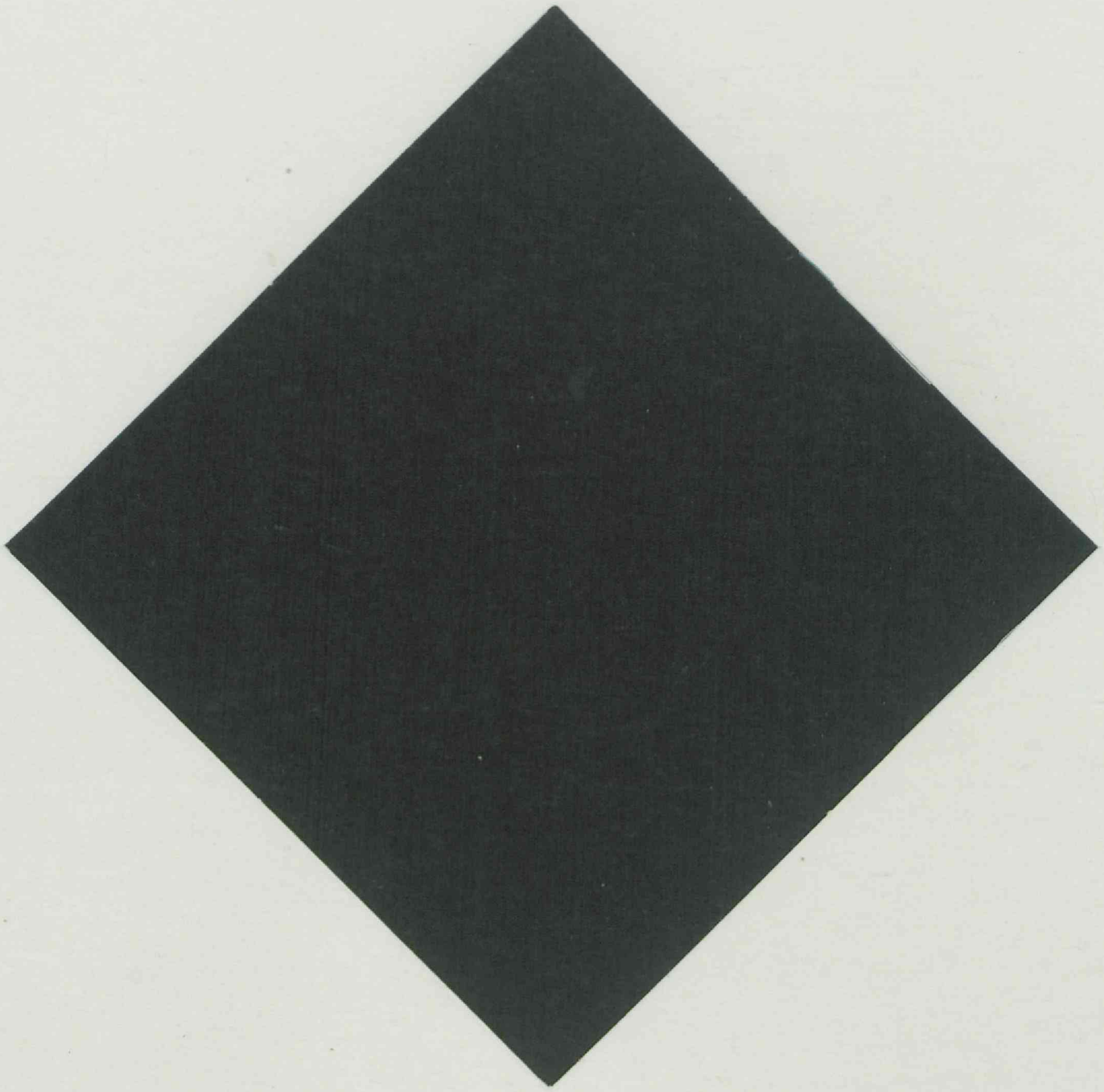
Department of Primary Industries Queensland Government

Annual Report 1987-88



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Contents

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Contour banks and the soil cover provided by a mature sorghum crop protected this Darling Downs farm from erosion damage during heavy autumn rains in 1988. The DPI's soil-conservation planning and surveying assistance, together with its crop and land management advisory services, helped many property owners to obtain good returns while securing their future on the land.

Queensland tea production should increase by 40% to 1m kg annually by 1990, as recent plantings come into production. The tea industry is confidently expanding on the wetter end of the Atherton Tableland and the wet tropic coast around Innisfail. Commercial yields and tea quality are of world standard, and Queensland is a world leader in mechanical tea harvesting.

Foreword

The Honourable N. J. Harper, M.L.A. Minister for Primary Industries

By Command, I have the honour to present this report to Parliament.

Higher values for livestock, sugar, cotton and oilseeds increased the estimated gross value of rural production in Queensland during 1987-88 by 14%, over that of the previous year, to $3,768m.

While the value of livestock slaughterings at $1,346m was marginally down on the 1986-87 figure of $1,349m, wool production was valued at $462m, an increase of 58% on the 1986-87 figure.

These figures reflect the great importance that rural industry maintains as the cornerstone of Queensland's economy. Over the past five years, Queensland's rural industries have been responsible for 35 to 38% of the State's export income.

Queensland continues to maintain its position as Australia's leading rural export State. This has been achieved and maintained through careful attention to individual property productivity and astute marketing backed by sound research and extension services. In terms of production costs, the State's beef, sugar, grain and cotton industries are among the most efficient in the world.

World market prices were affected during the year by the EEC-USA trade war, with a subsequent influence on returns to Queensland producers. Australian grain prices did receive some protection from the low value of the Australian dollar, relative to major overseas currencies.

My Department continues to provide sound advice to ensure that the State's foods and fibres are produced efficiently, while maintaining the highest quality standards.

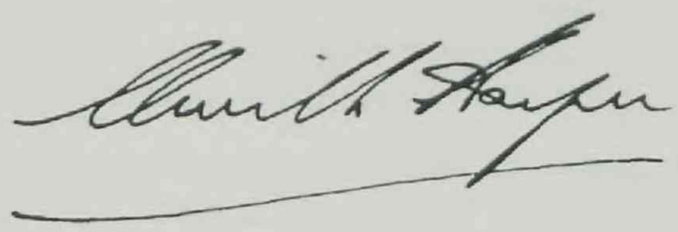
Constant attention is also given to soil conservation practices. During the year landholders showed remarkable commitment to soil conservation in conditions of drought and declining incomes, with 252 landholders implementing soil conservation measures for the first time. More than 12 600 Queensland farmers have now implemented soil conservation measures through contour control on cropping land. Landholder interest has increased significantly in management strategies to combat soil erosion and vegetation degradation in the State's grazing lands.

During the year landholders in many parts of the State experienced severe drought conditions. At one stage, 20% of the State was drought declared. My Department approved more than 600 loan applications, totalling over $15m.

We have also worked with the horticulture industry to develop export markets for Queensland fruit and vegetables. The State's horticulture industry had a preliminary gross value of $452m for the year. By tapping new overseas markets, the industry has the potential for substantial expansion. Strategies are being developed to overcome air and sea transport problems and quarantine barriers.

Our ability in Queensland to provide a quick response following detection of unacceptable levels of chemical residues in meat exports to the United States and Japan averted a potential crisis for Australia's livestock industries. My Department implemented a pesticide surrender programme to remove prohibited chemicals from rural properties.

The past year has been one of significant progress for the State's rural industries. Our role is to support and advance the State's rural industries through research and extension, and to provide protection to those industries, while helping to overcome land degradation. We are meeting those responsibilities and, in turn, Queensland's primary producers are well placed to meet the challenges of the future.



Corporate purpose

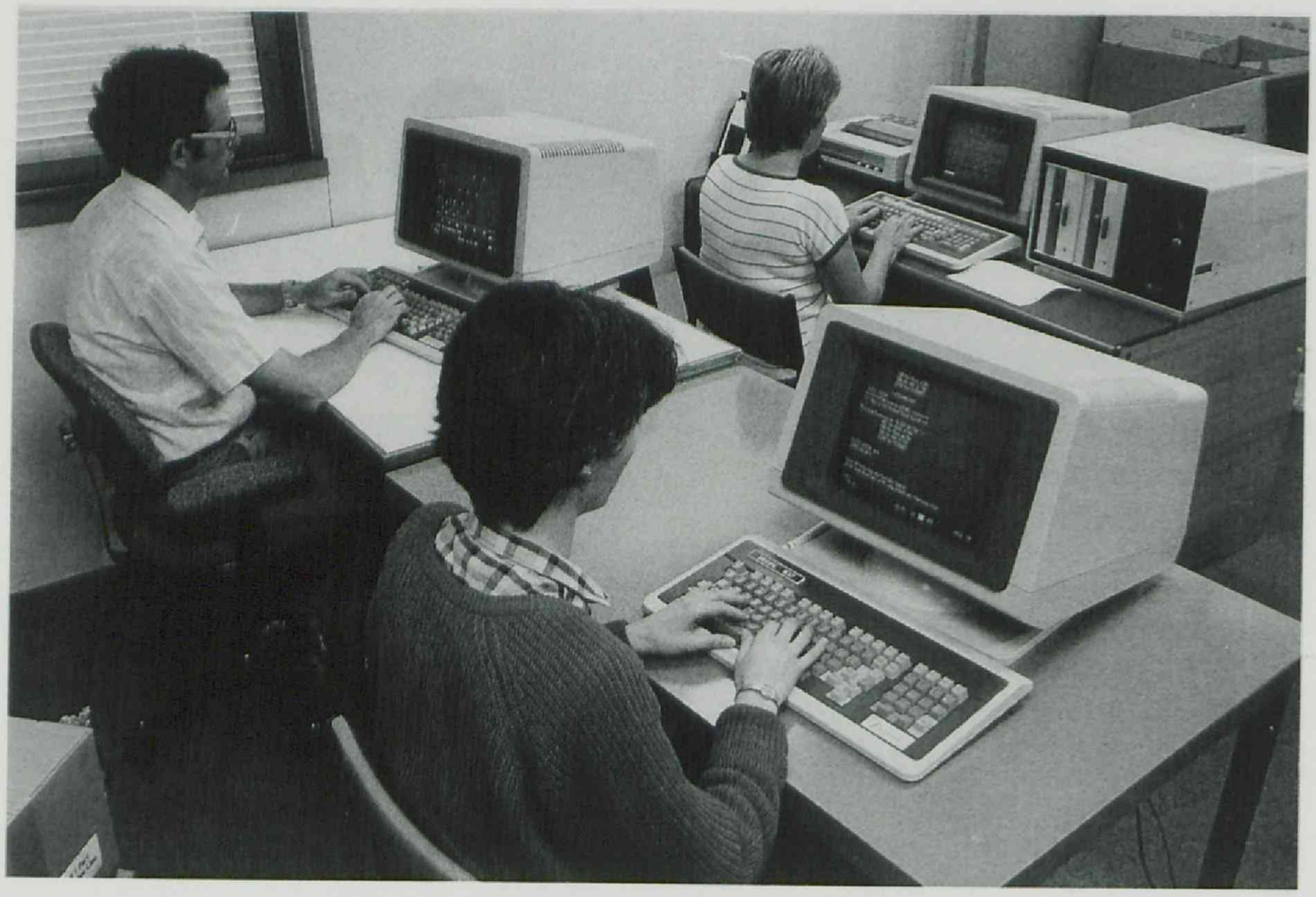
The Queensland Department of Primary Industries exists to promote and enhance the economic growth and sustained productivity of the State's agricultural and fishing industries, and to improve the quality of their products for the community's benefit.

The specific primary industries embraced by the DPI's operations include the horticultural and field-crop industries, the grazing and intensive livestock industries, and the fishing industries.

The DPI seeks to achieve its corporate purpose through:

- formulating and implementing rural policy, and implementing regulation based on legislative directives:
- doing research and development; and
- providing and extending technical advice and services to primary producers and the community.

Close liaison, through consultative interaction, is maintained with primary producers, industry bodies, statutory authorities, and a broad range of government bodies and other agencies to help solve problems and exploit economic opportunities for food-and-fibre production and marketing.



In pursuing its corporate purpose and goals, the DPI uses information technology and has automated many of its activities to provide a better and faster service to clients. DPI biometricians and computer systems officers play a central role in this process.

Corporate goals

The DPI undertakes diverse activities and projects to achieve these corporate goals:

- improving the long-term contribution of agriculture, fishing and associated industries to Queensland's economic growth;
- sustaining the use of natural resources by conserving and enhancing agricultural and water resources, and by protecting the environment;
- developing and adopting superior technologies and systems for producing and processing agricultural and fishing commodities;
- marketing safe and high-quality food-and-fibre products;
- developing efficient marketing systems and expanded export opportunities for Queensland products;
- diversifying the range of commodities produced and processed in Queensland;
- minimising the economic impact of pests and diseases of plants and animals, and preventing the introduction of exotic pests and diseases;
- recognising DPI as a prime source of technical and economic information by government, producers, consumers and other agencies; and
- enhancing the knowledge and skills of DPI staff and ensuring they are appropriately located and have adequate resources to achieve the Department's strategic goals.

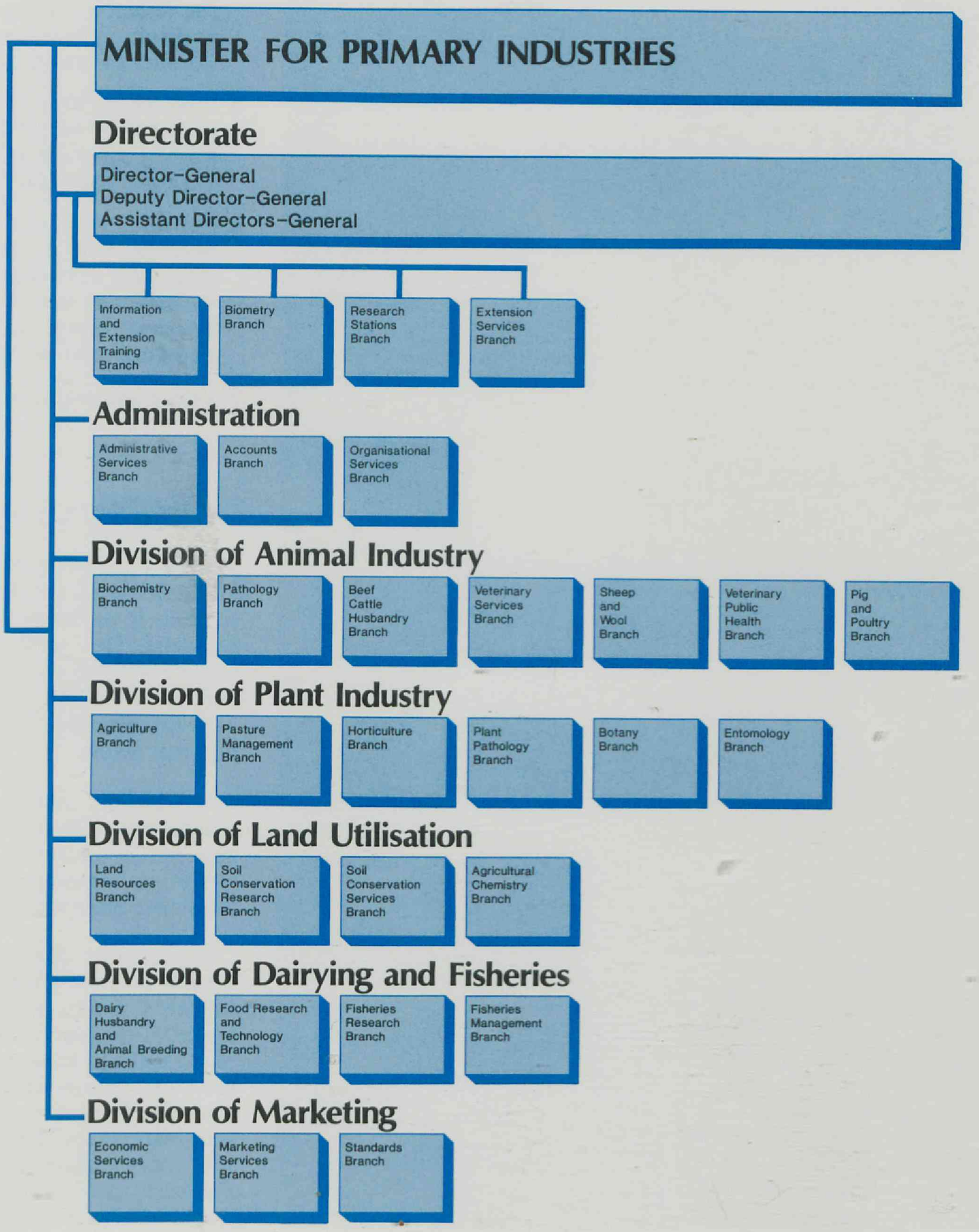
Corporate organisation

The DPI is responsible to the Minister for Primary Industries, who is also responsible for a wide range of statutory authorities established under Acts of State Parliament.

A directorate, headed by a director-general, is responsible for planning and developing broad research, extension, regulatory and administrative policies for departmental operation.

Twenty-four technical branches undertake research-and-service activities throughout the State and are grouped into five divisions whose directors report to the director-general. In addition, seven branches undertake administrative or support-service functions and report to the directorate.

At 30 June the DPI's approved public service staff establishment was 2990, which included some 430 positions funded from Commonwealth and rural industry sources. If officers' major activities are considered, about 18% are involved in administrative and clerical services; about 39% in research and resource activities; about 30% in regulatory and service work; and about 13% in fulltime extension. Many research and regulatory staff also have some extension duties.



Research

■ DPI research establishments

Applethorpe	Granite Belt Horticultural Research Station
Ayr	Ayr Research Station
Biloela	Biloela Research Station
Bowen	Bowen Horticultural Research Station
Bundaberg	Bundaberg Research Station
Burnett Heads	Fisheries Research Centre
Cairns	Northern Fisheries Research Centre
	Kamerunga Horticultural Research Station
Charleville	Charleville Pastoral Laboratory
	Croxdale Field Station
Cleveland	Redlands Research Station
	Redlands AI Export Centre
	Redlands Horticulture Centre
	Redlands Poultry Research Centre
Deception Bay	Southern Fisheries Research Centre
Emerald	Emerald Field Station
Gatton	Gatton Research Station
Gayndah	Brian Pastures Research Station
Indooroopilly	Agricultural Research Laboratories
Julia Creek	Toorak Sheep Field Research Station
Kairi	Kairi Research Station
Kingaroy	J. Bjelke-Petersen Research Station
	Redvale Sub-station
Longreach	Arid Zone Research Institute
	Rosebank Field Station
Mareeba	Mareeba Research Laboratories
	Southedge Research Station
Millaroo	Millaroo Research Station
	Swan's Lagoon Beef Cattle Research Station
Mutdapilly	Mutdapilly Research Station
Nambour	Maroochy Horticultural Research Station
Rocklea	Animal Husbandry Research Farm
Roma	Roma Field Station
South Johnstone	South Johnstone Research Station
Theodore	Brigalow Research Station
Toowoomba	Queensland Wheat Research Institute
	Kingsthorpe Field Station
Townsville	Oonoonba Animal Health Station
Wacol	AB Centre
	Dairy Herd Improvement Laboratory
	Pig Research Centre
	Tick Fever Research Centre
Walkamin	Walkamin Research Station
Warrill View	Warrill View Research Station
Warwick	Hermitage Research Station
Yeerongpilly	Animal Research Institute

The DPI's research activities are directed at solving a wide range of production, marketing and developmental problems. Research that provides practical solutions is emphasised.

Work is administered through branches and divisions for a research stations board that decides priorities. Although research work is not regionalised, regional groups are established within some branches to coordinate activities.

Research is carried out by:

- research stations administered by the research stations board, usually multi-disciplinary and involving a number of branches;
- research stations in rural areas operated by branches, usually serving a particular industry (for example, fisheries);
- central laboratories operated by branches with a large service/ diagnostic component and a variable amount of discipline-oriented research (for example, pathology and entomology); and
- field experiments and surveys.

■ Problem identification

The DPI liaises closely with industry and other government organisations to identify problems and set priorities. This occurs through daily contact with producers in the field and, more formally, through contact with organisations at local, state and national levels.

In addition, special advisory committees with producer representatives are set up from time to time to investigate and report on particular problems.

Consultative committees operate at the main country research stations. Branch and DPI priorities for research, extension and regulation are made through these consultative activities, except when government priorities have overriding importance. The DPI also liaises with other organisations in research problems, particularly with the CSIRO and universities.

Extension

The DPI extension service helps Queensland's primary producers improve their profitability through adopting new and improved practices, both technical and business, and through adapting existing resources using better methods. The extension service helps keep primary production efficient, thereby ensuring better-quality and more-economical food-and-fibre products for all the community. It also advocates practices to ensure long-term viability of the State's natural resources.

The DPI services all rural industries except timber and (for some purposes) sugar. Employing services ranging from enquiry centres and farm visits to educational programmes, the DPI operates a coordinated, regionally-based extension system, which an extension services branch administers within policies established by an extension services board.

Within each region, the units of coordination are industry extension groups, comprising extension officers with the varied technical expertise needed to provide a balanced extension service to each industry.

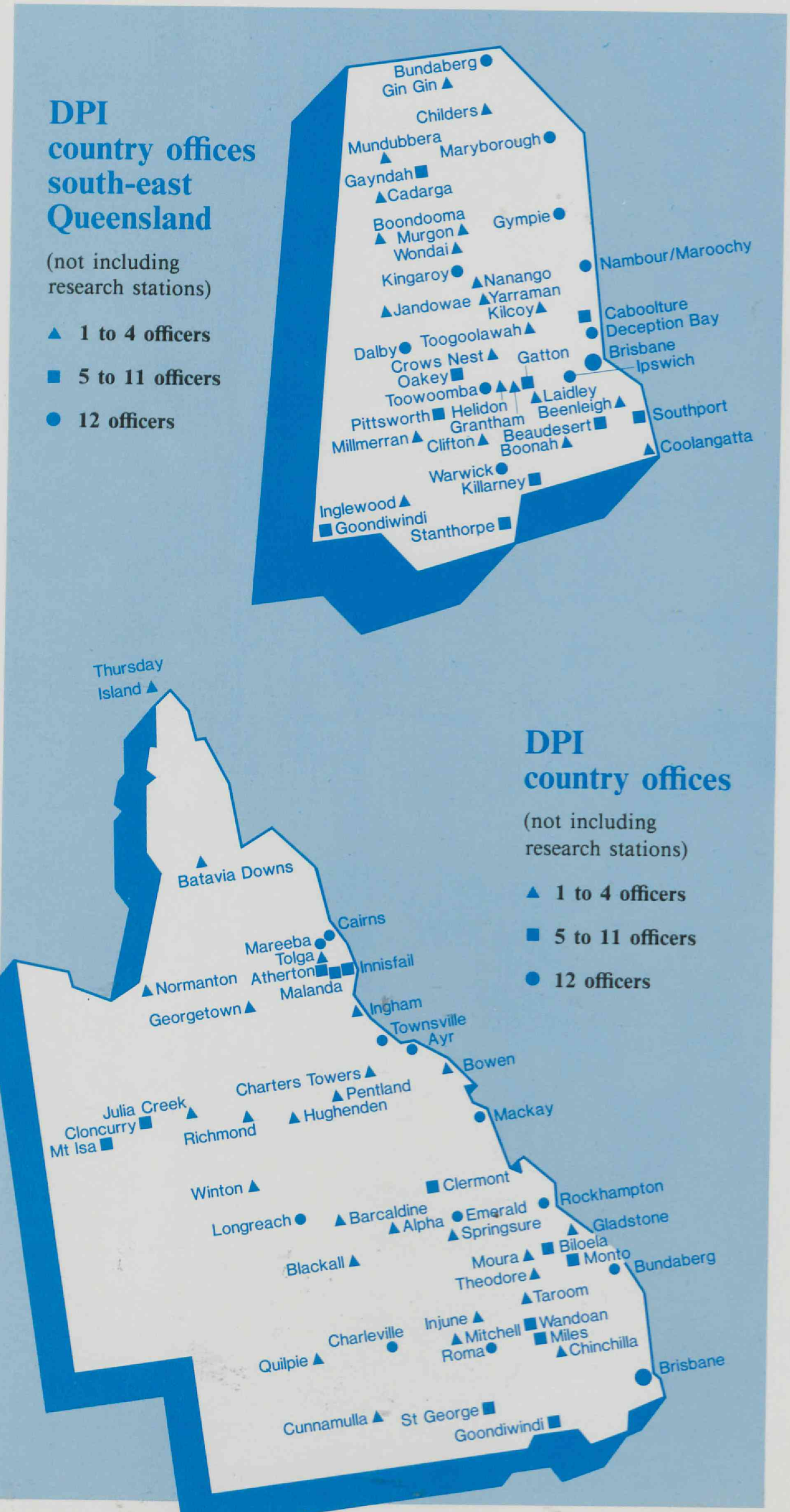
Most regions employ a fulltime regional extension leader to coordinate, assess, develop and improve extension services for farmers. Increasing complexity and specialisation in primary production mean that extension staff must carefully choose their priorities. Commercial advisory services to farming are now an additional part of a service that was once expected mainly of the Government.

DPI extension regions

1. Far Northern
2. Northern
3. Capricornia
4. Burnett
5. South Burnett
6. Near North Coast
7. Moreton
8. Darling Downs
9. Near South West
10. Far South West
11. Central West
12. North West

Cattle producers met with the DPI in the Burnett in 1988 and identified several areas for further development in the DPI's research and extension programme for the Burnett beef industry.

Regulation



The Acts administered by DPI regulatory staff are designed to protect the consumer, the producer and the environment. They cover disease control, product hygiene and quality, and the orderly marketing of produce. Regulatory staff are concerned with Acts such as the Diseases in Plants Act, the Dairy Produce Act, the Wheat Marketing Act, the Torres Strait Fisheries Act and the Agricultural Chemicals Distribution Control Act.

DPI officers administer Acts for both the Queensland and Commonwealth Governments. Their duties include:

- responsibility, as the Commonwealth Government's agent, for quarantine of plants and animals;
- supervising meat slaughtering and meat quality for the domestic market.
- recommending in relation to declarations of drought-affected areas;
- supervising the activities of rural marketing boards and co-operatives;
- testing of seeds, chemicals and fertilisers to ensure they conform with labelling requirements;
- registering and administering a diverse range of farming enterprises, including aquaculture and deerfarming; and
- assuring the quality of all rural produce.

Information services

To complement its research, extension and regulatory functions, the Queensland Department of Primary Industries maintains a State-wide information service.

The many facets of this service include:

- the DPI *Annual Report* to Parliament, which highlights DPI's achievements in a financial year;
- the *Queensland Agricultural Journal*, which is published six times a year, which is an important extension vehicle containing comprehensive articles on the practical application of DPI research, and which is sold on subscription to commercial and part-time farmers, agribusiness people, students and scientists in Australia and overseas;
- the *Queensland Journal of Agricultural and Animal Sciences*, which is published twice a year and which contains scientific papers written mainly by DPI research workers;
- Farm Notes, which are fact sheets prepared for primary producers to provide timely, practical and concise advice on particular agricultural topics, and which are available free as single copies on request at DPI offices or as part of a comprehensive, saleable Farm Note Agdex Filing System;
- an extensive range of saleable books, available to farmers and consumers at major DPI centres and through the DPI Information Centre in Brisbane;
- videos and films that demonstrate farming techniques and outline DPI activities, for use by extension officers and for loan to rural, farming and urban organisations and individuals;
- a news-release service to metropolitan, provincial and rural newspapers and to radio and television stations, in Queensland and other parts of Australia;
- tapes of interviews with DPI officers on topical issues for Queensland ABC and commercial radio stations;
- the work of regional information officers in Brisbane and Toowoomba, and agricultural journalists in Brisbane, who provide professional, planned information support to DPI research and extension staff and who publicise DPI work and activities through local mass media and other outlets;
- displays at the Brisbane Show and major country shows, and at other rural events;
- a variety of marketing publications, sent to mass media representatives and other interested people, which include the daily *Fruit and Vegetable Market Report*, the *Weekly Summary—Brisbane Wholesale Market, Rocklea*; the monthly *Average Price and Throughput—Brisbane Rocklea Markets* (for fruit and for vegetables), the bi-monthly *Agricultural Trends*, and the periodic *Talking Export*; and
- district and industry extension newsletters sent to primary producers from more than 25 DPI centres throughout the State, covering food research and technology, and the beef, dairy, field-crop, horticultural, pig, poultry, and sheep industries.

In 1987-88 the DPI published an important book entitled *Hungry Crops—A Guide to Nutrient Deficiencies in Field Crops.* ***Here, the author, Dr Noel Grundon (right), and Darling Downs farmer, Mr Wayne Anderson, use the book to check the nutritional health of Mr Anderson's grain sorghum crop. Altogether, in 1987-88, the DPI, through its Information Branch, published 19 new or revised books for sale and now has more than 100 individual titles on its book list.***

Legislation

New Acts

During 1987-88 the Minister for Primary Industries introduced 10 Bills into Parliament, nine of which passed all stages.

The remaining Bill, the Poultry Industry Act Amendment Bill, was introduced in March 1988 for debate in the 1988 Budget Session.

■ *Biological Control Act* 1987

Queensland's Biological Control Act is part of a national legislative framework to regulate biological control programmes.

The Act provides an inexpensive and effective way to control introduced plant and animal pests. In particular, it provides some protection against disrupting litigation and action for damages against authorised releasing authorities, acting in good faith and in accordance with the legislation.

Basically, the Act provides an opportunity for biological control activities to be equitably assessed and ensures that such activities are, in relation to all parts of Australia, in the public interest by:

(i) requiring the unanimous approval of all Ministers comprising the Australian Agricultural Council to any biological control programme to be conducted under the Act;

(ii) publishing proposals for public comment; and

(iii) where appropriate, ordering public inquiries to investigate and report on the implications of proposals.

If an emergency is developing, the Act provides for preventative action through immediate implementation of biological control.

■ *Fishing Industry Organisation and Marketing Act Amendment Act* 1987

This amendment Act was designed to help implement the Government's decision to commercialise the Queensland Fish Board's operations.

■ *Primary Producers' Organisation and Marketing Act Amendment Act* 1987

This amendment Act revises and updates the Princpal Act covering the operations of commodity marketing boards, statutory producer representative bodies and the Council of Agriculture.

The main amendments are: updating and improving the commercial operations of Boards; improving their accountability and that of producer representative bodies; updating the winding-up provisions of the Act, in relation to Boards; varying the structure and consolidating the functions of the Council of Agriculture; consolidating and updating the powers and functions of producer representative bodies; improving administrative arrangements and allowing for alternative regulatory instruments; and providing for review of the Act at intervals not exceeding 10 years.

■ *Stock Act Amendment Act* 1987

This amendment Act has three main aims:

(i) the strengthening of measures necessary to prevent chemical and antibiotic residues in stock in excess of prescribed limits;

(ii) the strengthening of interstate stock-movement controls; and

(iii) a general tightening of controls upon stock movements within the State.

In 1987 the excessive chemical residues that agricultural authorities in the United States and other countries detected in Australian meats jeopardised the meat export trade. In 1986-87 this trade was worth more than $900m to the Queensland economy.

Accordingly, the Stock Act was tightened so that, when chemical or antibiotic residues in excess of prescribed limits are detected, immediate and effective action can be taken to locate, isolate or eradicate the contamination source.

■ *Hen Quotas Act Amendment Act* 1987

This amendment Act empowered the Hen Quota Committee to establish or amend its superannuation scheme for employees, after the egg industry inspectorate's transfer from the Egg Marketing Board to the Committee.

The transfer resulted from the phasing out of funding arrangements for inspectors under Commonwealth hen levy legislation.

■ *Queensland Meat Inspection Agreement. Act Repeal Act* 1988

This Act repealed the 1932 Act, which enacted a Commonwealth State Meat Inspection Agreement.

After meat inspection by Queensland and Commonwealth meat inspectors was rationalised in 1984, the agreement was ended and the Act became redundant.

■ *Meat Industry Act Amendment Act* 1988

This amendment Act is designed to address issues important to the Queensland meat industry.

Butchers and smallgoods manufacturers may now sell buffalo meat, derived from approved interstate premises, for human consumption in Queensland.

Procedures were formalised and approved for sampling and testing meat for pesticide residues. Abattoir and slaughterhouse licensees must now have tests conducted at either a Government laboratory or an approved private laboratory.

The Amendment Act covers other important issues. These include de-regulating controls on meat movement within Queensland and validating Livestock and Meat Authority of Queensland actions to assist the commercial viability of the Metropolitan Regional Abattoir at Cannon Hill by establishing a boning room in conjunction with four of the major operators at the abattoir.

■ *Poultry Industry Act Amendment Bill* 1988

This amendment Bill is designed to help develop and improve the Queensland poultry industry for producers' and consumers' benefit.

Provisions that are no longer relevant in today's highly competitive commercial poultry industry will be deleted. The obsolete provisions cover disease control, stock suppliers and chicken sexing.

The appointment of check egg graders will be simplified. Provision has been made for disposing of seized eggs and egg products, and recouping from the proceeds of costs associated with seizure of disposal.

The Amendment Bill ensures that interstate suppliers wishing to sell eggs in Queensland have access to authorised egg-grading and marking facilities so that they comply with grading, quality and marking requirements under the Bill.

The Bill was introduced into Parliement on 16 March and will be debated during the 1988 Budget Session.

■ *Fruit and Vegetables Act and Other Acts Amendment Act* 1988

This amendment Act allows Commonwealth export-quality standards to be adopted for domestic fruit and vegetable sales. Adopting these standards brings Queensland into line with other States and promotes fruit and vegetable trade.

The Amendment Act also enables the Minister to vary maturity standards and maturation periods for fruit and vegetables to take account of seasonal factors. The Minister may also approve the experimental use of new packages for wholesale fruit and vegetables.

The Amendment Act extends the Australian Canned Fruits Corporation's operations to 31 December 1988. This will enable further discussion with industry and with the Commonwealth Government on the Corporation's future.

Legislation that is designed to help primary industries works most beneficially when trusting cooperation exists between all sectors of an industry, including the DPI. Here, a DPI plant pathologist and a banana grower examine a newly identified bacterial disease to determine its potential to affect Queensland's valuable banana industry.

■ *Queensland Grain Handling Act Amendment Act* 1988

This amendment Act enables the Grain Handling Authority to make cash advances to growers who use its storage facilites for their grain before sale. Amounts advanced may be secured by creating a lien on the grain. Persons other than growers as defined under the Act will also be able to use this service.

The Act also allows the Authority to operate a receival service interstate and provide services to other parties on a fee-for-service basis. Formal appointment of a deputy chairman and review of the Act after 10 years are also included.

Acts and Regulations

The Minister for Primary Industries administers 76 Acts of Parliament and 68 sets of Regulations, dealing with subject matter that ranges from artificial breeding of livestock to the wine industry.

Regulation Revocation Programme

Stage II of the Regulation Revocation Programme was successfully completed by 30 June. Of the 19 sets of regulations reviewed during Stage II, three sets were re-enacted after updating and redrafting to reflect present requirements while nine sets lapsed. A further three sets of regulations were permanently exempted from further review while four sets were granted temporary exemption to allow industry discussion and consultation to be completed. These will be included in Stage III of the Programme.

Acts

Agricultural Chemicals Distribution Control Act 1966-1983
Agricultural Standards Act 1952-1981
Apiaries Act 1982
Artificial Breeding of Stock Act 1979
The Banana Industry Protection Acts, 1929 to 1937
Biological Control Act 1987
Brands Act 1915-1979
Brands Act & Another Act Amendment Act 1974
The Brands Act & Diseases in Stock Acts Amendment Act of 1941
Bread Delivery Act Repeal Act 1982
Bread Industry Committee Act 1979
Brisbane Milk Board Extension Act 1977
Canned Fruits Marketing Act 1981-1985
Chicken Meat Industry Committee Act 1976
City of Brisbane Market Act 1960-1985
The Cotton Industry Acts, 1923 to 1926
Dairy Produce Act 1978-1979
The Dairy Produce Acts & Other Acts Amendment Act of 1934
Dairy Products Stabilisation Act Repeal Act 1981
Deer Farming Act 1985
Diseases in Plants Act 1929-1972
Exotic Diseases in Animals Act 1981-1982
Farm Produce Marketing Act 1964-1986
Filled Milk Act 1958-1982
Fisheries Act 1976-1984
Fishing Industry Organization and Marketing Act 1982-1988
Fruit and Vegetables Act 1947-1988
Fruit Marketing Organisation Act 1923-1985
Grain Research Foundation Act 1976
Hen Quotas Act 1973-1987
Liens on Crops of Sugar Cane Act 1931-1981
The Local Sugar Cane Prices Boards Confirmation Act of 1915
Margarine Act 1958-1982
Margarine Act & Another Act Amendment Act 1974
Meat Industry Act 1965-1988
Milk Supply Act 1977-1986
Milk Supply Act Amendment Act 1983
The Peanut Industry Protection and Preservation Acts, 1939 to 1965
Poultry Industry Act 1946-1984
The Poultry Industry Acts Amendments Act of 1965

A DPI experimentalist in Ayr examines rice plants used in the DPI rice-breeding programme. In 1987-88 the DPI released a new rice cultivar, Fin.

Primary Producers' Co-operative Associations Act 1923-1986
Primary Producers' Organisation and Marketing Act 1926-1987
The Primary Producers' Organisation and Marketing Acts Amendment Act of 1946
The Primary Producers' Organisation and Marketing Acts Amendment Act of 1954
The Primary Producers' Organisation and Marketing Acts and Another Act Amendment Act of 1965
Primary Producers' Organisation and Marketing Acts and Other Acts Amendment Act 1941-1973
Primary Producers' Organisation and Marketing Act and Other Acts Amendment Act 1984
Primary Producers' Organisation and Marketing Act & Another Act Amendment Act 1985
Queensland Grain Handling Act 1983-1988
Regulation of Sugar Cane Prices Act 1962-1986
Rice Industry Stabilization Act 1973
Soil Conservation Act 1986
The Soil Survey Act of 1929
Stock Act 1915-1987
Stock Act and Another Act Amendment Act 1978
Stock Act and Other Acts Amendment Act 1973
The Stock Acts Amendment Act of 1965
Sugar Acquisition Act 1915-1987
Sugar Board Act 1966-1982
Sugar Experiment Stations Act 1900-1983
The Sugar Experimentation Stations Acts and Other Acts Amendment Act of 1941
Sugar Milling Rationalization (Far Northern Region) Act 1987
Swine Compensation Fund Act 1962-1975
Tobacco Industry Protection Act 1965-1985
Tobacco Industry Stabilisation Act 1965-1972
Torres Strait Fisheries Act 1984
Upper Burdekin Co-operative Association Limited Validation Act 1979
Veterinary Surgeons Act 1936-1986
Wheat Delivery Quotas Act 1970-1974
Wheat Industry Stabilization Act & Another Act Amendment Act 1978
Wheat Marketing Act 1984-1986
Wheat Pool Act 1920-1986
Wheat Pool Act Amendment Act of 1925
Wheat Pool Act and Another Act Amendment Act 1986
Wheat Pool (Validation of Proclamations) Act 1983
Wine Industry Act 1974-1982

Regulations

Agricultural Chemicals Distribution Control Regulations of 1970
Agricultural Standards Regulations 1984
Apiaries Regulations 1983
Artificial Breeding of Stock Regulations 1981
Banana Industry Protection Regulations 1987
Brands Regulations 1987
Bread Industry Committee Regulations 1986
Brisbane Market By-laws 1982
Brisbane Market Trust (Appointment of Licensed Buyers Representative) Regulations 1982
Brisbane Market Trust Form of Accounts Regulations 1985
Brisbane Market Trust Inscribed Stock Regulations of 1962
Chicken Meat Industry Committee Regulations 1977
Committee of Direction Levy Regulations of 1973
Dairy Produce Regulations 1980
Deer Farming Regulations 1985
Diseases in Plants Regulations 1987
Exotic Diseases in Animals Regulations 1981
Farm Produce Marketing Regulations 1984
Fisheries Regulations 1977
Fishing Industry Organization and Marketing Regulations 1983
Fruit Marketing Organisation Regulations of 1964
Fruit and Vegetables Grading and Packing Regulations 1979
Hen Quota Regulations 1988
Margarine Regulations of 1958
Meat Industry Regulations of 1973
Milk Supply Regulations 1978
Poultry Industry Regulations of 1946
Primary Producers' Co-operative Associations Regulations 1987
Queensland Commercial Fishermen's Organization Regulations 1984
Regulations under the Primary Producers Organisation and Marketing Act 1926-1987:
Commodity Marketing Boards Elections Regulations 1987
Atherton Tableland Maize Marketing Board Levy Regulations of 1936
Barley Marketing Board Hail Insurance Levy Regulations of 1930
Central Queensland Egg Marketing Board Administrative Levy Regulations of 1947
Central Queensland Grain Sorghum Marketing Board Levy Regulations of 1970
Cotton Marketing Board Hail Insurance Regulations 1985
Cotton Marketing Board General Reserve Revolving Fund Regulations of 1965
Council of Agriculture Regulations of 1936 *Egg Marketing Board Regulations*
Navy Bean Marketing Board Levy Regulations of 1970
Peanut Marketing Board Levy Regulations of 1927
Queensland Cane Growers' Council Regulations 1987
Queensland Commercial Pig Producers' State Council Regulations 1978
Queensland Dairyfarmers' State Council Regulations of 1947
Sugar Levies 1979-1981 Seasons
Sugar Levies 1983 Season
Sugar Levies 1984 Season
Sugar Levies 1985 Season
Sugar Levies 1986 Season
Sugar Levies 1987 Season
Sugar Levies 1988 Season
Tobacco Leaf Marketing Board Levy Regulations of 1948
Queensland Fish Board Regulations 1984
Queensland Grain Handling Authority (Elections) Regulations 1983
Queensland Grain Handling Authority By-laws 1984
Regulation of Sugar Cane Prices Regulations of 1963
Stock Regulations 1988
Identification of Stock Regulations 1985
State Wheat Board General Regulations 1987
State Wheat Board Meeting By-laws 1988
State Wheat Board (Elections) Regulations 1988
Hail Insurance Scheme Regulations 1972
Hail Insurance Reserve Fund Regulations of 1926
Sugar Experiment Stations Regulations 1987
Tobacco Industry Protection Regulations 1988
Tobacco Industry Stabilisation Regulations 1988
Veterinary Surgeons Regulations 1986
Exemption from Delivery of Wheat Regulations 1984
Wine Industry Regulations 1979

The year reviewed

Mr A. Hegarty, Director-General

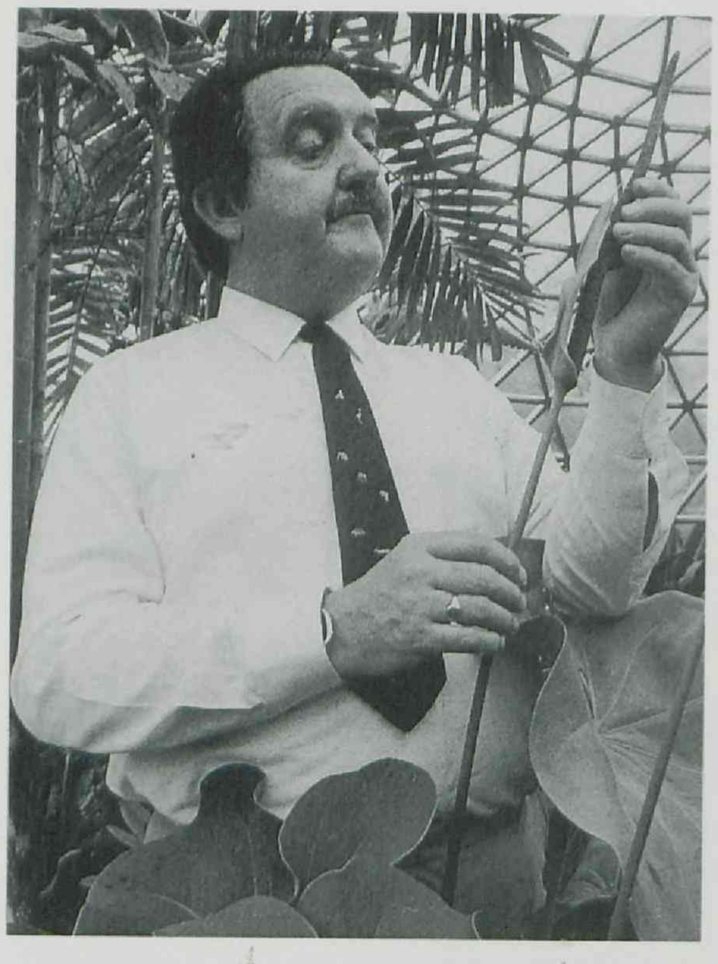
A special report by the Director-General, Mr A. Hegarty.

A prosperous year

In 1987-88 the prosperity of rural industries turned significantly for the better, after a prolonged period of depressed prices for major commodities on world markets. And the gross value of production increased 14% to $3,768m.

Wool and cotton prices rose to near-record levels. Favourable exchange rates for the Australian dollar sustained returns for meat, grains and oilseeds, despite another year of unfavourable seasonal conditions in many districts. Sugar prices improved significantly for a near-record crop, and prices for intensive livestock industries kept pace with inflationary trends. Horticultural production continued to expand, but lower prices reflected keen competition on domestic markets for fresh fruit and vegetables.

Good rains in most districts in the latter half of 1987-88 and improving market prospects for most commodities set the scene for a further substantial rise in gross value of production in 1988-89.



Mr Grenville Lucas, OBE, Keeper of the Herbarium, Royal Botanic Gardens, Kew, England, visited Queensland in April at the invitation of the Minister for Primary Industries, Mr Neville Harper. The DPI, the CSIRO and the Royal Botanic Gardens are collaborating in researching the use of castanospermine from black bean (or Moreton Bay chestnut) as a possible cure for AIDS.

Research

The research effort. Research and development programmes continued to be significant sources of technical information, essential to the vitality of, and innovation in, Queensland's agricultural industries.

About 750 DPI research staff were mostly involved on R & D projects. They used facilities (33 in total) that the DPI provides in central laboratories in Brisbane, in laboratories at major regional centres, on 26 research stations and, in some instances, in local farmer trials.

A total of 780 major projects were recorded on the Department's project-management information register and, of these, about 546 had some outside funding. External funding for research work amounted to about 10% of total R & D funding and was an important financial input to projects. Rural industry research funds worth $5m were funding 42 major projects.

AZRI. An event of great significance to the long-term management of Queensland's arid and semi-arid pasture lands was the commissioning of the $5.5m Arid Zone Research Institute (AZRI) at Longreach in January. A world-class research facility, AZRI contains six large and five small laboratories, three veterinary preparation rooms and an autopsy room. Its current staff of 21 includes experts in many fields: pasture ecology, botany, range management, land resources, financial management, animal husbandry, extension, and veterinary epidemiology and services. An initial AZRI project is an intensive study of the relationships between climate, soils, herbage, grazing ruminants and native and feral animals.

Decision-support packages. In another enterprising research area, the DPI is developing computer-based decision-support packages to help farmers in their decision making. This is a natural development from research-based simulation models. Currently, the DPI is concentrating on specific crops or species, and these packages are being evaluated in the field.

Many decision packages have been developed to support primary production; for example, pest management for crops, planting decisions for wheat farmers, irrigation scheduling in cotton and soybeans, and fertiliser recommendations for avocado, citrus and macadamia. Some packages have concentrated on distribution and transportation in the horticultural industries.

Many farmers who have attended demonstrations or who have been involved with evaluations are enthusiastic about the contribution of the packages to decision making. These packages complement ones already being used; for example, dairy-farm management, least-cost rations for poultry, and budget and gross margins analyses. As more systems are developed and evaluated,

the packages can be integrated to provide computer-aided decision-support for whole-farm systems.

Other achievements. Other noteworthy research achievements include the development of a new tick-fever vaccine, which has great potential for export and can be tested for quality before release. Owing to its safety, it will replace the current product in parts of the local market. And important new test was found for identifying common blight of beans. It resulted from monoclonal antibodies being produced to identify blight accurately.

DPI botanists provided the basic source material for HERBRECS, a herbarium label database, the second largest in the world. The database provided information for a strategic land-zoning plan for Queensland's wet tropical rainforest region. The DPI was also collaborating with the Royal Botanic Gardens, Kew, England, and the CSIRO in researching the use of castanospermine from black bean (or Moreton Bay chestnut) as a possible AIDS cure.

Biotechnology. The DPI continued to develop practical applications of new biotechnological advances for the improvement of plant and animal industries. Areas of particular interest are molecular probes for disease diagnosis and expanded resources for plant-tissue culture research and development.

Agricultural engineering. In recent years the DPI's agricultural engineering effort has shifted from service and advisory work to research and development. As a result, many new projects started in 1987-88, most of them externally funded. The largest project was on harvest management for cereal and grain legume crops to find the best economic compromise between quality and yield losses caused by field drying and the cost of artificial drying after harvest. Energy conservation and alternative energy sources such as coal and solar were being investigated for tobacco curing, grain and hay drying, and greenhouse heating. DPI engineers were also helping in a study on the fuel efficiency of prawn trawlers.

Computer advances

The DPI pursued a policy of using computer technology to increase the efficiency of its research, extension, regulatory and administrative functions. Its Biometry Branch was working with other DPI branches to develop a range of databases, simulation models and other software.

QDPINET. The DPI computer network, QDPINET, was enhanced to enable more than 590 officers to share computing resources. The major hosts on the network (at the Animal Research Institute, Yeerongpilly; the Agricultural Research Laboratories, Indooroopilly; and Tor Street, Toowoomba) were used to develop and interrogate information systems, simulate agricultural systems and analyse experimental data.

Other hosts. To provide access to further hosts, QDPINET was connected to the Wide Area Network of the Centre for Information Technology and Communications, Brisbane. One such host, the State Library's computer, allows DPI officers to interrogate the DPI Library catalogue. Temporary links over QNET to QDPINET were arranged for field days so extension officers could retrieve information on pesticides and herbicides, climatic records, and brands for cattle, horses and pigs.

Extension

DPI extension officers supported Queensland's primary producers through on-farm visits and extension activities associated with more than 200 planned extension projects. Extension officers were also playing key roles in integrating research and community interests in solving rural production problems.

Extension conference. In October 1987 the DPI hosted an Australasian extension conference to review extension policy in Australian and international settings. The DPI invited world extension expert, Professor Niels Roling, from the Netherlands, to review, and to report to the Department on, the operations of the DPI extension service.

Monitoring. The Department was monitoring its extension services so that its extension policies and programmes stay up-to-date and relevant to producer and community needs. Statewide industry reviews were made of key industries.

Evaluation. The extension service's relevance was strengthened by its evaluation unit, which helped conduct more than 25 evaluation projects. These included such topics as market research for rural produce, the extension needs of producers and the effectiveness of specific extension events.

Computer support. Computer systems officers enhanced the extension effort by helping develop on-line computerised information systems with data such as all the registered uses of pesticides and herbicides. Computer tools were being evolved to enable DPI officers to translate their knowledge and reasoning into computerised packages that help primary producers in their decision making.

Information delivery. The popularity of DPI extension services placed increasing strain on extension officers and resources, and the DPI was seeking even more efficient ways of providing much-needed information to the community.

The Department was cooperating with TAFE through television system TSN-11 in broadcasting extension material by satellite throughout the State (see below). Educational videotapes were also being produced for use by DPI extension officers' use and for sale.

Newsletters, posted to primary producers and rating high as DPI information sources, were an extension medium of growing significance. Altogether, 39 DPI newsletters were serving primary producers in Queensland.

In addition to its major exhibit at the Brisbane RNA Show, the DPI mounted displays at trade and agricultural shows throughout the State, and was represented at Fieldfest '87 (Rockhampton), Agfest (Toowoomba), Expo 10 at Gatton, and the Woollahra Small Farm Field Days.

Farm financial counselling. Farmers, industry organisations, agribusiness and financial institutions overwhelmingly supported the farm financial counselling service, which the Queensland Government established in January 1987. During the service's first 15 months, more that 800 farmers were helped to analyse their financial status and to consider the advantages and disadvantages of retaining their livelihoods.

In addition, counsellors helped producers to improve their farm business management skills; spoke on farm financial matters at industry meetings; and educated agribusiness personnel and banking staff in farm business management and in the economics of local rural industries.

Counsellors are located at Roma, Dalby, Goondiwindi, Toowoomba, Biloela, Bundaberg, Ingham and Innisfail. Further appointments were to be made at Ayr and Mundubbera.

Farmers information centre. An innovative farmers information centre was established on a trial basis at the DPI's Nambour office. Self-help is the key to farmers obtaining technical and farm-management information at the centre. Literature on a range of horticultural crops gives farmers direct access to the information they need. Videotapes and written information on all aspects of farming were being added as they became available. When farmers needed help to understand complex issues, extension officers gave a back-up support service.

Information

Clients' access to information and the methods by which information is presented and delivered are crucial aspects of the DPI's performance. These 1987-88 activities and achievements illustrate the point.

Agricultural visitors centre. A specialised agricultural visitors information centre was established in Brisbane as an initial contact point for World Expo 88 visitors seeking information on DPI services and expertise, and on trade and investment opportunities in Queensland's rural and aquatic industries. Set up in the State Law Building, the centre coordinated liaison between visitors, DPI officers and other organisations, and maintained a computerised record of visitors and follow-up action.

The reception desk at the DPI's Agricultural Visitors Centre, which was set up in Brisbane's State Law Building as a contact point for World Expo 88 visitors. The centre was kept busy handling inquiries about DPI services and expertise, and trade and investment opportunities in Queensland's rural and aquatic industries.

DPI publications. An expanding selection of saleable DPI books and Farm Notes was popular with farmers, hobby farmers, students, teachers, agribusiness people and the public. Because of increasing buying demand, the Department, through its Information Branch, negotiated with book wholesalers and retailers to sell DPI books through bookshops and newsagents. This was part of an increased marketing effort to make DPI books more widely known and available. The DPI Information Branch organised a successful first-ever DPI book exhibition for booksellers, librarians and educationists in Brisbane, with more than 100 individual saleable-book titles on display.

First mass-market books. The Department published its first mass-market books: *Harvests and Heartaches—Images and Stories of Queensland's Agricultural Past* and *The Queensland Food Book*. Both books were DPI Centenary-Year (1987) projects and were well received by critics and the buying public. *Harvests and Heartaches*, a hard-cover book, contains 245 historical photographs and more than 70 short stories dealing with Queensland's agricultural past. *The Queensland Food Book*, a soft-cover, illustrated book written and edited by DPI food research scientists and technologists, with contributions from people in the commercial food industry, presents Queensland's foods from harvest to table and highlights the importance of Queensland's primary production to Queenslanders' daily needs. Both books were available at the Queensland Pavilion throughout World Expo 88.

Centenary Year gold award. The DPI's Information Branch won an Australian Society of Business Communicators national gold 'Serif Award' for its comprehensive multi-media public relations and communications campaign to promote the Department's Centenary celebrations in 1987. The Serif Awards are judged annually in different communication categories. The winning DPI campaign included the Centenary logo, stationery, souvenirs, books, photographic displays, special events, a media kit, a motion picture and brochures. In another category, the DPI won a merit 'Serif Award' for its cinema-

release movie short, *The Farm Behind the Beach*, written and produced to celebrate its Centenary Year. The film was shown in cinemas throughout Queensland.

***My Soil* award**. A DPI publication entitled *My Soil*, comprising a students booklet and a teachers guide, won the best 'non commercial and low-budget resources' award for a publication in 1987. The award was presented at the Australian Geography Teachers' Association Conference in Sydney in January. The DPI published *My Soil* to meet teachers' demands for resource material covering land management and soil conservation.

Journalists group. The DPI's Information Branch journalists group re-evaluated its role, set new objectives and moved into new areas of activity, such as television and video production, and communications planning. These changes are making the group's work more timely, relevant and responsive to the Minister's and the Department's needs.

In May the four-member group produced the first entirely DPI-produced television show on the TSN-11 satellite network. The timely subject, 'Farm financial conselling: the choice is yours', clearly showed the value of interactive television. Primary producers, bank managers and DPI extension staff, watching the show at locations statewide, were able to phone in live to talk to the panel in the Brisbane TSN-11 studios.

Communciations planning become an invaluable tool for maximising departmental publicity. The plans identify an entire communication strategy and action for the client. In the first half of 1988, this planned approach to publicity was used successfully to promote more than 15 major events involving DPI extension and research effort. These included the DPI contribution to the North Queensland Rural Field Days, in Townsville, and the North Queensland Horticultural Expo, in Ayr.

World events

World Expo 88. The DPI was a major participant in the industry-funded Primary Industries Pavilion (PIP) at World Expo 88. The PIP highlighted agriculture's importance to Queensland and Australia, having the theme 'fine foods and fibres from the lastest technology'. The DPI produced five videos for screening in the pavilion and contributed to a central sculpture symbolising the role of research and information in underwriting Queensland's export-oriented primary industries.

During the course of World Expo 88, the DPI cooperated with the Primary Industries Pavilion to provide information on Queensland's primary industries for the benefit of groups of overseas agricultural visitors and for several trade delegations.

Beef 88. The DPI was a major sponsor of, and participant in, Beef 88 in Rockhampton in May. This 6-day international conference and exhibition was the Australian beef industry's main contribution to Australia's Bicentenary celebrations and was designed to display the industry to Australian and overseas visitors. A well-balanced programme included business sessions, cattle shows and sales, exhibitions and displays, social activities and property tours.

Beef 88 gave DPI technical branches a unique opportunity to display and share the results of projects of interest to all industry sectors. Interaction with a wide range of people before and during the Beef 88 week enhanced the cooperative spirit with all industry sectors and with other research organisations such as the CSIRO.

International involvement

Overseas projects. The DPI, a leader in tropical agriculture, was managing eight projects on behalf of the Australian Centre for International Research (ACIAR). These collaborative research projects cover animal health, grain storage, soil conservation, fruit flies, peanut production, banana diseases and animal life-cycle studies, and are conducted in South-East Asia and the Pacific. Apart from its usefulness for farmers overseas, information from the projects directly benefits Queensland farmers.

In another project, India's black-soil environment, which is similar to that of the Darling Downs, was being studied by a DPI-led team. Long-term sustainable agricultural systems that do not degrade the environment are being derived from this work. Experienced DPI agriculturalists were sent to Papua New Guinea to help combat an outbreak of coffee rust disease.

Training. The DPI organised a 2-month training course on tropical pasture and fodder-seed production, in Queensland, for overseas participants. A course in pasture management for East Africa was held in Kenya, while an extension and communication skills course for fisheries extension officers was held in Fiji. In addition, 19 overseas visitors were attached to various sections of the DPI for training in aspects ranging from beef cattle husbandry to epidemiology. The attachments were from 2 weeks' to a year's duration. Many study groups visited Queensland and were given tours and information on DPI activities. A newsletter was published to keep in touch with overseas people who had attended DPI training courses in Queensland.

Technical exchanges. Under technical cooperation agreements with China and Russia, the DPI hosted several visiting missions and sent its scientists overseas to obtain information and materials. The Department's director of plant pathology visited China to examine postharvest treatment and ripening of bananas. An experienced citrus entomologist visited China to obtain information on biological control measures in the citrus industry there. After this visit, some parasites of citrus scale were brought to Australia and were being studied as a way to combat citrus scale.

Another mission, to examine dairy and beef cattle for harsh environments in southern Russia, led to Russian authorities closely examining Australian cattle. A plant breeder from the DPI's Agriculture Branch visited Russia as part of a scientific exchange to examine sunflower breeding research. Missions from Russia visited Queensland to examine tropical cattle breeds and to discuss plant-breeding programmes.

The AFS breed. The DPI-developed breed of tropical dairy cattle, the AFS (Australian Friesian Sahiwal), was gaining increasingly widespread acceptance in tropical countries. A sale of 30 000 doses of AFS semen to Malaysia was the Wacol AB Centre's largest single sale of semen. Strong demand for AFS semen continued from Thailand, the Philippines, Mexico and other tropical areas.

To meet a growing demand from tropical countries for live AFS animals, a commercial group (AFS Breeding Services) was arranging matings of Holstein-Friesian cows with proven AFS heifers. The group was offering Queensland dairy farmers forward contracts to produce appendix AFS heifers for export. A field day promoting this project was held in September.

Artificial breeding. The Wacol AB Centre's national marketing programme gained momentum with 43 new agencies operating throughout Australia. An exclusive Australian agency for importing semen from the St Jacob's AB Centre, Ontario, Canada, was negotiated. The pig artificial breeding service, started in August 1986, attracted more pig producers; consequently, semen sales increased.

A storage and distribution service for beef producers had been developed and the first artifical insemination of sheep was carried out successfully. Thirty courses were run to train beef and dairy cattlemen in artificial inseminaton techniques.

External events

Each year, the DPI organises and is involved in many external events. Of particular note were the events, in the second half of 1987, that were part of the Department's Centenary celebrations.

Charity fun run. The DPI's highly successful Centenary charity fun run on 19 July in Brisbane raised more than $2,000 for the Royal Queensland Bush Children's Health Scheme. The money was raised from entry fees.

The manager of the St Jacob's AB Centre in Ontario, Canada, Mr Doug Brown, and his wife, Leslie, with the Minister for Primary Industries, Mr Neville Harper (right), inspect the Australian bull Anda at an open day at the DPI's herd improvement and artificial breeding complex at Wacol, Brisbane.

Centenary film. In August the DPI Centenary film , *The Farm Behind the Beach*, was the feature and theme of the Department's 1987 RNA exhibit. This entertaining and dramatic film was shown on a giant video screen in a specially constructed cinema in the Sir Frank Nicklin Pavilion. The cinema was able to seat about 40 people in a relaxed, informal setting—reflecting farm and beach scenes—during each half-hour screening. An estimated 6000 RNA visitors saw the film, which depicts the contribution of farmers to the Queensland life style. The film, has also been screened in cinemas throughout Queensland.

Photographic display. The DPI's Centenary photographic tribute to life in early Queensland, 'The Johanson Collection', was seen by thousands of people at venues in Brisbane and on the Darling Downs, during the last half of 1987 and in early 1988. This superb 29-photograph collection features the work of Mr Charles 'Plum' Johanson (1887-1969), who lived and worked in the Swansfel district of the Darling Downs. The photographs, which are derived from Mr Johanson's glass-plate negatives, are unique because they offer varied glimpses of life in early rural Queensland as seen by one of its residents. The Brisbane venues included the DPI's RNA exhibit in August and the Queensland Museum in December and January.

Open days. DPI field days and a series of open days at DPI establishments were important Centenary activities in the second half of 1987. Open days were held at Ayr Research Station and the Ayr town office, Bowen Research Station, Bundaberg Research Station, Croxdale Field Station (Charleville), Gatton Research Station, Hermitage Research Station (Warwick), the Mareeba office, Oonoonba Veterinary Laboratory (Townsville), Redlands Research Station, Toorak Sheep Field Research Station (Julia Creek), and the Toowoomba office. These days were well attended not only by primary producers but also by rural business people, schoolchildren and the general public. The Brigalow Research Station (Theodore) open day, held in April in conjunction with the Aus-meat/Beef 88 Performance Competition, attracted

much attention from people in Australia and overseas.

Industry days were held at the DPI's Queensland Food Research Laboratories, Hamilton, to demonstrate the laboratories' activities and services to the food industry. At an all-food industries evening in October, 200 industry guests were treated to displays, demonstrations, talks and a dinner at which DPI-developed foods and beverages were served. At a special afternoon in August, seafood retailers were given the results of an extensive survey of retail seafood quality. Displays presented at country centres and in Brisbane included computerised information on the nutritive value of foods.

Sheep diversification field days. To meet the challenges posed by producers re-introducing sheep to farming land on the Darling Downs, the DPI held field days at seven centres. The topics were: using leguminous crops and pastures, and grazing sheep in cropping programmes. High wool prices and using sheep instead of herbicides to control weeds influenced producers to re-introduce sheep.

Land degradation seminars. Because of the serious land degradation in the mulga zone of south-west Queensland, the DPI held seminars in December to discuss the issue with producers at Langlo Crossing, Colladdi, Quilpie, Eulo and Nebine.

Farm mechanisation conference. In Toowoomba in March, the DPI ran two workshops, involving study tours of south-east Queensland, for 20 senior agricultural engineers and agricultural machinery manufacturers from developing countries. The Regional Network on Agricultural Machinery and the FAO Panel of Experts on Agricultural Mechanisation provided participants, while agricultural mechanisation experts from around Australia presented information to the group. Darling Downs farmers demonstrated the latest in agricultural machinery technology for conservation cropping.

Poultry information exchange. Held on the Gold Coast in April, this exchange covered such subjects as State egg-marketing strategies, problem-solving techniques on poor-performance farms, egg oiling, alternative litter sources and vaccination programmes. For the first time the exchange included a separate programme for people interested in game birds and other avian species. Seminars and group discussions were also organised for small groups with common interests and problems.

Pig Fair. The National Pig Fair in Toowoomba in May attracted about 6000 visitors. DPI officers helped organise and run the fair. The DPI display, featuring the broad-based DPI approach to improving Queensland pig production, was one of the many organisational and commercial stands.

DPI facilities

Maintenance and development of DPI research and field stations is essential to supporting the Department's massive statewide research and extension commitment.

Stations. Work to develop two newly acquired stations continued. At Rosebank Station, Longreach, new sheep yards were erected and, at Batavia Downs Station, Cape York Peninsula, the homestead was renovated, relocatable quarters were constructed and fence building began. On Batavia Downs Station, the old Moreton Telegraph Station, comprising two houses and associated buildings, was taken over from Telecom.

At Bundaberg and Roma, research programmes were implemented as staff and facilities gradually became available for these new centres. At Bundaberg, a machinery shed was erected and roadworks completed. A pad for the proposed glasshouse complex was constructed and two plant-propagating houses erected. At Roma, refencing of the station was completed and a new diversion weir and dam built.

At Biloela, the 'genetic resource centre' building was completed and underwent preliminary testing before its full-scale use as a long-term store for tropical field-crop seeds. A glasshouse and potting shed were completed.

At Mutdapilly, an additional 300 ha with irrigation water rights were acquired. The extra land will increase the carrying capacity and productivity of Mutdapilly, and of neighbouring Warrill View, and allow the dairy industry development programme to continue to expand. A new office building was erected at Mutdapilly and a second set of feeding stalls, for dairy-cattle nutrition investigations, constructed.

At Warrill View, a new residence was built; an animal shed, hay sheds and grain silos were erected; and a hard-standing feeding area was constructed.

At Gatton, a new office accommodation block was completed and a seed-potato storage cool room built. Irrigation and water-storage facilities were upgraded.

At Redlands, an additional residence was built in association with the new Poultry Research Centre and improvements were carried out to a boat shed built to house DPI fisheries vessels and equipment.

At Maroochy, three machinery workshop and storage buildings were completed to replace old and inadequate facilities, and additional land acquired in 1986-87 was fenced.

At Toorak, one of the translocated old school buildings was upgraded to provide a conference room. Extensive haymaking equipment was acquired and considerable maintenance to fencing of some sections of the property carried out.

At Ayr, Kingaroy and Millaroo, new machinery sheds were built and, at Ayr, Kairi and Toorak, farm buildings were extended and modified. Modifications were carried out to the glasshouse at Applethorpe; sections of Croxdale station were refenced to cater for goat research; a plant house was built at Brian Pastures, Gayndah; portion of the old timber stock yards at Rocklea were replaced with glavanised steel yards; the rodent-proof shed at Kingaroy was upgraded; and the office at South Johnstone was upgraded and airconditioning installed.

At Kingaroy, a clay core was added to the research station's weir level to improve water-storage capacity. Existing water reticulation, irrigation or drainage systems at Applethorpe, Bowen, Brian Pastures, Croxdale, Emerald, Hermitage, Kairi, Southedge, South Johnstone and Swan's Lagoon were extended or upgraded.

Other developments included the installation of: a solar absorpter at Hermitage; a generator at the Leichhardt research sub-station; a feed pelletter at Rocklea; a decompression chamber for vermin control in the peanut laboratory at Kingaroy; an animal-handling facility at Swan's Lagoon; and a coffee wet factory at Walkamin.

Mango and other tropical fruits orchards were established at Ayr, Bundaberg and Southedge. At Brigalow, parts of the station were effectively treated with 'Graslan' herbicide to control regrowth of brigalow scrub that had significantly reduced the carrying capacity of some paddocks.

At Wacol, a new 160-pen boar-performance test station began operating in March. The Wacol facility, with twice the capacity of the Rocklea station it replaced, operates with the same number of staff.

Construction began on a new building to house the DPI's pig artificial insemination service. The AI service, which operates from temporary facilities at Wacol, uses the top 5% of boars approved through the central boar test station.

Chemical residues

Pesticide residues. In late May 1987, Australia's beef export market was jeopardised after unacceptable levels of chemical residues were found in meat exported to the United States and Japan.

In Queensland steps were taken immediately to ban the registration and sale of offending chemicals and their use in any association with livestock. An integrated residue-testing programme was introduced to establish a chemical residue status for every livestock enterprise.

The DPI's laboratories at the Animal Research Institute (ARI), Yeerongpilly, increased sample handling and testing from 20 to 600 a day to accommodate the requirements of export markets and the speedy clearance of properties. Altogether, the ARI laboratories analysed more than 65 000 beef-fat samples and smaller numbers of samples from other animal species, both domestic and feral.

The quick response of governments and producer organisations averted a crisis that could have been disastrous for the economic viability of the Australian livestock industries.

Residues in wool. Testing for pesticide residues in wool began in January 1988. DPI staff undertook a mass media programme to advise producers on the use and disposal of chemicals, and of measures to minimise contamination risk.

Residue identification. To help primary producers, the DPI introduced an analytical service to identify sources of organochlorine residues in feed and soil. Primary producers submitted about 1000 samples, which were handled at the DPI's Agricultural Research Laboratories, Indooroopilly.

Pesticide tests database. An on-line computerised database of pesticide tests conducted on animals from individual Queensland properties was established to provide results to veterinary officers and through them to the producers concerned. State and shire statistics were collated on the levels of residue detected and the level of testing done.

Food technology

Tea expansion. Since 1986 tea plantings have increased by 176% in north Queensland, and further expansion is expected. The DPI report, *North Queensland Tea Land Suitability Study*, was published to underpin the industry's future expansion. Tea growers were well advanced in planning a tea factory on the Atherton Tableland to augment the Nerada factory near Innisfail.

Coffee industry support. Coffee processing projects were helping Queensland's infant coffee industry. A joint industry-DPI taste panel and chemical test were assessing the cupping quality of north Queensland coffee varieties; a small wet-processing factory had been designed for Walkamin Research Station, Atherton Tableland; and DPI economists had investigated the profitability of Arabica coffee production in far north Queensland. Research was continuing into increasing crop yields through improved varieties, production practices, and harvesting and processing techniques.

Tomato variety world first. The world's first commercial tomato variety with resistance to a new race of Fusarium wilt was released to industry. The disease had devastated tomato crops at Bowen for the last 8 years. The new variety has high yield and excellent fruit quality.

Food irradiation. A multi-disciplinary DPI project team studied ways to apply food irradiation. A main objective was to show that irradiation can be used to disinfest fresh fruit and vegetables of insects that have quarantine significance in export markets. In this regard, the effect of irradiation on the viability of two species of fruit fly and of the seed weevil in mango was studied. In a complementary study, the effects of irradiation at disinfestation doses on quality and shelf life of a range of fresh fruits and vegetables was determined.

Use of irradiation to extend the shelf life of seafoods and certain fruits and vegetables, and methods to detect irradiated foods were also investigated.

Fisheries achievements

Seagrass resources. The mapping of Queensland seagrass beds, apart from a small section of coast between Gladstone and Noosa, was completed. This is the largest mapping programme of its type done in Australia. Seagrass beds are vital as nursery grounds for commercial prawn species. The mapping

programme's completion and the protection of the seagrass beds will help maximise the yield of prawn stocks.

Barramundi breeding. Major advances in barramundi breeding technology were made at the DPI's Northern Fisheries Research Centre, Cairns. Maximum survival of larvae during hatchery was achieved. The heavy mortality in 12-to-20-day-old larvae had been restricting commercial development. However, improved larval nutrition reduced the number of deaths.

Recreational fisheries. As a result of the Queensland's Government's recreational fishing enhancement programme, about 1.5m fingerlings had been stocked in Queensland dams. Management committees in each district had played a key role in surveying existing fish in dams, in stocking the fingerlings and in creating public awareness about the programme. Together with shire councils and other community groups, the management committees had raised funds to buy fingerlings in their local freshwater impoundments.

Lake Tinaroo fish stocking. A major recreational fishery had been established in Lake Tinaroo. DPI officers from Walkamin Research Station had been developing this multi-species fishery through releases of prime angling species, including barramundi. The Tinaroo fishery was promoted in 1988 when an invitational tournament, featuring 20 of Australia's top anglers, confirmed the lake's high-quality fishing. Barramundi, while difficult to catch, were proving a drawcard.

■ Conservation farming

Protection. More than 44 000 ha of the State's cropping lands were protected with soil-conservation measures (contour banks, waterways and strip cropping layouts), bringing the State's total protected cropping lands to more than 1.14m ha.

Grain farming. Grain farmers continued to reduce the number of fallow-tillage operations and to increase herbicide use as circumstances allowed.

Cane farming. In Queensland's canelands, a cooperative effort between the DPI, the Bureau of Sugar Experiment Stations and Queensland's cane farmers has led to trash-management practices being rapidly adopted — a change that has increased productivity and reduced soil erosion.

When trash-management development work began at Innisfail, Mackay, Maryborough and Childers in 1982, almost every farmer burnt the cane crop before harvest and removed the trash from the field after harvest, leaving caneland bare and vulnerable to soil erosion. Nevertheless, by 1987-88, some 70% of the Innisfail and Mackay canelands and 60% of the Maryborough canelands were protected by burnt cane trash left on the field after harvest.

The trend towards the practice of not burning cane before harvest and of retaining the unburnt trash on the field after harvest is noticeable in many districts. For example, a massive 50% of the Cairns canelands are now protected in this manner.

■ Natural disasters

Drought. Early in the year, the areas worst hit with drought were the north- and central-coast hinterlands, the central lowlands, and the western Darling Downs-Maranoa. In early 1988 drought was extending into the Wide Bay-Burnett region and further west into north and central districts. Rain from Cyclone Charlie and the Easter floods relieved the drought in southern parts of the western Darling Downs-Maranoa and on the north and central coasts. Other areas in drought had little prospect of relief until the 1988-89 summer.

Before Cyclone Charlie and the Easter rains, 20% of the State had been drought declared. After these rains, the drought area declined to 16% by June. Properties in the drought areas had experienced a series of below-average summer rain and many were in serious financial difficulties.

Extensive destocking in many areas and hand feeding of nucleus breeding stock caused drought-relief subsidy payments to increase by 35%. In June payments peaked at more than $2m for the month. More than 600 loan applications, totalling more than $15m, were approved.

Other disasters. Primary producers had to contend with Cyclone Charlie, heavy rain and floods. In late February Cyclone Charlie damaged crops and caused severe flooding in coastal and hinterland areas between Townsville and Rockhampton. Horticultural and sugar-cane crops were damaged, farm buildings and many kilometres of fencing were destroyed, and stock were lost.

During Easter, low-pressure weather systems moving eastwards from the Northern Territory brought record rainfall and flooding. Cotton and summer grain crops on the Darling Downs were severely damaged and small crops in the Lockyer Valley were destroyed.

After Easter, continued heavy rain flooded the Macintyre and Weir river systems near Goondiwindi. DPI officers from Goondiwindi coordinated one of Queensland's biggest aerial fodder crops to flood-stranded stock. In 14 days, more than 11 000 bales of lucerne hay were distributed to 37 properties. Producers described this response as the quickest and most accurate to occur in the border region. A total of 58 100 sheep and 1380 cattle were fed to ensure their survival.

■ Parks and gardens

Construction of new government buildings in Brisbane increased the demands on DPI staff responsible for upkeeping gardens associated with government facilities. Additional responsibilities include: the State Works Centre, Harris Court, The Mansions, Forestry House, Education House and the David Longland Building (serviced by staff based at Queens Gardens); the Dental Clinic, the Government Printer and Sunmap Centre (serviced by a new complement of gardeners based at Woolloongabba); and the Metrology Building at Spring Hill (serviced by the old Museum garden staff). The DPI's parks and gardens section employed 41 gardeners, who were maintaining 31 sites in the Brisbane metropolitan area.

Primary industries overview

Rural production values

The estimated gross value of rural production in Queensland in 1987-88 was $3,768m, about 14% more than in 1986-87. This improvement was due mainly to increases in the value of livestock products, sugar, cotton and oilseeds.

Livestock slaughterings (and other disposals) were valued at $1,346m, down marginally on last year's $1,349m. The value of cattle and calf slaughterings fell by 1% to $1,134m. The value of poultry slaughterings, at $83m, and pig slaughterings, at $108m, rose 7.6% and 12% respectively. Wool production was valued at $462m, up 58%. Value of horticultural production rose 1% to $452m.

The value of cereal grains was expected to be $313m, the same as last year, owing to improved prices for lower production.

The EEC-USA trade war continued to affect world market prices and to influence returns to Queensland producers. Only the low value of the Australian dollar, relative to major overseas currencies, kept Australian grain prices from falling for much of the period. Exchange-rate fluctuations could affect returns in 1988-89.

Beef

Beef cattle numbers in Queensland were estimated at 8.6m head (a 1% decrease) at 31 March 1988. Herds were reduced because of poor seasonal conditions in many areas.

Generally, demand was good, with slaughterings, production and exports all increasing. Overseas demand strengthened, especially in the USA and Japan markets. As a result, the Queensland cattle market index rose from an early 106 to 126.6 by the end of the period.

Wool

The Queensland sheep flock numbered 14.66m head at 31 March, up 60 000 from 1986-87. Wool production was estimated at 74m kg, marginally less than last year's production.

Highlights of the wool market were continuing large increases in auction prices and reductions in the Australian Wool Corporation stocks. The Market Indicator price increased from 755c/kg in July to 1191c/kg clean near the end of May.

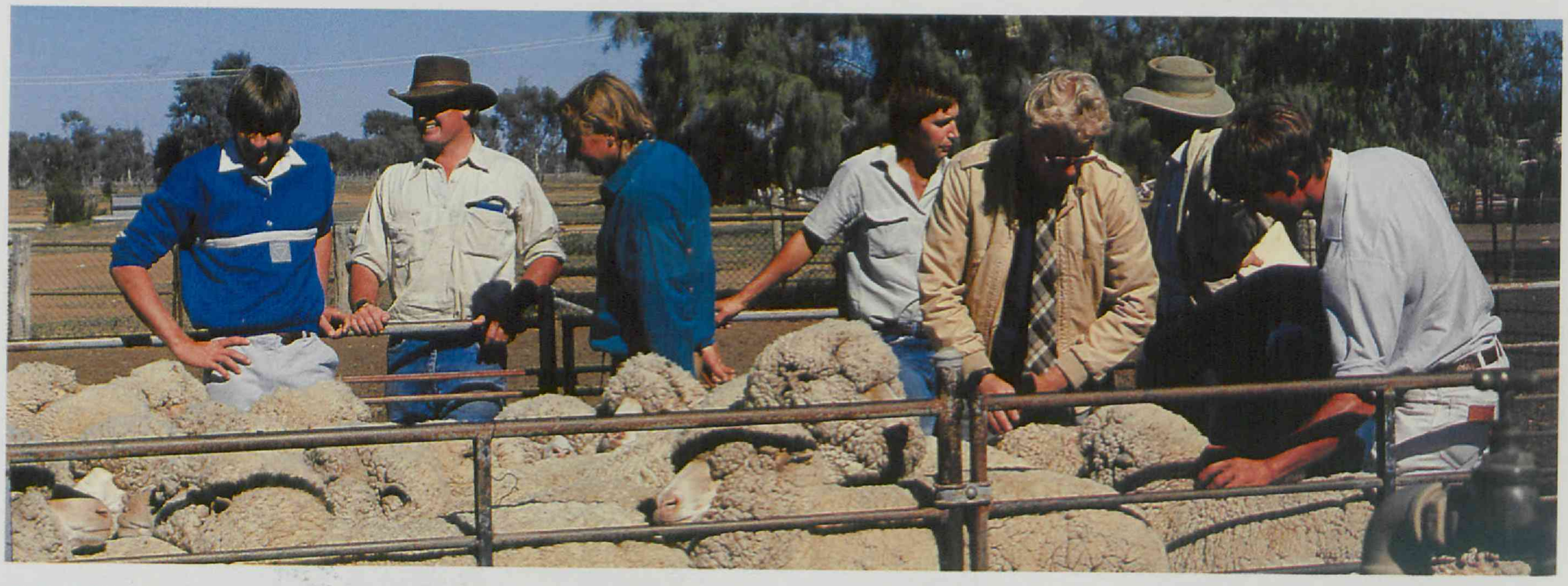
Overseas buyers, in order of importance, were Japan, China, USSR, France and Italy.

Dairying

Despite prolonged dry periods and a loss of 126 dairy farms, Queensland milk production increased marginally on 1986-87 to 607m L. Of the total milk received, 51% was bought as market milk compared with 50.6% in 1986-87. Average price paid to producers for all milk received, including deferred payments, was 29c/L, compared with 27.3c/L in 1986-87 and 24.2c/L in 1985-86. Average payment for market milk was 41.5c/L.

Market milk sales, including white, flavoured, UHT and low-fat milk, increased by 1.2% to 250m L.

Pasteurised cream production increased by 52% to 75.2m L. Under national dairy marketing arrangements, returns from dairy product exports are subsidised from a market support levy (40c/kg butterfat in 1987-88) on all milk produced and levies on sales of domestic butter and cheese. These arrangements and increasing competition from southern processors and New Zealand are placing great pressure on the processing sector in Queensland to rationalise operations.



WOOLPLAN, the Australian performance recording scheme for the merino industry, allows producers to rank and select sires on their Estimated Breeding Value, an index based on the sires' potential for wool growth, reproduction performance and growth rate. Here, a DPI officer discusses the selection of replacement rams using a combination of visual and WOOLPLAN data.

Deregulation measures were introduced in response to this competition, including:

(i) abolition of the prescribed quantity above which trading in market milk producer entitlement is restricted from 1 July 1988;

(ii) abolition of relocation and additional assessments (that is, forfeitures of milk relating to the relocation of milk entitlement from one dairy to another); and

(iii) reintroduction of transferability of supply from one processor to another as from 1 July 1988.

Pigs

Sow numbers increased marginally, despite concerns about the availability of grain supplies.

The least-cost grower diet fluctuated around $190/t for the year depending on grain availability.

Consignment prices for top-grade baconer pigs rose from $1.50/kg in June 1987 to $1.95 in early 1988. From 1 July 1987 all export licensed meatworks dressed pig carcasses according to the Aus-meat carcass definition and adjusted prices paid accordingly.

Poultry

After the regular half-yearly review of indexed production costs, the Chicken Meat Industry Committee set the price paid by processors to contracted growers for rearing chickens at 34.5c/bird for July to December 1987 and 35.9c/bird for January to June 1988. The average growing fee was 35.2c/bird, up 6.2% on last year.

Eggs

Egg production was estimated at 33.5m dozen, an increase of about 3% over 1986-87 production. Shell egg sales in both the South and Central Queensland Egg Marketing Board regions increased over sales for 1986-87.

Barramundi fishing on the Burrum River, north of Maryborough. This is part of a continuing DPI fisheries survey to collect adult broodstock for breeding at the DPI's Southern Fisheries Research Centre, Deception Bay.

In south Queensland a trend emerged towards increased sales of larger grade eggs in response to changing consumer demand. Expo 88 caused an increase in sales towards the end of 1987-88, while new products, including peeled hard-boiled eggs and Scotch eggs, also contributed to sales growth.

Sheep meat

Sheep and lamb slaughterings were estimated at 1.63m head, down nearly 16%. Except for a short period in March-April, sheep and lamb prices remained above last year's. Increased Japanese demand for mutton and USA demand for lamb caused exports of these products to rise. Increased wool and sheepmeat prices were expected to result in increased sheep and lamb numbers in 1988-89.

Deer

Queensland's deer farming industry continued to expand. A total of 118 deer farms, with a population totalling more than 7 500 deer, were registered with the DPI. Venison production, although expanding, was insufficient to meet local demand, and imports continued from New Zealand.

Fishing

The fishing industry had another mixed year. Export returns, particularly for prawns, were lower; but the landed price of imported product was also lower.

Catches were relatively stable in most areas. The Queensland Fish Management Authority introduced catch log books for all commercial fishermen. The log books should enable more reliable production statistics to be collected.

A 10-week trawl closure over Christmas-New Year north of 22°S longitude (roughly north of St Lawrence and the Broad Sound) covered all major north Queensland prawn fisheries. This was the widest area covered for a trawl closure to date. However, results from the closure were not as encouraging as in previous years.

The Off Shore Constitutional Settlement was extended on 14 April to bring the Gulf prawn fishery under Commonwealth jurisdiction. This complemented the June 1987 extension of the Queensland jurisdiction on the East Coast from the territorial base line to the outer edge of the Great Barrier Reef.

To reduce fishing pressure on the scallop resource, the Queensland Fish Management Authority and the industry examined alternative management methods for the scallop fishery, including an increase in allowable scallop sizing. A scallop meat count was examined as another way to measure and control fishing effort.

The Minister for Primary Industries released a Green Paper on possible amendments to the *Fishing Industry Organization and Marketing Act* 1982-1985. One proposal, which the industry strongly supported, was to increase the Queensland Fish Management Authority's membership to include additional representation by commercial fishermen, recreational fishermen and local authorities. Amending legislation was expected to be brought before Parliament in the August Session 1988.

Early in June the Minister announced increased penalties for anyone caught possessing undersized and female mud crabs. This action stemmed from the interception of many undersized and female crabs destined for interstate markets.

Early in 1987-88, sale and transfer of the former Queensland Fish Board to A. Raptis and Sons Pty Ltd was completed. The industry has expressed general satisfaction with the new marketing arrangements.

Sugar

Queensland's 1987 sugar crush was completed on 8 January 1988. Altogether, 24.02m t of cane was crushed, marginally down on the record 24.05m t crushed in 1986.

The sugar content increased, with an average recorded c.c.s. of 13.27 compared with 13.12 in 1986. Sugar production rose to 3.246m t from 3.209m t in 1986. The tonnage of cane harvested per hectare decreased 2.6% to 79.3, while the sugar yield fell 1.3% to 10.72 t/ha.

The season was mixed with too little rain during the normal growing period and too much rain during the harvesting period. Most mills achieved higher production, but the Central Queensland mills suffered a 22.3% decline on 1986 production levels.

World sugar prices continued the improvement shown since mid-1985. After averaging US6.06c/lb in 1986, prices increased to US6.71c/lb in 1987. The average monthly price dropped from a high of US7.51c/lb in March 1987 to US5.57c/lb in August, before recovering to US8.86c/lb at the end of May 1988.

Fruit and vegetables

Preliminary figures indicated that total gross value of horticultural production rose by 1% to $452m.

Heavy and prolonged rainfall in south-east Queensland in April damaged vegetable crops and caused significant crop losses in the Brisbane, Lockyer and Bremer Valleys, pushing up market prices. Prices for fruit were influenced by the steady increase in production of tropical and sub-tropical fruit.

Large quantities of fruit and vegetables are sold through the Brisbane Wholesale Markets at Rocklea, Brisbane. A comprehensive review of marketing horticultural produce in Queensland, including the operation of the Rocklea markets, began in April.

Greater efforts were being devoted to developing both domestic and export markets to cater for the continued expansion in horticultural production, particularly for mangoes, lychees, tomatoes, bananas and custard apples.

The Queensland Horticultural Export Council took a pivotal role in helping export market development. It targeted markets for both fruit and vegetables, and developed strategies to overcome problems in air and sea transport and import quarantine barriers.

The Commonwealth Government enacted legislation to abolish the Australian Apple and Pear Corporation and to create three new Commonwealth statutory authorities: the Australian Horticultural Corporation (intended to coordinate export marketing of horticultural produce); the Horticultural Research and Development Corporation (intended to coordinate the funding of research and development in the horticultural industry); and the Horticultural Policy Council (intended to provide policy advice to the Commonwealth Minister for Primary Industries and Energy). The Australian Horticultural Corporation took over the activities of the Australian Apple and Pear Corporation.

The Industries Assistance Commission presented its report on Fruit and Fruit Products in February 1988. The industry opposed the IAC's recommendation that the tariff on citrus fruit be changed to an *ad valorem* rate and scaled down over 5 years from an equivalent rate of 33% to 10%, and that sales tax on citrus juice be increased over the same period from 10% to 20% (in line with other beverages).

The Commonwealth Government subsequently announced, in the May Economic Statement, that the tariff would be converted to an *ad valorem* rate of 30% immediately, reducing 3% each year to 15% by 1992. Imports from Brazil, the major source of imported juice, will enter 5% below the general rate as part of tariff preference applying to developing countries.

In April 1988 the Minister for Primary Industries appointed the former Director-General, Dr G. I. Alexander, to carry out a comprehensive review of marketing horticultural produce in Queensland, including operation of the terminal market at Rocklea in Brisbane.

Cotton

Queensland ginned lint cotton production was expected to be a record 260 000 bales compared with 138 000 bales in 1986-87. The previous highest production was 211 000 bales in 1984-85.

Rain and flood damage at ripening time caused large yield losses and downgrading on colour.

Increased plantings resulted from a substantial recovery in world prices.

During the year the Minister approved the Cotton Marketing Board's adoption of the business name 'Queensland Cotton' as part of a more aggressive overseas marketing programme.

Cotton growers strongly supported Queensland Cotton's alternative pricing options for the 1988 season. Under the new arrangements, growers may elect to price a proportion of their expected crop through cash price, 'on-call', or at a guaranteed minimum price offered on a daily basis.

Queensland Cotton began a major strategic-planning exercise to decide corporate objectives and to plan long-term strategies.

Wheat

The wheat industry had another poor year, with adverse seasonal conditions again reducing production. Only 760 000 t of wheat were produced, 12% less than in 1986-87.

The final guaranteed minimum price for AWB wheat was $144.29/t compared with $139.83/t in 1986-87. Commonwealth underwriting payments for the 1986-87 crop were made during the year. No payments are likely for the 1987-88 crop owing to improved world market prices.

Overseas demand for high protein Australian wheats remained firm despite continued pressure on prices from subsidised sales of EEC and US wheat.

The State Wheat Board obtained Government approval to increase the assistance available under the Necessitous Growers Seed Wheat Scheme to enable growers to take advantage of improved planting conditions. The Board also revised and expanded its seed-wheat credit arrangements and introduced a Wheat Crop Establishment Credit Scheme.

Grain sorghum

Grain sorghum production was estimated at 1.167m t, an increase of 13% on 1986-87, although the area planted (585 000 ha) was 9% less. Generally favourable growing conditions resulted in the average State yield improving to 1.99 t/ha from 1.63 t/ha for 1986-87.

The world market for coarse grains, including grain sorghum, improved as a result of increased world trade and a 15% reduction in carry-over stocks.

Grain handling

The Queensland Grain Handling Authority expected to handle about 1.5m t of grain, 21% less than in drought-affected 1986-87 and 59% less than in 1985-86. Dry planting and growing conditions in most parts of the State caused the reduction.

Oilseeds

The area planted to soybeans at 25 000 ha was down on last year's 30 500 ha. Sunflowerseed plantings, however, increased from 109 000 ha in 1986-87 to an estimated 123 000 ha owing mainly to improved prices and excellent seasonal conditions in the Central Highlands.

Soybean production was expected to decline more than 16% to 37 500 t because of unusually wet conditions in April. As a result of increases in both area planted and yields, sunflower seed production, estimated at 102 000 t, was almost 50% higher than the previous year's.

Australian oilseed prices were higher than the depressed prices prevailing at the end of 1986-87.

Tobacco

Tobacco sales to the end of May accounted for 70% of the 1988 State Marketing quota of 7 730 938 kg at an average price of 563c/kg. Total value of sales from the Mareeba-Dimbulah district were expected to exceed $40m for the first time.

Growers' 1988 quotas were set at the same level as their 1987 selling entitlements. Tobacco quota transfers from New South Wales were 7741 kg, down from 23 054 kg in 1986-87 and 41 571 kg in 1985-86.

Growers were anxious about their industry's future, with the expectation of only one more stabilisation period and a possible State tax on tobacco products.

Barley

Barley production was reduced by adverse seasonal conditions for the second successive season and by the depressed international grain outlook. Queensland output was about 270 000 t, down nearly 5%.

The Barley Marketing Board received 166 000 t, and the small crop again restricted export sales. The Board was able to export about 40% of intake to markets in Japan and Western Europe. The rest of the crop was sold domestically, either as feed grain or as malting barley. During 1986-87 sales of feed barley by the expanded direct delivery scheme from grower to end-user accounted for about 14 000 t.

A first advance of $110/t was paid on all deliveries to the Board compared to $90/t for the previous pool. About 29% of intake was paid under the cash option scheme whereby growers elect to accept a discounted cash payment in lieu of the normal pool payments. Cash option payments ranged from $111.83/t for feed to $123.75/t for malt. Remaining growers elected to cash out about 20% of the net pool tonnages under the cash barley scheme. Cash out payments ranged from $2/t for feed to $14.48/t for malt.

Peanuts

The 1987-88 Queensland peanut crop was estimated at 36 000 t, down 19%. Dry conditions in south-east Queensland contributed to low yields in many crops and some crop failures. In north Queensland, growing conditions were dry but yields were good and quality was excellent. The Peanut Marketing Board estimated receivals of 33 000 t from the 1987-88 crop.

The Board paid suppliers 55c/kg net of general reserve fund deductions for the 1986-87 pool and paid a first advance of 38c/kg for the 1987-88 pool.

International peanut prices remained firm during 1987-88, with US 40/50 florunners at around US $1,000/t for much of the year. Increased exports from China and Argentina contributed to a world market over-supply. Reliability of supply and quality of peanuts from both countries will play an important role on the international peanut market in the future.

The Peanut Marketing Board adopted a new corporate identity, 'PMB Australia', and implemented a new marketing slogan, 'Perfect Aussie Peanuts'. This action followed the Board's review of its activities in the peanut industry. The Board also identified asset replacement and product handling efficiencies that could reduce operational costs and maximise returns to growers.

A DPI team is studying the physiological basis of tropical adaptation in grain sorghum. These studies are crucial to achieving higher-yielding sorghum hybrids for the tropical districts of Queensland.

Maize

Queensland maize production was estimated at 100 000 t, down 18% on last season. Maize prices remained firm, reaching $160/t delivered into Brisbane at the end of 1987-88. The Queensland maize crop's gross value was estimated at $14.4m.

In north Queensland the Atherton Tableland Maize Marketing Board received 22 129 t from the 1986-87 maize crop and forecast a final payment to suppliers of $120/t before levy deductions.

Navy beans

The 1987 crop of 9000 t was an improvement on the 5490 t in 1986, although unfavourable seasonal conditions continued to depress both yields and crop performance.

The Navy Bean Marketing Board paid a first advance of $500/t on canning grade beans compared with $450/t in previous seasons. The final returns to growers were expected to reach $690/t. Growers were also given a cash advance option of $130/t, less administration charges and interest.

Dry conditions during planting, reduced crop expectations to 12 500 t for 1988. Heavy rain in April further reduced crop prospects to about 10 000 t.

Rice

Rice production from the 1987 winter crop and the 1988 summer crop was expected to be about 19 500 t of paddy, a 5% increase on the 1986-87 harvest.

The summer rice harvest (or 1987 winter crop) was 10 630 t, with strong production in Mareeba. Production in the Burdekin area fell, with reduced areas being planted (800 ha) because of water problems in some crops and an improving outlook for sugar.

Production from the winter harvest (or 1988 summer crop) was expected to be about 8900 t. Yields were good, with above-average yields occurring in the Mareeba district and lower production in the Burdekin. Renewed interest in rice production should follow the release of new Burdekin farms in 1988.

Returns to growers were expected to exceed $220/t, with little available for export.

Ginger

Conditions favoured ginger production in 1987. The yield was 4238 t compared with 2981 t in 1986-87. Buderim Ginger Growers' Co-operative Association Limited receivals for 1988 were expected to be slightly above 4000 t.

Most of the expanded intake was processed into dried ginger, with exports again accounting for about 60% of total processed ginger. The Co-operative retained its market share of 40% of the world market for ginger preserved in sugar and of more than 80% of the premium ginger market.

Animal industries highlights

Meat industry

The meat industry was being encouraged to accept more responsibility for quality control and for maintaining hygiene standards.

'Skip lot', an innovative time-saving inspection procedure, was introduced. Only a specified number of introduced meats, cartons and carcases are inspected, and action is taken if deficiencies are detected.

Uniform abattoir construction standards had been developed in consultation with other States to promote uniform hygienic dressing procedures that would lead to greater confidence in the quality of product from complying meatworks.

Beef industry

Burnett region producers were surveyed to define their needs for research and extension. Issues given highest priority were identification of suitable legumes to enhance pasture and animal production, renovation of run-down pastures and maintenance of grass productivity. Many respondents were concerned at the land degradation that can result from excessive use of supplements combined with high stocking rates. These issues were being addressed by research, either underway or planned, in the region.

A successful meat quality and marketing programme involving beef producers and more than 140 butchers continued. Nutrition, health and marketing aspects were emphasised.

Interactive television through the TSN-11 satellite network was used in an innovative extension approach with beef producers throughout the State. This 'Rural Focus' programme highlighted advances in automatic cattle management, transport and marketing.

Producer demonstration sites, established to hasten the transfer of research results to the cattle industry, were highly successful in showing the benefits of early weaning in north Queensland. Similar sites in central and southern Queensland were demonstrating the benefits of spear traps for self mustering and the use of supplements and improved pastures to enhance cattle growth rates.

Cattle tick control

Producers benefited greatly from the proclamation of two cattle tick protected areas. Livestock movement conditions are now based on the tick status of properties rather than on the status of whole areas. This gives stockowners incentive to eradicate ticks and enhances protection for the Cattle Tick Free Areas. Hundreds of properties previously restricted are now in the Cattle Tick Free Area with unrestricted access to New South Wales.

Brucellosis and tuberculosis

The BTEC programme ran smoothly and progressed satisfactorily, despite a delayed start to the 1987 cattle season caused by financial difficulties encountered during 1986-87. More than one million blood samples were taken from 96% of eligible breeder cattle slaughtered.

By 1 May 1988 only 63 tuberculosis and 10 brucellosis infected cattle herds remained in Queensland. The target of brucellosis freedom by 1 January 1989 and of tuberculosis freedom by 1 January 1990 is achievable.

A Ministerial Advisory Committee has ensured greater input from industry on BTEC matters. A 'core group' of industry and DPI representatives was appointed to review all property programmes, organise regional meetings to achieve a coordinated area approach and seek feedback from producers.

Sheep industry

The DPI actively promoted 'Sale by Additional Measurement'. With about 25% of all eligible wools being tested, Queensland's wool producers have the highest adoption rate.

DPI scientists culture** Babesia **parasites as part of a new technique, developed in the DPI's Animal Research Institute laboratories, to produce cattle tick fever vaccine.

The LAMBBOOST programme, investigating low lambmarking percentages in central-west Queensland, identified several contributing factors. Participants implemented husbandry techniques to minimise identified losses. For example, three Longreach properties, by eradicating feral pigs 3 weeks before lambing, increased lambmarking percentages from 10% to 15%.

Computer technology helped DPI officers improve the quality of advice to producers. Computer models enabled producers to examine their enterprise, to gauge the effects of new technology and to be more objective in decision making.

A client needs identification survey conducted in the Longreach area involved 325 people (83% of district properties). High-priority issues identified included animal nutrition, woody weeds and toxic plants, financial policy, kangaroo populations and conservationists, animal performance, and land degradation and drought strategies. These confirm the relevance of DPI regional extension and research programmes, but signal that more emphasis is needed on financial policy and management, and on the damaging effects of fauna populations.

Dairy industry

The DPI continued to operate its cost-effective management-information service for dairy farmers. The benefits of this service include rapid genetic progress and more effective management decisions.

A survey of Queensland dairy farms showed an advantage of 33% higher milk production (1 200 L/cow) for herds using A.I. and herd recording. This is an additional income of about $180/cow or between $25m and $30m extra for the Queensland dairy industry.

Stability of membership in DPI recording (about 900 Queensland members) and management schemes (about 200 members statewide) was a highlight. The positive farmer attitudes toward these services acknowledge the need for today's farm manager to take full advantage of modern technology to make profitable decisions.

Import agencies for cattle and pig semen had been established with Swedish, Danish and two Canadian organisations.

Dairy farmers in all States were participating in proving Wacol AB Centre's Holstein-Friesian bull team. Facilities acquired, expertise developed and experience gained over many years on behalf of dairy AB are being used to accelerate genetic improvement in the Australian beef industry.

Improved versions of the farm management software were released. FARMACC, a financial management programme, and HERMAN, a herd management package for commercial dairy farms, now include ABVs, mastitis cell counts and protein.

Sales of the software showed a 32% increase when compared with sales in 1986-87.

An induction training kit for dairy factory staff was produced in association with the Queensland Food Industry Training Committee. The kit comprises a technical resource manual for each new employee and a video. The kit highlights hygiene, processing and safety for food handling, and is the first of its kind in the Queensland food processing industry.

Goat industry

A non-milch goat workshop, attended by industry and government representatives from throughout Australia, recognised the fibre goat industry's potential and suggested that orderly development, leading to increases in number, size and productivity of goat herds, was required.

Poultry industry

The DPI surveyed the south Queensland egg industry to provide a financial profile of the industry and information for monitoring cost increases.

Results of a chicken meat industry survey were used in calculating the growing fee. The survey considered the variable and fixed costs of production in relation to returns.

Queensland egg quality surveys showed that unrefrigerated eggs reaching consumers were stale. Research has shown that egg oiling minimises evaporation and maintains freshness, even without refrigeration. Developmental work is proceeding to find the most effective oiling procedures and these will form the basis of an extension programme to improve egg quality.

Pig industry

Extension officers developed a technique to assess piggery operations based on the rating of five key factors affecting the whole enterprise's efficiency. The next phase is to apply this technique in setting extension objectives.

A project for forecasting optimum piggery management strategies based on analysis of kill slips, grading and health information began in central Queensland and, as resources permit, was to be extended to other regions.

Stock poisoning

Plant poisonings cause stock losses in Queensland each year. A computerised poisonous plants database was being established. When completed, it will be a big advance on present ways of providing plant-poisoning information to producers.

Disease diagnosis and research

The DPI's new regional veterinary diagnostic laboratories at Rockhampton and Toowoomba completed their first year of operation. Demand for their services, particularly at Toowoomba, grew steadily, and plans were developed to increase staff and the range of services offered at Toowoomba.

The application of new technology to improve laboratory diagnostic services continued.
Immunofluorescence assays were developed for bovine virus diarrhoea, porcine encephalomyocarditis and parainfluenza virus. Enzyme-linked immunosorbent assay (ELISA) complemented the tests available for detecting the agent of infectious laryngotracheitis, and antibodies to avian encephalomyelitis in poultry, and melioidosis in sheep and goats. DNA probes were produced for detecting the causative agents of bovine brucellosis and tick fever in cattle. DNA analysis techniques were used in detecting rotavirus in calves.

A new diagnostic test for enzootic pneumonia of pigs, using immunofluorescence to detect the bacteria in affected lungs, reduced the laboratory confirmation time from about 6 weeks to 3 days. The more rapid diagnosis will help maintain control of this insidious infection.

A patent was filed to modify an analytical technique that allows biological samples to be analysed for cadmium, cobalt, chromium, lead, molybdenum, nickel and silicon without long clean-up procedures.

Enzootic bovine leucosis, a viral disease, affects 70% of Queensland's dairy herds. Research into a genetically-engineered vaccine was underway. Promising results were obtained towards developing more sensitive tests for diagnosing infection early.

Commercial vaccine against tick fever in cattle was produced in culture for the first time.
Traditionally, vaccines against the blood parasites *Babesia bovis, Babesia bigemina* and *Anaplasma marginale* are produced from the blood of calves infected with special strains of each organism. New methods for culturing the two *Babesia* strains in the laboratory were developed. Cultures replaced calves as the main source of *B. bigemina* vaccine, and good progress was made towards using cultured *B. bovis* vaccine. The new techniques provide added insurance against contamination of the vaccines with other infectious organisms.

Engineering

A big increase in DPI engineering input to the animal industries occurred. Ways to reduce dust levels in cattle trucks on unsealed roads, by modifying truck and crate aerodynamics, were being studied in a wind tunnel and with instrumented cattle trailers. Design assistance was provided to the automatic cattle-management project with devices for automatically applying drugs to cattle and an audio-signalling device for calling animals. The economic cost of sub-optimal pig housing environments was being researched.

Research in animal industries

Research results on automated cattle management were presented to industry representatives at a special forum. The forum looked at developing spear gates for self mustering and systems for substantially reducing annual mustering costs. The forum also discussed an automatic applicator for medicaments developed at the DPI's Swan's Lagoon Research Station, Millaroo, and an automatic weighbridge developed in conjunction with the Engineering Department, University of Queensland. The beef industry endorsed the DPI's work and embraced the opportunity to field test prototypes.

As a basis for research planning, gaps in knowledge were identified by using research reports to collate and summarise basic biological data on growth, reproduction and mortality for beef herds in Queensland, Northern Territory and the northern part of Western Australia. Scientists and producers from northern Australia discussed and revised these summaries at a workshop in Townsville. For breeder studies, fertility data were mostly reported, but mortality and liveweight were not given at many sites. Most studies on growing animals reported growth data, but mortality rates were rarely given.

Research at Charleville to improve survival and productivity of cattle consuming mulga *(Acacia aneura)* showed that feeding cattle a supplement with polyethylene glyco! (PEG) improves their performance by increasing available protein. The response was improved by adding energy supplements. These results have implications not only in improving growth rates of cattle grazing mulga but also in decreasing cattle deaths during droughts.

The efficiency of drought feeding programmes for sheep has been improved as a result of research projects involving mulga and Mitchell grass diets.

Management strategies to significantly improve lamb marking percentages were identified by researchers at the DPI's Toorak Research Station, Julia Creek. A breeding flock was established at Toorak to demonstrate to central and north-west Queensland producers the combined benefits of implementing all of these management strategies.

A nitrogen-fertilised grass pasture trial, begun in 1984 to research milk-production responses, continued. Twelve dairy farmers in south-east Queensland are participating. The trial continued to demonstrate milk-production responses to nitrogen fertiliser in what was, for most farms, the second successive dry year. Cows showed increased milk yields, increased liveweights and improved reproductive performance, with generally lower levels of supplementary feed inputs. (Grain usage was less than 70% of pre-trial levels.)

Overall, nitrogen fertiliser has reduced the costs of production per litre of milk. The results have attracted great interest, with many farmers attending annual field days on each participating farm.

The role of complementary grazing of goats and sheep in controlling prickly acacia *(Acacia nilotica)* and gidyea *(A. cambagei)* was being examined at Aramac and Isisford, as part of the DPI's programme to control woody weed infestations in western Queensland. Browsing by goats is causing severe stem damage to both species after only 6 months' grazing. The project is planned to extend for 5 years to monitor the effects on the *Acacia* species and the re-establishment of useful pasture species.

Research programmes at the DPI's Mutdapilly and Kairi research stations continued to demonstrate the potential of pasture for milk production in Queensland. Dryland and irrigated forage systems are used in these studies. At Mutdapilly, temperate and tropical pastures were being used with irrigation. One forage system has 66% tropical and 33% temperate pasture; the other has 66% temperate and 33% tropical pasture. Milk production in the first lactation was 10% higher for the cows grazing 66% of the area allocated to irrigated summer feed.

Nitrogen fertiliser is increasing the level of milk production and the efficiency of use of dryland pastures at Mutdapilly. The response has continued to grow over 4 years of application. Milk yield of cows on unfertilised pasture averages 2300 L/lactation and, with 150 kg N/ha, this increased to 2700 L/cow in the first year. In the fourth year, milk yield was 4000 L/cow at 150 kg N/ha.

The research programme on cashmere goats has produced significant findings. Length of cashmere measured *in situ* at three sites (neck, shoulder and rump) was studied and validated as a simple and inexpensive method of reliably estimating cashmere production in groups of goats within a herd. Industry adoption of this technique would allow the use of objective selection in the doe component of herds without the high cost of fleece testing.

Mouldy, weather-damaged grain amounts to more than a million tonnes annually. Assessment of changes to the palatability and nutrient content, and identification of mycotoxins present, are enabling the grain to be used as animal feed in the most cost-effective way.

Research began on defining the optimum dietary lysine requirements of fast-growing lean pigs to develop a blood test that detects pigs carrying genes harmful to meat-quality and to investigate the effect of pre-slaughter stress on meat quality.

Spear gates, like these short-arm gates, are being used by cattle producers to increase mustering efficiency in the State's expansive grazing areas. Self mustering, using spear-gate technology, is an integral part of the DPI's automatic cattle management programme.

Poultry industry research focused mainly on improving nutrition and management. Projects in progress included effects of abrupt changes of protein sources in laying diets, controlled feeding of replacement pullets, nutritional value of chick pea for poultry, new feeding systems for layers, effects of dietary energy level on economics of chicken meat production, and toxicity of weedseed contaminants of grain.

Research for ACIAR

The DPI's Pathology Branch managed an Australian Centre for International Agricultural Research (ACIAR) project. The Branch collaborated with the Sri Lankan Department of Animal Production and Health, in a project to control tick-borne diseases of ruminants in Sri Lanka. Research led to improved methods for producing vaccines against tick fever of cattle not only in Queensland but also in the overseas countries the project was designed to help.

Quarantine

The quarantine risk to Australia's northern shores was exemplified by the stranding of the Irian Jayan vessel *PMT Kombacy* on Badu Island in the Torres Straits in February. The vessel's cargo included 600 sets of deer antlers, crocodiles (live and dead), a cuscus, live chickens and feathers. All quarantine risk goods were destroyed.

The number of international passengers entering Queensland by air has increased dramatically. At Cairns International Airport, the number doubled in less than 2 years and was expected to increase further. World Expo 88 and the lifting of the Brisbane Airport curfew vastly increased international passenger numbers on a 24-hour-a-day operation. Quarantine services were reorganised to handle the increased traffic.

Plant industries highlights

Agriculture

The maize hybrid Barker was released from the DPI's Kairi Research Station. The new hybrid has up to 14% better grain yield and much better standability than the current hybrid, Sloan.

The newly released peanut cultivar, Shulamit, has 13% better kernel yield on the Atherton Tableland and 5% better kernel yield in south Queensland. It also produces an increased proportion of higher quality kernels than current cultivars.

An early garlic cultivar, Glenlarge, with 79% higher commercial yields, was released. Glenlarge has uniform cloves of large size and white appearance, all of which are required in the market place.

A sunflower female parental line, Impera HRS, with resistance to four races of rust *(Puccinia helianthi*), was released. Several companies were evaluating hybrids developed from the female Impera HRS and their own male parental lines.

The sunflower breeding programme at Hermitage Research Station (Warwick) released the rust-resistant female parental line, Impera HRS, for use by commercial seed companies.

A male sorghum germplasm line, QL37, was released from the DPI's Biloela Research Station for use by private seed comapnies. QL37 has better midge resistance than an older male line, QL36, and makes available, in a male line, the high midge resistance of the female line QL29.

The new sweetcorn hybrid, Mapee, is well adapted to all the major Queensland growing areas. It produces cobs with excellent fresh market acceptability and should also be suitable for the processing industry.

The new rice cultivar, Fin, is a short-statured, lodging-resistant, bacterial leaf-blight resistant, late-maturing variety with 30% higher yield than the older late-maturing variety Starbonnet. Grain quality of Fin is acceptable in Australian markets.

Recent research demonstrated that barley varieties show big differences in adaptation between south and central Queensland. The barley breeding programme was modified to seek different varieties for each environment.

Two computer-based decision-support packages to enhance farmers' decision making were close to commercial release: WHEATMAN to help wheat farmers make planting decisions and WATERSCHED for irrigation scheduling in cotton and soybeans. Farmers involved in developing these packages are enthusiastic about their contribution to decision making.

Research and extension officers were working with Atherton Tableland potato growers to develop a yellow-fleshed potato industry based on an export market in South-East Asia. Superior cultivars had been identified and a trial consignment of about 2000 t was to be harvested and shipped to Singapore in August.

Research showed that, at high temperatures, tropical grain-sorghum hybrids had a higher rate of converting radiation into dry matter than hybrids developed in temperate areas. This is the first report of this type affecting grain sorghum adaptation to tropical environments. It will help with work to develop higher-yielding hybrids for tropical areas.

Successful projects increasing the adoption of improved pastures in the beef industry covered a range of pasture-improvement technologies, including leuceana, ponded pastures, adapted grasses and stylo legumes. Seed supplies are a major constraint to widespread planting of sown pastures.

The use of reduced tillage fallow management expanded greatly. Development, demonstration and other extension activities in all field-cropping areas resulted in widespread farmer recognition of the advantages in increased moisture retention and enhanced soil erosion control.

The crop management decision booklets produced for Darling Downs, Western Downs and Maranoa, and South Burnett farmers were widely distributed and appreciated. Published with agribusiness support, the booklets were also widely used by bankers and crop consultants.

Cooperation between DPI extension agronomists and agribusiness personnel, in providing extension services, increased. Cooperation provides a better service to the State's farmers.

A booklet of tables was published so that statistical ranking and selection procedures would be easily accessible to plant breeders.

Agricultural chemistry

Nitrate-nitrogen in the top 40 cm of soil was found to be the key to deciding nitrogen fertiliser requirements of irrigated cotton at Emerald. Cotton-lint yield was closely related both to soil nitrate and to nitrogen fertiliser applied. Nitrogen fertiliser recommendation tables for irrigated cotton were drawn up, based on pre-planting soil-nitrate levels.

Soil phosphorus needs of sorghum, barley, soybeans and peanuts were found to be substantially different, after long-term research at Kingaroy. Soil phosphorus levels of 34, 29, 18 and 10 mg/kg were required for maximum yields of the four crops respectively. Peanuts and, to a lesser degree, soybeans were efficient at utilising soil phosphorus. Sorghum and barley were more able to utilise banded phosphorus fertiliser.

Dimethoate dips, required by regulation to enable interstate trade of some Queensland fruits, were studied. A prototype detector for simple, on-farm measurement of dimethoate concentration in dips was constructed and tested.

A rapid biochemical method was set up to analyse plant material for storage carbohydrates in horticultural crops. Research began into the importance of starch levels in peach, lychee, nectarine, macadamia, mango and pineapple plants.

More than 3000 rice samples were measured for amylose, as part of the DPI's rice-breeding programme. Amylose is considered the single-most important determinant of rice grain quality.

Cereal chemistry at the Queensland Wheat Research Institute, Toowoomba, concentrated on quality assessments of wheat and barley. Dough stickiness in rye-derived wheat varieties was further studied and processes to produce good-quality flour from rain-damaged wheat were developed. Biochemical tests to screen for sprouting resistance in new wheat-breeding lines were devised and new methods were developed to measure the carbohydrates that influence barley malting quality.

Horticulture

Tissue-culture research programmes and facilities were expanded at the DPI's Maroochy and Redlands research stations. Treatment with irradiation and fungal toxins, and rapid callus culture techniques were being used to breed a banana variety

Continuing DPI research into all aspects of production and marketing is helping the further development of Queensland's dynamic horticultural industries. Selection of improved lettuce cultivars has expanded interstate markets and extended the production season into the summer months.

A quarantine officer explains controls on the movement of plant material into Australia. Plant quarantine officers at Queensland's international airports serviced an increase of 21% in passenger arrivals in 1987-88.

resistant to a new race of Fusarium wilt. More than 2000 banana lines, some of which had been introduced from overseas, were being evaluated. Varieties resistant to black Sigatoka leaf spot disease had been identified and were being multiplied in tissue culture for planting in Sigatoka-disease areas of Cape York.

The grape variety, Flame Seedless, from California, proved rain-tolerant during ripening. Most seedless grape varieties, including Sultana, show berry-splitting if rain falls before harvest. Flame Seedless gives the Queensland grape industry a competitor to seedless grapes from southern States.

A new peach variety, Granite Supreme, was bred for the Granite Belt. It ripens in late December to early January and has attractive flesh colour and flavour, and excellent shape and firmness. Over the last 4 years, it had consistently outyielded its competitors by up to 30%.

Fruit set in custard apples was enhanced by nitidulid beetles being present on the flowers. Poor fruit set, which results in low yield and misshapen fruit, was a major problem with the important variety Pink's Mammoth.

Tetraploid forms were selected for all important citrus rootstocks used in Queensland. These stocks have the potential to reduce tree size for easier harvesting and higher per hectare yields. This new approach to controlling tree size has great potential for use in citrus production.

Trials to evaluate the potential of tree crops for the Burdekin district were well established at Ayr Research Station. Plantings include mango, lychee, West Indian lime, coffee and neem. The mango varietal collection at Ayr is the largest of its kind in Australia and contains more than 170 varieties.

The mini-melon cultivars, Minilee and Mickylee, from Florida, showed outstanding potential as new crops for the Bundaberg region. These small melons, averaging 3 kg in weight, have excellent eating quality and carrying capacity. They have potential for both domestic and export marketing.

All known forms of the native rice flower *Helichrysum diosmifolium* had been collected from 60 sites around the State. This flower's commercial potential was being investigated at the DPI's Redlands Research Station.

The marketing knowledge of horticultural producers and extension officers was increasing, recognising the importance of marketing to farm profitability. Tomato growers were provided with marketing information gained from interviews with wholesalers and retailers and from out-turn surveys on the major capital city markets.

The mango industry was encouraged to market only high-quality fruit to help it to cope with its largest production season to date. Information on production methods, crop protection and postharvest handling that lead to high-quality fruit were conveyed to growers through a series of publications and field days. Reports on market out-turns and investigations on postharvest handling problems were provided as the season progressed. The result was increased prices in spite of significantly higher production.

World Expo 88 received much quarantine attention. Liaison between participating countries and quarantine was maintained at all stages to ensure that materials imported for displays and attractions met quarantine requirements.

Pasture management

The challenge for native pasture managers throughout Queensland is to increase animal productivity and maintain healthy pastures, often while confronting drought. Supplements, less burning, higher stocking rates and adding legumes have destabilised some native pastures. Innovative and economic ways to redress these emerging problems were being sought.

A video entitled *Clearing Eucalypt Country* was produced to help landholders improve grass production and minimise timber regrowth, erosion and salting. The needs for shade, shelter, timber and wildlife habitat protection were addressed.

Coordinated plant evaluation began with 12 sites strategically located to represent the range of soils and climates in eastern Queensland where annual rainfall exceeds 550 mm.

Desmanthus, a legume suited to clay soils, was evaluated rapidly by a task force dedicated to commercialising new pasture plants.

Brigalow regrowth in central Queensland was killed with heavy blade ploughs at up to 20 000 ha/month and often sown simultaneously to silk forage sorghum and purple pigeon grass. Seca shrubby stylo was sometimes used.

Prickly acacia invasion posed a serious threat to the Mitchell grass country and studies were conducted to help understand and devise ways to contain this exotic shrub.

Legume developmental sites throughout the State involving stylos, annual medics, serradellas, roundleaf cassia, jointvetch and centro were established.

Kelson snail medic, a late-flowering, leafy and productive annual legume, was released for use in crop-pasture rotations on fertile clay soils in southern Queensland.

Madeira yellow serradella, an early-flowering and persistent annual legume for the deeper sandy soils in southern Queensland, was released jointly with Western Australia.

In north Queensland, cattle production from native pasture, with stylo added, was enhanced in the dry season by higher feed protein and in the wet season by higher feed-phosphorus concentrations.

Climatic records for meteorological stations throughout Queensland were assembled on a database in a computer-accessible form.

DPI engineers, in conjunction with the CSIRO, developed a planter for sowing improved pasture species for the extensive animal areas. This simple but rugged machine is able to plant seed into an unprepared seedbed and still achieve satisfactory establishment.

Plant pathology

An unusually high number of new diseases affected the ornamentals industry. Carnations were attacked by anther smut and bacterial wilt, neither of which had been recorded in Queensland before. Chrysanthemum stunt, a virus disease, threatened the traditional Mother's Day trade and was traced back to infected propagating material. Foliage crops were not spared; a new Syngonium stem rot damaged the popular 'White Wings' and 'White Butterfly' varieties, and another new fungal disease attacked Spathophyllum.

A new approach to bean root rot control has led to an effective chemical-free method of overcoming the most limiting disease of fresh market beans. Trials at Gympie over two seasons showed that by planting beans at shallower than normal depths, root rot severity decreased and yields were greatly improved.

Citrus canker, a serious exotic disease with the potential to damage the entire Australian citrus industry, had not been seen on Thursday Island since February 1986. Its eradication from Queensland seems to be a success.

Research on sorghum head smut showed that, of about 60 commercial hybrids, two-thirds were resistant to one race of the fungus that causes the disease and one-third were resistant to both known races. This information will help farmers select varieties in areas where head smut has been a problem.

Phosphorous acid was effective in controlling pineapple root and heart rot after planting. However, the plants appeared to be sensitive to this fungicide and did not grow as well as others treated with the alternative fungicide, metalaxyl. Further interesting results from avocado root rot studies showed phosphorous acid to be effective at rates lower than those previously registered. This is important because it may result in lower fruit residues.

A DPI plant pathology technician inoculates mango leaves with a severe strain of the leaf spot bacterium to assess varietal reaction to this major disease of mangoes.

Sunflower blight was severe in many coastal Queensland crops owing to wet weather. Some sunflowers growing in the Roma area, remote from any commercial crops, were severely affected. However, individual plants with low disease levels were collected from among the more diseased plants. These will be assessed as sources of resistance in the sunflower breeding programme.

Anthracnose of the pasture legume stylo remained the greatest threat to improved pastures in northern Australia. Disease levels in mixtures of varieties were compared with those in pure stands. Mixtures showed definite promise as a means of combatting disease spread.

Rice yield losses from bacterial blight in the Mareeba district were sporadic. However, screening for resistance continued because the disease is still the major threat to the industry. Five hundred rice cultivars and breeding lines were screened and about one-quarter were resistant. This resistance is being used in the DPI's breeding programme.

A severe rockmelon disease causing premature death was caused by increased susceptibility of plants to gummy stem blight as they became stressed from either root-rotting organisms or fruit filling. This indicated that the disease could be overcome by controlling root rot fungi, optimising cultural practice, and intensively controlling gummy stem blight during the final month of cropping.

Two important diseases—tomato grey mould and cucurbit powdery mildew—have been difficult to control since the pathogens became resistant to fungicides 3 to 4 years ago. Strategic spray programmes for both diseases were recommended to growers and improved control was evident.

Entomology

Pineapple growers enthusiastically adopted a methyl bromide fumigation treatment to control false spider mite on pineapple planting material, after successful field trials in central Queensland. The fumigation treatment is the only way to control the mite, which has resistance to all common miticides and has become a State-wide problem. Fumigation also controlled pineapple scale and mealybug, and had the further advantage of avoiding any possible chemical residues in fruit. Since using the treatment, many growers have reported more rapid plant establishment, resulting in better plant growth.

New chemical treatments tested in north Queensland bananas proved to be as effective against banana scab moth (*Nacoleia octasema*) as the banned DDT and DDT/BHC treatments used previously. A new technique of direct bunch injection with chlorpyrifos is more effective and safer than the usual bunch treatments and is also more economical. Growers were quick to adopt the new technique because of its advantages over conventional bunch spraying.

Investigation of grain sorghum resistance to the sorghum midge (*Contarinia sorghicola*) discovered that female midges laid fewer eggs in resistant than in susceptible sorghums when they were not given a choice between sorghum varieties for egglaying. In some types only one-tenth the number of eggs were laid. This inability to lay eggs was the most important resistance mechanism and meant that large plantings of resistant varieties would reduce overall midge damage. If fewer eggs were laid, fewer seeds would be destroyed and yields would be higher. Yearly losses in grain sorghum resulting from midge damage can be as high as $10 million. Investigation of resistance mechanisms is an important aspect of an ongoing DPI programme to develop midge-resistant sorghums.

Experiments, at Ormiston, based on monitoring pest densities, identified workable action thresholds for controlling *Heliothis* in trellised tomatoes. In finding the thresholds, DPI entomologists compared a strategic spraying approach with conventional schedule spraying at weekly intervals. With the action thresholds, fewer sprays were needed to achieve effective control. *Heliothis* larvae are the major tomato pests in south Queensland and unchecked infestations cause extensive fruit damage. The action thresholds are a step towards more efficient *Heliothis* control and, at the same time, reduce insecticide usage.

INSECOLL, a new computer-based data storage system, was established to organise ecological and biological data from the DPI's insect collection at Indooroopilly. The system stores information on distribution, seasonality and host associations of insects of agricultural and horticultural importance in Queensland. Data on parasites and predators are also included. DPI officers will be able to access INSECOLL data from any DPI field station.

Recent research in the Central Highlands found germinating seed baits detected all potential soil-inhabiting pests, including subterranean forms. Soil-inhabiting insects damage seedling field crops throughout Queensland, but are particularly prevalent in the grain-growing areas of the Central Highlands. The occurrence of these pests had to be determined before planting so farmers could use the appropriate control measures. Trials confirmed that the insecticide-treated crushed-grain baits used previously to detect the pests only indicated the presence of surface-active insects.

Both bait methods involved a similar amount of labour, but the germinating seed-bait technique gave growers a more accurate population assessment of all soil pests.

Botany

The Queensland Herbarium is part of the DPI's Botany Branch. *Austrobaileya*, the Queensland Herbarium's journal, published descriptions of 18 new species, 3 new subspecies and 1 new variety of Queensland plants. New names were published for 253 existing named species; most are from Queensland and all but four relate to the newly recognised *Racosperma* as a segregate from the genus *Acacia*.

The HERBRECS herbarium label database provided basic source material for developing a strategic land-zoning plan for Queensland's wet tropical rainforest region. Prepared by the Northern Rainforest Management Authority (NORMA), the plan provides opportunities for the sustainable multiple-use of resources while maintaining all nature conservation values.

The manuscript of Volume 3 of the *Flora of South-eastern Queensland* was completed. Descriptions of 1 114 species including grasses, sedges and orchids were included.

Service to the people of Queensland was maintained, with 12 000 plant specimens identified by botanists. These specimens included many seized by quarantine officers at Queensland's entry points. Several police officers were trained in forensic botany.

A floristic survey of Murgon district rainforests was carried out as a joint project with the Department of Forestry.

Land management highlights

Strip cropping proved successful in preventing heavy autumn flood waters from concentrating and causing severe soil erosion and crop damage on the Darling Downs.

■ Erosion incidence

Early autumn rains resulted in severe soil erosion in southern Queensland especially on sloping land that was finely tilled, devoid of stubble cover and without contour banks. Erosive flooding on some valley floors resulted in the total stripping of soil to cultivation depth. In many situations, good ground cover, and contour banks on the slopes and strip cropping on the plains reduced soil movement to small amounts.

In central Queensland in early March severe erosion occurred on the floodplains of the Mackenzie and Isaacs rivers, after Cyclone Charlie. In north Queensland, severe erosion was reported on the red soils of the Atherton district and the tobacco soils at Mareeba.

Only minor erosion was reported on the State's canelands because cane trash had been widely retained.

■ Extension

Because of the tight economic conditions and the sequence of dry seasons, soil-conservation officers concentrated on low-cost conservation practices and on preparing catchment plans. Bus tours by groups of farmers to other districts successfully demonstrated sugar-cane trash-management techniques and green-cane harvester modifications.

Conservation-cropping demonstration plots and farmer discussion groups were used in most major grain and sugar areas to develop and foster conservation-cropping practices. Farm walks and field days at all sites were well attended.

Catchment schemes in the broad-acre grain areas were successful in increasing the adoption level of soil-conservation measures. These schemes were catalysts for adoption on properties near the catchments.

Growers inspect a reduced tillage planter developed and built by DPI staff. It was successfully used to plant oats on the western Darling Downs in both reduced and zero-tilled situations.

Community involvement

Seven district land-management and conservation advisory committees on the eastern Darling Downs and another in the Coastal Burnett were formed. These replaced the Soil Conservation Advisory Group Committees that operated in Areas of Soil Erosion Hazard under the repealed 1965-80 Soil Conservation Act. Each committee comprises industry, shire, special-interest group and farmer representatives.

Technical support was provided for other landholder committees at Inglewood and in the Lockyer and Central Burnett areas.

Adoption of measures

Soil-conservation officers surveyed soil-conservation measures (contour banks, waterways and strip-cropping layouts) on 44 000 ha of cropping land, less than that protected in recent years. Landholders showed a remarkable commitment to soil conservation in conditions of drought and declining income.

A large area of the arid and non-arid grazing lands in Queensland suffers from soil erosion and vegetation degradation, and grazing management strategies are required to ensure sustainable economic production. Landholder interest increased significantly. Plans were developed to provide soil-conservation services in the black spear-grass areas of the upper Burdekin River Catchment and in the mulga lands of the Warrego Region. A total of 6 300 ha of pasture land was protected with pondage banks, pasture furrows and water-spreading systems.

Grain farmers in central Queensland reduced the number of fallow-tillage operations by 30 to 40% and increased the use of herbicides on an opportunity basis. Canegrowers increasingly adopted trash-retention practices. The area under unburnt trash blankets increased from 40 to 50% in the Cairns district. In southern Queensland, burnt trash blankets were used on 61% of Maryborough's caneland.

Farm plans that incorporate land-management recommendations were prepared for 377 farms involving 193 000 ha.

Soil-conservation measures were implemented for the first time by 252 landholders. More than 12 600 Queensland farmers have now implemented soil-conservation contour measures on cropping land.

Technical successes

A low-cost, reduced-tillage, trailed planter developed by DPI officers was successfully used to plant oats on the western Downs in both reduced- and zero-tillage situations.

African star grass provided a quick, dense ground cover for waterways on the southern Downs. The legume, Arachis pintoe, performed well at Innisfail. A mixture of Indian blue, creeping blue, angleton and purple pigeon grasses gave best results in the Clermont district.

Land resources

Land-evaluation studies in the sugar-cane, grain-growing, irrigation development and potential agricultural areas continued.

The Cardwell-Innisfail study covered 242 000 ha comprising the Tully, South Johnstone and Mourilyan sugar-mill areas. An additional 30 000 ha of lands were shown to be suitable for arable agricultural uses, while 1 500 ha of current sugar-cane assignment occurred on lands too steep for long-term sustainable production. A similar field study was completed for about 35 000 ha in the Mossman-Julatten area.

High-intensity soil survey (1:25 000) of the Burdekin River Irrigation Area completed a further 8 000 ha. The report for the Mulgrave section (8 580 ha) was completed. It indicated that 6 277 ha are suitable for sugar-cane, 5 154 ha for grain crops, 5 426 ha for rice, 476 ha for small crops and 602 ha for mangoes. About 1 893 ha were assessed as unsuitable for any of the crops being considered.

Low-intensity surveys (1:100 000), funded from the National Soil Conservation Program, continued for land-assessment projects in the near south-west (Roma), central Queensland (Kilcummin) and the Einasleigh-Atherton dry tropics (Ravenshoe). About 240 000 ha have been mapped for Roma, with 1650 sites described in detail. A further 170 000 ha were mapped for Kilcummin, and the Atherton-Einasleigh overview study was prepared for publication. The soil survey of the agricultural soils of the South Burnett was completed.

The reconnaissance survey (1:250 000) of the central Burnett region was completed and a programme to describe existing and potential cropping lands in the Lakeland Downs area was begun.

Evaluation and planning

Evaluation and planning activities that more effectively use land-resource data continued for potential irrigation developments, shire planning and industry studies.

The irrigation potential for 24 000 ha of lands adjacent to the Warrego River, at Charleville and at Cunnamulla, were assessed for their agricultural, pastoral and horticultural potential. Similarly, 40 000 ha of land was studied, downstream of proposed dams for hydro-electricity use on the Millstream and Blunder creeks near Ravenshoe.

Local authorities continued to request land-resource data for shire planning purposes. Advice on town planning schemes, rezoning and subdivision proposals was provided to the Local Government Department for a range of shire councils. A collaborative study for future planning in the Maryborough Mill area was undertaken.

A horticultural land-suitability study for the Sunshine Coast, north of Brisbane, was published and released for industry, local authority and governmental use. The report identified 33 000 ha as suitable for growing horticultural crops, although

15 000 ha were shown to be suitable for tree and vine crops only. This study, plus an early DPI report on the Moreton Mill area, provide an important basis for planning land use in Sunshine Coast rural areas.

A land-suitability study of potential tea-growing lands on the wet tropical coast was completed. Significant areas of suitable lands occur on the eastern Atherton Tableland and on the coastal strip between Tully and Innisfail.

Land-management field-manuals, providing the south-east Downs and Roma districts with a resource base for farm planning and erosion measures, were published.

Salinity investigations, in collaboration with BSES, were undertaken in the Maryborough Irrigation Area, in the Isis Mill area and at Torbanlea.

Management of mulga lands was studied in a project, funded by the National Soil Conservation Program, to help develop strategies to maintain long-term productivity.

Computer handling of resource survey data was further improved and a promotion brochure and user manual on WARIS were made available.

The GIS/CAD facility, utilising ARC/INFO software accessed through CITEC, greatly enhanced both data handling and thematic mapping.

The CAD (computer assisted drafting) workstation was used to meet Queensland Water Resources Commission (QWRC) mapping requirements in the Burdekin Irrigation Area. The workstation's improved mapping techniques enabled the QWRC to rapidly assess farm-design layouts. In addition, individual 1:5000 scale property plans showing soils and land-suitability data were provided to the QWRC for the first farms to be auctioned in the Burdekin Irrigation Area.

A DPI experimentalist at Ayr tests the operation of the 'tip bucket' on a rainfall runoff measuring system. Twenty of these are installed in the Mingela-Charters Towers area.

Soil-conservation research

Trials on artificial erosion (topsoil removal) at Drillham, Bringalily, and Murgon clearly showed that soil loss can reduce yield drastically. When 100 mm of topsoil was removed (1 000 t/ha), grain yield was reduced by about half at Drillham and Murgon, and by 25% at Bringalily. The cause of a yield depression depended on soil types and the amount of soil loss.

In the wet tropical coast, research identified tillage operations and the lack of ground cover as the two main factors contributing to caneland soil erosion. At Innisfail under conventional methods, soil loss during the 1985-86 season was 506 t/ha. When trash was not burnt after harvest and chemical weed control was practised, 54 t/ha of soil was lost. Green cane harvesting reduced this amount to 20 t/ha.

To apply research results to a wider area of the State from a limited number of trials, a computer model PERFECT was being developed and tested for Queensland conditions. The model was designed to provide long-term probabilities of run-off, soil erosion, crop growth and yield so as to produce options for soil management.

A 50 ha experiment was established on permeable upland soils of the Burdekin River Irrigation Area to study the effects of furrow irrigation on potential for water-table rise, subsequent waterlogging and salinity down slope. Over 18 months of cropping and a net water addition of 2370 mm, the water tables rose about 1.5 m in addition to the filling of the initially dry soil profile. Total water loss below the root zone was about 600 mm.

The cropping area in the Maranoa region has expanded rapidly, but is considered only marginal for crop production. To help farmers decide on land suitability for crop production, a long-term research programme was initiated to establish the relationship between wheat yield and soil physical and chemical characteristics. Reduced-tillage and other systems are part of the study.

Horticultural crop production in south-east Queensland is expanding progressively onto lands once regarded as too steep for agricultural production. Studies on Gympie district pineapple farms quantified the effects of slope length, slope angle, cover and soil physical characteristics on very steep land under horticultural crops.

Controlled traffic cultivation in the tropics is being researched in the Burdekin as a way to overcome soil management problems and to reduce production costs. The system uses permanent beds and traffic lanes to reduce compaction.

Food research highlights

Research and technology

The scope of DPI processing research increased, with projects underway on cocoa, ginger and live seafoods, and with the acquisition of an engineer.

Dairy

A monoclonal antibody produced for measuring spoilage bacteria in milk reacts with a wide range of bacterial species. A framework of a marketable assay has been constructed and is being used to estimate the method's cost and sensitivity. The new method could replace the total-count test, currently required for all farm milks, with a test that takes a few hours instead of 3 days.

White crystals that sometimes form on matured Cheddar cheese have been identified as mainly calcium lactate, an innocuous compound. Because they are commonly mistaken for mould, the crystals are a serious defect in appearance. Control methods involving changing the types of bacteria in cheese were being evaluated.

A cream liqueur with a Queensland flavour had been produced on a pilot-plant scale. Its main ingredients are rum, cream and sugar. The flavour is appealing and the problem of preventing separation during storage had been solved.

Seafood

Live prawns could be successfully transported using a moistened inert medium, according to preliminary trials carried out in collaboration with the local prawn-fishing industry. The export market is prepared to pay substantially higher prices for live seafood than for the frozen product.

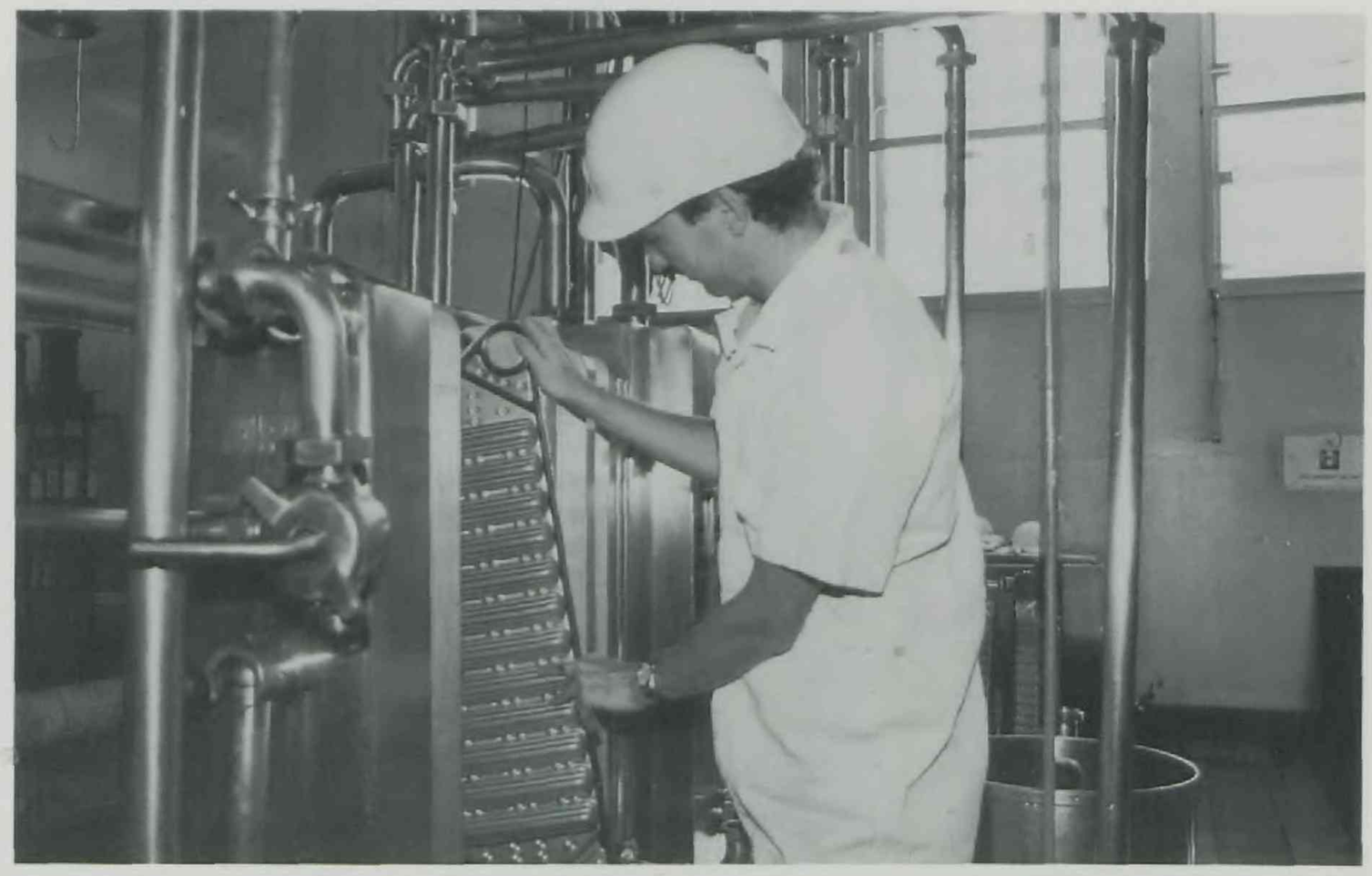
A smoked tuna product that slices and tastes like ham has been developed to make use of less-utilised species of tuna caught off the Queensland coast. Improvements to weight recovery and texture were achieved by changes to the cure formulation and the use of vacuum massaging technology.

Meat

Antibiotic residues, if detected in Australian meat, could threaten sensitive export markets, as pesticide residues have done. A simple two-plate microbiological inhibition assay employing *Bacillus subtilis* has shown promise as a reliable and sensitive means of detecting antibiotics in pig and cattle urine. This urine test could be used as an indicator of antibiotics in meat.

Microwave cooking readily destroyed bacteria on the surface of meat. Preliminary trials suggested that 'standing time' was necessary after cooking to ensure elimination of all bacteria inside rolled and minced-meat products.

The Minister for Primary Industries, Mr Neville Harper (right), discusses monoclonal antibody research at the all-food industries evening held at the DPI's Queensland Food Research Laboratories, Hamilton, in October 1987.



A DPI extension officer checks one of the heat-exchange plates in a milk pasteuriser. He is looking for small cracks or holes, which, if undetected, ultimately cause poor-quality milk to be produced. Many pasteurisers like this one are used by dairy factories throughout Queensland.

■ Fruit and vegetables

Vegetable salads are an increasingly important outlet for Queensland horticultural produce and need a lengthy shelf life for marketing through supermarkets. Initial work towards maximising salad quality showed that loss of consistency of mayonnaise ended shelf life in some types of salads, whereas microbial spoilage was the problem in others.

Banana chips have been produced from Queensland Cavendish bananas. The chips were superior to imported chips and were well received at a trade fair in Kuala Lumpur. Bananas that would otherwise be discarded due to minor skin damage or discolouration could be used to make chips. Banana processors are interested in using the manufacturing process.

■ Food irradiation

Low-dose irradiation could improve the quality of export horticultural produce. Trials on a wide variety of fruits and vegetables showed that strawberries and mushrooms, in particular, benefited from treatment. Moulding of strawberries was prevented, and cap opening and browning of mushrooms decreased. In some fruits, ripening was retarded.

Methods for checking whether food has been irradiated are also being studied. Irradiated foods are assessed for measurable changes caused by irradiation. Trials with fish showed that irradiation changed the types of bacteria present. Identification of food microflora might provide a way to detect previous irradiation treatment.

■ Food engineering

With the appointment of a food engineer, new projects on optimum drying conditions for ginger and microwave applications in the food industry, including disinfestation, began.

A new machine to peel and slice mangoes was undergoing further development and commercialisation. The machine helps make a mango-processing industry economically feasible. With minor modifications, the machine can process other fruits such as avocado, papaw and melons.

The Queensland Food Book ***was the focus of attention for these DPI officers at a DPI book exhibition, held in Brisbane, for booksellers, librarians and educationists. This book attracted Australia-wide interest.***

■ Quality services

From July 1987, regular monitoring of liquid milk products from Queensland dairy factories ceased. Dairy factories now monitor milk quality. The DPI helps by providing standards and maintaining an interlaboratory testing programme involving all Queensland dairy factories.

The range of food products tested in the DPI laboratories continued to expand, with an increased proportion of samples handled on a fee-for-service basis.

Two major activities undertaken were a survey of locally produced pâté and the increased monitoring of liquid milk supplies for pesticide residues.

■ Food book

Publication of *The Queensland Food Book*, which presents the story of Queensland-produced foods from harvest to table, culminated teamwork and cooperation between many sections of the DPI and the food industry. The book provides information on buying, storing, preparing and serving a wide spectrum of foods; on their nutritional value; and on the background story to their production.

Fisheries highlights

Recreational fishing

A total of 20 different dams and weirs in Queensland were stocked with more than 750 000 fingerlings of barramundi, silver and golden perch, east coast and Murray cod, sotty grunter and saratoga.

An angler-card programme was introduced into the inland recreational fishery for impoundments stocked during the last 2 years. This programme will monitor catches and growth of fish in areas stocked with fish. Honorary rangers were appointed and trained to supervise freshwater fishing at remote inland areas.

With the support of recreational fishing groups, more than 3000 tailor have been tagged from the Gold Coast to Fraser Island. The high recapture of juvenile fish, identified by the project, was a major factor in the recent introduction of the 30 cm minimum size. Big movements of adult tailor have been recorded, including one of 900 km from Fraser Island to Newscastle.

Barramundi production techniques were refined to achieve 94% survival from metamorphosis (10 mm) to fingerlings (45 to 50 mm). Some fingerling were stocked into Lake Tinaroo to enhance existing stocks, and 7000 were also stocked into Clare Weir on the Burdekin River. Barramundi already stocked into Lake Tinaroo in December 1985 continued to show high survival and rapid growth, with two-and-a-half-year-old fish averaging 4 kg. The largest caught weighed 6.8 kg.

A fishing exposition conducted at Lake Tinaroo in February highlighted the quality of angling and diversity of species available to freshwater fishermen in northern Queensland.

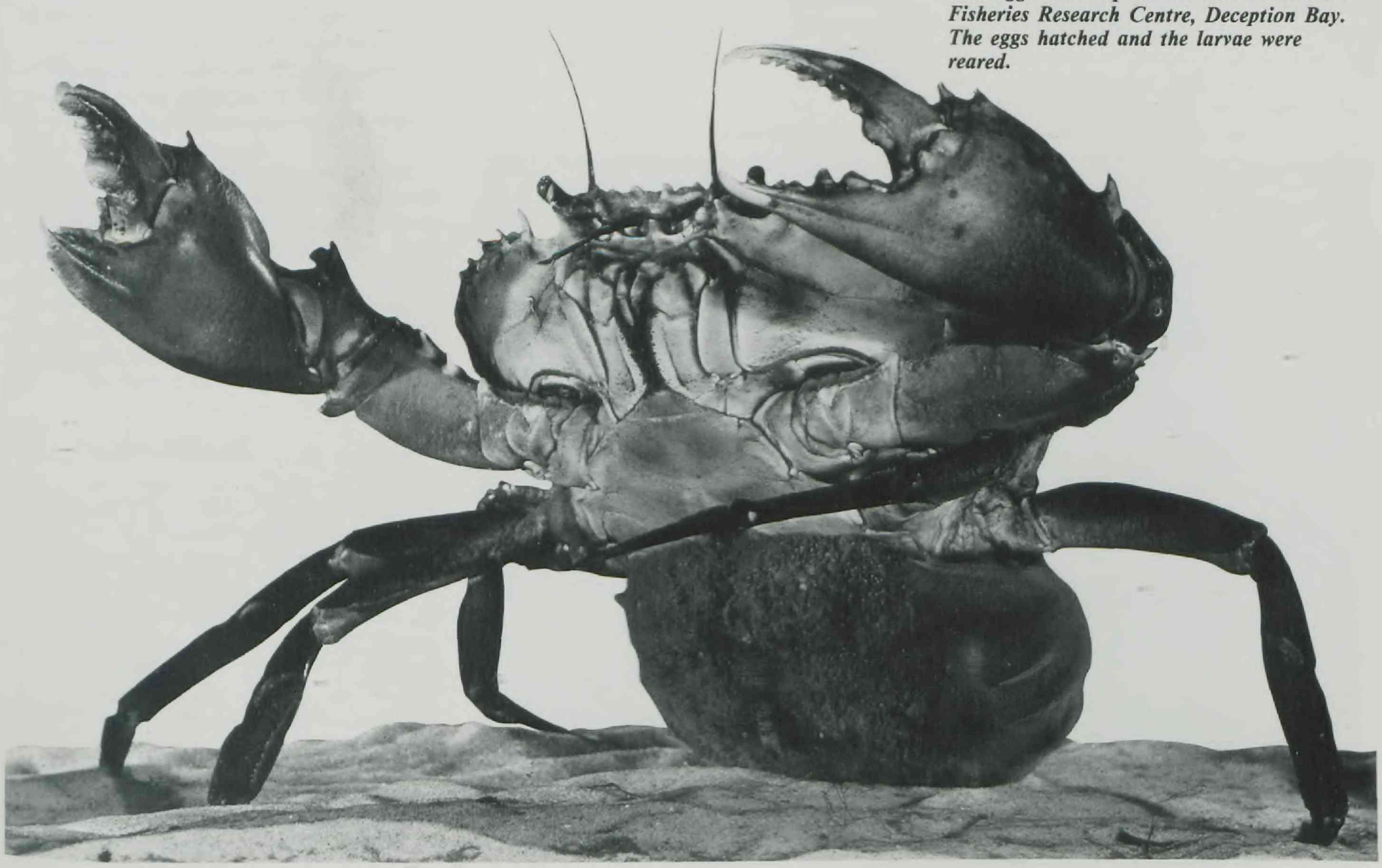
Experiments showed that juvenile Barramundi can be acclimatised from salt water to fresh water in as little as 6 hours (compared to 24 hours previously). This will increase the efficiency of commercial hatcheries when preparing fish for stocking.

A three-year recreational fishing survey began in the Lakefield National Park. The survey is providing valuable information on levels of recreational fishing effort and catches for comparison with similar information from commercial fishermen.

An experimental fish-attracting device (FAD), installed near Bundaberg, successfully attracted pelagic and demersal species including mackeral, black king and red emperor. Recreational fishermen reported good catches near the device.

A fishladder incorporated into a tidal barrage across the Burnett River near Bundaberg was found to allow upstream movements of many adult fishes but severely limit juvenile fish migrations. The ladder design requires the fish to jump up a series of steps.

Female mud crabs carrying eggs are an unusual sight because they move out to sea and are seldom seen. Female mud crabs with eggs were kept at the DPI's Southern Fisheries Research Centre, Deception Bay. The eggs hatched and the larvae were reared.



Commercial fisheries

Torres Strait prawn species were studied using the research vessel *Lumaigul*. Twelve percent of the 20 000 brown tiger prawns tagged in 1987 were returned providing valuable information on their growth rates and movements. After this initial success, a further 10 000 tagged tiger prawns (two species) were released in January. After extensive surveys, the extent and quality of Torres Strait prawn-nursery habitats were identified.

A review of the Moreton Bay prawn fishery was completed to give fishery managers a description of this complex fishery and a summary of the available biological information on penaeid prawns in the Bay.

Red-spot king-prawn stock dynamics are being monitored off central Queensland through fishermen's catch and effort information. No evidence of overfishing exists, despite 1988 catch rates being well below those of 1986-87. A detailed two-year study of by-catch revealed few true coral reef species were taken in the trawls.

Seagrass communities in Moreton Bay were surveyed and mapped. Several seagrass meadows in the Bay have declined because of adjacent foreshore development. But large-scale recovery of seagrass was evident in Deception Bay, where seagrass almost completely disappeared during the 1970s. Seagrass habitats, providing valuable nursery areas for prawn and fish species, are predominantly intertidal and considered highly susceptible to the effects of coastal development.

In north Queensland, studies confirmed that seagrass beds associated with coral reef islands provide nursery grounds for at least three commercial prawn species. Meanwhile, nearly 80 fish species have been identified in coastal seagrass beds. The new relocatable 'Sealab' was providing an ideal research platform for detailed seagrass studies in Trinity Inlet.

An east-coast gill-net fishery study found that the current management plan (in force since 1981) needed 'fine-tuning' to achieve its goals. New management initiatives were being considered by industry and the Queensland Fish Management Authority.

Tripcony Bight, looking west across Goat Island to the Glasshouse Mountains. This area is part of the Pumicestone Passage Marine Park and Fish Habitat Reserve, and is a valuable, shallow, tidal seagrass and mangrove wetland habitat.

Threadfin salmon biology studies revealed that the several species comprising the fishery follow complicated life cycles. They were found to be long-lived, undergo sex changes as adults, and begin breeding when they are quite old. The king salmon, *Polynemus sheridani*, exhibits rapid growth similar to barramundi.

Reproductive biology of yellowfin tuna has been studied using fish caught on Japanese longline and handline vessels. The fish appear to spawn from October through to late summer, in the north-western and central Coral Sea. Spawning most frequently occurs when the tuna aggregate in the Coral Sea adjacent to Cairns during full moon in October and November.

Studies of coconut crab growth, exploitation and recruitment were studied by DPI officers cooperating with fisheries personnel in the Republic of Vanuatu. Very slow growth, infrequent and sporadic recruitment, destruction of habitat and overharvesting are causing their population decline. The crabs reach marketable size after about 12 years and juveniles enter the stock only once or twice a decade. Local quotas and replenishment areas have been suggested as management strategies.

Marketed spanner crabs were sampled for cadmium levels in body muscle tissue. Handling crabs poorly may cause leaching of by-products from the digestive gland into the muscle cavities, which in turn may cause increased cadmium levels in muscle tissue. The cadmium is believed to come from a natural source.

Scallop catch rates have been very low for the last decade, and some concern exists that the stock may be overfished. Studies show that artificial spat catchers hold little promise as ways of either monitoring spawning levels or enhancing scallop stocks. A study incorporating the tagging of scallops and underwater video observations indicated that trawling over scallop beds may kill many juvenile scallops.

Ciguatera researchers have made significant advances in finding a way to detect toxic fish. Poisonous fish from south Pacific countries and rare ciguatoxin-like compounds donated by overseas laboratories were helping develop antibodies that will be used to develop the test.

A survey of 125 commercial fishermen was conducted to obtain the industry's views on important areas for research in Queensland's fisheries. The results show that commercial fishermen are mainly concerned about destruction of fisheries habitats, the benefits of seasonal closures, and better communication between researchers and fishermen.

A cost model for the otter trawl fishery in southern Queensland is being developed. This project will determine the fixed and variable costs of operating trawlers in Queensland. In conjunction with this project, a fuel-efficiency study of otter trawlers is being conducted. Preliminary results show that trawlers can save fuel by modifying vessels, fishing gear and operating methods.

Mangroves function as a nursery area for many species of commercially and recreationally important fish, a survey indicated. Many predatory fish present in open estuarine waters are absent from mangrove areas, which appear to offer protection or 'sanctuary' for juveniles. When completed, this study will provide the first Australian quantitative data on the value of mangroves to fisheries.

A DPI fisheries technician checks the growth of a culture of the ciguatera-causing organism, *Gambierdiscus toxicus.* ***Various strains of the organism are cultured in an effort to isolate the ciguatoxin for antibody studies. The development of an antibody will allow rapid determination of whether a fish is ciguatoxic.***

■ Aquaculture

Many enquiries were received from potential participants about Queensland's aquaculture industry. A north Queensland freshwater crayfish red claw (*Cherax quadricarinatus*) generated much interest. It is being studied at the DPI's Walkamin laboratory and was found to have attributes making it ideal for intensive culture.

More than one million barramundi fingerlings were produced, with the production of plate-size fish being between 70 to 80 t. The emerging barramundi aquaculture industry has quickly adopted DPI-developed dietary supplementation techniques, allowing large numbers of fingerlings to survive.

Small numbers of juvenile mud crabs were successfully raised in a pilot hatchery project. This was despite a delayed breeding season and unseasonally low temperatures during February and March.

■ Fishery management support

Management controls on collection areas and size-limitations were introduced to allow trochus shell to maintain stocks in the long term. Pearl culture has been rationalised by restricting the use of harvested shell to registered pearl farms.

Discussions with industry representatives led to a review of techniques for bait-worm collection. Techniques exist for minimising the impact of worm collection in inter-tidal lands. A limit was placed on the number of permits issued for the commercial collection of beach worms at Fraser Island.

A limit on the issue of new permits for the taking of marine aquarium fish for sale was implemented in January 1988. The industry has agreed to a new monitoring programme, requiring each collector to submit catch returns.

The Queensland Fish Management Authority requested that a compulsory logbook programme be introduced for all vessels in Queensland commercial fisheries. The logbooks were introduced in January 1988. The information fishermen provide includes the quantity of each species landed, fishing effort and location where fishing occurred. An on-line computerised information system was developed to store and retrieve this information. The database will help determine trends on how stock is responding to fishing pressure.

Many proposals for coastal development have been reviewed in terms of their likely impacts on fisheries and fish habitat. Where appropriate, detailed environmental impact studies were assessed before DPI comments on each proposal were provided.

Marketing and economics highlights

Royal Commission

The Royal Commission into Grain Storage, Handling and Transport, established in 1986 by the Commonwealth and the five mainland States, submitted its three-volume report to the Queensland Governor in February 1988.

The Commission recommended major changes to the current arrangements, including substantial deregulation. The DPI's Division of Marketing is coordinating the report's assessment for the Queensland Government.

IAC wheat inquiry

In July 1987 a submission, on the Queensland Government's behalf, was made to the Industries Assistance Commission inquiry into the wheat industry. The IAC's report in February 1988 recommended reduced Australian Wheat Board control of domestic and export marketing. The DPI's Division of Marketing participated in a Standing Committee on Agriculture working party to consider the report.

DPI regional agricultural economists monitor the profitability of rural enterprises and provide valuable business management advice to producers. Here, the DPI's Dalby agricultural economist and a cotton farmer discuss the farmer's financial results.

IAC tobacco inquiry

Evidence was presented on behalf of the Queensland Government in response to the Commission's draft report on production and marketing arrangements that would apply after the 1988 tobacco season.

The Commonwealth Minister for Primary Industries advised that the general tariff rate on imported leaf would be replaced by an *ad valorem* rate of 15% by 1 July 1992 and that the concessional tariff, which supports local content arrangements, would end on 1 July 1993. The Australian Tobacco Board would cease at the end of a further stabilisation period.

Financial counselling

Financial counselling featured in the DPI's first interactive satellite television programme. Interviews with producers were pre-recorded, and a studio panel responded to enquiries from counsellors and invited agribusiness leaders, bankers and industry representatives gathered at eight TAFE colleges throughout the State.

Drought assistance

At the Minister's direction, a report was prepared on 'Drought problems in Queensland—the need for continuing assistance'. The report outlines the impact of continued drought and low commodity prices on producers' financial positions; notes the major regions affected by drought; and summarises assistance measures.

Rural debt kit

A booklet entitled *Understanding and managing rural debt* was prepared for the Queensland Producers' Federation and widely distributed to complement the farm financial counselling service. It contains information on financial management, types of financial help and contacts for further advice.

Director workshops

DPI officers, in conjunction with the Council of Agriculture and the Co-operative Federation of Queensland, ran a series of one-day workshops for directors and senior management of statutory marketing boards and rural co-operatives. The objectives were to help participants to understand their role and responsibilities, especially the legal aspects, and to improve usage of boardroom reports, particularly financial statements.

Research and extension

The DPI's Division of Marketing expanded its marketing research and extension thrust. Activities included more than 20 research projects, business plans for DPI branches and dissemination of market intelligence information.

Industry and research funding organisations helped meet costs of several research projects. The Committee of Direction of Fruit Marketing (COD) funded work to identify attributes of vegetables important to Australian consumers and develop marketing strategies for each commodity. The COD also provided funds to assess the market environment for bananas and develop market-promotion options.

Market development work for mangoes, custard apples, and lychees was helped by funds from Sunshine Coast lychee growers and the COD.

Diversification options

Alternative farming activities open to rural producers in Queensland were compiled into a book to be released in the second half of 1988. The DPI identified these new opportunities as possible ways to offset adverse marketing pressures on traditional rural industries.

Export tree-crop project

In collaboration with the Papua New Guinea Department of Agriculture and Livestock and industry organisations, the DPI completed a 3-year agro-economic study of the largeholder sectors of the Papua New Guinea coffee, cocoa and coconut industries. An ACIAR-funded project, the study tested and evaluated alternative data collection and analytical techniques appropriate for monitoring industry production and costs in Papua New Guinea. The project also yielded valuable information on production costs, industry location, type of plantation ownership, yields, age of trees, varieties and agronomic practices.

Sugar-horticulture project

A major project examined the profitability of sugar-cane farms and evaluated the profitability of diversification into horticultural crops in the Bundaberg, Mackay, Burdekin and far north regions. Results indicate that new cane-production technologies can enhance profitability. For growers with unassigned land, roaming of sugar-cane is likely to be profitable. However, diversification into horticultural crops may also be profitable if growers maintain a high management level. For growers without additional land, horticultural crops on fallowed sugar-cane land are risky propositions unless growers have a high management level.

Coffee evaluation

The DPI evaluated the likely profitability of Arabica coffee plantations in far north Queensland. Current financial estimates and cropping technology indicate that coffee should be considered a speculative enterprise. Research to increase commercial yields through improved production practices, varieties, harvesting and processing was proceeding.

Software publication

A new edition of the DPI book, *Inventory of Agriculturally Oriented Software in Australia and New Zealand*, was published. It contains extensive details on more than 300 agricultural software packages for primary producers, extension officers, agricultural consultants, researchers, teachers and students.

The DPI helped establish an agricultural software library at the South Burnett TAFE College so that farmers can gain 'hands-on' experience with software packages on personal computers. A second library was planned for the Bundaberg TAFE college.

DPI officers helped TAFE QNET (now TSN-11) produce two television programmes—*Computer Talk* and *Rural Computing*—to explain on-farm computer applications. In both programmes, farmers using microcomputers on their own properties gave first-hand reports.

To communicate with producers in remote areas, DPI staff participated in TSN-11 (TAFE-QNET) telecasts. These telecasts included a 'talk-back' segment allowing producers to obtain professional advice from the studio panel.

Industry surveys

Industry organisations requested economic surveys of the chicken-meat and peanut industries. The chicken-meat survey updated the industry's cost base, which is used in negotiations between growers and processors to establish growing fees. The peanut survey provided cost and returns for the Peanut Marketing Board to assess the impact of changing economic conditions. This information gives a better understanding of growers' debts and helps in preparing industry submissions.

Livestock modelling

Stocking-rate policies that ensure profitable and sustainable production were identified in several projects. A computer model, based on soil water balance and historical rainfall records, was analysing risks associated with higher sheep stocking rates in south-west Queensland. At Charters Towers, another study was monitoring the relationship between economic performance and stocking rates for beef-producing properties. A computer package for beef enterprises was predicting the effects on property income from varying branding rate, growth rate and age of turnoff. With this package, individual producers can analyse herd structure, cash flow and taxation position for up to 10 years and identify likely effects of different management strategies.

Whole farm analysis

In the Central Highlands, whole-farm business analysis provides valuable management information for 30 participating producers, including comparative enterprise costs, returns and farm overheads for beef, dryland grain and irrigated properties in the Dingo, Capella, Springsure, and Emerald Irrigation areas. The DPI's regional economist at Emerald helps the producers interpret individual farm results as a way of improving farm profitability.

BTEC campaign

DPI agricultural economists continued to help individual producers understand and plan for involvement in BTEC, plan requirements for different forms of financial assistance, and develop alternative disease-control strategies. Other work included assessing the implications of proposed BTEC policy changes.

Export inspection

Dry conditions adversely affected Queensland grain exports. Bulk wheat, barley and sorghum exports fell by 1.246m t to 1.08m t in 1987-88.

Fruit and vegetable exports increased by 5030 t to 19 074 t in 1987-88. Exports increased for all classes of produce. Export of ornamental plants and cut flowers trebled to more than 2m packages. Citrus exports rose from 4458 t to 5401 t.

Grade standards

Changes in export inspection procedures, including stringent inspection of cucurbits bound for New Zealand, greatly increased the inspectorial workload and resulted in exporters having to pay for the inspection service.

Orders under the Export Control Act were introduced to control the exporting of fruit and vegetables and to enable export-grade standards to be introduced. Grade standards for a number of commodities were introduced.

Chemical services

Organochlorine insecticides for agricultural use were deregistered and removed from the Queensland market. The DPI's Agricultural Standards Branch participated in the departmental programme to recall unregistered organochlorine insecticide products from farms and to deal with registration-related activities, including registration cancellations, labelling modifications and listing recalled products.

A Green Paper on the need for legislative controls over the use of agricultural and veterinary chemicals was released to prepare for the legislation's introduction later in 1988. At the request of Co-ordinating Committee on Agricultural Chemicals, the DPI co-ordinated a review of all uses of agricultural and veterinary chemicals in Australia to ensure uniformity of maximum residue limits and withholding periods, and to help administer the proposed legislation.

A Darling Downs extension project, 'Spray Safe-Spray Sure', involving DPI officers and the Cotton Marketing Board, was undertaken to reduce chemical spray-drift damage to crops near large plantings of cotton.

Examinations involving 220 applicants for commercial operators licences and 20 applicants for pilot chemical rating licences were held at centres around Queensland. Eight applications for permits to distribute certain restricted herbicides in hazardous areas were received and, after inspection of the areas, were approved. Thirty-eight complaints of damage were investigated, compared with 31 in 1986-87.

A total of 3201 applications for registration of agricultural chemicals were received, an increase of 166 on the number for 1986-87. Applications for initial registrations increased by 430 (44%), including transfers of registrations to new owners.

The Technical Committee on Agricultural Chemicals (TCAC) issued clearances for 59 new agricultural chemicals. Health aspects of agricultural and veterinary chemicals continued to be reviewed in liaison with the National Health and Medical Research Council. Backlogs within the TCAC federal secretariat continued to delay the issuing of clearances.

The INFOPEST database was expanded to generate reference handbooks on control of insects and diseases in (a) field crops, forage crops and pasture and (b) annual vegetable and fruit crops. Work proceeded towards publication of handbooks on weed control in horticultural and agricultural crops.

A new database VETMED was developed for the registered uses of veterinary medicines.

The ACDC database was upgraded to an online system to help administer commercial operators licences.

Seed certification

The area registered for certified seed production increased by 440 ha, owing mainly to increased sunflower plantings from 78 ha in 1986-87 to 523 ha in 1987-88.

Oat seed planted for certification decreased to 44 ha compared with 180 ha in 1986-87 and 452 ha in 1985-86, owing to a shift from certified to approved seed production and some carryover seed.

Mung beans were certified for the first time in 1987-88.

Production of certified pasture seed decreased from 141 t to 96 t, owing mainly to carryover stocks of callide rhodes grass.

Seven independent seed certification officers were appointed to undertake seed-certification inspections under the Agricultural Standards Act.

Seed testing

The number of seed samples tested at the Brisbane, Toowoomba and Mareeba laboratories increased from 8 043 in 1986-87 to 8838 in 1987-88.

A computerised SEEDTEST system was developed for entering and retrieving seed-testing data, including production of both seed-analysis reports and invoices. This system will speed responses to enquiries for results and progress of tests, and will yield a variety of statistics to aid managerial and regulatory functions.

A technique that uses gel electrophoresis was developed to distinguish between the seeds of several *Sida* species.

During their first 15 months of operation, DPI farm financial counsellors helped about 900 farmers who were in financial difficulty or who were concerned about their financial situations. They helped farmers analyse their financial positions and consider the advantages and disadvantages of options in retaining their livelihoods.

Significant deregulation of grain movement has been recommended by the Royal Commission into grain storage, handling and transport. The DPI's Division of Marketing is coordinating the assessment of the Commission's report for the Queensland Government.

Finance

CONSOLIDATED REVENUE FUND

	1986-87 $	1987-88 $
Department of Primary Industries		
Salaries	61 642 883	63 432 369
Contingencies	62 130 418	54 382 430
Payment authorised by special act		
Grant in aid of the Banana Industry Fund	158 604	115 202
Total	**123 931 905**	**117 930 001**

Costs associated with Commonwealth-State Bovine Brucellosis and Tuberculosis Eradication Programme were:

	1986-87 $	1987-88 $
Eradication	11 996 000	12 993 000
Compensation Payments	16 434 000	6 242 000
Additional Assistance	994 000	2 580 000
Total	**29 424 000**	**21 815 000**

TRUST AND SPECIAL FUNDS

	1986-87 $	1987-88 $
Department of Primary Industries Special Standing Fund	20 887 480*	30 067 015†
Banana Industry Fund	266 473	278 629
‡Commonwealth Poultry Industry Assistance Fund	1 036 862	78 191
Commonwealth Quarantine and Export Inspections Fund	4 584 457	4 526 891
Commonwealth Rural Industry Grants Fund	4 266 705	4 876 028
Fisheries Research Fund	373 998	454 284
Meat Inspection Account	3 648 704	3 607 786
Poultry Industry Fund	966 296	1 026 135
Stock Disease Compensation and Stock Improvement Fund	34 433	26 990
Sugar Cane Prices Fund	2 157 953	2 165 609
Swine Compensation Fund	621	NIL
Total	**38 223 982**	**47 107 558**

* Includes $9,948,197 on account of the Disaster Assistance Scheme and $805,448 on account of the Queensland Fish Board.

† Includes $14,041,639 on account of the Disaster Assistance Scheme and $741,383 on account of the Queensland Fish Board.

‡ This Fund is inactive from 1 July 1988.

LOAN FUND

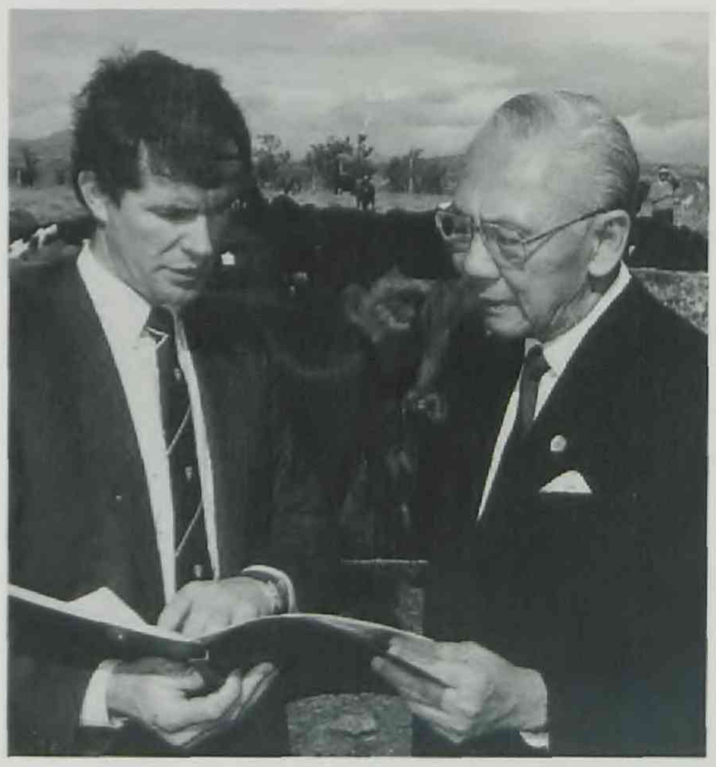
Expenditure of $210,000 was incurred through the Loan Fund to 30 June 1988.

■ Upgrading continues

The DPI's computerised accounting system continued to be upgraded with the development of a new revenue-collection system being completed.

These developments are part of a continuous programme to enhance and expand the DPI's accounting system, enabling its Accounts Branch to provide higher-quality accounting information.

Departmental expenditure from the various funds is shown on this page.



At the DPI's Warrill View Research Station, near Ipswich, Thailand's Deputy Prime Minister, Mr Bhichai Rattakul, talks to Mr Paul McMahon, of AFS Breeding Services, about the potential for exporting AFS cattle to the developing Thai dairy industry. The Deputy Prime Minister was on a fact-finding mission to Australia in July 1987. AFS Breeding Services is working closely with the DPI to market and promote the AFS breed.