spot (*Mycosphaerella musicola*) and speckle (*M. musae*) was excellent compared with the previous season. This dramatic improvement is the result of an intensive extension campaign stressing the need for plantation hygiene. The weather conditions allowed a normal spray schedule to be followed, and this was also a factor in the improved control.

In trials in north Queensland, the nematocide phenamiphos when applied three times a year reduced infestations of the burrowing nematode *Radopholus similis*, increased banana yields and prolonged plantation life.

PAPAW

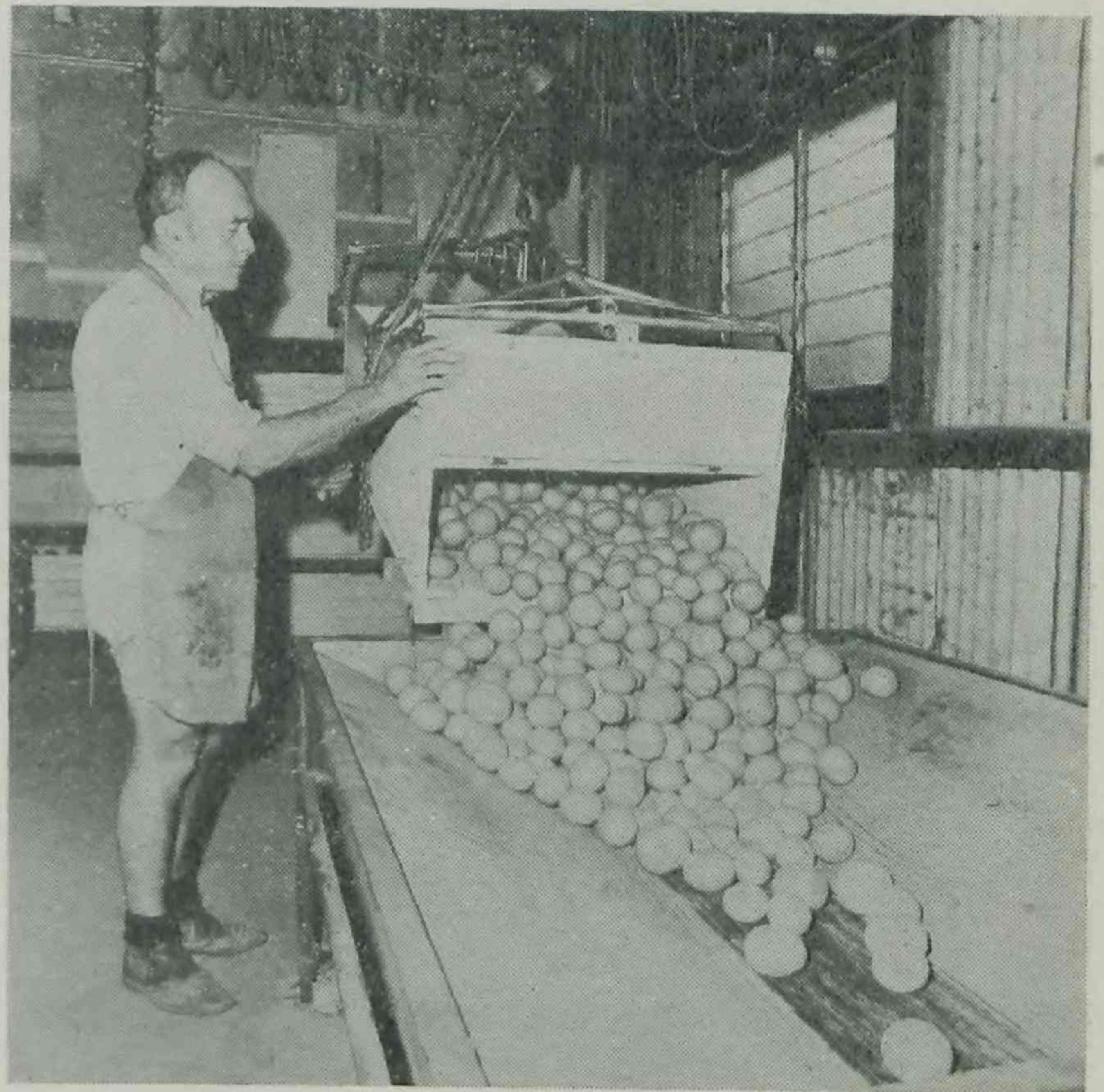
After a series of severe setbacks in recent years from disease epidemics, the papaw industry is now recovering and new plantings are being made. Many of the newly-planted areas are irrigated and have incorporated water control systems to provide drainage and reduce erosion. Productivity of these plantations is expected to be less variable. In present plantings, dieback disorder, although variable, is generally low and about 'normal' for the crop. Investigations of the disorder are continuing and centre on the hypothesis that a deficiency of calcium in the growing point is responsible. Field trials are in progress, but greater emphasis is being placed on more basic approaches including calcium deficiency, plant water stress and root development interactions.

Much of the papaw material used by the industry is variable and of poor quality, and the plant improvement programme aims at selecting more uniform types. As this work progresses, a gradual lift in the standard of field plantings can be expected.

CITRUS

Citrus growers harvested a crop in 1974 which was only slightly below the record crop of the previous year.

Mandarin production is well suited to Queensland and a considerable export market for this crop is developing. Much fruit damage occurred in autumn on some farms as a result of spray damage and this made it difficult to fulfil export orders.



Grading mandarins for export. Mandarins are Queensland's biggest citrus export.

The programme to reduce citrus fruit packing time and labour costs by replacing the conventional hand-pattern packing method with semi-mechanized vibration packing has made good progress. During the year, the process, which has been called 'vibra-pack', has been widely publicized. Shed demonstrations, which were well attended by growers, were held in the major citrus growing areas.

About 20 sheds have now installed 'vibra-pack' equipment. Some growers are weight-filling packages while others are counting fruit in. Studies have shown a good correlation

between fruit number and weight in the various size grades. Early reports from markets indicate that 'vibra-pack' has been well-received.

The technique of determining fertilizer requirements from soil and plant analyses is now being used to advantage in Queensland citrus orchards. Local trial work in recent years, together with overseas experience, has enabled the fertilizer requirements of each individual orchard to be accurately determined. This is resulting in improved cropping and, often, considerable fertilizer savings.

A good market for orange juice now exists throughout Australia. The production of oranges for juice is small compared with southern States and this trend has been of little benefit to Queensland growers.

Nearly 100 000 citrus buds and 60 kg of seed were supplied to Queensland nurserymen and growers in the last year. The scheme is designed to ensure that only high quality citrus material is available for sale.

AVOCADO

As well as being one of the highest value tree crops, avocados are also one of the most unreliable. This is because of their susceptibility to *Phytophthora* root rot.

Heavy losses were again recorded this year and losses from 50 to 100% were common. Many of the losses have been older, heavily-bearing trees and it is estimated that, in spite of the heavy plantings over the years, production will remain low for at least the next few years.

Before deciding to plant, growers are being encouraged to examine the soil profile thoroughly and at depth to obtain disease-free planting material, and to prepare planting holes well in advance to improve the physical, chemical and microbiological properties of the soil. However, the prospects of success are not high except under very favourable conditions, which are rare.

The avocado rootstock 'Duke 6' has some resistance to the root rot. As propagation must be by vegetative means and, as this is difficult, tests are in progress to achieve maximum strike using hot-bed and mist propagation techniques.

Ripening of avocados under controlled conditions has now been successfully introduced to the retail industry. Further studies are in progress to develop methods for testing when avocados are mature and acceptable to the consumer.

STRAWBERRY

The high labour component of the strawberry crop led many large growers last year to reduce their production. Plantings are slightly higher this year as a number of small growers has entered the industry and indications are that pickers may be more readily available.



Earlisweet, a new strawberry variety, was bred by the Department at the Redlands Horticultural Research Station. It was released to the industry this season.

The new variety, Earlisweet, which was developed at the Redlands Horticultural Research Station, has been received with considerable interest by growers and its commercial performance is being carefully assessed. It has been found that the variety produces a much better early crop as well as giving higher overall yields.

It has been found to be more susceptible to magnesium deficiency than other varieties and foliar magnesium sprays are needed.

The strawberry industry has depended on the Runner Approval Scheme for supplying quality disease-free runners for many years. To purify plants of some hard-to-remove viruses, meristem cultures have been made. Tests have shown that these techniques have been successful and the improved material will be introduced into the industry.

Studies of 'crimp' have shown that soil is an important source of infestation of the bud nematode *Aphelenchoides besseyi*, the organism responsible for the disease. The soil can become contaminated by nematodes from infested seed-heads of many common grasses.

Spray trial work aimed at controlling both grey mould (*Botrytis cinerea*) and black spot (*Colletotrichum acutatum*) has now been concluded. A recommended schedule involving the use of benzimidazole fungicides and captan is now being promulgated. The widespread use of the new schedule has markedly improved fruit quality.

MISCELLANEOUS

Macadamia.—The areas of producing orchards are increasing as young plantations come into bearing. It is now clear that this crop is highly labour intensive and the industry is looking towards mechanical harvesting.

The variety trial is now in its twelfth year and Own Choice remains the most successful with Keauhou, Schimke, and Don also bearing well. Yields of nuts are relatively low and vary widely from year to year. Preliminary investigations are being made into methods of improving yields.

Ginger.—The overall area of production has increased recently to meet improved overseas markets. Several imported varieties have been under test, but it has been found that the Queensland variety outyielded all of the others by at least 16%. Further investigations have been made in processing ginger. The requirements for a continuous crystallizing process have been developed.

Mango.—Production of mangoes in 1974 was the second highest on record. Most of the crop was for the fresh market, but a small amount was processed as a sliced product in syrup. Expansion of production is being limited in north Queensland as the crop is in competition with expansion in the vegetable and sugar-growing industries.

The maturity and eating quality of mangoes have been investigated with the aim of improving storage techniques and also of developing improved tests to ensure that fruit which will not ripen does not go to consumers.

In co-operative work between Plant Pathology and Horticulture Branches, it was shown that field sprays with fungicides reduced the incidence of anthracnose (*Colletotrichum gloeosporioides* var. *minor*) threefold in fruit stored for 9 days after picking. These investigations will be continued during the coming year.

It was established that post-harvest treatment of cv. Kensington Pride with hot water at 55°C for 5 minutes provided excellent control of anthracnose. The risk of heat damage was reduced, without loss of efficiency, by lowering the temperature and adding benomyl fungicide to the dip.

Passionfruit.—New plantings have been greatly reduced following suggestions of increased juice imports and the use of synthetic passionfruit flavourings. Increased utilization by new product development is under investigation.

Virus diseases are becoming more important in the main varieties and attempts are being made to purify the material by meristem culture.

Harvesting costs are a major component in the production of passionfruit. Attention is being given to trellis design and crop control as well as the development of a machine to pick up fruit.

Following unsatisfactory control of leaf spot (*Septoria passiflorae*) with benomyl sprays in commercial plantations, trial work was begun. This has revealed that isolates of the fungus tolerant of this type of fungicide are very prevalent. Good control was achieved with the protectant fungicides mancozeb and copper oxychloride. The use of these latter materials by growers will mean better control at less cost.

Guava.—Introduced varieties are being tested and the practicability of growing this crop for processing in Queensland is being assessed.

VEGETABLES

Following a return to a more normal seasonal pattern in Queensland, vegetable prices were generally lower than in the previous year.

Tomato.—The increase in production in the dry tropics has been a significant feature of the year's crop. These increases were the result of growing tomatoes in preference to other crops and increasing the yields of existing areas by improved cultural practices. The quality of the fruit marketed was also improved as a result of the wide adoption of colour sorting, artificial ripening and pre-cooling.

Thirty-three new, fresh-market varieties were imported from overseas and grown in autumn and spring crops. None of these performed as well as current standard varieties. At Bowen Horticultural Research Station, progenies from the improvement programme have been tested and several lines from crosses with the variety Walter are showing promise.

The use of forced-air cooling for pallet loads of fruit is being developed under commercial conditions. This process has been shown to be capable of rapidly removing field heat and thus improving the quality of fruit and the rate of handling.

Processing tomatoes can be grown successfully in some parts of Queensland. More than 40 varieties were introduced and tested for field performance and processing characteristics. Their commercial potential has yet to be determined.

In a field trial, two new commercial cultivars from the U.S.A. (Saturn and Venus) showed some resistance to bacterial wilt (*Pseudomonas solanacearum*), while two breeding lines from the Philippines were completely susceptible.

In July 1974, a major soft rot epidemic caused by *Rhizopus stolonifer* developed in a packing house and ripening rooms at the Rocklea markets. Losses in one week were estimated at \$15 000. The Plant Pathology Branch identified the problem and made recommendations on general hygiene which greatly reduced the problem. Various fungicides were tested and adequate control was obtained with dechloran, Tego and D.S. 9073.

French Bean.—Growing beans for processing is now a major industry. The arrangement of plants in the field has to date been limited by harvesting machines which require a row spacing of 0.76 metres. Newer machines, which are replacing the older models, can handle any row spacing and potential exists to improve yields by closer plant spacing. Initial trials have shown that the moist environment of closer spacing favours development of *Sclerotinia* with serious results. Further tests are in progress with the aim of reducing individual bush size.

Zinc deficiency is a major problem in growing processing beans in the Lockyer Valley. As yield responses to zinc often occur where no symptoms are obvious, a programme is in progress to define soil and leaf values which are associated with deficiencies of the element.

A new bean variety has been proposed for release to growers. The variety is an improved selection of the popular variety Redlands Pioneer, and it gives improved yields under cold conditions.



'Baby carrots' for processing being examined for harvest maturity. Baby carrots are becoming an important Queensland vegetable crop.

Severe outbreaks of common blight (*Xanthomonas phaseoli*) and halo blight (*Pseudomonas phaseolicola*) occurred in processing crops in the Lockyer Valley. Crops sown both with Queensland-produced approved seed and imported Idaho seed were affected. Siratro sown in mixed pasture and phasey bean, commonly found adjacent to bean plantings, were both affected by halo blight. Careful attention will need to be given to isolation from such sources of infection if the industry is to survive in that area.

In the bean rust survey, 65 viable samples were typed during 1974. Of these, 30 were strain H, 2 strain G and 31 a mixture of these strains.

Capsicum.—Production has increased in the Bowen and Burdekin areas. The development of a treatment for fruit fly disinfestation has meant that it can be marketed in Melbourne, and this has been a major reason for the increased production. About 10% of the crop was pre-cooled and shipped by pre-cooled transport.

Root Crops.—The area planted to carrots for processing continued to increase, with particular emphasis on the cropping of baby carrots. *Alternaria* leaf blight caused severe loss of leaves in some plantings. As a healthy top is essential for the top-lifting mechanical harvesters, some of the badly-affected crops could not be harvested.

Canned beetroot is a popular product on the market and most of Australia's needs are grown and processed in south-east Queensland. The main problems are difficulties in getting even stands and seedling losses from damping off.

Sweet Corn.—Corn ear worm, *Heliothis* spp., is a serious pest of sweet corn and great difficulty and expense have been experienced in the past in keeping this pest under control. Work at the Ormiston Horticultural Research Station has shown that several insecticides will effectively control corn ear worm provided the insecticide is applied every 2 to 3 days during silking.

Celery.—Recent experimental work in the Granite Belt has established that benomyl, copper oxychloride and chlorothalonil will all give satisfactory control of the important leaf spot caused by *Septoria apiicola*.

Cucurbits.—Bacterial spot (*Xanthomonas cucurbitae*) of pumpkin was again particularly severe in the Lockyer Valley. In a screening trial, copper fungicides gave promise of controlling this disease to a limited extent.

In north Queensland, benzimidazole fungicides are now completely ineffective against powdery mildew in the Bowen area. Afugan and Milcurb have both remained highly effective and are now being widely used.

A new pathogenic race of the water-melon fusarium wilt organism, *Fusarium oxysporum* f. sp. *niveum*, attacked the previously resistant Calhoun Grey cultivar. Work is in progress screening a range of cultivars for resistance to the new race.

Brown etch of butternut pumpkin causes severe downgrading of fruit each year. Research during the past few months has indicated that the fungus *Ascochyta cucumis* may be responsible for the disease. The association of the condition with fruit approaching maturity in rainy weather is consistent with a fungal disorder.

Fresh Fruit Disinfestation.—Development of commodity treatments against fruit fly is essential to interstate trade. In the last year, the Australian Fresh Fruits Disinfestation Committee has accepted a commodity treatment using ethylene dibromide (EDB) developed for the control of cucumber fly (*Austrodacus cucumis* (French)) in cucumbers. A further commodity treatment, again using EDB, has been developed to control Queensland fruit fly (*Dacus tryoni* (Froggatt)), in mangoes. When accepted, this treatment will allow Queensland mangoes to be exported to Victoria and South Australia, where they are not now permitted.

ORNAMENTALS

Interest in floricultural crops has increased greatly in many parts of Queensland in the last year. The major crops are gladioli, chrysanthemums, asters, carnations, and roses.

Many of these crops appear to be particularly susceptible to a range of diseases and this represents one of the major production problems. The use of hot fungicidal corm dips gives improved control of diseases in gladioli. Many growers have taken the opportunity to attend demonstrations of the equipment and techniques used in this process.

Carnations are also particularly susceptible to a range of diseases. The introduction of virus-free planting material in which fungal diseases have also been controlled has reduced the problem to some extent but re-infection in the field occurs rapidly.



Spraying gladioli for thrips control. Gladioli have become an important crop for the cut flower trade.

The system of using artificial light to produce out-of-season chrysanthemums and asters is being applied successfully in the industry. Additional light is supplied to the plants by using incandescent fittings which are installed above the crop and switched on for up to 4 hours each night.

The flower film titled 'Out of Season', produced by Information and Extension Training Branch, was released and has been shown to several groups of flower growers, nurserymen, and florists.

The occurrence of collar rot and wilt in carnations has been common for some time. An experimental programme by the Plant Pathology Branch is aimed at developing effective control measures under Queensland conditions. There have been numerous inquiries on turf diseases including some caused by nematode infestations.

PACKAGING

The plastic returnable fruit and vegetable crate is now in the final stages of development and testing. Provisional approval has been given for its use and 1 000 have been

manufactured for commercial testing. It is planned to introduce the crate with a range of commodities such as bananas, apples, pears, citrus and lettuce.

Volume filling and vibration packing are now well established in the tomato industry and their introduction into the citrus industry is well advanced. The process offers potential in the banana industry.

Preliminary tests showed that vibration packing was not suitable for apples and pears. In an attempt to overcome these problems, detailed studies have been made of the bruising failure mechanism in apple flesh. An energy balance model is being prepared to explain the bruising in the various layers of the package.



An interested group watches a demonstration on 'Vibra-pack', a new packing system for citrus.

The trend to colouring and ripening tomatoes has meant that the fruit must be graded for colour as well as size, but most packing sheds are not set up for this system. A co-operative project is in progress for the re-design of a grower's tomato packing shed involving colour sorting, drop size rollers and semi-automatic weight filling of packages.



The avocado is one of the highest value tree crops, but root rots cause heavy tree losses. Departmental research is aimed at identifying resistant rootstocks so that consistently good crops, like that pictured, can be obtained.

VII. Development Planning and Land Use

The Department has a continuous association with other Government departments in development planning projects and land-use studies. The Development Planning Branch plays a major part in co-ordinating the activities of the many branches involved in joint work and, in addition, undertakes various types of field work associated with land use and development.

The Agricultural Chemical Laboratory Branch performs much independent as well as joint work by way of soil and water surveys. The Botany Branch has a particular interest in controlling and destroying trees and other woody plants as factors in land development. The Economic Services and Marketing Services Branches have an important role in studies of the economics of production and marketing.

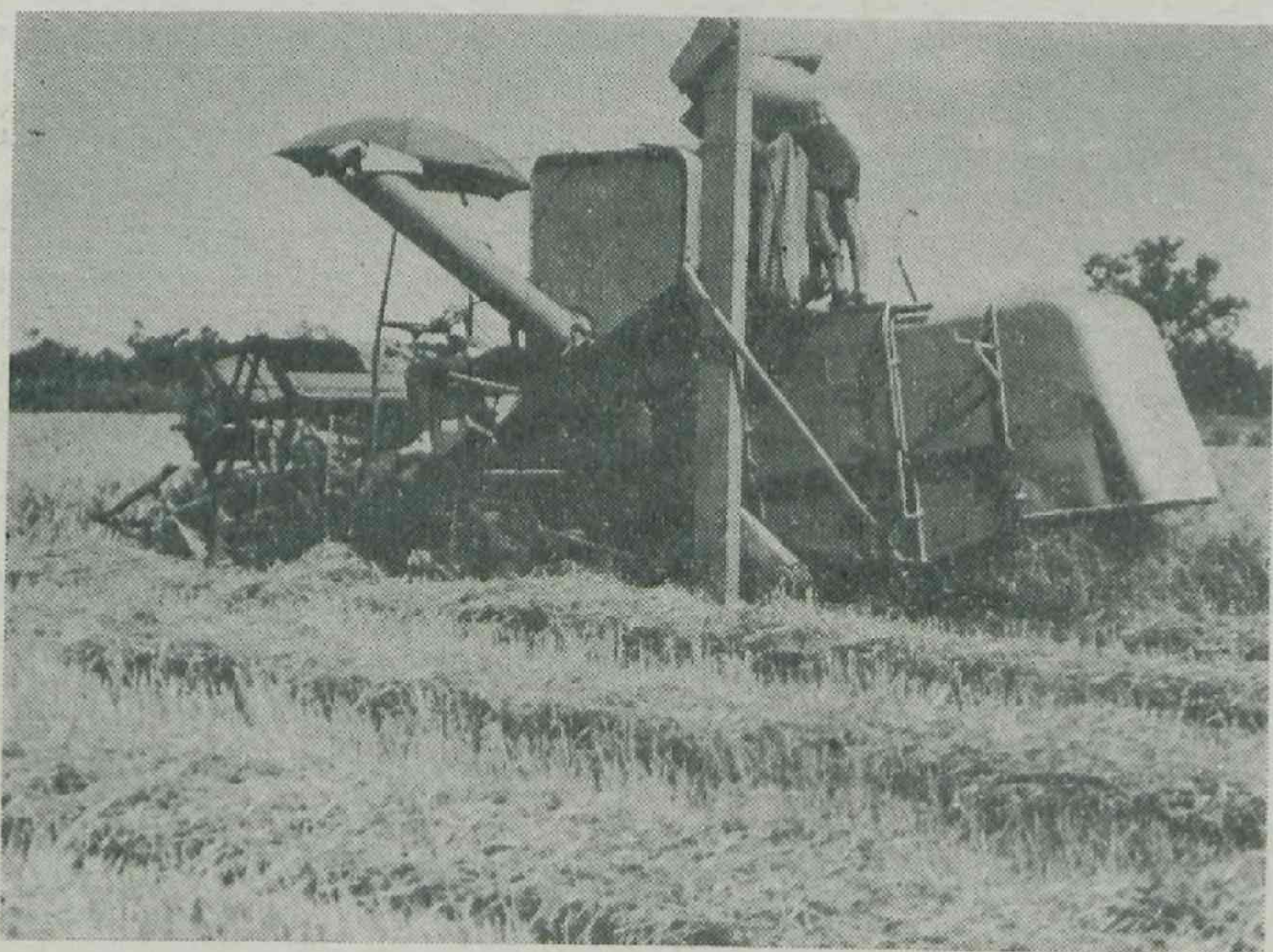
DEVELOPMENT PLANNING

Burdekin Basin Investigations.—The Department of Primary Industries is responsible for identifying the characteristics of the soils of the Burdekin flood plains and catchment area. It is also charged with assessing their value for commercial irrigated cropping and grazing, as well as for improved dryland agriculture. Evaluation of soil erosion problems is a further responsibility.

Investigations to facilitate these assessments include soil surveys, edaphic studies (inter-relationship between plants and soils), commercial trials of various crops and pastures under irrigation on various soil types, land productivity assessments and soil erosion studies.

A major contribution relates to the joint land capability and catchment erosion studies being undertaken by Division of Land Utilisation staff. The size of the surveyed area is approximately 6 million hectares and has been described in terms of some 8 500 morphogenetic units.

Automatic data processing routines have been developed to derive land capability ratings for each of the units, and then to produce line printer map output showing the location and distribution of each of five land capability ratings. Only 2.6% of the surveyed area is classed as suitable for cultivation, and much of this requires careful use. Up to 85% is suitable for grazing with light to heavy restraints on land use and management.



Harvesting rice in the Burdekin.

Coastal Lowlands Technical and Land Use Studies.—A committee with representatives from Lands, Forestry and Primary Industries Departments, under the chairmanship of the Director, Division of Land Utilisation, is studying land use in the northern wallum lands. This Maryborough-Elliott River Land Use Study encompasses an area of 203 000 hectares between Boonooroo Point south-east of Maryborough and the Elliott River south of Bundaberg.

The study area is 19 000 ha of State Forest Reserve, 10 000 ha of National Park and 17 special wallum development leases with an original aggregate area of about 27 000 ha. The study area also covers 76 000 ha of vacant Crown land. This is the largest aggregation of such land in the over 1 000 mm rainfall category close to population centres in Queensland.

The aim of the study is to provide recommendations on the possible future uses of vacant Crown lands in the area.

To assist in the land suitability rating for Outdoor Recreation, Miss P. J. Harmon was seconded to the Development Planning Branch from the Co-ordinator-General's Department for 3 months. She undertook field investigations and prepared relevant sections of the report.

Sheep Industry Climatology Studies.—The study has been based on a computer model of a sheep property on the northern Mitchell grass downs. It aims at a better appreciation of the problems of management in an environment with highly variable rainfall. The study has also allowed an assessment of the potential contribution of computer simulation techniques to agricultural research. Possible roles for modelling and the systems approach are in the promotion of inter-disciplinary research, the extrapolation of research results and in determining research priorities.

The model was used to evaluate taxation averaging procedures and resulted in a private submission to the Industries Assistance Commission Inquiry into Rural Income Fluctuations. Marginal adjustment averaging and the current averaging procedures were compared for a range of incomes and a range of variability of income. The most equitable alternative investigated was marginal averaging without an upper income limit on eligibility. The model was also used to evaluate Drought Bonds.

The model was used to determine the most favourable stocking rates in relation to drought. The best policy in terms of maximum income was an opportunist one. The effects of drought-induced forced sales were such that conflict existed between additional objectives of reduced variability of income and conservation.

Beef Industry Problems.—Because many important rural land development projects have been based on the beef industry, any changes in the industry outlook have significant interest to the Development Planning Branch.

After a period of stability, development and prosperity dating back to 1952, the beef industry reached a boom in late 1973. This was followed by a serious market collapse in 1974, from which it has not yet recovered.

Cattle prices to the producer have fallen by some 70% from their peak, with devastating effects on the equity and liquidity of many cattlemen. The worst affected are generally those who have relied heavily on stock trading, together with those who entered the industry in recent years or are engaged in major development programmes. Heavy retrenchments in staff have occurred while debts of producers have increased sharply. Staff in associated service industries have also suffered retrenchment and loss of income.

Forecasts by the Bureau of Agricultural Economics indicate a favourable medium to long-term market. However, the Bureau is not hopeful of an appreciable improvement in 1975 but expects that the market could improve in 1976. Because of the large export component in beef sales, Queensland is hardest hit of all the States by the severe restriction of the export market.

On 3 June 1975, Cabinet appointed a 13-member Committee comprising six Parliamentarians, five producer representatives and two Departmental representatives under the chairmanship of the Minister for Primary Industries to report to Cabinet on—

1. The beef market situation and its economic implications for the Queensland producer.
2. The practicability of establishing a successful floor price scheme.
3. The practicability of establishing successful alternative price support schemes.
4. Any other avenues for affording financial relief to beef producers.

The Assistant Director of Development Planning Branch is carrying out secretarial duties for the committee.

Brigalow Scheme.—The twentieth and final Lands Department ballot for blocks in the Brigalow Scheme was conducted in Rockhampton in October 1974 when five blocks were allocated. In spite of the current depression in the beef cattle market, there is apparently a great deal of confidence in the future of the industry since there were 328 applicants for the blocks, and 215 were admitted to the ballot. With the completion of the initial development programmes for these five blocks, the field commitment for Development Planning Branch in the Brigalow Scheme is virtually complete.

Western Arid Studies.—The year has been notable in that the survey of Part I has been published. It is identified as Division of Land Utilisation Technical Bulletin No. 12 and comprises a text plus three maps, namely land systems, vegetation and soils. Part I area is located in the far south-western corner of the State and comprises approximately 15 000 000 ha. The area consists of all lands in the Bulloo Shire, a large proportion of Quilpie and the western section of Paroo Shires.

The suitability of the area for pastoral production is discussed. Grazing of native pastures by either beef cattle or sheep is the most important form of land use. Soil, location and climatic conditions make the area unsuitable for intensive use under cultivation and sown pastures. Mining, hunting and trapping, tourism and beekeeping are complementary industries contributing to income in the region.

IRRIGATION

Eton Irrigation Project.—State Parliament in April 1975 considered the Joint Report prepared by the Department of Primary Industries and the Irrigation and Water Supply Commission on the Eton Irrigation Project.

The Eton area, west of Mackay, is relatively subject to drought and it has been calculated that an average annual application of about 450 mm a year from irrigation sources will enable high production every year. At the farm level, the availability of water is expected to increase sugar production from the present rain-grown average by 3.5 to 4.2 tonnes per ha because of increased farming efficiency. A greater degree of security would also be provided for the smaller farmer.

Departmental assessments indicate that the scheme could be expected to provide a return to capital of approximately 7% and, as such, is regarded as economically sound for a project with a life of 75 years or more. For the purposes of the economic evaluation, a sugar price of \$125 a tonne was adopted, which is some \$100 or so below current levels.

The first objective of the scheme is to provide adequate water for irrigating 6 940 ha on some 185 holdings. The secondary objective is to increase production on a stable and economic basis as opportunity for increased output occurs. This can be achieved by providing irrigation for an additional 1 295 ha of unassigned land within the irrigation area.

Boyne Valley—Preliminary Land Use Assessment.—In January 1975, the Gladstone Area Water Board requested that the Division of Land Utilisation carry out a study to identify 'At Risk' areas in the Awoonga Dam catchment with regard to preservation of water quality and stability of the catchment in general. The dam receives water from most of the Boyne River catchment and provides for Gladstone's urban and industrial water needs.

The study was aimed particularly at investigating and identifying water pollution threats in the catchment. Soil erosion potential was examined, together with the effect of fertilizers and agricultural chemicals.

Three Moon Creek.—A reassessment of the Three Moon Creek Irrigation proposal was completed in September 1974. Provided the coastal milk market is available, dairying will be a profitable venture in the area. Economic feasibility of the project depends on full utilization of additional irrigation water within 5 years of completion of the dam.

Bowen-Broken Rivers.—Work is continuing on evaluating the Urannah Dam (Bowen-Broken Rivers system). Comparative returns for a wide range of crops were prepared for a Melbourne consultancy firm undertaking an agro-industrial study at the request of the Australian Department of Northern Development.

Leslie Dam.—Crop production and marketing data have also been supplied to the Bureau of Agricultural Economics who are undertaking an economic assessment of the second stage of the Leslie Dam on the Darling Downs.

Wivenhoe Dam.—At the request of the Co-ordinator-General's Department, a report was prepared on the economic and social impact of the Wivenhoe Dam on the citizens of Esk Shire. A total of 238 properties is affected by the dam. The report gave details of population movements, expenditure patterns and multiplier effects on the local centres of population.

SOIL CONSERVATION

In a situation where changes in taxation approaches and deterioration in cost-price relationships tend to discourage investment in soil conservation by landholders, it is reassuring that the previous year's disturbing downward trend in farmer interest in soil conservation has been arrested and an upward trend recorded.

An additional 349 farmers entered the programme for the first time. This is a 24% improvement on the previous year but still well below the 657 recorded in 1966-67 and only slightly better than the 1 339 recorded in 1961-62. The level of farmer interest in the Darling Downs and south-west regions has not improved, but the Burnett has shown a 71% increase while Carpicornia has increased by 28%. A decline is evident in the Moreton region.

The State area treated by the application of contour banks (Stage 1 of programmes) and associated measures increased to 33 665 ha, a 30% improvement on the previous year but well below the 52 424 ha for 1970-71.

The Darling Downs region is the most critical in soil conservation requirements and in early 1973 was placed on a 20-year control programme. Government assistance was provided in accordance with this aim. The data indicate that the 1974-75 control rate of 4 426 ha on Category I lands needs to be increased to 9 200 ha a year to meet programme requirements. For Category II lands, an increase from 2 626 ha to 20 000 ha is needed.

Land Use and Conservation Practices.—Bare soil suffered various degrees of erosion during the summer, even where structures existed, but where stubble or good crop cover was present this provided adequate protection against erosion. This provided support for expanded field programmes involving demonstrations of modified tillage and planting machinery over a wide range of soils, soil conditions, crop residue, soil moisture levels and crop types.

These demonstrations have indicated an economic potential for these soil conservation practices and interest in machinery capable of handling stubble is growing.

Industry issues have led to some land use changes and increased the erosion potential. The collapse of the cattle market and favourable grain prices have resulted in large areas of grazing land being cultivated. Expansion of sugar-cane assignments has resulted in some land too steep for cultivation coming under the plough in the Mackay district. In the Isis and Gin Gin districts, this problem was avoided through Soil Conservation Branch assistance in determining desirable slope limitations.

Work Programmes.—Progress by landholders in applying soil conservation measures has been unsatisfactory. It is apparent that a significant growth in producers' interest is needed to emerge from the trough resulting from a combination of poor seasons and unattractive cost-price relationships.

Resource inventory mapping is an important pre-requisite for planning operations and a further 44 844 ha were mapped, to give a total of 144 000 ha now mapped.

Provisional Project Plans were prepared for 111 properties on the Darling Downs and involve works on an area of 20 000 ha. These works are eligible for subsidy.

Eight Project Plans covering 13 950 ha on 138 properties on the Darling Downs were finalized during the year and approved by the Governor in Council. Notices for Stage I work programmes have been discussed with and issued to relevant landholders and work has commenced on 25 properties.

Programme Liaison.—The Darling Downs Regional Soil Conservation Committee, as previously endorsed by the Soil Conservation Advisory Committee, was reconstituted during the year under the title Darling Downs Inter-Departmental

Soil Conservation Committee. This Committee now comprises the regional representatives of interested Government Departments together with technical representatives from appropriate Shires as and when required.

Provision has also been made for setting up Advisory Group Committees consisting of one representative from each Shire in the area and one landholder elected from each major resource area. These Committees will assess the local implications of programmes and advise the Soil Conservation Authority on programmes generally and their priorities and stimulate local interest and understanding.

The Machinery Evaluation Programme is now supported by three area committees: the Eastern Darling Downs Uplands, Eastern Darling Downs Plains, and the South Burnett. These committees include members of Soil Conservation and Agriculture Branches as well as farmer representatives. The Machinery Evaluation Committee is now called the Central Committee of the Queensland Machinery Evaluation Committee. The central committee consists of members of Soil Conservation Branch, the convenor of each area committee at least one producer from each area committee and technical officers appointed by branch directors of this Department.

Field Investigations and Observations.—A project has begun to assess and to demonstrate methods of maximizing cropping, moisture usage, and stubble mulching. Two to four-hectare plots are to be used in this programme.

The Machinery Evaluation Programme has gained momentum with the purchase of additional machinery for evaluation and demonstration, and the setting up of the Three Area Committees.

Problems encountered with the development of a rod weeder to operate behind 91 cm sweeps have been overcome.

A scarifier seeder was used in a wide range of soils on the Darling Downs and South Burnett with good results for barley plantings on heavier soils with subsoil moisture.

Some measure of the success of this programme is the increase in the number of farmers modifying machinery along the lines recommended by Soil Conservation Branch.

Photographic measurements of leaf cover for peanut and soybean crops have been undertaken to give C values for the universal soil loss equation for the Rosalie Division 4, Area of Soil Erosion Hazard.

A hydro-mulching unit is being developed in the South Burnett to demonstrate stabilization of roadside erosion and other bare soil surfaces.

African star grass is being tested as a waterway grass on the C.O.D. farm at Beerwah. By May, the African star grass had provided a reasonable surface cover after its plantings in February. It appears to be controlled with Hyvar and Karmex, chemicals used frequently in pineapple culture. Without spraying, the grass becomes a pest.

With the assistance of officers of the Forestry Department, an attempt has been made to stabilize a large landslip near Montville. Some 800 trees have been planted and areas seeded to *Eucalyptus grandis*. Tube trees are growing vigorously, but seed germination was poor.

An officer of this branch has provided information to the Moreton Region Growth Strategy Group on hazards associated with land use due to land slope, soil erodibility and land slip. A map has been prepared showing different slope ranges within that region.

Key Area Mapping.—Mapping of soils in key areas on the Walloon Coal Measures and Marburg Sandstones was completed during the year. To provide additional information on these soils and their land use limitations, a series of field and laboratory measurements was made. These included water entry, water storage and soluble salt measurements.

It has been found that moisture storage and depth of water entry varies considerably between the soil series found on the Marburg and Walloon Coal Measures. In the soils formed on Walloon Coal Measures, for example, 80% of the total available water of 10 cm is stored in the upper 45 cm in the Elphinstone soil series, while only 65% of the total available water of 14 cm is stored in the same depth interval in the Talgai soil series. On the Marburg Sandstones, the soil series stored from 7 cm to 14 cm of available water. Little moisture is stored below 120 cm in these soils.

Interim zoning criteria were prepared during the year in collaboration with Field Services staff for soils formed on Marburg Sandstones. They were released for use by farm planners in March 1975. Interim zoning criteria for the Walloon Coal Measures soil series are already being used by farm planners.

North Pine Dam Catchment Study.—This study was set up by the Department of Local Government. This branch, as one member of an inter-Departmental study group, was requested to document resource information, hazards and possible management solutions for the North Pine Dam Catchment. An outdoor recreation land use plan of the area was also prepared. A summary of the findings is—

The catchment, in its present state of development, is relatively stable, and it is unusual for serious pollution to occur in the North Pine River. The land in the catchment is suitable for a wide range of uses. Hazards associated with the forms of land use include pollution by agricultural fertilizers and biocides, pollution by bacteria and organic matter, landslip, soil erosion, sedimentation and flooding.

Pineapple growing is the most environmentally hazardous rural industry, because of its high fertilizer use and high soil erosion hazard. Some regulation of the total area and location of this and other environmentally hazardous land use activities will be necessary to control water pollution.

Suitable land is available to house up to 35 000 people in the catchment. The soils are, however, generally unsuitable for septic systems. Thus, disposal of treated sewage effluent would be a major problem.

Substantial areas are suitable for bush-walking, trail riding of horses, primitive camping, picnicking, organized camping, recreational farming and dwelling, local walking, viewing, photography, painting and horse riding. Provision was also made in the land use plan for trail bike riding, an activity which can cause environmental deterioration.



Sheet and rill erosion often results on sloping basaltic soils after rain.

Moreton Region Land Suitability Study.—Soil Conservation Branch was one member of an inter-Departmental study group formed to examine the natural resources of the Moreton Region and to comment on their suitability for flora reserves, native fauna habitats, agriculture, forestry and outdoor recreation.

Part 1 of this report was published in September 1974. The remainder of the report, Part 2, will be available later in 1975. A summary of the more significant findings is—

Relatively large areas of the Moreton Region are suitable for multi-purpose use for recreation, fauna and flora. The main areas are well distributed and total more than 500 000 ha.

A substantial part of the region is occupied by the catchments of present or proposed storages for urban water supply. Management should receive emphasis in any strategic land use plan for these catchment areas. Careful examination is required before allocating non-urban areas to housing as, for example, only small areas of the region are suitable for agriculture.

More than 60% of the severe erosion occurs in the Bremer and Lockyer catchments which occupy about 10% of the region. It is proposed to study this area in more detail to determine the cause of the erosion and to recommend measures for its control.

Burdekin Basin Land Deterioration Studies.—The aim of this study is to assess the extent of land deterioration (present and potential) and to comment on its effects on water quality. This study is being undertaken jointly by officers of Soil Conservation and Development Planning Branches.

A survey of land to the north of the 21°5'S parallel is completed and a report of this survey is in preparation.

Extensive use was made of computer storage and retrieval techniques in conducting this survey. This was made possible by the availability of 1:100 000 orthophotomaps for most of the area.

Opportunity Cropping.—The soil water balance model (WBAL 3) was used to estimate water use by wheat and sorghum crops on the Darling Downs and compare the results with actual soil water data from crop sequences.

The model was used with actual climatic data for a 30-year period to compare continuous wheat or sorghum fallow with an opportunity cropping system. The investigation showed—

1. More crops can be grown over a given span of years using an opportunity cropping system.
2. Individual crop yields are not greatly reduced.
3. Economic returns are increased in non-arid areas.
4. Surface run-off and erosion are reduced.

Economic Assessment.—An economic assessment of the impact of the mandatory provisions affecting land use in soil erosion hazard areas is to be initiated on the Darling Downs by Economic Services Branch. The study is an extension of work carried out by Queensland University using linear programming to determine optimum solutions.



Silt deposits occur in the lower corners of many of the unprotected paddocks in the basaltic uplands.

A best-bet, decision-making approach using monte carlo programming is to be adopted to allow for price and technological uncertainty to be incorporated into the best-bet decisions.

SOIL STUDIES

Burdekin Basin Re-assessment—Soil Survey.—Within the commandable area of 40 000 ha on the right bank of the Burdekin River as far east as the Elliott River, four sample areas of 1 200 ha each were selected as representative of the major soil associations on this bank.

Each sample area was mapped to a publication scale of 1:25 000. Fifty-three soil types, and associated land forms and vegetation, were mapped and described. All major soils have been sampled by 10 cm increments to 150 cm for chemical and physical laboratory analyses.

This has given a relatively detailed appraisal of the likely importance of soil type and variability in irrigated land use on the right bank of the Burdekin River.

Soil Physics.—A technique for assessing the suitability of soils for irrigation, by which a crop is grown in irrigated bays and soil and plant moisture parameters are measured, has been used at five sites on the right bank of the Burdekin River. Sites were chosen to represent the major soil series of a previous soil survey by C.S.I.R.O. officers. During two growth cycles of fodder sorghum, irrigation increment, water extraction patterns and plant growth and stress parameters were measured.

The project is continuing with 15 sites in 1975.

Emerald Irrigation Area—Soil Survey.—Detailed soil survey at a scale of 1:10 000 to provide the basis for farm design has continued for the right bank areas of the Nogo River. The soils map of the left bank irrigation area has been prepared for publication.

FARM MANAGEMENT ACCOUNTING SERVICE

The Farm Management Accounting Service (FMAS) is operating satisfactorily although the number of members has dropped to about 130 in the monthly mail-in service. Twenty-three farms were processed using the Annual Summary Service.

Few changes were made to the system during the year. It is proposed that integration of the B.S.E.S.—ACCRA programmes into the F.M.A.S. system be studied with the view to introducing the change during the coming year.

The Department is working closely with the Bureau of Sugar Experiment Stations and the ACCRA Secretariat in the development of a package system for accountants. The ACCRA Secretariat is field testing the system with the co-operation of several accountants from various parts of Australia and the system is functioning satisfactorily.

NATURE CONSERVATION

Maintenance of some environmental standards remained the statutory responsibility of several Departmental branches. Fauna and flora conservation have long been connected with this Department and legislation has progressively developed from *The Native Birds Protection Act of 1877* to the *Fauna Conservation Act 1974*.

The current Act which came into force on 1 September 1974, provides for the conservation of all native mammals, birds and reptiles. Two insect species also are included: the birdwing butterfly (*Ornithoptera priamus* L.) and the mountain blue butterfly (*Papilio ulysses* L.). Apart from this more comprehensive coverage of fauna, the important concept introduced involves habitat: provision now exists to control land rather than only the fauna inhabiting it. The new Act provided for a Conservator of Fauna.

Biological staff continued with inventories and a wide range of consequent specific studies. These included taxonomic investigations, ecological projects and bibliographic reviews on such diverse groups as insectivorous bats, rain-forest flycatchers and Cape York dragons.

Exploitative industries depending on native animals—kangaroo and crocodile harvesting, aviculture, duck shooting—continued to receive detailed attention and studies of the involved species advanced steadily. Good climatic conditions have resulted in substantial increases in wild populations, with no evidence of excessive use. The export ban on kangaroo and crocodile products during the period also diminished harvests, while creating internal regulatory problems. Thus a tagging scheme for all harvested kangaroos has had to be improvised as part of a 'kangaroo management programme' imposed by the Commonwealth Government.

Other regulatory matters were routinely handled. The introduction of an open season fauna permit to take waterfowl resulted initially in more than 3 000 applications and the methods used in, and data from this procedure, will be reviewed and analysed in due course. Other licences and permits, royalties, fauna dealers, zoos and aviaries continued to be handled. Deer have received particular scrutiny, and a film on the subject has been compiled.

Workshops for *ex officio* fauna officers were held at Gympie, Townsville and Toowoomba, and schools for honorary protectors were conducted by branch staff at Maryborough, Townsville and Dalby. Methods of presentation improved steadily. An open day for technical people was held at the North Queensland Fauna Centre, Townsville, on 28 November 1974 and attracted a large and encouraging attendance.

Involvement in environmental impact assessments and land use planning exercises continued to be extensive and many parts of Queensland were considered.

The development of the branch was curtailed by the announcement on 23 December 1974 of the establishment of a National Parks and Wildlife Service as a sub-department of the Department of Lands. This will incorporate the Fauna Conservation Branch, and the National Parks Branch of Forestry Department; several Acts or parts of Acts of Parliament are included to cover Environmental Parks and so on. The Director of the new Service is Dr. G. W. Saunders, Director of the Fauna Conservation Branch.

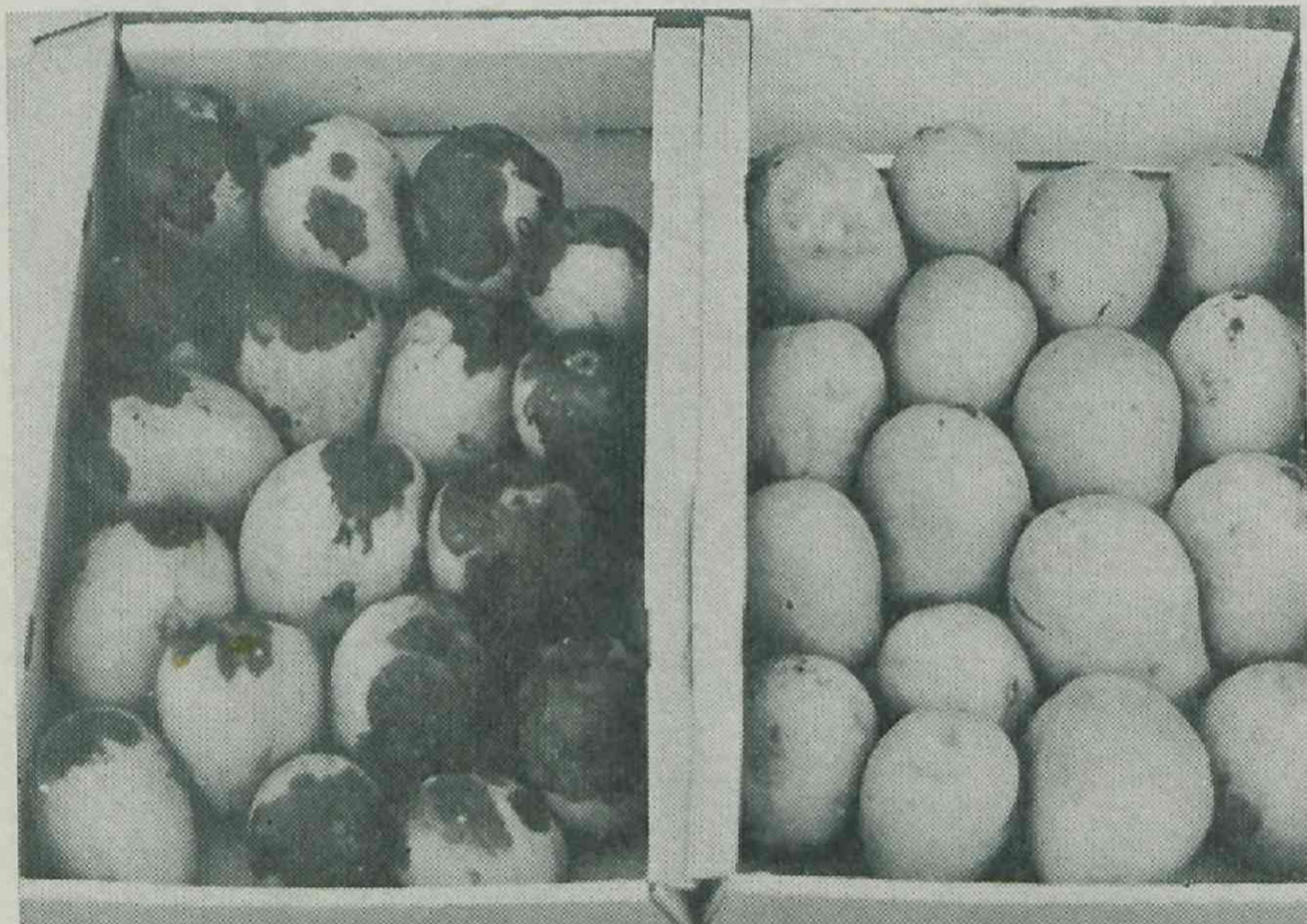
VIII. Special Field and Laboratory Services

The Department operates a number of services ancillary to its crop, livestock and commodity research, extension and regulatory services. Some of these are recorded elsewhere in this Report. This section deals with stored products, various diagnostic services, and agricultural engineering.

STORED PRODUCTS

Strains of insects resistant to the maldison grain protectant continue to pose a major threat to the grain industries. Alternative protectants are being tested in a collaborative programme involving this Department, the Australian Wheat Board, C.S.I.R.O. and the bulk handling authorities. Chlorpyrifos methyl, fenitrothion and pirimiphos methyl all have advantages over maldison but will not control resistant strains of the lesser grain borer. Combination with bioresmethrin or other synthetic pyrethroid insecticide appears necessary. An unnamed compound from Ciba Giegy Australia, CGA20168, which is in the early stages of development, was effective against all species.

With assistance from the industry, two bulletins on grain insects and their control were produced and distributed to all grain growers in Queensland. Technical backing was provided for a State-wide extension campaign to reduce the level of on-farm infestation. A range of biological studies is under way to further elucidate the technical problems involved.



A remarkable improvement in the keeping quality of mangoes has come out of the Department's trials using hot water treatment. The sample on the right, which was dipped in water at 55°C for 5 minutes, is in excellent condition compared with the untreated fruit.

The mango fly, *Dacus (Strumeta) frauenfeldi* Schiner, has been detected for the first time in Australia. Specimens were collected at Weipa and the northern extremity of Cape York Peninsula. The species probably has been introduced from Papua New Guinea within the last 2 to 3 years. This occurrence indicates the vulnerability of our northern coastline to the introduction of exotic insect pests.

A Rural Credits Development Fund Grant has been received for a study of fruit fly attractants and a study of fruit fly ecology in an area of rain-forest in south-east Queensland.

DIAGNOSTIC AND IDENTIFICATION SERVICES

The Pathology laboratory at Yeerongpilly and the Animal Health Station, Townsville, examined more than 13 000 batches of specimens in providing a diagnostic service.

Some of the more unusual cases and new techniques adopted are briefly mentioned.

The laboratory confirmation of ephemeral fever is both time consuming and expensive. The established methods involve measuring the level of serum antibody in samples

taken 2 to 3 weeks apart or attempts at virus isolation in suckling mice. A direct fluorescence antibody test which detects virus in the white blood cells has been developed at the Animal Health Station, and a positive result can be reported in hours.

For many years, the only means of detecting symptomless carriers of equine infectious anaemia virus has been to inoculate a susceptible horse with blood from the suspect animal. This is far too expensive a procedure to adopt routinely. A gel-diffusion precipitin test has been developed at the Animal Research Institute and this allows identification of infected animals by demonstrating the presence of antibodies in serum.



A Departmental plant pathologist examines a lucerne disease resistance trial at Gatton.

St. George disease (*Pimelea* poisoning) continues to be a problem with more cases than usual occurring this year. The disease is known to be caused by *Pimelea trichostachya* or flaxweed. Another member of the genus, *Pimelea altior*, has also been shown to cause the disease, and two other members of the genus are highly toxic. This group of plants is widespread, and is emerging as a major plant toxicosis problem of the State.

The possibility of people contracting Psittacosis from Psittacine birds is well known, but the disease has not been diagnosed in such birds for some time. However, the recent confirmation of Psittacosis as the cause of death of caged parrots in Townsville and Warwick served as a reminder of this hazard.

The causal organism of swine dysentery has been the subject of debate for some years. American workers have recently produced evidence to suggest that the spirochate *Treponema hyodysenteriae* may be responsible. An organism morphologically similar to *T. hyodysenteriae* has been detected in a number of cases of swine dysentery at the Animal Research Institute and one isolate has been cultured successfully.

Work at the Animal Health Station has shown that aged cattle are highly susceptible to *Babesia argentina* infection but calves are considerably more resistant. This is particularly relevant when cattle from tick-free areas are being introduced to tick-infested country. Basic studies into the metabolic requirements of *Babesia* are in progress with the long-term aim of culturing the organism in synthetic media. Culture methods which have achieved some success with similar organisms such as *Plasmodium*, which causes malaria, simply do not work with *Babesia* suggesting major differences in metabolic requirements.

Increasing numbers of cattle exported live have brought about an upsurge in the number and variety of blood tests done to satisfy the requirements of the importing countries. The staff and facilities of the serology section have been severely taxed in meeting this demand during the past year.

Improved methods of isolating the causative agent of swine erysipelas were studied. Low temperature storage of samples from arthritic joints led to a greatly improved isolation rate. This will be valuable information for research and diagnostic work.

A continuing interest is maintained in the occurrence of salmonellas in poultry and red meat products. While, in the past, extensive investigation into the presence of salmonellas has produced a good knowledge of the occurrence of these bacteria, emphasis is now being placed on the number present in various situations. In this way, it is hoped to understand how these bacteria can be reduced with the minimum cost.

Diagnostic services and the servicing of trials were undertaken by Biochemistry Branch on behalf of the Division of Animal Industry, the livestock branches of the Division of Dairying, and Fauna Conservation and Fisheries Branches. Services remained at the same level as the previous year with a 7% decline in the number of dipping vat analyses. The increasing cost in services has in part been offset by the static demand. The excision of fauna and fisheries interests from the Department will help to offset the increasing disparity between costs and contingency finance.

Pesticide residue work continues to occupy a large part of the Agricultural Chemistry Branch's endeavour. The phasing out of chlorinated hydrocarbons has been accompanied by the introduction of other types of pesticide whose residue chemistry is relatively unknown.

A record 11 867 soil samples were analysed during the year. Samples other than soils received for analyses totalled approximately 23 000, which included 900 waters analysed for stock or irrigation or both.



Rugose leaf curl on Kenya white clover (left) compared with a healthy specimen in this Departmental research project.



A plant pathologist examines the serological tests used for identifying root nodule bacteria.



A farmer group inspecting glasshouse trials at the opening of the J. Bjelke-Petersen Field Research Station near Kingaroy.

The X-ray fluorescence instrument has been used for many determinations including sulphur, potassium, phosphorus, zinc, manganese, copper, iron, tin, calcium, aluminium and silica. Types of samples analysed included plants, seeds, fruits, molasses, sheep faeces and urine, canned sweet potato syrup, soil and gypsum.

A new appreciation of the conversion of feed to protein by animals requires new analytical approaches to assess the value of feeding stuffs, and the branch is actively studying various aspects of those topics especially as they affect regulatory requirements.

During the year, Plant Pathology Branch prepared and published 32 disease profiles of crops such as French beans, maize, lucerne, pineapple, apples and wheat. These feature colour illustrations of disease symptoms together with written information and have been very well received by farmers. They are of particular benefit to extension officers. The



The Department undertakes fumigation, on behalf of the Commonwealth quarantine services, to control introduced insect pests. In this picture, a house is being fumigated to control an introduced pest, the West Indian dry-wood termite.

extension plant pathologist at Indooroopilly made 1 100 separate diagnoses from specimens submitted. More than 2 000 phone enquiries were handled.

At country field stations, nearly 2 000 diagnoses were accessioned. These represent only a fraction of those actually made in the day-to-day activities of plant pathologists at these centres.

Many specimens require the attention of specialists at Indooroopilly. For instance, 145 bacterial disease diagnoses were made and these required extensive laboratory testing. Three hundred soil and plant specimens were processed in the nematology section. More than 600 specimens, not including those for research projects, were examined under the electron microscope, and 293 virus diagnoses requiring laboratory studies or indexing in the glasshouse were made. Again, these represent only a fraction of the diagnoses made by these specialists in their day-to-day activities.

The number of accessions in the Plant Disease and Fungal Herbarium is now approaching 12 000. This collection continued to be used as a source of reference material in routine identification work as well as research on the taxonomy of plant pathogens occurring in Queensland.

Insect Taxonomy.—Huge cost is involved in applying chemicals to protect field crops and pastures from damage by grasshoppers and locusts. Investigations, therefore, have been undertaken into alternative control measures.

As part of this investigation, a taxonomic review of the family Scelionidae, a group of parasitic wasps which attack the eggs of many important pests, is being undertaken. The review will reveal the extent of the native parasite fauna and form a basis for expanding present ecological studies on grasshoppers and locusts.



Cowpea lines resistant to the serious stem rot disease (*Phytophthora vignae*) are developed by the Department. Susceptible and resistant selections show up clearly in screening trials.



In the passionfruit crop, the Department's major research effort is directed towards controlling *Septoria* spot. A diseased vine is in the foreground and healthy ones at the rear.

IX. Agricultural Standards

The Department is concerned in many ways with maintaining standards of primary produce, both raw and manufactured, intended for local consumption and for export. It is also concerned with the standards of certain agricultural requirements, mainly agricultural chemicals, and with standards of usage of certain materials. Where standards have statutory force, the Department polices them in appropriate cases as an agent of the Commonwealth Government.

The Standards Branch is the branch most involved in regulatory control of standards, though Dairy Field Services Branch and Dairy Research Branch have the chief responsibility for standards control of dairy produce, and Slaughtering and Meat Inspection Branch for meat and meat products.

AGRICULTURAL CHEMICAL CONTROL

One function of Standards Branch, through its Agricultural Requirements (Registration) Section, is constant surveillance of agricultural chemicals offered for sale.

During the year, 3 982 applications for registration or re-registration were received, 280 fewer than for 1973-74. In addition, 11 special mixtures of fertilizers and two special mixtures of stock foods were approved.

The Agricultural Requirements Board, at 21 meetings, examined claims made by manufacturers on the efficacy of 1 446 preparations for which applications for registration or re-registration were made.

It is Board policy to phase out chlorinated hydrocarbon insecticides where suitable alternative controls exist. Particular attention has been given to endrin, aldrin and dieldrin, of which both aldrin and dieldrin are persistent chemicals. Remaining uses are limited to pests for which no alternative methods of control are available. Some advice to the Board indicated that DDT is no longer effective in controlling cabbage moth, hence labels for those preparations containing DDT have been reviewed.

The Agricultural Chemicals Distribution Control Board met three times during the year. It received a total of 35 notifications of complaint on damage to crops. Of these, nine concerned alleged damage to fruit and vegetable crops grown in densely cultivated areas of sugar-cane.

For the third year in succession, notifications of complaint of damage to cotton crops were received from growers in the Cecil Plains area of the Darling Downs. Seven such notifications are at present under consideration.

The system of issuing permits to licensed commercial operators for the distribution of certain prescribed agricultural chemicals in 'Hazardous Areas' continued to operate smoothly. A total of 76 permits were issued for the ground and aerial distribution of 2,4,5-T butyl ester in 'Hazardous Areas Nos. 1 and 2'.

Twenty-nine examinations to qualify for commercial operator's licences, involving 92 candidates, were held in 12 centres during the year. In addition, 11 pilots were examined for pilot chemical rating licences in four centres. From these, and earlier examinations, results were—

- 75 unrestricted commercial operator's licences issued;
- 84 restricted commercial operator's licences issued;
- 928 commercial operator's licences renewed;
- 10 pilot chemical rating licences issued;
- 49 pilot chemical rating licences renewed.

The first set of amendments to the Commercial Operator's Manual was published and distributed. This comprised data sheets for nine weedkillers which have been registered for sale since the original publication.

DAIRY PRODUCTS

Bacteriological and chemical analytical laboratories are maintained in Brisbane at the Otto Madsen Dairy Research Laboratory and at the Butter Marketing Board, and at Malanda, Murgon and Toowoomba. These laboratories provide results which indicate the degree of compliance with State advisory and/or legal standards, export standards, or buyer specifications.

These results are used by producers and manufacturers as an external check on their internal quality assurance programmes. They are also available to Departmental inspectors for use in their consumer protection activities. They cover a wide range of products such as raw milk and cream,

various pasteurized milks and creams, yoghurts, cheeses, butters, milk powders and caseins. Some products are manufactured in Queensland but others are imported from interstate or overseas. The need for these analyses is emphasized by the high and intermittent incidence of excess moisture and by enzymic deterioration in some butters imported from Victoria.

Raw Milk.—In general, raw milk quality remains satisfactory as shown by the current acceptability tests (methylene blue, thermoduric colony count, and percentage fat content).

Pasteurized Milk.—Creamline and also homogenized pasteurized milk in bottles, cartons and sachets is, in general, of satisfactory quality. Bulk pasteurized milk quality, although improving, is not as good as that in smaller containers. The tendency to replace metal milk cans with single service containers is associated with an improvement in the bacteriological quality of bulk pasteurized milk.

Raw Cream.—The trend of factory intake towards receiving milk rather than cream is now almost complete, and most raw creams are now factory-separated rather than farm-separated.

Butter.—To satisfy local consumption, it has been necessary to supplement Queensland production with large amounts of butter from interstate factories. Bacteriological aspects of butter quality have generally been satisfactory. However, several samples of interstate butter have shown elevated moisture and free fatty acid contents.

Cheese.—Although cheddar is the main cheese variety produced in Queensland, several other recognized varieties are also manufactured locally. Many other varieties are imported in small amounts. N.A.T.A. analytical certificates are provided to assist producers to select cheese meeting buyers' specifications.

Casein.—Samples are regularly analysed to provide guidelines for manufacturers and officers of Field Services Branch.

Powder.—Here again, N.A.T.A. certificates are provided for manufacturers.

Pesticide Residues.—The Australian Department of Agriculture has intensified its detailed monitoring of manufactured products during the year. Occasional sporadic instances occur when residues are in excess of N.H.M.R.C. advisory standards. Follow-up sampling of milk supplies to problem factories has been done to localize the contaminating farms.

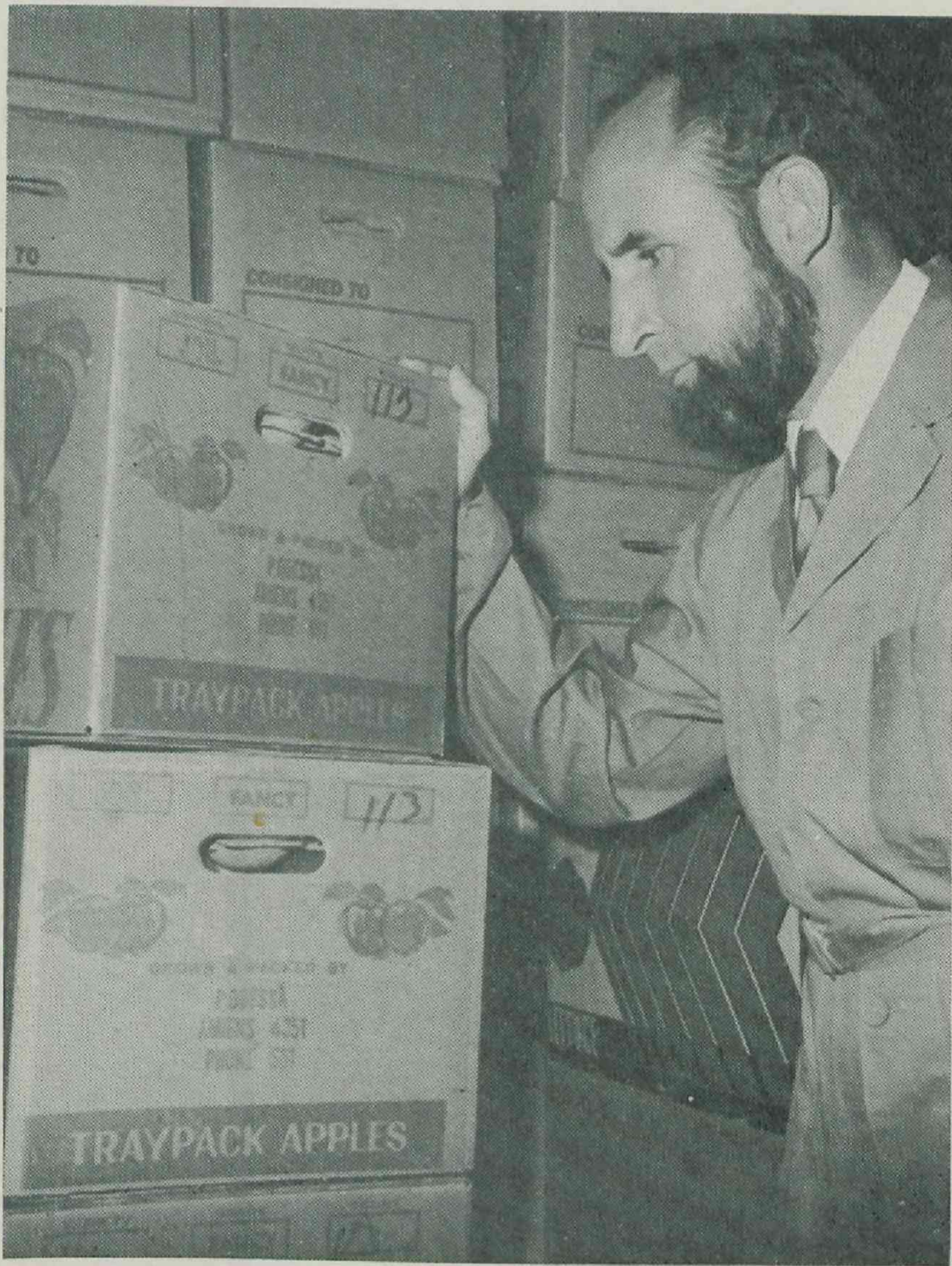
SEED AND GRAIN

More than 14 000 seed samples were tested during the year: 3 000 of them at the Toowoomba laboratory which now accounts for about 20% of all tests carried out in Queensland.

The demand for seed certification has fallen significantly through competition from pure seed schemes developed by seed merchants or by the seed industry in partnership with the Department of Primary Industries and the University of Queensland.

Eighty-seven shipments of barley, wheat and sorghum exceeding 1 million tonnes of grain were inspected under the Exports (Grain) Regulations compared with 46 shipments totalling 708 000 tonnes in the previous year. The risk of insect infestation and weed seed contamination in export grain is an ever-present threat to Australia's overseas markets, and inspection is a heavy branch commitment.

Inspections of agricultural requirements were carried out in all districts serviced by Standards Branch Inspectors. A total of 3 855 inspectors' samples was obtained and this involved 263 visits to firms in metropolitan areas and 292 visits to 36 country towns. Samples included 2 428 seeds and 1 042 stock foods. Deficiencies were detected in some of the stock foods.



Packages sent to market should be clearly and legibly marked. This helps both market agents and Departmental inspectors.

Fifteen seed research projects were carried out during the year. In nine of these, emphasis was on germination and dormancy of subtropical forage legumes. The effects of nutrition on seed production, identification and testing procedures were also major research projects. Five papers were accepted for publication during the year and eight Queensland candidates qualified for the practical examinations for the 1974 Seed Testing Proficiency Certificate.

FRUIT AND VEGETABLE INSPECTIONS

Fruit maturity was a highlight of the inspection services in the 1974-75 season. Citrus, pineapples, grapes, avocados, and mangoes require prescribed maturity standards, and 437 consignments were tested. Apple maturity, on the other hand, is regulated by specifying picking dates for the Jonathan and Delicious varieties.

Regular fruit and vegetable inspections were carried out at the Brisbane Market, Rocklea, as well as at produce agents, railway yards, cool stores, wharves, airports, container depots, pre-packaging centres, retail fruit shops and road fruit stalls. Centres visited included Ipswich, Redcliffe, Sandgate, Gold Coast and the Lockyer district. Condemnations included 24 652 packages of fruit compared with 35 685 packages in 1973-74. Of significance was a drop in the quantity of mandarins from 5 971 packages in 1973-74 to 845.

A significant increase in vegetable condemnation (28 837 packages compared with 11 895 packages in 1973-74) was largely the result of heavy losses of potatoes and onions (7 883 and 6 266 packages respectively). Major problems were in 'new season' lines from southern Queensland.



A modern seed testing laboratory is operated by the Standards Branch at Indooroopilly. In this picture, the technicians are testing seed purity and germination.

A fruit and vegetable marketing service was introduced. It is designed to give growers advice on up-to-date developments and trends in fruit and vegetable marketing. It is a combined service drawing on the resources of all branches, and covers every aspect of fruit and vegetable production from grower to consumer. Standards Branch inspectors at the markets are a vital link in providing details on market quality trends.

FARM PRODUCE AGENTS

In Queensland, 47 farm produce agents are licensed; 39 in Brisbane and the remainder in major country areas. This represents a loss of 13 agents in the last 2 years. Inspections under *The Farm Produce Agents Act of 1964* showed that agents have complied with the principal provisions of the Act and Regulations relating to keeping a book of accounts, operations of trust accounts and trust accounts audit requirements.

Under the Act, agents must pay their grower principals within 30 days of selling the produce. To retain growers' business, payments are usually made within 7 days although the agent himself has not been paid. Many agents are therefore forced to use bank overdraft finance. The high cost of this is reflected in the manner of operation of some agent trust accounts. Close scrutiny will be kept on such accounts in the coming year.

