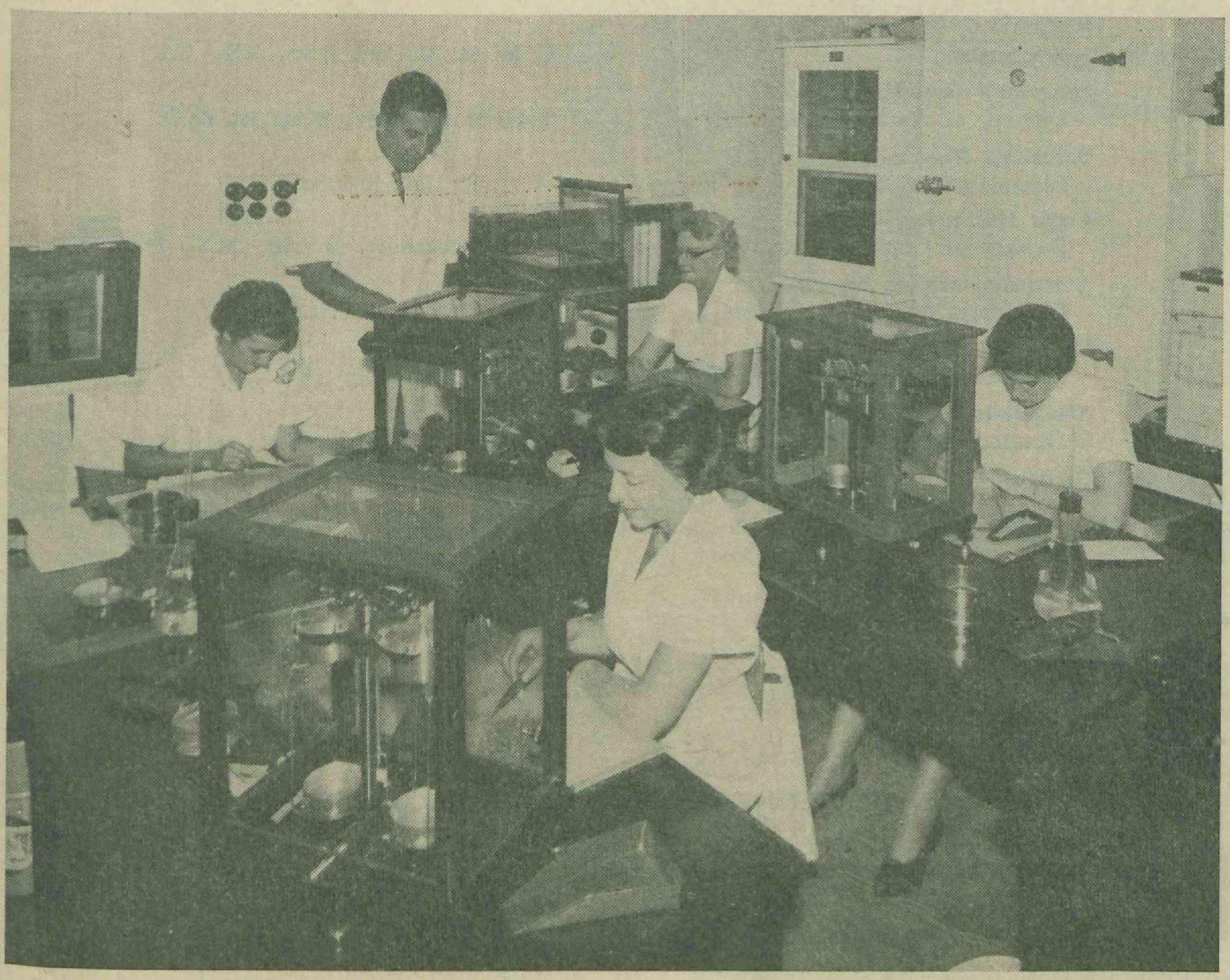
ANNUAL REPORT, 1965-66

Queensland Department of Primary Industries



A Section of the Department's Seed Testing Station

Presented to Parliament by Command

A. 26—1966

ORGANISATION OF THE DEPARTMENT AS AT 30th JUNE, 1966

MINISTER FOR PRIMARY INDUSTRIES .. Hon. J. A. Row, M.L.A.

CENTRAL ADMINISTRATION AND CLERICAL AND GENERAL DIVISION—

Director-General and Under Secretary .. J. M. Harvey, D.Sc., F.R.A.C.I.
Deputy Director-General .. .. .. A. A. Ross, M.Agr.Sc.
Chief Advisory Officer (Administration) .. C. L. Harris, A.A.S.A.
Assistant Under Secretary .. .. .. H. Barnes
Director, Information and Extension Training Branch .. .. C. W. Winders, B.Sc.Agr.
Accountant .. .. E. C. R. Sadler, A.A.U.Q.

DIVISION OF ANIMAL INDUSTRY—

Director of the Division .. .. .. A. L. Clay, B.V.Sc.
Deputy Director .. .. C. R. Mulhearn, B.V.Sc.

Animal Research Institute—

Director of Veterinary Research .. .. J. W. Ryley, B.V.Sc.

Biochemical Branch—

Biochemist .. .. C. W. R. McCray, B.Sc., A.R.A.C.I.

Husbandry Research Branch—

Director of Husbandry Research .. .. J. G. Morris, B.Sc., B.Agr.Sc., Ph.D.

Pathology Branch—

Director of the Branch .. .. .. W. T. K. Hall, M.V.Sc.

Cattle Husbandry Branch—

Director of Cattle Husbandry .. .. G. I. Alexander, B.V.Sc., M.S., Ph.D.

Veterinary Services Branch—

Director of Veterinary Services .. .. L. G. Newton, B.V.Sc.

Sheep and Wool Branch—

Director of Sheep Husbandry .. .. A. T. Bell, B.V.Sc.

Slaughtering and Meat Inspection Branch—

Director of the Branch .. .. .. B. Parkinson, B.V.Sc.

Sections—

Poultry Husbandry (F. N. J. Milne, B.Sc., Chief Poultry Husbandry Officer); Pig Husbandry (F. Bostock, Senior Pig Husbandry Officer).

DIVISION OF DAIRYING—

Director of Dairying .. .. E. B. Rice, Dip.Ind.Chem., M.Inst.Biol.

Field Services Branch—

Director of Field Services .. .. .. W. D. Mitchell, B.Agr.Sc.

Research Branch—

Director of Research .. .. V. R. Smythe, M.Agr.Sc.

DIVISION OF DEVELOPMENT PLANNING AND SOIL CONSERVATION—

Director .. .. J. E. Ladewig, B.Sc.Agr.

Development Planning Section—

Chief Development Planning Officer .. A. Hegarty, B.Sc.

Soil Conservation Section—

Chief Soil Conservationist .. .. .. J. Rosser, B.Agr.Sc.

DIVISION OF MARKETING—

Director of Marketing .. .. .. D. P. Lapidge, B.Com., A.A.U.Q.
Assistant Director of Marketing .. .. E. O. Burns, B.Com., A.A.C.A., A.A.S.A.

Economics Research Branch—

Director of Economic Services .. .. E. O. Burns

Marketing Services Branch—

Director of Marketing Services .. .. D. R. Lewis, B.Sc.(Econ.)

Standards Branch—

Director of Agricultural Standards .. .. A. C. Peel, Dip.Ind.Chem., A.R.A.C.I.

DIVISION OF PLANT INDUSTRY—

Director of the Division .. .. .. L. G. Miles, B.Sc.Agr., Ph.D.

Agriculture Branch—

Director of Agriculture .. .. .. S. Marriott, B.Sc.Agr.

Horticulture Branch—

Director of Horticulture .. .. .. J. H. Smith, N.D.A., M.Sc.

Agricultural Chemical Laboratory Branch—

Director of the Branch .. .. .. W. J. Cartmill, M.Sc., A.R.A.C.I.

Food Preservation Research Branch—

Director of the Branch .. .. .. S. A. Trout, M.Sc., Ph.D., F.R.A.C.I.

Sections—

Botany (S. L. Everist, B.Sc., Government Botanist); Entomology (W. A. McDougall, D.Sc., Government Entomologist; A. R. Brimblecombe, M.Sc., Ph.D., Deputy Government Entomologist); Plant Pathology (B. L. Oxenham, B.Agr.Sc., Government Plant Pathologist).

REPORT OF THE DEPARTMENT OF PRIMARY INDUSTRIES FOR THE YEAR 1965–66

To the Honourable the Minister for Primary Industries

SIR,

I have the honour to submit the following report on the operations of the Department of Primary Industries for the year ended June 30, 1966. The Permanent Head of the Department up to October 12, 1965, was the late W. J. S. Sloan, and my occupancy of the position of Director-General dates from that time.

The report opens with some comments and observations by myself on items of general interest. These are followed by a pictorial record of the Department's work, a survey of conditions in the main rural industries during 1965-66 and a summary of the Department's operations during the year. Because of the extremely wide range of Departmental activities and the multitude of projects in progress, it is practicable only to give an outline of the work undertaken and results achieved.

Yours faithfully,

J. M. HARVEY,

Director-General.

DIRECTOR-GENERAL'S VIEWS AND COMMENTS

. . . AND STILL MORE DROUGHT

The drought experienced in Queensland in 1965 was one of the most severe, widespread and devastating ever recorded. In western areas from Bedourie to Urandangie it was a continuation of severe drought in 1964, and in the far south-west was the culmination of many years of drought and semi-drought conditions. Fortunately, planting rains suitable for winter cereals were received and reasonably satisfactory harvests were made.

At the beginning of July 1965 almost the entire area south of the 20th parallel and west of the Great Dividing Range was drought-stricken, and in the pastoral regions only the Gulf, Peninsula and limited southern areas had favourable conditions.

Heavy rains in July brought relief to south-eastern and central coastal areas, but the accompanying low temperatures caused heavy losses in recently shorn sheep and in weak cattle. These rains were too late for wheat planting in some areas, but barley was widely substituted. Scattered rains brought relief to limited areas during the following months, but general rains did not occur until November/December, and these missed the south-west and some other districts. These drought-breaking rains enabled summer crops to be planted, and follow-up rains in most agricultural areas assured good harvests.

In the pastoral areas, hot, dry conditions in February/March dried up pastures, and surface water supplies diminished rapidly. Useful falls of rain for pasture were not experienced in most districts until early June.

Estimates show stock reductions in the year to March 31, 1966, as: cattle 500,000, sheep 5,620,000. Other short-term effects of the drought were the premature slaughter of many animals, including dairy cattle, for salvage value, and heavy losses of newborn calves and lambs. Dairy production suffered severely, percentage decreases on the previous year, itself partly a drought year, being butter 5%, cheese 8%.

Winter crop plantings and production were about 15 and 27% respectively lower than in the previous season, which was a record for both plantings and yield. Summer grain production, on the other hand, is expected to be half as much again as the 1965 harvest, which was affected by drought in the first half of 1965.

STABILISATION SCHEMES

In last year's report, reference was made to price stabilisation measures proposed for tobacco leaf and wool.

The tobacco leaf stabilisation scheme was given legislative backing by the Federal, Queensland and Victorian Parliaments during the year, and complementary legislation is expected to be introduced in New South Wales.

The stabilisation scheme involves the issue of marketing quotas to all growers and this has been carried out in Queensland by a statutory Tobacco Quota Committee. An Appeals Tribunal has been set up to deal with appeals by aggrieved growers.

The advantages of the scheme became evident at the early Queensland leaf sales. Of 11,282,735 lb. of quota leaf offered for sale at the first three Mareeba sales, 11,214,177 lb. was sold at an average price of 115·4 cents per lb. During the first series of Brisbane sales in May, a total of 1,458,197 lb. of quota leaf from an offering of 1,466,256 lb. was sold at an average price of 117·5 cents per lb. The average price for the State's 1965 disposals was 95·7 cents.

Proposals for a conservative reserve price plan for wool were submitted by the Federal Government to a referendum of woolgrowers in December, 1965. The proposals were not acceptable to a majority of voters. The preponderance of "no" votes in New South Wales and South Australia was the deciding factor. Queensland growers voted 3,235 to 2,947 in favour of the plan.

Legislation aimed at equalising returns for eggs as between the domestic market and the much less remunerative export market came into operation throughout Australia on July 1, 1965. The legislation provides for the collection of a levy on all commercial egg-producing flocks, excluding the first 20 birds in any flock. The levy is used to equalise returns. The Queensland poultry industry as a whole probably stands to gain more from the scheme than farmers in other States because of the high proportion of Queensland production exported. However, northern growers, who produce only for the local market, are greatly disadvantaged by the scheme and a case for their relief has been presented.

MENACE OF EXOTIC DISEASES

It was discovered in November that cows in the Mount Crosby area, close to Brisbane, had been inseminated with semen introduced without permission from an artificial breeding centre in Canada. This raised the possibility of bluetongue virus having been introduced to Australia and an immediate examination of the implication was made.

A Commonwealth Veterinary Consulative Committee was called together and on its recommendation drastic slaughter-out action was taken. All ruminants, comprising 723 bovines and 2 goats, within a 1½ mile radius from the point of use of the semen were removed for slaughter. This and the fogging of the area to destroy possible insect vectors were virtually completed within 4 days. The fogging was done by an Army detachment under the direction of scientists of C.S.I.R.O. and the Queensland Medical Research Institute.

Meatworks paid $25,000 for the stock slaughtered and owners received in addition compensation and stock transport charges totalling $51,000.

Material submitted to South African authorities was reported later not to reveal any evidence of bluetongue. However, the risk of disastrous consequences to the Australian sheep industry could not be accepted pending a negative report and the slaughter-out action taken had the full agreement of Commonwealth and State authorities.

Early in 1966, the Animal Research Institute isolated the virus of Newcastle disease from chickens from flocks at Hemmant and Belmont, in the Brisbane area. This disease was believed not to be present in Australia and its discovery was viewed with concern throughout Australia. Surveys to determine the incidence of the disease in Queensland, and to ascertain whether it was present in other States also, were undertaken. Apart from one possibly non-specific positive reaction from a Mount Morgan flock, all the positive reactors in Queensland tests came from 14 Brisbane flocks. The presence of the disease was detected in other parts of Australia.

Fortunately, the strain of virus causing the disease is a weak one and it was agreed that drastic action to eliminate the disease from the various outbreak areas in Australia was not warranted.

PLEUROPNEUMONIA AREA RECEDING

Queensland veterinary services achieved a notable feat by completing the first year free of evidence of bovine contagious pleuropneumonia since this disease was introduced into the State late last century.

No conclusive evidence of the disease was found in 1965 or to date in 1966, despite an extensive field campaign and examination of lungs of slaughtered animals plus testing of tens of thousands of blood samples.

The present improved state is the result of many years of work, which commenced in 1951 with compulsory inoculation of store cattle before movement. In 1954 an eradication campaign on a State-wide basis was launched; this was expanded in 1960 into a national campaign supported by all mainland States and the Commonwealth Government.

To speed up eradication, a mobile laboratory was put in the field in 1964 to blood-test animals at the crush side. Results are available in a few hours and reactors may be autopsied or consigned to slaughter and healthy animals released.

To date, practically the entire area south of the Great Northern Railway line and east of the western and Kynuna dingo fences is a pleuro-free protected area. Similar protection applies to much of the Peninsula also.

It is hoped to include all other areas south of the Great Northern Railway line in protected areas by the end of the year. This will enable future efforts to be concentrated on freeing the Gulf and north-west from the disease.

RESISTANT TICKS

The problem of resistance of strains of ticks to one or more of the common tickicides has been with us for some time. Resistance to arsenic was countered by the use of DDT, and DDT-resistant strains have in general proved susceptible to newer tickicides. But even though an alternative tickicide has usually been available for the recharging of dips, such recharging has imposed considerable expense upon the dip owner. Further, to contain susceptible strains of ticks within their outbreak areas, great care has had to be taken in the supervision of stock movements.

In the past year, a most disturbing situation has arisen with the discovery of a strain of ticks clearly resistant to all organophosphorus tickicides. Following the discovery of this resistant strain in the Esk area, a comprehensive survey of ticks on 175 properties in the area was made. The presence of highly or moderately resistant ticks was confirmed on over 20 properties.

BETTER BULLS

During the past year, the Department completed its first 10 years of proving dairy bulls for use in commercial artificial insemination. The project has involved selecting young bulls of various breeds on the basis of production backing of sires and dams, using artificial insemination to produce a large batch of daughters of each bull, measuring the productivity of the daughters, and rating the bulls on their ability to improve production of a herd.

The result of the first 10 years of bull proving is that the Department's Artificial Insemination Centre has on its strength five A.I. proven Jersey and two A.I. proven A.I.S. bulls. A further 13 bulls of these breeds will be proven or potentially proven by the end of 1966. The stage is now set for the testing of sons of the A.I. proven bulls and this will be commenced in 1967.

In view of the increasing importance of the Friesian breed, steps have been taken to include bulls of this breed in the proving scheme.

DEVELOPMENT PLANNING

Various Branches of the Department, and in particular the Development Planning Branch, had an extremely busy year working on various development projects in association with the Department of Lands and the Department of Irrigation and Water Supply.

Departmental officers participated in the preparation of property development plans in Areas I and II of the Fitzroy Basin Land Development Scheme, and 80 such plans in various stages of completion have been dealt with. Land capability assessments currently are being undertaken for over 2 million acres in Area III. Property budgets also have been prepared for Area III as a guide to financial requirements, both Government and private.

Co-ordination of Departmental surveys and reports on various development projects included the Emerald Irrigation Project, the Kolan-Burnett Irrigation Project, the St. George Irrigation Extension, and the Bowen-Broken River Irrigation Project. The gross area of irrigation land involved in these projects is over 140,000 acres.

PROGRESS ON THE WALLUM

Back in 1957, the late Arthur F. Bell said of the wallum lands: "At present they are wastelands but some day, after a lot more soil and plant research, they will be a food bowl for the then great metropolis of Brisbane".

Only 7 years later, fat cattle were being sold off pasture paddocks of commercial size established on wet heath areas of the Department's Coolum Research Station. Further, the techniques for land preparation and the plant nutrition systems developed in the investigational programme are being applied in several large privately operated projects along the coast.

One 40-acre area of pangola grass and lotononis at Coolum is now carrying its third group of steers, and stocking rate has improved from 1 to 1·6 acres in 1964 to 1 to 1·1 acres in 1966. Liveweight gains vary from ½ to 2½ lb. per day in the summer months; weights are static in the late winter/early spring, but net gain is round about 1 lb. per day over the whole year.

Improved pastures based on tropical legumes have been developed without difficulty on the ridge country on the station following partial clearing and use of basic fertilizers.

The emphasis at present is on beef production from the wallum country, but as experience in manipulating the soils is gained, the "food bowl" in its wider sense could become a reality.

PROGRESS IN PASTURE IMPROVEMENT

As might be expected, Queensland is far behind the more climatically favoured States in acreage of sown pastures and in quantity of artificial fertilizers used on pastures. Nevertheless, we are advancing on both fronts and but for the drought might have expected spectacular increases during 1965-66.

In 1964-65, plantings of 15,000 acres brought the Queensland total of area under sown pastures to 3·44 million acres. The average annual sowings in the five-year period to 1964-65 were nearly 27,000 acres and the increase over 1959-60 was nearly 63%. The only State with a better percentage improvement was South Australia.

Queensland farmers and graziers used fertilizer on only 88,000 acres of pasture in 1964-65. As the Australian total was nearly 38 million acres, the Queensland figure on the face of it is not an impressive one. There are many factors which give the other States an advantage in the use of fertilizers on pastures. One is that the legume content of their pastures assures them of a response to the cheapest fertilizer, superphosphate. Another is the development of aerial topdressing facilities. On both scores we can expect some improvement in Queensland.

For instance, the demonstration of the value of topdressing pastures containing Townsville lucerne has encouraged many graziers to apply superphosphate, and it is estimated that last year in North Queensland alone, some 1,100 tons of superphosphate were used on Townsville lucerne pastures on nearly 40 properties. The dependence on fertilizers for the maintenance of tropical pasture mixtures has also added to the volume of fertilizer used.

The new attitude towards fertilizers for pastures has encouraged the expansion of aerial topdressing as well as aerial sowing of pastures. It is estimated that more than

100,000 acres were topdressed in the past year. On one property on the wet coastal belt, some 1,200 tons of superphosphate were used.

The decision of the State Government to subsidise pasture establishment on dairy farms over a period of five years will certainly result in a substantial increase not only in plantings but also in areas topdressed.

PLACE FOR BROWSE PLANTS

The pasture grasses and herbage of Queensland's semi-arid grazing lands are renowned for their drought resistance and recuperative properties. Nevertheless, their productivity during drought is low and supplementation with some other form of standing feed during dry times would add to the security of these grazing areas.

Australia is not well endowed with browse shrubs and trees suitable for domesticated animals. Queensland is best served in this regard through its stands of mulga in the south-west. Through recurrent droughts, the mulga shrubs have proved the saviour of millions of sheep and cattle and of many properties. The usefulness of the mulga has from time to time inspired thoughts of planting belts of mulga and other browse plants as standing fodder reserves for dry times.

Over the years, various shrubby plants, mainly legumes, have been introduced in an endeavour to find tall and deep-rooting plants which may be better able to cushion the effects of wide weather variations more than the diminutive grasses and herbage.

This search was taken a step further during the year when the Department's Chief Agrostologist was sent to South America and Africa to search for promising plants in areas with climate and soil types corresponding with those of south-western Queensland. Such areas in Peru, Brazil, Ethiopia and Angola were chosen on the basis of literature studies and correspondence with pasture specialists in those countries.

POSSIBILITIES FOR RICE

The potential for rice production under natural rainfall on the tropical coast was tested by the Department in the post-war years and the conclusion was reached that yields were not high enough to warrant the establishment of a rice-growing and milling industry under non-irrigated conditions.

The potential for paddy rice production has been examined from time to time on a small scale. Although promising yields were obtained at times, it was obvious that large-scale production would be necessary if production and processing costs were to be at a reasonable level. The lack of large expanses of suitable soils commanded by large irrigation storages has tended to inhibit interest in commercial rice production.

It would be premature to suggest that the Burdekin will one day become a major rice producing area, but there are pointers from recent experimental work that this crop could ultimately play a part in the agriculture of the Burdekin.

Rice crops grown on the Millaroo Research Station in the past year, primarily for testing as soil ameliorants, have yielded well enough to suggest that this crop may well prove to be a factor in the economic use of some 300,000 acres of flood plain country on the Lower Burdekin which suffers from poor water penetration.

THE PATTERN OF EXTENSION

An active interest has been shown in the educational arm of the Department—its extension services—in recent years. The services have been looked at critically from time to time from the viewpoint of organisation, objectives and methods.

Organisational changes to improve extension services in a Department in which research, extension and regulatory services have been intimately mixed for nearly 70 years cannot be effected overnight without considerable disruption. This could be justified only if substantial overall improvement in the Department's operations could be assured—and this is by no means the case.

Current thinking is along the lines of introducing changes gradually in the light of experience gained from exploratory probes. The Far North Queensland Extension Committee, composed of officers of various Branches, is one such essay into extension. This Committee guides the joint extension work of regional officers but does not attempt complete integration of extension work in the region. Another exploratory venture has been launched in the Maranoa, where an officer specially trained in extension education has been given the task of co-ordinating regional extension work based on the voluntary co-operation of his colleagues.

The objectives of the extension services require re-statement from time to time as conditions change. It is not so long ago that the Department had little concern with whole-farm management advice or with extension as a major tool in some at least of its regulatory work. Today, emphasis is placed on both of these. The over-riding emphasis in the past has been on efficiency in agricultural production. This has been promoted largely by direct advice to primary producers and by providing protective services. Production efficiency must remain the main objective of an extension service, but if experience elsewhere is a guide we may expect to see greater interest in conservation of resources, in marketing and utilization of farm products, and perhaps in general family living.

Methods in extension are changing, too. The mass media are being used more frequently and more skilfully in creating an awareness of better practices. The potential of television in extension is being more widely realised. Perhaps the most significant changes in methods in recent years relate to group activities, in particular rural discussion and development groups and producers' schools. Group activities have waxed and waned over the years, but the upsurge in recent years is likely to be sustained. There are several reasons for forecasting this: technology is advancing more rapidly than ever before; the rising level of general education encourages group activity; the extension services are becoming more aware of the value of the group process in effecting change.

An important new phase of extension activity during the year was the initiation of what may be called a "unit demonstration farm" programme. A representative farm in an area is selected and an agreement reached with the owner on the demonstration of approved practices. Instead of the farm operations being regarded by extension officers as a number of separate elements, the operation of the farm as a unit is the main consideration. The Departmental team of specialised advisers join together and with other parties to offer the best possible advice on the overall management of the farm. In this way it is hoped to demonstrate what improvement is possible from an integrated approach to management advice.

EVALUATION OF RESEARCH FINDINGS

The annual report of this Department, in common with those of other research organisations, carries references to large numbers of research projects in train or just completed.

The findings of research in many cases have to be adapted to local conditions; further, they have to be fitted into the individual property enterprise.

The yardstick of value of any new practice or material is the return it yields to the individual in terms of greater net returns through higher or more economical production, improved quality and so on. This yardstick is not always easy to apply and one suspects that irrigation or fodder conservation or pest control as practised on some properties may not be profitable at all to the operator.

It is of interest to note that sponsors of research, researchers themselves, adaptators and the users of research results are all showing an increasing concern with appraising the results of their contributions and efforts.

This Department's concern in this area is evident from the following list of appraisal surveys in progress or completed during the year by the Economic Services Branch:

1. Determination of the best combinations of stock raising and crop production in the Tara and Goondiwindi districts. Co-operating producers are keeping records of their activities for five years.
2. Economic aspects of grain drying. Co-operating growers are keeping detailed costs of drying various grains with different grain drying units.
3. Assessment of the value of irrigation on dairy farms. Results of survey farms show favourable increases in farm production and income with the use of irrigation.
4. Economics of miscellaneous dairy farm practices, such as silage-making, vealer raising and use of tropical pastures.
5. Economics of use of plant and machinery on Darling Downs wheat farms.
6. Banana farm management research study.

ORGANISATIONAL CHANGES

A number of organisational changes were made during the year as a result of changing conditions.

Within the Division of Marketing, the Marketing Branch and the Economics Research Branch were renamed the Marketing Services Branch and the Economic Services Branch, respectively, to designate more accurately the wider functions now being performed by those Branches. A Director of Marketing Services was appointed and the position of Standards Officer was raised to Director of Agricultural Standards.

In view of the expansion of functions and responsibilities projected as a result of additional Commonwealth funds becoming available, the Information Branch was redesignated Information and Extension Training Branch, and the positions of Director and Senior Information Officer were created.

To avoid confusion following the formation of the Queensland Meat Industry Authority, the title of the Meat Control Branch was changed to Slaughtering and Meat Inspection Branch.

The status of the Cattle Husbandry Branch was raised as a result of expansion of staff and responsibilities.

The position of Chief Advisory Officer (Administration) was created with a view to providing a central source of advice to the Director-General on finance and other administrative matters.

A Chief Extension Officer was appointed in Agriculture Branch to supervise the extension activities of this major Branch.

REPRESENTATION ON ADVISORY COMMITTEES

The Department was strongly represented on two advisory committees which presented reports to the Honourable the Premier during the year.

The Dairy Industry Advisory Committee, set up in May 1964 to advise the Government on matters relating to farm production problems in the industry, presented a report and recommendations to the Premier in May 1966. Recommendations accepted by the Government and having particular reference to future activities of this Department included the payment of a subsidy to encourage pasture improvement and provision of farm management advisory teams in the main dairying areas.

A Drought Mitigation Committee was established by the Premier in May 1965 to consider drought problems with particular reference to such mitigation measures as encouragement of fodder storage, both individual and co-operative, freight concessions, full use of the Farm Water Supplies Assistance Act, and encouragement of specialist growers of fodder for storage. The Committee's report and recommendations have been submitted to the Premier.

WELCOME SUPPORT

With a view to improving the volume and efficiency of production of dairy products as an aid to Australia's balance of payments, the Commonwealth Government in 1948 commenced a series of annual grants to State Departments of Agriculture for the improvement of their extension services to dairy farmers.

In 1952 this form of aid was extended to cover various other industries, mainly those with an export component.

These two grants have been continued at a very useful level in the intervening years, the amount available annually to this Department in recent years being some $294,000. The funds have been used mainly for services to the dairying, beef and agricultural industries, though other industries have benefited to some extent.

Despite the size of the Commonwealth contribution and the magnitude of the sums expended on extension from other sources, throughout Australia a big gap still exists between the actual and the possible volume and efficiency of primary production.

Recognising this, the Commonwealth Government has decided to progressively increase the total amount of its extension grants to the relevant State Departments, and for 1966-67 has allocated an additional $294,000 to this Department.

The Commonwealth indicated to the States that it saw as priority needs the training of extension officers, the strengthening of regional research, expansion of farm management advice, and improvement of information services. This Department's proposals for expenditure in 1966-67 took cognizance of this.

The additional funds for 1966-67 and the assurance of even greater assistance over the next few years will enable the Department to plan ahead for a substantial improvement in extension services and regional research.

The Commonwealth has made it clear that the States, to qualify for the additional funds, must continue their normal expansion of expenditure on extension from State funds.

RESEARCH FACILITIES

It is pleasing to be able to record substantial improvement in research facilities during the year, but there are still deficiencies in many areas, particularly in capital works.

A large administration building at Biloela Research Station was completed at a cost of $130,000. This building provides office and laboratory accommodation to service projects on the Station and in the surrounding districts, including brigalow areas.

Several buildings were erected at the Brigalow Research Station, Theodore, and additional watering facilities were provided.

Progress with facilities at the Tick Fever Research Centre, Wacol, advanced to the stage at which occupancy by the Protozoology Section was possible in May. The laboratory and calf pens are completed and moated pens for housing tick-infested cattle are under construction.

Foundation work for the Metabolism Unit at the Animal Research Institute, Yeerongpilly, was begun in May.

Improved facilities for staff being provided at Toorak Sheep Field Research Station, Julia Creek, will, it is hoped, assist in the recruitment and retention of research and ancillary staff.

Progress was made on the erection of an isolation building at the Animal Research Station, Oonoonba.

The new Dairy Research Laboratory at Hamilton, which is an undertaking of the order of $500,000, is still in course of construction.

An $80,000 laboratory and office building was opened at the Granite Belt Horticultural Research Station at Applethorpe.

Some facilities were provided on the small horticultural research station being developed at Bowen to serve the special needs of this area.

As mentioned elsewhere, the decision of the Commonwealth Government to provide substantial funds for regional research will enable machinery and other research station equipment to be brought more into line with requirements than has been possible in the past.

OVERSEAS VISITS

In pursuance of the policy of providing or facilitating overseas studies and observations by scientific officers, five Departmental officers were given opportunities for overseas visits during the year.

Dr. J. G. Morris, Director of Husbandry Research at the Animal Research Institute, went overseas to attend two International Congresses—Grasslands at Helsinki; and Animal Production at Edinburgh—and to make a study tour in South Africa and U.S.A.

Dr. J. P. Ebersohn, Chief Agrostologist, also went to attend the International Grasslands Congress. During his absence from Australia he is searching for pasture plants in South America and Africa.

Mr. V. R. Smythe, Director of Dairy Research, left to attend the World Dairy Congress at Munich and to study developments in dairy products and dairy research in Europe and U.S.A.

Mr. J. G. Young, Senior Cattle Husbandry Officer, was seconded to a World Bank team investigating development possibilities in the Sudan Gezira. While overseas, he was given an opportunity by the Department to examine dairy cattle husbandry practices in Israel and Europe.

Mr. G. Purss, Senior Plant Pathologist, was given assistance to study plant pathology in the U.S.A. supplementary to a Winston Churchill Fellowship.

Mr. R. C. Cannon, Assistant Director of Horticulture, left in June to study horticultural research, extension and production methods in Great Britain, U.S.A., Canada, Philippines, Israel and Ecuador.

Most of these visits, as is usual with overseas visits by Departmental officers, were supported with funds provided by the Commonwealth Government and various industry funds.

DEATH OF W. J. S. SLOAN

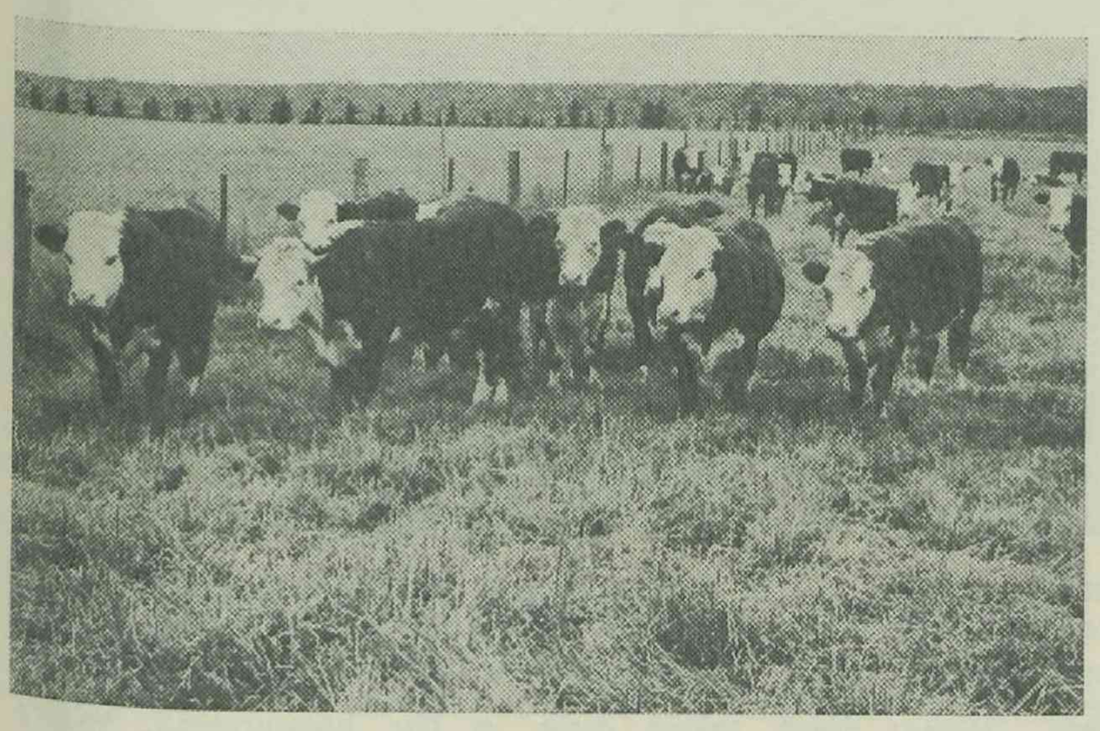
The death of the Director-General (Mr. W. J. S. Sloan) in October 1965 meant the loss to the State of an administrator who had made his mark in various administrative positions, including Director of Agriculture, Director, Division of Plant Industry, and Deputy Director-General, before taking over the duties of Director-General in June 1964.

The late Stuart Sloan was forward looking in his approach to the Department's responsibilities, and had he been spared to serve as Director-General for the ten years or so that was his expectation would undoubtedly have left an indelible mark.

To his successor he left many firm linkages that he had helped to forge between the Department and industry organisations and individuals.

PICTORIAL RECORD 1965-66

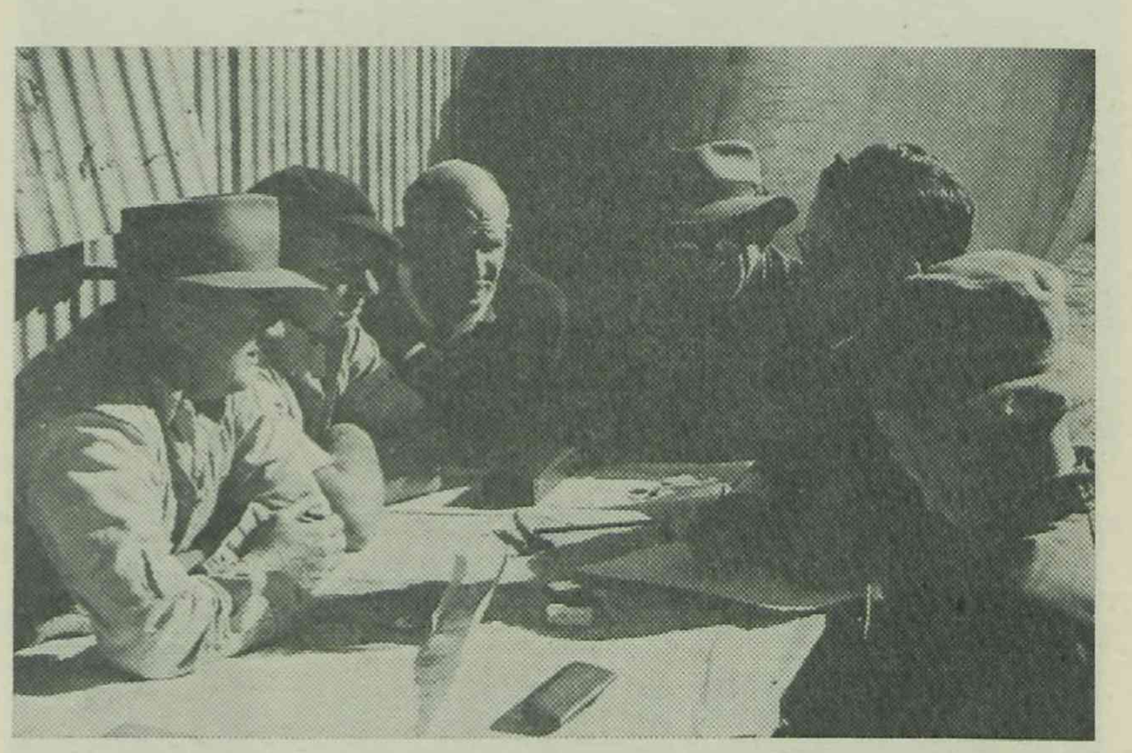
LAND DEVELOPMENT



Left: **Wet heath wallum country on the Department's Coolum Research Station converted to fattening pastures.** The results obtained on this Station are now being applied in commercial beef production on the wallum.

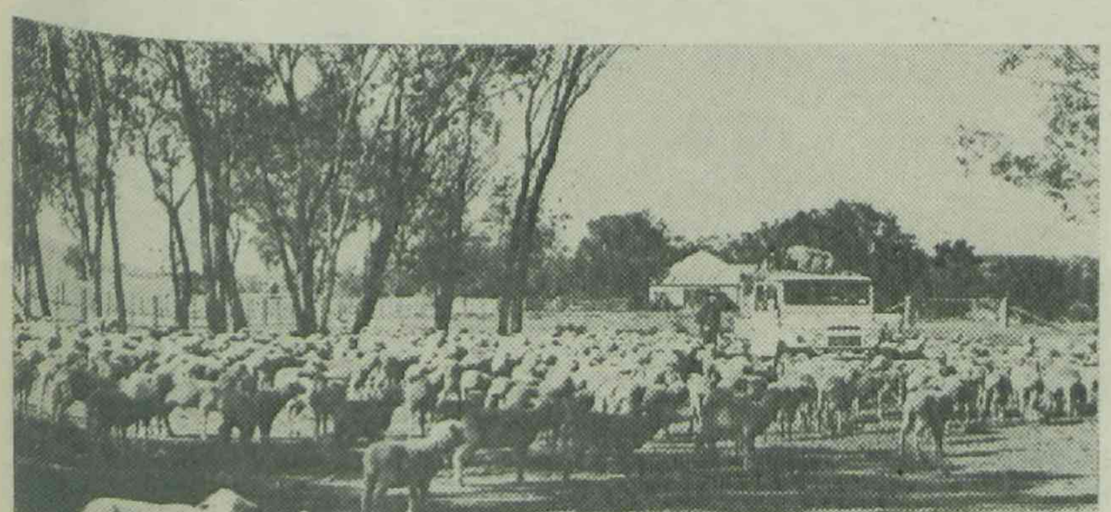
Right: **Brigalow development is not all plain sailing.** Prolific sucker growth and poor grass establishment on this cleared whipstick brigalow area point up the need for the additional research being undertaken at the Department's Brigalow Research Station in the Fitzroy Basin.

SOIL CONSERVATION



Two aspects of the Department's Soil Conservation Service: *On the left,* on-the-spot advice is being given to a farmer in the Mareeba-Dimbulah Irrigation Area. *On the right,* soil conservation officers and farmers meet on a Darling Downs farm to discuss a new farm layout designed for the farm.

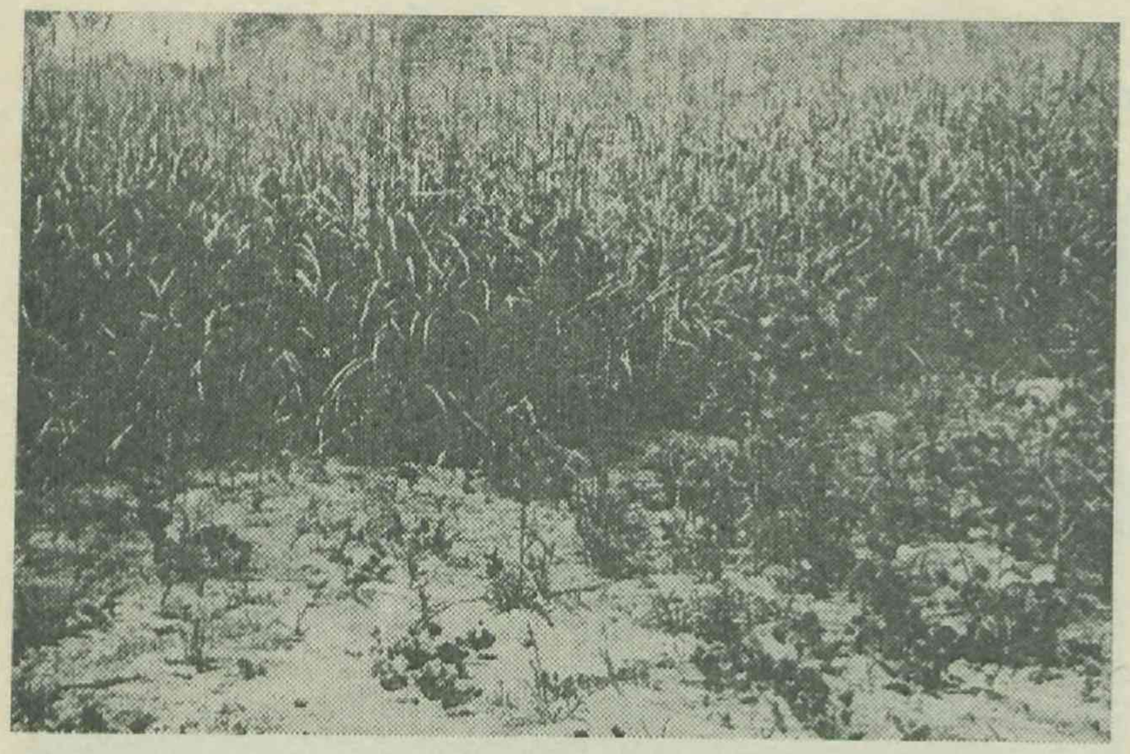
DROUGHT MANAGEMENT



Left: **Situations such as this were common in 1965.** With paddock feed exhausted, sheep had to rely on hand-fed fodders. Departmental officers gave advice to many woolgrowers during the year.

Right: **Survival rations were fed to many beef cattle.** Results of previous Departmental investigations into nutrition enabled the advisory officers to give reliable advice on drought feeding.

PASTURE DEVELOPMENT



Left: **Fertilizer often means the difference between failure and success.** This Departmental experiment on the wet tropical coast demonstrated the need for superphosphate in establishing guinea grass pasture. The plants in the foreground received no superphosphate at sowing.

Right: **The wet tropics have special pasture establishment problems.** Weeds have taken over in the background, where preplanting weed control measures were not adopted.

IMPROVEMENT OF HORTICULTURAL CROPS

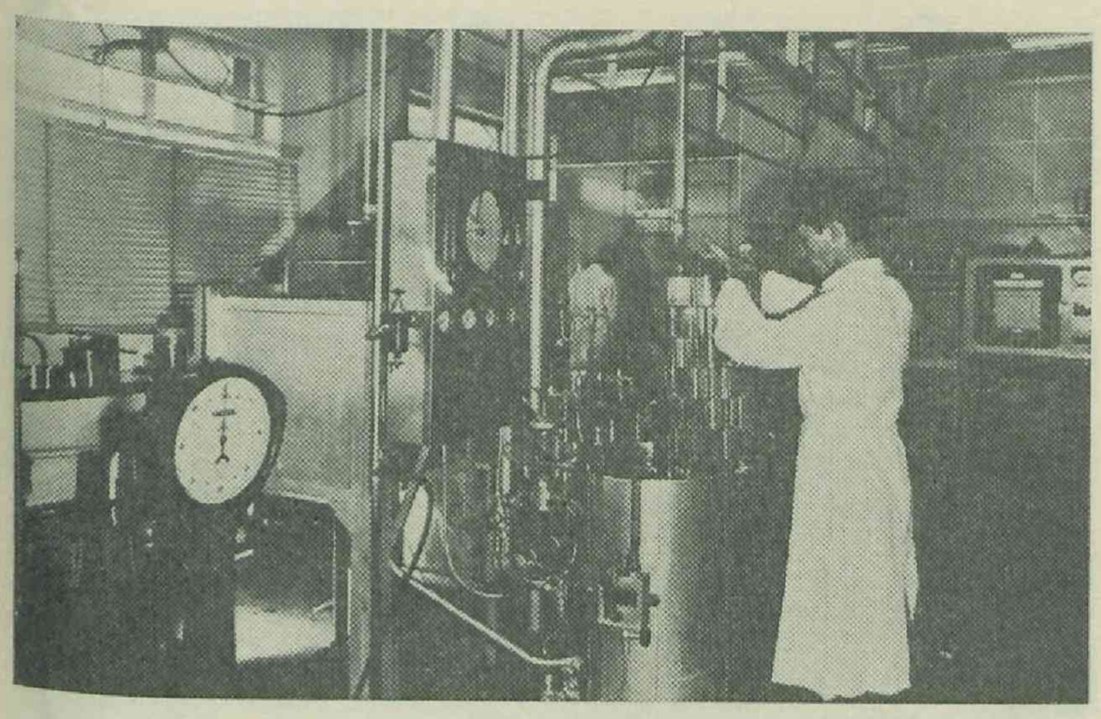
Top Left: **Cavendish banana strain N.** This selection, with a high rating for fruit appearance and palatability, was made at Maroochy Horticultural Research Station.

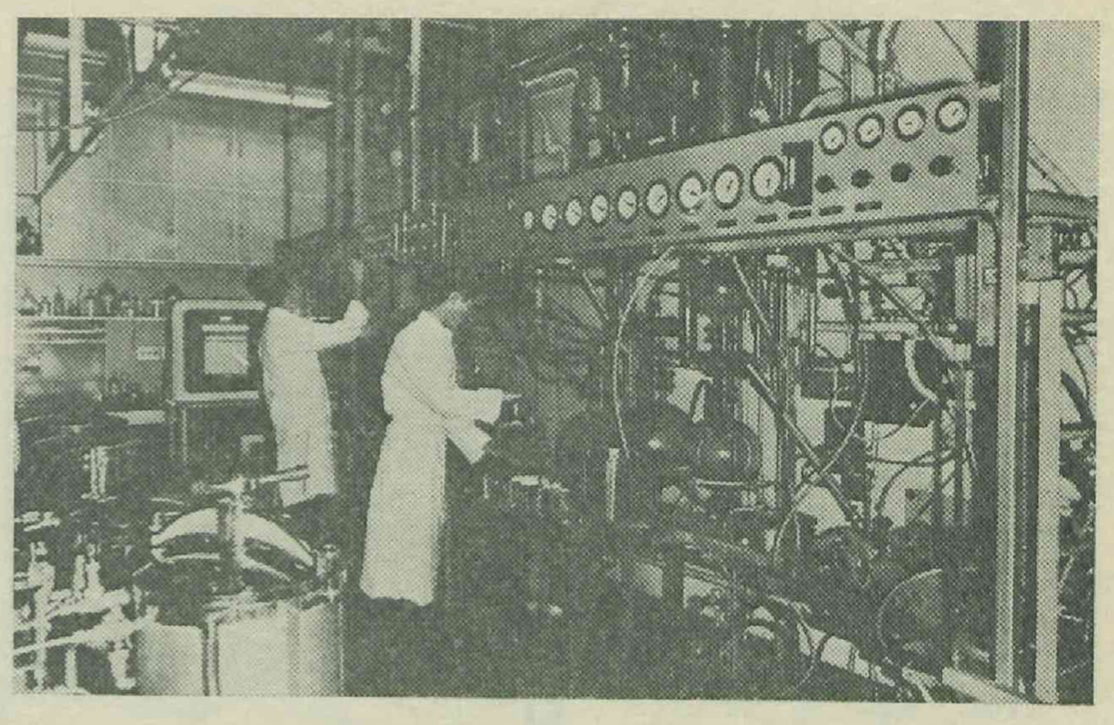
Lower Left: **Jonathan apples on Malling Merton 109 rootstock at the Granite Belt Horticultural Research Station.** Vigorous, early-bearing trees are produced on this rootstock.

Top Right: **Majestic strawberries at Woombye.** Planting material was obtained through the Strawberry Approved Runner Scheme operated by the Department in association with C.O.D.

Lower Right: **Florida 64-8 tomato.** This disease-resistant variety, tested by the Department, has performed well at Bowen and elsewhere.

PROCESSING RESEARCH

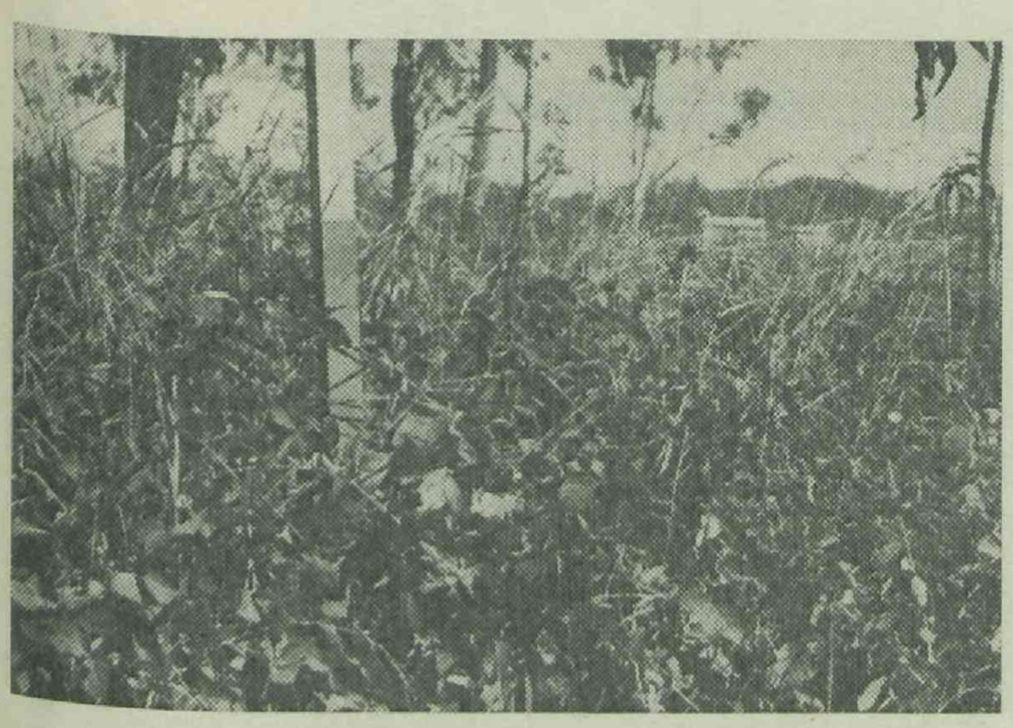


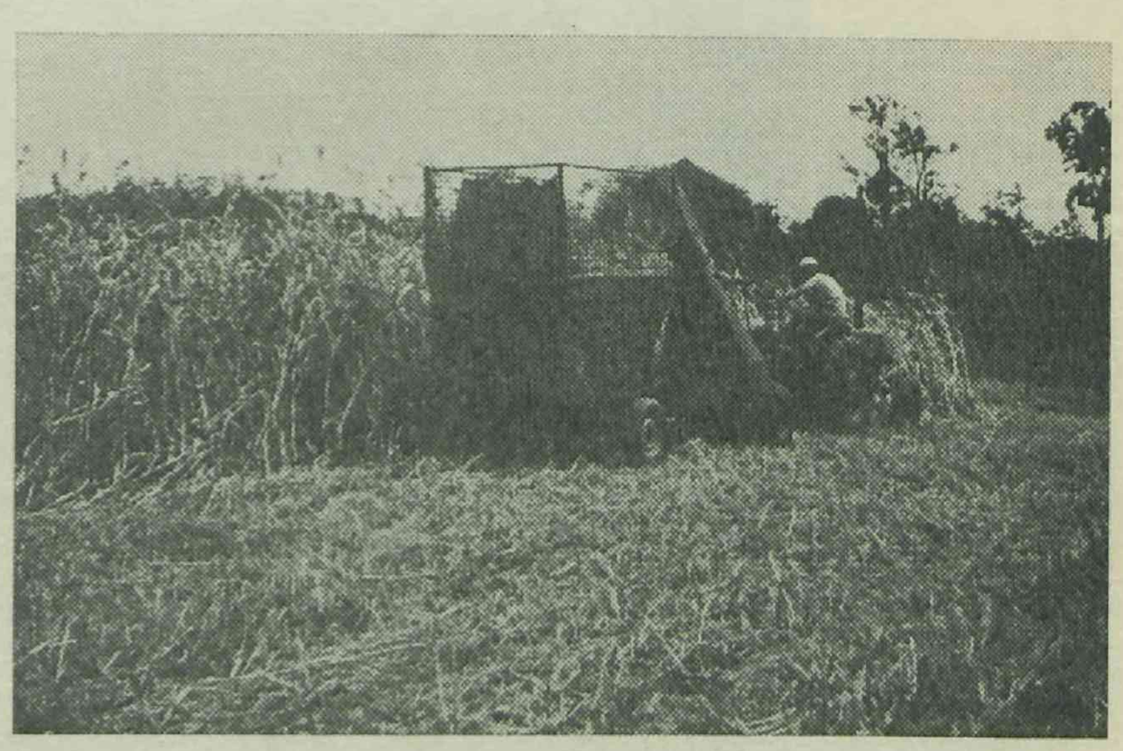


Left: **Canned vegetable retort in the Department's Food Preservation Research Laboratory.**

Right: **Fruit juice concentration plant in the Food Preservation Research Laboratory.** Considerable savings in container and transport costs are possible through concentration of pineapple and other fruit juices intended for distant markets.

FORAGE CROPS

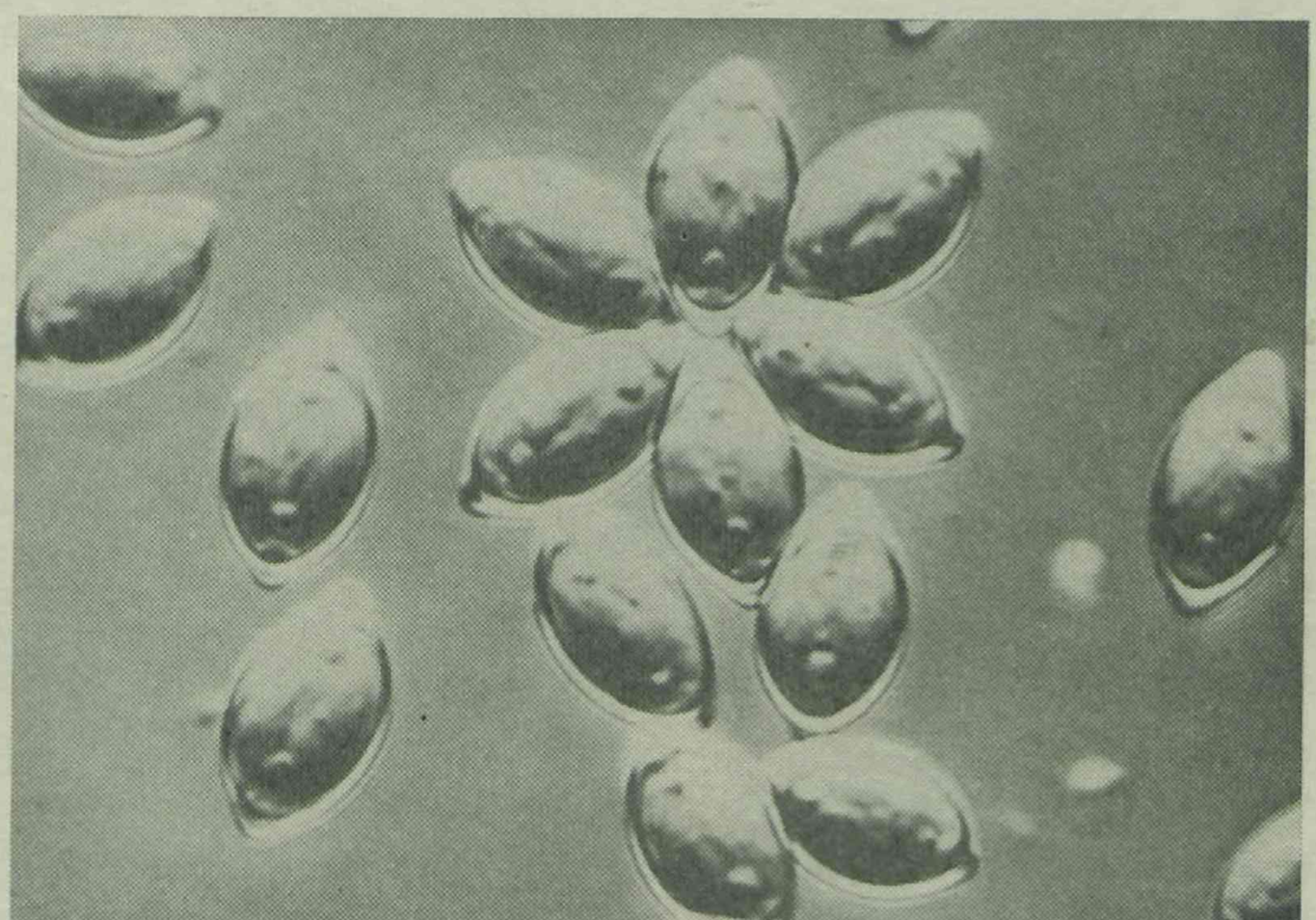




Left: **Leichhardt biflorus, a newly released legume.** This plant, shown here climbing on native pasture at Parada Research Station, is promising for standover feed in the dry tropics.

Right: **Fodder sorghum being harvested on a Central Queensland property.** Departmental releases are now being widely used.

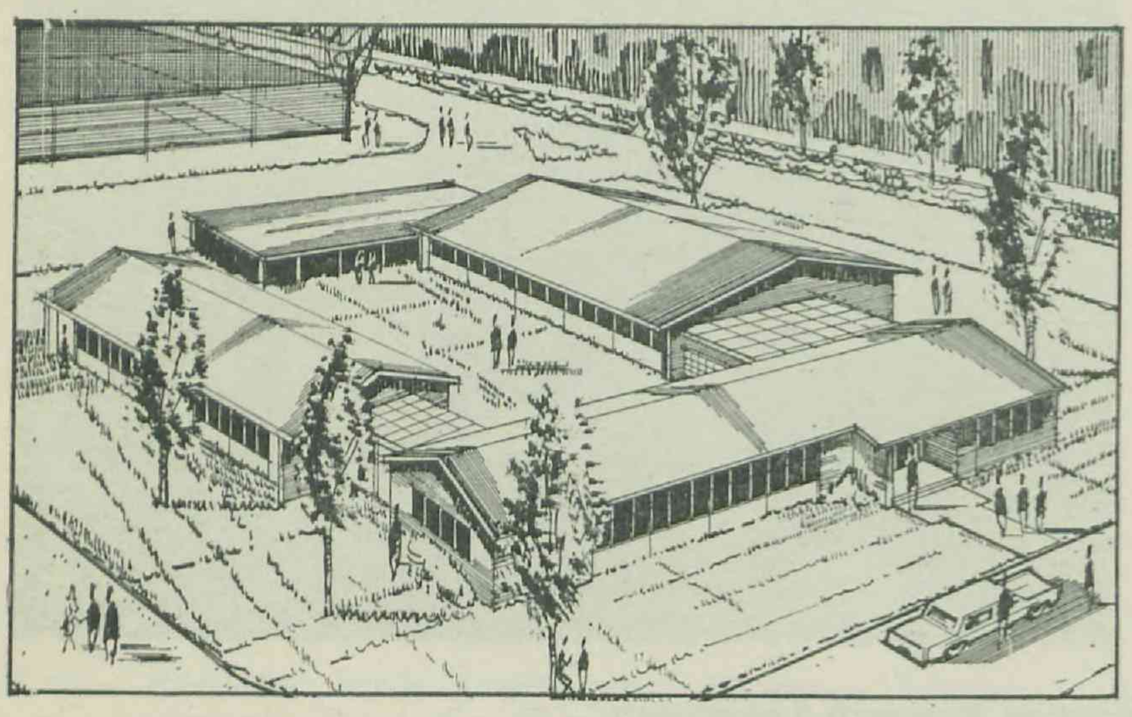
AN UNUSUAL PHOTOGRAPH

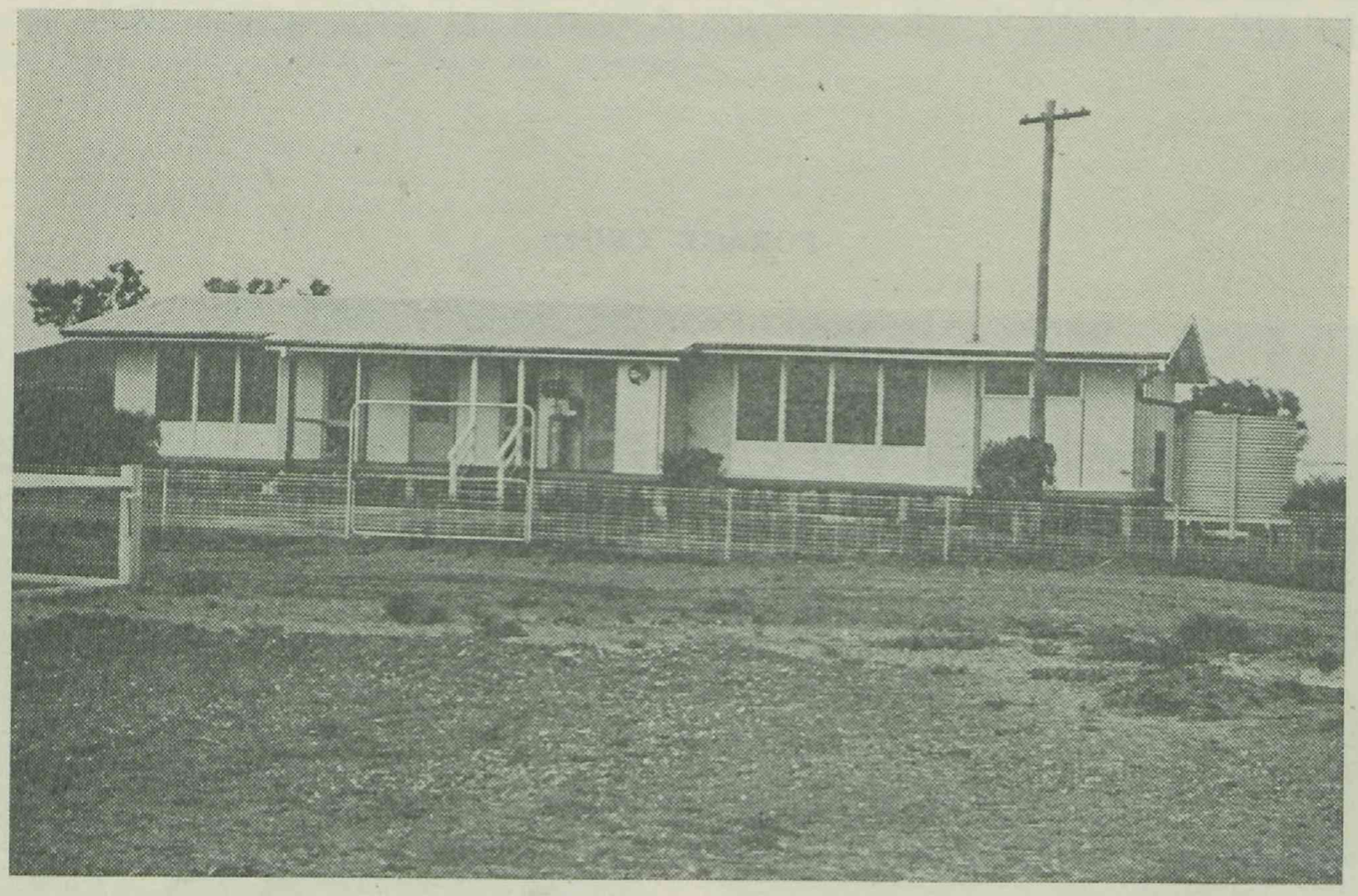


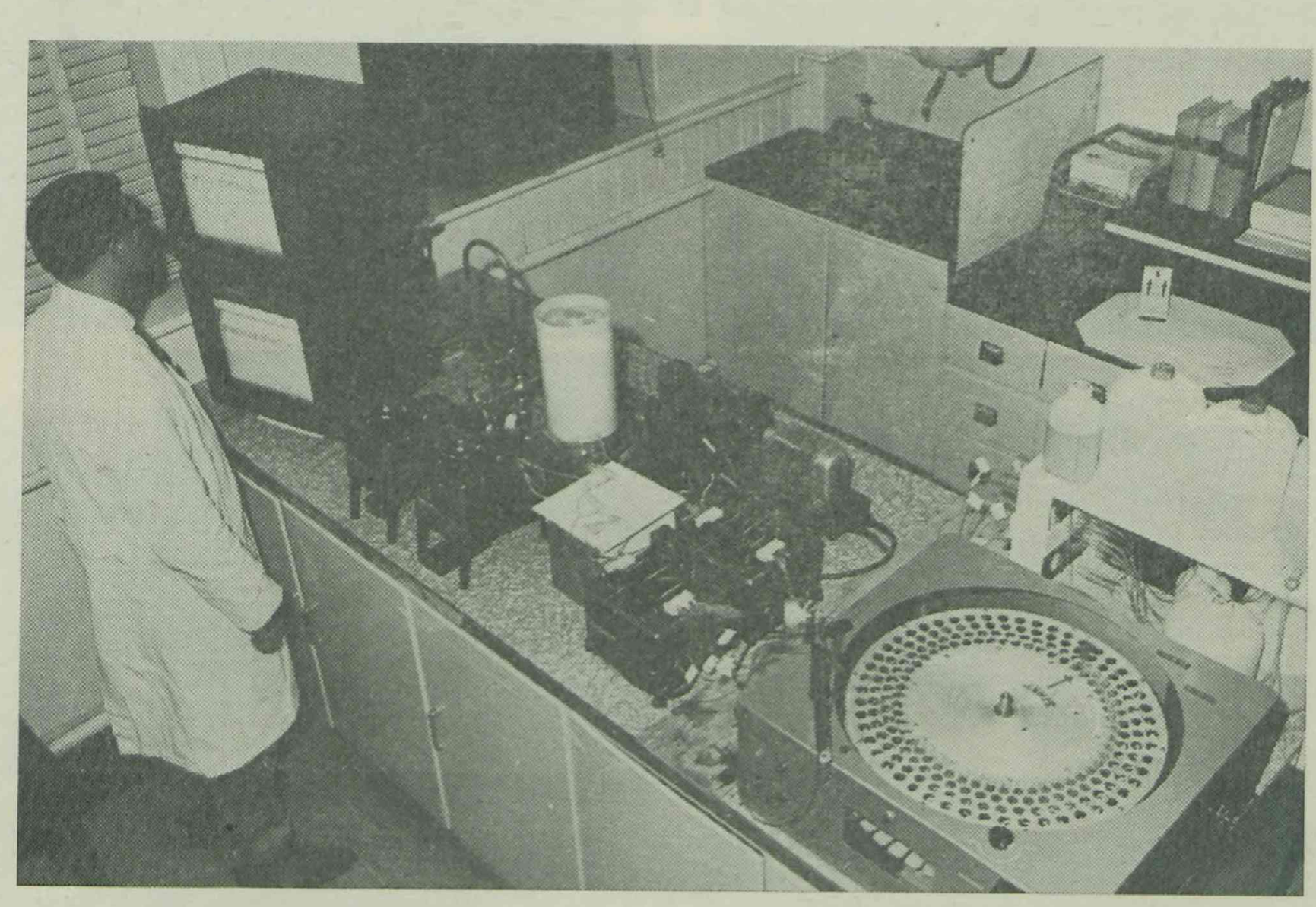
Little pests have smaller pests. This is a fungus taken from the larva of a serious grain weevil. It causes mortality in both larvae and adults. Technical details: *Triboliocystis garnhami* Diss. from *Tribolium castaneum* Herbst. Interference photomicrograph by William Manley.

8

RESEARCH FACILITIES







Left: **Sketch of the new laboratory and administration building at Biloela Research Station.** Productive research can be carried on under makeshift conditions, but adequate facilities make a big difference.

Right: **Speeding up sorghum breeding.** This glasshouse at Hermitage Research Station, on the Darling Downs, enables plant breeders to grow summer crops out of season.

Centre: **Living and working conditions are important.** This is one of the new buildings at Toorak Sheep Field Research Station in the north-west. Recruitment and retention of staff in hard living areas can only be assured if reasonable facilities are offered.

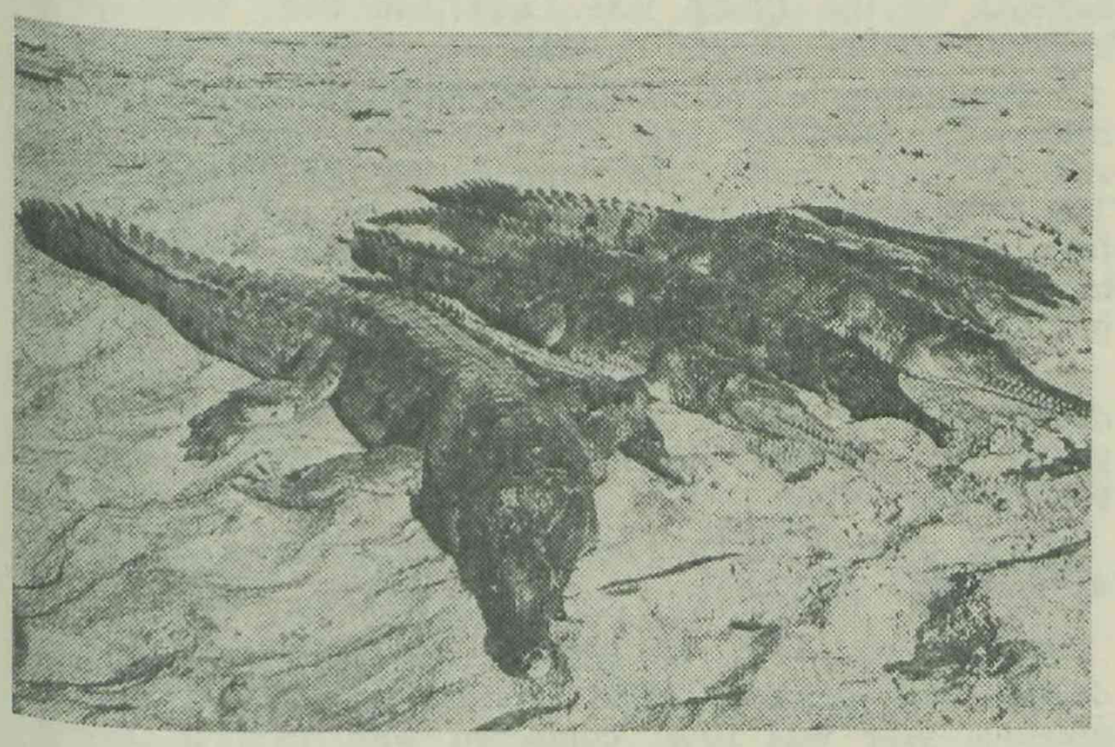
Bottom: **Automatic chemical analysis.** This Autoanalyser, a new addition to the equipment in the Department's central agricultural chemical laboratory, is capable of making several hundred determinations of nitrogen and phosphorus automatically every day.

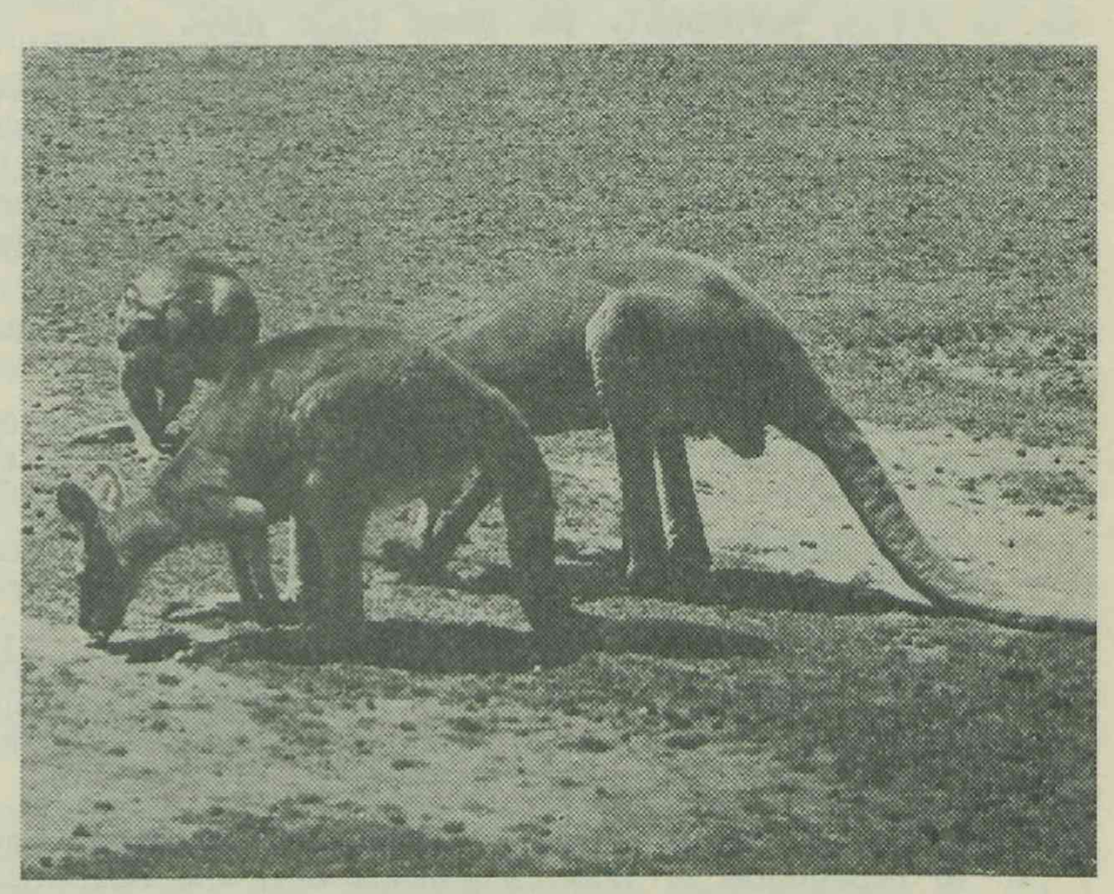
"UP-AND-COMING" . . . and a "POSSIBLE"

Left: **The soybean is growing in importance.** The seed from this experimental crop at Hermitage Research Station was evaluated in pig feeding studies on the Station.

Right: **Bluebonnet rice at Millaroo Research Station on the Burdekin.** Grown experimentally for soil amelioration purposes, this crop yielded well.

FAUNA UTILISATION

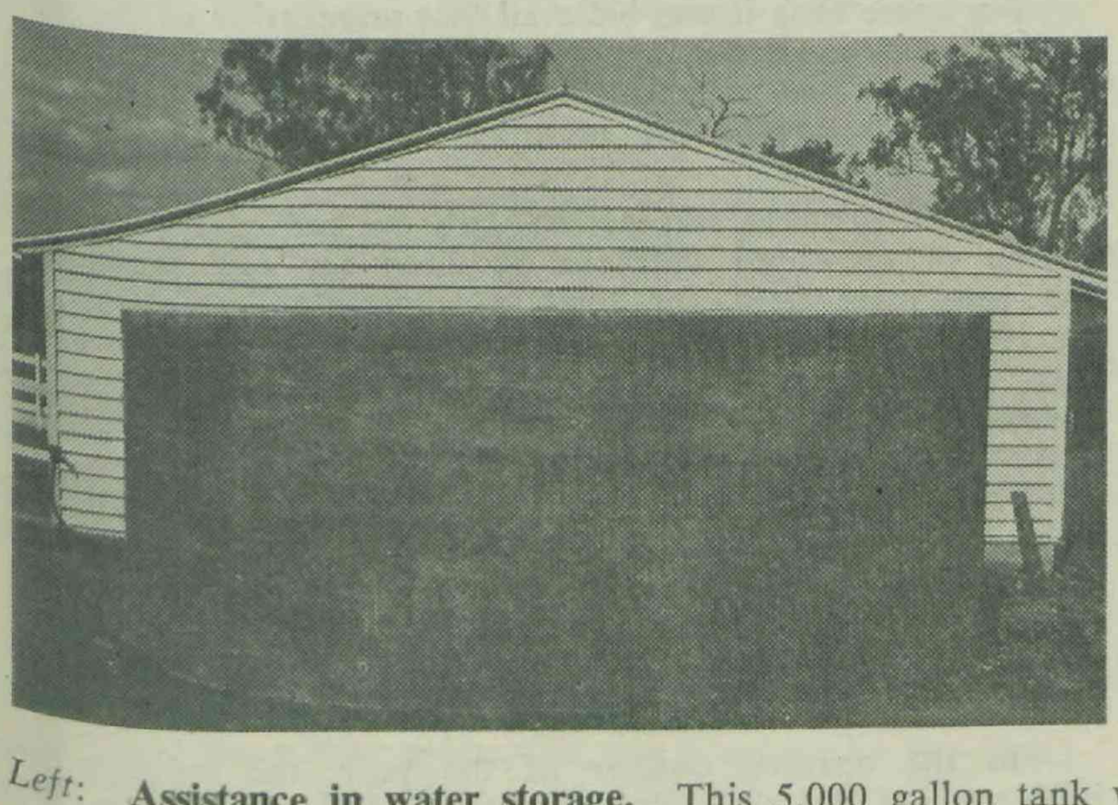




Left: **Freshwater crocodiles in the Gulf and Peninsula provide an income for professional shooters.** Their conservation for sporting and tourist purposes must also be kept in mind.

Right: **Striking a balance.** Departmental studies on the habits of the kangaroo are providing information basic to a programme of conservation and utilisation.

DAIRY INDUSTRY FACILITIES



Left: **Assistance in water storage.** This 5,000 gallon tank was built by the farmer using moulds supplied by the Department on loan.

Right: **Handling of farm milk in bulk.** The Department has given considerable technical assistance to farmers and transporters in the development of bulk handling of milk. This is an imported insulated bulk milk tanker.

THE PRIMARY INDUSTRIES IN 1965-66

LIVESTOCK INDUSTRIES

Beef.—Early in the year drought mitigation measures were already being adopted widely on properties in the Darling Downs, Maranoa and South-western regions. An important management method that was widely accepted and implemented throughout the drought-affected areas and which tempered significantly the extent of the losses was the early weaning of calves. Many thousands of calves were weaned, yarded and fully drought-fed on grain-roughage rations and a high degree of success was achieved.

In addition, and as a consequence, a production burden was removed from breeders and the full or semi-drought feeding of this class of animal was thereby made more efficient and economical.

An additional and significant advance in drought management that was widely practised was grain feeding of cattle where supervision was adequate. This method was successful.

For cattle owners, the approach of the calving season was the critical stage. Greatest losses were amongst breeders. Brandings for the current season can be expected to be considerably reduced as a result of breeder and calf losses. This position is likely to carry into the next season under the influence of reduced conception rates in breeders following the prolonged period of nutritional stress.

As may be expected, the supply of fat cattle from southern regions last winter was short, but suitable trade lines were fairly readily available from northern and central regions. The drought conditions in New South Wales and the attendant shortage of slaughter cattle on this market resulted in strong competition for Queensland fats and a rise in prices, particularly for good trade lines.

After the relief rains of December, the store cattle market was generally firm. Keen demand existed for male cattle, particularly fattening age steers. However, there is an understandable hesitancy on the part of many buyers influenced by uncertainty of the season and limited financial resources.

The expected heavy demand for breeders has not eventuated.

In 1965-66 Queensland beef and veal production was 12,000 tons carcass weight lower than the production of 1964-65.

Cannon Hill saleyard prices for cattle were maintained throughout the year at higher levels than in 1964-65, reflecting the satisfactory prices being realised on the United Kingdom and European markets. The United Kingdom market for Australian boneless beef, as well as for mutton and lamb, was good, although the United States of America was the major buyer of beef.

Smaller supplies of chilled beef from the Argentine and a fall in production in Western Europe over the last three years were major factors in creating a buoyant overseas market. There are indications, however, of increased quantities of chilled beef becoming available from the Argentine in 1966-67. Export of beef to Japan continued to increase, as the import quota for 1965-66 was raised by 5,100 tons to over 10,000 tons. It is anticipated that world trade in beef will continue at satisfactory prices.

Wool.—The year was a disastrous one in the sheep areas, with absence of effective rains making the year's drought cumulative with that of 1964-65. Sheep losses were high and hand-feeding and scrub-feeding involved owners in large financial commitments.

Wool values in the 1965-66 selling season, though modest in comparison with the values that were realised in 1963, held fairly well in spite of much of the year's offerings being badly drought affected or prematurely shorn. Reduced receivals caused the cancellation of two sales.

From August to November, values rose from 55·68d. to 61·04d. per lb. Variable but generally declining values have occurred since then as the increasing impact of drought affected clips made itself felt. Total wool sales in 1965-66 realised $95·9 million for 630,688 bales.

Pigmeats.—The year was a difficult one for many pig-raisers due to the effect of unfavourable weather on feed supplies. Those who depend on pig production for the major portion of farm income have learned to prepare for emergencies and were little affected.

Feed supplies varied considerably during the year according to materials used and weather conditions in the various districts. Generally feed grains were in short supply by spring, except on properties where adequate reserves had been set aside. Release of wheat by the Wheat Board enabled producers to continue production until winter cereal harvests commenced in October. These crops carried pig raisers through until summer grains became available in quantity, when grain reserves were replenished.

Due to drought conditions there have been some decreases in pig populations in the drier areas, but these were compensated by increases in others. The greater dependence on grain rather than dairy by-products for pig feed, and the storage of feed on the farms, enabled pig production to be maintained throughout one of the worst droughts experienced by pig raisers.

Prices paid for pigs dropped to 22 cents per lb. by the beginning of summer and stayed at this level until autumn, when small increases occurred.

One interesting feature was the introduction by one major bacon factory of payment of a premium for quality pigs, based on grading after slaughtering, with lower prices for overfat pigs. The better class of producers has shown considerable interest in this scheme, and other factories are introducing similar schemes.

There is also interest amongst producers in "contract" supplying to a factory which issues reports on pigs slaughtered, enabling the producer to correct poor breeding or feeding standards. However, the grading standards will have to cover factors such as meat in the carcasses rather than fat measurement alone, before they will help the better men appreciably.

Eggs.—Egg production in South-eastern Queensland, as measured by the intake at the South Queensland Egg Marketing Board and sales by producers on permit, rose by 15% in comparison with recorded production for 1964-65.

The increased intake by the Egg Marketing Board was countered to some degree by a rise of 14% in local sales. Moreover, nearly four times as many eggs were sold overseas as "eggs in shell" during the year under review. More favourable export market values combined with the stabilization brought about by the Commonwealth egg marketing agreement provided an overall net return as much as 6–7 cents higher than in the previous year. The total number of eggs handled by the Board was 13,861,146 doz., while permit holders handled 2,325,733 doz.

Production in Central Queensland was maintained slightly below the level of 1964-65, and some eggs had to be acquired from South Queensland during the autumn months. The Central Queensland Egg Marketing Board called tenders for the erection of a modern egg packaging floor in Rockhampton to permit more efficient handling and to cope with increasing intake.

The price of feed was high during the year because of demand due to the drought, but by the end of the year grains and protein meals had returned to approximately pre-drought values.

The number of chickens sexed for commercial egg production was 5,145,039.

Table Poultry.—The rate of increase of broiler production has steadied. The increase in 1965-66 over the previous year was 10%, compared with 16% in 1964-65. A high proportion of Queensland production is marketed in southern States, where production is also increasing, and this will necessitate exploration of other outlets for Queensland production, including an increase in local sales. The possibility of Queensland markets being invaded by southern producers cannot be overlooked.

Higher production costs have resulted in a more stable advancement of the broiler industry, but a fall in feed prices would be welcomed by growers.

The meat-type chicken is now being marketed at a lower age, mainly at 9–10 weeks of age, and a conversion of 2·4 lb. of feed per lb. of liveweight gain is normally expected by growers.

For some time it was believed that segregation of the sexes would result in better conversion rates being obtained for both cockerels and pullets. Experimentally this has not proved to be the case, and the idea has been dropped by most growers.

Several growers still persist with the use of the cockerel residue of crossbred chickens acquired for egg production. The low price paid for these chickens (approximately $3 per 100, compared with $14 for meat-type chickens) is about their only redeeming feature. Only small abattoirs are interested in this class of bird, reared to about 14 weeks of age.

Nearly 9 million chickens were hatched specificially for the table poultry trade, and 240,000 were sexed for broilers to be reared as segregated groups.

DAIRYING

In the opening quarter of the year, the industry was in a state of distress. Production was little more than 50% of that for the same period of the previous year and had fallen by a further 25% from the previous quarter. Hand feeding, often at survival levels, was practised on a wide

scale. The July rains favoured most of the dairying districts of the south-east, and in some areas, notably the north coastal regions, the conditions were particularly good.

Butter and cheese production during 1965-66 continued the decline which has been evident since 1962-63. Compared with 1964-65 butter production declined by 5% and cheese production by 8%.

Consumption of butter in 1965-66 also continued to decline. Sales by the Butter Marketing Board in Queensland for table use were 39,319 boxes less than in 1964-65 and 82,005 boxes less than in 1963-64. This fall can be attributed to competition from products using other fats, particularly fats of vegetable origin, but also to changes in dietary habits with the tendency to cut down fat consumption.

The United Kingdom export quota of 66,700 tons for Australia, as agreed for the year ended March 31, 1966, has been left unchanged for the succeeding 12 months. This quota, although additional authorisations are uncertain, should enable a clearance of Australia's exportable surplus.

Butter prices realised on the United Kingdom market weakened, falling from stg. 319s. per cwt. in July, 1965, to 300s. by February, 1966, at which level they remained until the end of the financial year. Cheese prices in the United Kingdom were satisfactory and remained steady at stg. 260s. for rindless, but values for waxed cheese fell slightly. As a result it is expected that average returns to local manufacturers of butter for 1965-66 will fall below the $48·33 per cwt. paid for 1964-65, although cheese values should show some slight increase on the $28·00 per cwt. paid in 1964-65.

With the deterioration in the United Kingdom market for butter and cheese, increasing attention is being given to the development of other markets, and also to diversifying manufacture in the form of milk powder, butter-oil and casein. The dairy industry is concerned with the increase, in recent years, in competition from imported cheese of fancy varieties and a case for protection has been submitted to the Tariff Board.

The year just closed saw some changes in the location of factories throughout the State. Because of the overall reduction in supply, three cheese factories were forced to close. The Dayboro factory ceased manufacturing butter and suppliers to this factory diverted their milk as direct supply to the Brisbane Milk District. In North Queensland, the Millaa Millaa factory changed from butter to cheese production, while on the Darling Downs the Jandowae factory commenced the manufacture of cheese.

To meet increased production costs of market milk, a drought loading of ½d. per pint in the retail price operated from June 3, 1965, on milk distributed in areas south from Rockhampton, and on the Darling Downs. This loading had been intended as a temporary loading to operate until the end of September, 1965. However, apart from an adjustment of margins from October 1, the price to consumers remained unchanged and the drought loading was incorporated in the price at the changeover to decimal currency from February 14, 1966. Prices were increased by 4d. per gal. in Townsville from 1st October, 1965, and compensating adjustments were made in other centres north from Mackay. These were also followed by fractional adjustment increases on the introduction of decimal currency.

Milk supplies to the Brisbane Milk District for the month of July, 1965, were the lowest for any July for the past six years. However, rains in July rapidly changed the supply position and the peak of 39,800 gallons per day for the December-January period was the highest daily average supply since the inception of the Brisbane Milk Board in 1939.

Consumption of market milk in the Brisbane Milk District continued to increase. Average daily consumption in 1965-66 was 56,834 gal., a slight improvement on the 1964-65 figure. Cream sales for the year fell to 141,841 gal., the lowest level of sales since 1960-61.

Improvement to dairy premises was maintained at the normal yearly rate, a total of 146 new buildings being constructed and 416 being renovated. A large proportion of these improvements were effected on properties concerned with the conversion to bulk milk storage.

Seasonal conditions precluded any significant changes in the basic equipment in dairy premises. The number of properties with refrigeration remained at 30% of all properties, while the installation of new or renovated milking machines was confined to less than 3%. There is still substantial room for replacement of copper-based dairy equipment with equipment of stainless steel construction.

CROPS

Sugar.—A record 1,883,477 tons of 94 n.t. sugar were produced from the 1965 season's crushing of 13,545,719 tons of cane, and the whole production was acquired by the Sugar Board. Production was affected by unseasonal conditions and was some 200,000 tons below the mill peak aggregate.

The overall average price paid was $84.58 per ton. Sugar within peaks averaged $86.58 and the return from excess sugar was $42.50.

Harvesting of the 1966 crop is estimated to produce a record 15,000,000 tons of cane and 2,100,000 tons of raw sugar.

The market outlook is chequered. On the one hand the industry benefits from the protected domestic market to the extent of about 600,000 tons, while the U.K./Commonwealth Sugar Agreement provides an assured market for 335,000 tons at satisfactory prices. In addition, sales to the United States of America account for a further 150,000 tons at comparable prices.

On the other hand, almost two-thirds of Australian exports are sold on the basis of free market prices. These were severely depressed throughout the year, falling to £16 15s. stg. per ton in early June, the lowest since World War II. The lower price was a direct result of lack of demand and the sale of a large parcel of sugar by Brazil from substantial surplus stocks. At the end of the year prospects were not bright for any immediate improvement in the free market price.

Delivery price for up to peak raw sugar for the 1966 season was fixed at $64 per ton f.o.b., compared with $70 per ton 94 n.t. sugar paid for 1965.

Following the transfer of sugar cane assignments on the Ingham line from the Invicta mill to the Victoria Mill, the membership of the Invicta Mill Suppliers' Committee was reduced from 9 to 6 members by the vacation from office of three members representing Ingham line growers.

The Primary Producers Co-operative Associations Acts were amended during the year to provide for the conversion of a primary producers' co-operative association into a public company. This legislation was somewhat unusual but was necessary to enable the take-over by a sugar milling company of the Gin Gin co-operative mill, which was in financial difficulty. The amendment provides the legal procedures to be followed in such cases.

Wheat.—In contrast to the previous year, when a record wheat harvest of 22·8m. bus. was recorded, severe drought conditions and the lateness of planting rains resulted in the acreage planted to wheat for the 1965-66 crop falling by almost 15% to the low level of 880,000 acres. Continuing unfavourable conditions during the growing period caused many farmers to graze or bale their crops and total grain production fell to 14 m. bus.

Some Queensland growers took advantage of the shortage of high-quality wheat in New South Wales, which was also affected by drought, and sold their crops outside the State Wheat Board and obtained relatively high premiums for their high-protein wheat. On the Queensland market, the shortage of other feed grains in 1965 resulted in relatively very large sales of wheat for stock feed. On the export market, Mainland China and Russia continued to make large purchases of Australian wheat.

Barley.—The production of barley in Queensland has increased consistently since 1961-62. Plantings for the 1965-66 crop were given a further impetus, many wheat growers switching to barley as planting rains were received too late for wheat. The harvest is estimated to have produced 7·5 m. bus., the largest crop since 1958-59.

The high quality of Queensland barley and its ready acceptance by southern maltsters enabled the Barley Marketing Board to sell forward a considerable tonnage. Unfortunately, the general shortage of feed grains on the local and interstate markets induced many barley growers to sell their crops outside the Board and it is regrettable that as a result of this lack of support by growers for their own marketing organisation the Board was unable to supply more than about one-third of sales committed to the maltsters, thereby jeopardising the future of firmly established market outlets.

Grain Sorghum.—Grain sorghum production from the 1966 harvest is estimated at 8 m. bus., compared with 5·0 m. bus. produced from the 1965 harvest, which was the lowest since 1957. There was a record crop of 4·7 m. bus. on the Darling Downs. The State average yield of 28 bus. per acre was well above normal. Central Queensland again received poor summer rains. However, production estimated at 2·3 m. bus. was a big improvement on the 1·2 m. bus. from the 1965 crop, with surpluses available for export.

The new system of local sales by growers, on permit from the Board, which operates in Central Queensland only, has proved a success and has been a contributory factor enabling the Board to re-enter the export market.

Maize.—Maize production in Queensland in 1966 is estimated at 4,800,000 bus. compared with 3,300,000 bus. from the 1965 crop. Yields and overall production were improved in both southern Queensland and on the Atherton Tableland, but the central and southern Darling Downs crops received some severe setbacks. Seasonal conditions in the South Burnett were in marked contrast to the severe drought in early 1965.

Tobacco.—Reference is made elsewhere to the satisfactory results of tobacco leaf clearances during the year.

The area planted in 1965-66 was less than in the previous season. Mareeba-Dimbulah with 9,670 acres was down by 1,500 acres. Caboolture-Beerwah planted 1,050

acres compared with 1,230 in 1964-65. The biggest percentage reduction was in the Inglewood district, where only 300 acres were planted. Yields generally were satisfactory, with the average estimated at about 1,000 lb. leaf per acre and individual crops exceeding 1,500 lb.

Disease and insect control is improving as a result of better facilities and the adoption of tighter control schedules.

Cotton.—The 1966 Queensland cotton crop is expected to yield around 8,500 bales raw cotton, compared with 7,421 bales in 1965. Of the 14,050 acres planted, 6,458 acres were under irrigation (2,635 acres in Central Queensland and 3,823 acres in South Queensland) and 7,592 acres were dryland cotton. This compares with 4,680 acres under irrigation and 8,902 acres raingrown cotton harvested in 1965. While Queensland production has increased by some 22%, overall Australian production, estimated at 85,000 bales in 1966, represents an increase of almost 100% on that of 1965.

Under the Federal "Raw Cotton Bounty Act, 1963," an amount not exceeding $4,000,000 per annum is made available for bounty payment on all Australian-produced raw cotton of a grade higher than strict good ordinary, at a rate based on 16·125d. (13·4375 cents) per lb. 1 in. middling white raw cotton. With an estimated total Australian production in 1966 of between 80,000 and 85,000 bales of raw cotton, the rate of bounty will be approximately only 10 cents per lb. raw cotton, compared with 13·174 cents per lb. in 1965.

A rationalisation of the Cotton Marketing Board's Capital and Working Account structure was effected and new revolving fund regulations have been issued to cover the provision of general reserves for the replacement and purchase of assets and for working capital.

Peanuts.—Peanut production from the 1965 crop was sufficient to meet less than half Australian requirements, and imports of 6,000–7,000 tons of kernels were made in 1965-66 to meet the shortfall. Improved conditions in the South Burnett, the main growing area, resulted in the 1966 crop producing an estimated 24,000 tons of nuts in shell, approximately Australia's normal annual requirements, from 62,000 acres planted.

During the year the Peanut Marketing Board continued its programme of modernisation of facilities, including the provision of large cold stores at Kingaroy. This programme is already showing results in increased efficiency and reduced handling costs.

Navy beans.—The expected 1966 navy bean crop of 1,200 tons was one of the largest yet produced in Australia. Nevertheless, there is still plenty of scope for increased production. The upright variety of navy bean produced by the Department has proved successful under commercial growing conditions and has resulted in higher quality beans being delivered to the Navy Bean Marketing Board.

Oilseeds.—Unsatisfactory rainfall limited the season's planting of soybeans to about 50% of the normal area in the South Burnett and Monto districts, which produce virtually all of the State's crop. Total production for the 1965-66 season's planting is estimated at 23,000 bus. from 3,000 acres. Yields were adversely affected by dry weather at flowering and pod-setting.

Production of linseed in 1964 was a record 34,175 tons from 97,092 acres. As a result of a heavy surplus from that crop, restrictions were placed on the acreage contracted by The Linseed Crushers' Association in 1965. Although the final acreage planted was considerably above that initially contracted, production was curtailed seriously by drought. The estimated 1965 crop, 2,500 tons from 17,000 acres planted, was the lowest since 1953.

Australia's annual consumption of linseed oil has fallen from a general level of around 16,000 tons during the mid-1950s to the present level of about 10,000 to 11,000 tons. This has been the direct result of the development of substitutes used in paints and linoleum. The price paid by the Linseed Crushers' Association for Queensland linseed grown under contract since 1953 has declined from $140 to $134 per ton (in bags).

Although the present position in the linseed industry is far from good as a direct result of the contracting domestic market, the longer term prospects are better than is generally recognised. There has been a substantial improvement in yields per acre in the more favourable production areas during the last few years and if yields can be increased by a further 3 to 4 bus. per acre, the industry in Queensland should approach the position where it is able to compete on the world market at export parity prices.

The widening use of safflowerseed oil as an edible fat in Australia, together with the wide interest in the crop overseas, augurs well for the development of this industry, and Queensland plantings increased to some 75,000 acres in 1965. The crop was adversely affected by drought and frost and much was grazed off. Production was without doubt considerably below the 11,491 tons produced in 1964 from 43,350 acres. Intended plantings for the 1966 crop are estimated at 70,000 acres. Very dry conditions in Central Queensland curtailed plantings there. The price has been maintained at $95 per ton delivered Sydney.

Deciduous fruits.—The Stanthorpe apple industry showed marked improvement following recovery to normal conditions from the disastrous drought and hail losses experienced in 1965. Exports of 200,500 bus. were, however, well below the record 240,000 bus. exported in 1964.

Following complaints from importers that the proportion of light-weight containers consigned overseas in 1965 was excessive, the Commonwealth Department of Primary Industry raised the minimum net-weight for cell cartons by 2 lb. and for traypack cartons by 3 lb. No difficulty was encountered in complying with these weights; light-weight containers are seldom a problem with "heavy" varieties such as Granny Smith, the main variety exported from Queensland.

Pear exports fell below the target of 12,000 bus., mainly because the fruit was below acceptable export standards; shape, never very good in the variety Packham, was worse than usual and surface blemishes were excessive. Some 9,000 bus. were consigned overseas.

Pineapples.—Production of pineapples showed a further increase of some 12½% in 1965-66, when 4,500,000 bus., valued at over $6 million, were harvested. With the expectation of further increases, the Golden Circle Cannery at Brisbane has announced an extended building programme estimated to cost $1 million.

Bananas.—Banana production in 1965-66 will be slightly below 1964-65 levels but values are expected to be higher. Export shipments of bananas in cartons to New Zealand in 1965 were not a success; temperatures during transit were too high and the fruit opened up in only fair condition. This problem could doubtless be overcome, but the position is complicated by a decision of the New Zealand authorities to impose EDB fumigation before consignment as a condition of entry to that country. This quarantine requirement virtually precludes the export of bananas. Treatment tends to trigger off the ripening process and complicate the handling and distribution of the fruit on arrival in New Zealand. Alternative treatments, e.g., dipping the fruit in fenthion, may be equally effective and a case for the use of this treatment in lieu of EDB fumigation will shortly be presented to the New Zealand authorities.

Citrus.—The export season for citrus is expected to follow the pattern of 1965, with a steady increase in the quantity of fruit shipped to Asian countries, and some exploratory probes at more distant markets. Access to some markets is hampered by quarantine restrictions, mainly against fruit fly. The approved EDB treatment schedule, though effective for oranges and certain varieties of mandarin, is distinctly hazardous for the Ellendale mandarin, which has the greatest export potential from Queensland. This variety is very susceptible to rind injury when subjected to EDB fumigation unless the fruit is harvested from mature trees at the right stage of maturity. This same characteristic could also be responsible for the occurrence of rind injury in fruit packed in cases fabricated from P.C.P. treated timber. Exports in 1965 amounted to 54,826 bus.

Vegetables.—A Queensland record crop of 100,000 tons of potatoes valued at $12,900,000 was dug in 1965-66. This further substantial increase in values established in 1964-65 reflects the overall Australian shortage of potatoes in 1965. If former production cycles are any indication, the likely pattern in 1966-67 will be a still higher level of production but depressed prices.

Onion production in 1965-66 was only 15,500 tons, which was about 30% below normal. The gross value of the crops, however, exceeded $2 million for the second year in succession.

The trend in beans over more recent years has been for both production and value to decline. This trend continued in 1965-66, when production fell a further 1,500 tons to a level of 9,400 tons. The increasing availability of frozen vegetables, particularly peas, has no doubt contributed largely to this trend.

Tomato production at about 1 m. bus., valued at $5 m., showed little change.

Ginger.—Further expansion of the ginger industry was achieved in 1965-66. The area planted was 301 acres, compared with 242 acres for the 1965 crop. There is every indication that production will exceed 2,400 tons; 1,300 tons were produced in 1965. The major factors responsible for the larger production, other than increased acreage, were an increase in late-harvested ginger for drying, favourable seasonal conditions, and increased use of irrigation.

The Australian market potential is now estimated at 2,200 tons. Current seed usage in 1966 of about 400 tons should produce 2,400 tons of ginger to satisfy Australian processing requirements. Attention now being given to cultural practices, mechanical harvesting and processing techniques could well provide a favourable economic climate for further expansion of the industry.

SUMMARY OF DEPARTMENTAL WORK—1965-66

BEEF INDUSTRY

A fundamental study of the breeding performance of beef cattle in the northern environment is progressing at "Swan's Lagoon" Cattle Field Research Station. The effect of mating and calving cows at various times of the year is being examined in relation to conception rates, cow and calf survival and the growth performance of calves. The influence of nutrition on the occurrence of oestrus and conception rates is a central feature of the investigation. In preliminary data, it is apparent that a period of approximately 6–8 weeks on good quality feed is necessary to overcome the setbacks to breeding occasioned by cows calving in poor condition.

In the past year a major effort has been started to give specific definition to the reproductive performance of herds in various environments in the State. With the assistance of co-operating producers, a number of breeder observation trials are in progress on properties in the Rockhampton, Emerald, Clermont, Darling Downs and Brisbane Valley areas. The basis of the investigations is pregnancy diagnosis.

A preliminary dissection of results so far obtained suggests an intimate relationship between early conception and plane of nutrition as indicated by condition scores. Lactating cows perform at a much lower level of breeding efficiency than dry cows and the effect appears to be strongly influenced and related to body condition.

The employment of an early pregnancy diagnosis technique should assist in relating findings more closely to conditions at mating and should strengthen the validity of inferences brought out at the time of examination for pregnancy.

An experiment to measure the response to supplements providing a constant amount of protein but a variety of energy intakes in the diet of cattle grazing spear grass/blue grass pasture at "Brian Pastures" Pasture Research Station was continued. Although supplemented groups gained 0·78 lb. per head per day compared with 0·43 lb. per day for unsupplemented animals from May to November, there was no response to additional energy at the protein level fed.

The vitamin A reserves of cattle have been studied in grazing beef cattle at 3-monthly intervals, in drought-stricken cattle in the terminal stage of under-nutrition and in cattle being intensively finished. The liver vitamin A reserves of grazing animals at "Brian Pastures" Pasture Research Station remained adequate in cows and calves throughout the year. The liver vitamin A levels in 18 drought-stricken cattle from seven properties ranged from 27 to 879 micrograms per gram. In the animals being intensively finished on high-grain rations over a 3–4 month period, liver reserves fell to a low level (less than 10 micrograms per gram) in 26% of the animals. Night blindness was apparent in some animals but no significant response to supplementation was obtained. The likelihood of a production response to vitamin A in this class of animal is dependent on the initial liver reserves and on the length of the feeding period of these highly productive rations of low carotene content.

Experiments based on a 90% sorghum grain, 10% roughage (sorghum stubble or sorghum silage) ration were designed to investigate the effects of processing of both grain and roughage and supplementation with selenium and vitamins A, E and K. Studies were also made on the feeding of cracked grain *ad lib.* for the finishing of cattle grazing sorghum stubble. The degree of processing of either grain or roughage did not consistently affect performance of the animals. On the basis of the result, coarse grinding of grain and processing of roughage only to reduce wastage would appear to be sufficient for finishing cattle on high-grain rations. The addition of selenium, vitamin E or vitamin E and K did not appear to affect growth rate, feed intake or feed efficiency. Although the rate of gain of the grazing group was lower and more variable than that of groups fed in yards, no serious complications with grain engorgement were encountered. Further investigation is warranted.

A study of the effect of a low plane of nutrition of dams during late pregnancy and of progeny during the first 200 days of life on subsequent performance of beef cattle is in progress. At 200 days of age all calves were fed a 75% grain-25% lucerne ration *ad lib.* Results to 300 days of age show that the low-plane calves have not been able to make compensatory growth during the period 200–300 days. Skeletal measurements indicate that low-plane calves have much smaller skeletons than those receiving a moderate plane of nutrition during pre-natal and early post-natal life. The experiment will continue until the animals reach 900 lb. Growth rate and feed consumption will be recorded throughout and carcass studies will be made at slaughter.

A co-operative experiment conducted by the Department at "Lowville", in the Rockhampton region, has confirmed the benefit of fertilizing Townsville lucerne. Cattle grazing Townsville lucerne pastures topdressed with superphosphate put on 440 lb. liveweight per head in the 6 months from December to June, while their counterparts grazing native pasture alone and having double the area of pasture available to them put on only 280 lb. It is of interest that the benefit of fertilizing was higher in the second year, when the Townsville lucerne sward had thickened considerably.

The release of Leichhardt biflorus (*Dolichos biflorus*) during the year may well prove to have been a noteworthy event for both the beef and dairy industries. This quick-growing annual legume with its high yields of nutritious seed pods has shown promise in the dry tropics. The plant is best used as a standover feed for the dry season, after grazing in the summer period has been deferred. The seed pods do not shatter and seed in considerable quantities is now available to producers at a reasonable price. Last year steers grazing Leichhardt biflorus pastures at Parada Research Station, near Mareeba, at the rate of 1·5 acres per head, put on an average of 126 lb. liveweight per head over the August to November period, a time when animals grazing native pastures normally lose a lot of condition.

A large-scale research project on "Swan's Lagoon" Cattle Field Research Station is concerned with the establishment and management of Townsville lucerne. The primary objective is a comparison of native pastures with Townsville lucerne/native pasture with and without annual maintenance fertilizer.

The modified tick fever vaccine containing only *Babesia argentina,* first introduced in 1964, has been well received by producers. Field reports have indicated that it has generally produced mild reactions and has increased the effectiveness and reliability of the vaccination procedure. Approximately 300,000 doses were supplied by the Department, this being almost a 50% increase on the amount supplied in 1964-65.

Experimental work still in progress has indicated that the mildness of reactions produced by the vaccine is due to attenuation of the organisms, which is resulting from short-interval passage in the young splenectomized calves now being used as vaccine donors.

Exposure in three field locations of experimental cattle previously immunized with only *Babesia argentina* has provided further evidence that naturally transmitted *B. bigemina* is of low pathogenicity. These findings, together with field reports, have vindicated the decision to omit *B. bigemina* from the standard vaccine.

Research has also been undertaken on the toxicity of drugs used to treat clinical tick fever. Results with quinuronium sulphate indicate that twice the recommended therapeutic dose can be dangerous even under ideal conditions, while toxicity of amicarbalide ("Diampron") was very low at six times the recommended dose rate. Results with an experimental drug (HR 2073) indicate that it is of low toxicity and show it to be of considerable promise for the treatment of *B. bigemina* and *B. argentina* infections. Further studies with quinuronium sulphate as a depot drug for the prevention of tick fever showed that when given at the time of infection it prevented clinical symptoms and parasitaemia, but local damage at the site of inoculation and death from kidney damage in some animals precludes its use.

The outstanding problem encountered in tick control measures during 1965-66 was the discovery of a strain of ticks clearly resistant to all organophosphorus tickicides. To date, such highly resistant ticks have been confirmed on a number of properties in the Esk district. Following discovery of this strain of ticks a comprehensive survey was made of nearly 200 properties in the area for organophosphorus resistance.

During the year no positive lung lesions of C.P.P. were found in the State. Laboratory support was given to the National Campaign for Eradication of Contagious Pleuro-pneumonia by serological testing of approximately 60,000 samples and by assisting the Huddard field team with reagents. The role that vaccination is playing in the overall campaign can be judged by the fact that over 800,000 doses of vaccine were distributed from the laboratories in 1965-66.

Research on leptospirosis has been directed at determination of the effectiveness of vaccination for the prevention of abortion and "white spotted" kidneys in cattle. Vaccination with bivalent (*Leptospira pomona* and *L. hyos*) vaccine resulted in peak titres ranging from $^1/_{30}$ to $^1/_{300}$ for *L. pomona* and $^1/_{100}$ to $^1/_{1000}$ for *L. hyos*. Re-vaccination resulted in higher and more persistent titres. Vaccinated animals, when exposed to *Leptospira pomona,* either did not excrete leptospira in the urine or excreted only small numbers for 1 or 2 days. Leptospiruria in non-vaccinated animals was marked and persisted for at least 2 months. In calves, a single vaccination prevented the "white spotted" kidneys which result from severe natural *L. pomona* infections.

The year was marked by an increasing awareness on the part of stock-owners that losses from botulism can be overcome by inoculation. This was evident in the North-west, Gulf, Townsville, Charters Towers and Central districts, where many owners have adopted annual inoculation of all cattle as a routine husbandry measure.

Results of experimental work at the Animal Health Station, Oonoonba, have shown that a single vaccination of cattle against botulism with C.S.L. bivalent toxoid (containing the South Australian type D strain) is able to protect

animals for at least 2 years. A further experiment using the vaccine now commercially available is in progress. This vaccine contains the South African type D strain of *Clostridium botulinum*. Results to date show that animals are protected for 18 months by either a single vaccination or by two doses of vaccine, 6 weeks apart. Further challenges are planned at 2 years post-vaccination.

Work continued in the Tara and Goondiwindi areas on a beef-sheep study which attempts to determine optimum stock combinations for properties in these districts. Budgets have been prepared for planned development, and, with the assistance of the Department, co-operating producers are to keep records of their activities for a period of five years. Progress will be reviewed annually.

SHEEP AND WOOL

Progress was made with the two long-term trials under way at Toorak Sheep Field Research Station, which is situated in the harsh sheep environment of the north-west. These are the nucleus trial, in which long-term heritability and lambing performances of wrinkled, plain and random sheep are being observed, and the oestrus trial, to observe the manifestation of oestrus in ewes running continuously or intermittently with vasectomised rams.

Time-of-joining and supplementation trials were also continued at Toorak.

The Wool Biology Laboratory received 1,744 samples for examination, and 3,651 evaluations covering fibre diameter, crimp and staple length were made.

The testing of promising compounds for the control of sheep blowfly was continued, eight products being examined during the year. None were as efficient as diazinon 0·025%.

Suggestions by commercial firms that sheep being fed mulga for survival would not receive adequate carotene prompted an examination of the liver vitamin A reserves of sheep maintained on mulga for period of 3-16 months. Further studies were also made on the beta-carotene content of mulga leaves at the time of lopping and after drying for periods comparable to those in use in field practice. The liver vitamin A reserves of the sheep were satisfactory, ranging from 63 to 1,710 micrograms per gram. The results of analyses of the leaves, when considered in relation to the intake required for survival, showed that they would provide carotene intake in excess of recommendations.

One of the main limitations to studies on the nutrition of grazing animals is the difficulty of accurately determining feed intake, particularly under extensive grazing conditions. Present methods involve frequent handling of animals. Studies are in progress in an endeavour to relate faeces output during a period of two days in confinement without feed to feed intake while grazing. The direct relationship between feed intake and faeces voided is less satisfactory, showing significant differences between feeds. Studies with grazing sheep are continuing in order to further assess the value of the technique.

Geo-chemical studies in north-western Queensland have shown that, in the area under study, selenium excess is confined to the Toolebuc Member of the Wilgunya Formation or to watercourses draining this Member.

An experiment involving 40 rams is in progress to compare the accuracy of the various serological tests for the diagnosis of ovine brucellosis, with a view to standardisation throughout Australia.

DAIRYING

In a study of the decline of kikuyu grass pastures at Maleny it has been established that nitrogen is the chief nutrient deficiency in deteriorated situations, but deficiencies of molybdenum, sulphur and magnesium are sometimes implicated. Field trials have indicated that management can largely rectify the situation in that by controlling the aggressiveness of kikuyu grass a compatibility with white clover is developed and adequate nitrogen nutrition of the grass is thereby ensured.

Funnel ants are still the major pests on the Northern Tablelands. Investigations have proved that these pests are not native to dairy farm areas. They have invaded the closely grazed pastures from adjoining open forest. Active spread into new areas is still increasing. By their soil-moving activities the funnel ants smother short over-grazed swards and destroy soil structure to the extent of producing artificial drought conditions around the grass roots. Resort to insecticidal control has not revealed any chemicals effective at economic levels. The use of chemicals, however, can be avoided because the ants can be suppressed by ecological methods. The tall grasses such as green panic and guinea grass were first shown to be effective in ant suppression. Recent investigations have proved that sward density rather than height alone is the key to ant control . "Dense sward" on uninfested country will prevent infestations. "Dense sward" on infested country will completely suppress funnel ants. The Department now has several large demonstration projects in hand on Tableland dairy farms to show that by attending to the pasture's nutritional requirements and controlled grazing, "dense sward" is readily and economically practicable.

In many dairy districts the early promise of greenleaf desmodium and silverleaf desmodium is being fulfilled. Greenleaf desmodium is proving a much more versatile pasture legume than many species previously available. This is especially true of its performance on the Atherton Tableland, where it is growing better than Tinaroo glycine on long-cultivated maize soils.

The work of plant introduction is being continued. Early in 1965 Dr. B. Grof, Officer in Charge of the Tropical Agriculture Research Station, South Johnstone, collected over 400 pasture grasses and legumes in Africa, South America and Mexico. The legumes included species of *Phaseolus, Stylosanthes* and *Desmodium*. Two of the stylo lines appear to be very promising, one because of its excellent yield and quick recovery after cutting, the other because of its leafy growth and fine, well-branched prostrate stems. A white-flowered Desmodium from Guatemala has attracted attention. Its yield and recovery after cutting are excellent and it has better resistance to disease and insect attack than other related species.

The increasing use of tropical legumes in pasture has raised the question of their suitability for incorporation in silage. The effect of wilting and the addition of molasses on the quality and digestibility of silage prepared from *Dolichos lablab* was studied. Even though the experimental crop was grown under dry conditions and contained a high proportion of stalk, crude protein content on a dry-matter basis was approximately 15%. All silages were well preserved but showed rapid deterioration on exposure to air. Dry-matter digestibility was improved by addition of molasses at 80 lb. per ton. The quality of glycine/green panic silage, as judged by pH, lactic acid content and level of volatile bases, was improved by including molasses at either 120 or 200 lb. per ton at the time of ensiling.

Drought conditions reduced the rate of expansion of artificial insemination, there only being a small increase in the number of cows inseminated during the year. The first service non-return rate of 67·7% obtained with semen supplied from the A.I. Centre at Wacol was the highest on record and partially reflects the technical advantages of using liquid nitrogen refrigerant for deep-frozen semen. Notable features of the last two years are the almost complete change to use of deep-frozen semen, the increased proportion of Friesian semen supplied and the high percentage of beef-breed semen used by dairy farmers.

The progeny testing of dairy bulls is a continuous and long range process. The programme was maintained during the year with the assistance of co-operating dairymen for the A.I.S. and Jersey breeds. Some difficulties in the maintenance of an adequate rate of growth in heifer weaners and in the re-breeding of dams as a result of depression of nutrition was expected and did create some temporary difficulties. However, a concentrated advisory programme preceded the breeding season and reproductive performance was subsequently at an acceptable level in the circumstances.

The progeny testing of Friesian bulls is a matter of importance due to the demand for semen of this breed and its expected role in dairy production in future years. The organisation of the Friesian testing will require considerable assistance from commercial A.I. Co-operative Associations and from owners of commercial production-recorded herds. The co-operation of producers and of their organisations is being sought and received in the development of the project.

The training of technicians for commercial A.I. Co-operatives continues at a steady level of demand.

In the drought year, a problem of major importance to beef and dairy producers was nutritional infertility. With a proportion of cows calving in poor body condition, the problem was consistently manifest as post-calving anoestrus. When rapid weight loss occurred during early lactation post-service anoestrus was a common feature of reproductive performance. These effects, more widespread in the current year, have been additional to the complex of specific and non-specific infections that modify the breeding performance of herds.

In addition to the survey and pathology investigations that have been in progress for several years, there is a growing body of evidence linking deficiencies in nutrition to anoestrus. Some field trials support the view that plane of nutrition in late pregnancy is of prime importance in early manifestation of oestrus. In addition, there is evidence that deficiencies in dietary energy may be associated with lower conception rates. Field trials on dairy farms are current to test the effect of energy feeding in late pregnancy and early lactation on conception rate.

During the year an economic assessment of dairy farms assisted under the Farm Water Supplies Acts was carried out at the request of the Irrigation and Water Supply Commission. Results from survey farms in the Brisbane, Gympie and Central Queensland districts generally show favourable increases in farm production and income, compared with the situation prior to irrigation. The average cost of

producing a unit of output on survey farms had fallen since irrigation was installed, and the average return on extra capital investment in supply facilities, irrigation equipment, pastures, fencing and stock was quite satisfactory. The results of this survey, as well as indicating the benefits to the scheme to dairy farmers generally, should prove of practical value to those concerned with the consideration of future applications under the Acts.

The last report in the series to be issued in the Wide Bay Dairy Survey, dealing with the economics of various farm practices and their impact on commercial dairy farms in the Wide Bay area, has been prepared for publication. It deals with silage-making, vealer raising and other practices feasible in the area which were investigated but not included in previous reports. These investigations were undertaken at the request of the Wide Bay Dairy Extension Advisory Committee to provide economic information on specific farm practices for use by extension workers and farmers in the area in the absence of local economic advice. The appointment of an Agricultural Economist to the district will allow work to continue from the foundations and guide lines established by these investigations. The first project of this nature has already been started and concerns the effects of the introduction of tropical pastures into the farm fodder programme of Wide Bay dairy farmers.

The drought caused a number of farmers to withdraw from Herd Recording Groups and by August the number of herds was down to 882, compared with 1,075 in January 1965. The numbers gradually increased until during November 954 herds were being recorded.

The average yield per cow under the group Herd Recording Scheme for the 9 months ending June 30, 1965, was 4,465 lb. milk and 187 lb. fat. A total of 38,557 completed lactations was included. The average yield was the highest yet recorded despite the drought. The average length of lactation fell from 257 to 247 days.

During the year 173 herds were recorded under the Pure Bred Scheme, a decrease of three on the previous year. For the year ending June 30, 1966 a total of 4,117 cows completed recorded lactations, average production being 6,358 lb. milk and 276 lb. fat.

During the year some high yields were recorded, reflecting the ability of some studmasters to breed and feed for production. The highest yield recorded was that of the A.I.S. cow "Sunny View Little Princess 30th". Her yield for 270 days as a 7-year-old was 25,425 lb. milk and 1,063 lb. fat. The lactation was extended to 360 days, during which period she gave 29,385 lb. milk and 1,225 lb. fat. One other A.I.S. cow produced over 900 lb. fat for the 270 days.

In order to indicate herds which have a number of merit cows from which progeny may be available for sale, the title of "Merit Stud" is conferred on any stud where the number of Merit Register animals exceeds 40% of the cows over 4 years of age. In 1965 there were 25 such herds. This year the number to qualify was 21.

More dairy farmers are accepting the Register of Merit for Dairy Cows as a guide to an animal's productive ability, rather than the Advanced Register of the Herd Books, to which an animal is admitted on the results on one lactation only. During the year the 100th cow was admitted to the Elite Section of the Merit Register. The qualification for entry is 3,600 lb. fat produced in not more than 10 lactations.

Sire surveys were made of bulls used in stud herds and the results of 114 surveys were published. Of these, 43 bulls had plus ratings, 64 had minus ratings and 7 were maintaining.

From funds available from the Commonwealth Dairy Industry Extension Grant, 132 demonstrations have been continued to indicate the benefit of improved farm practices. In many instances these have been associated with the extension advisory programmes of Dairy Extension Advisory Committees. The adverse seasonal conditions were not conducive to the successful operation of many demonstrations. Most raingrown pasture demonstrations were unproductive. The only exception was in the Wide Bay area, where tropical legume based pastures continue to show good results.

Two sets of tank moulds were made available during the year for loan on a roster system to dairymen and there was a heavy demand for these in the districts in which they were stationed. Twelve reinforced concrete water storage tanks ranging from 5,000 gal. to 10,000 gal. capacity were built in the Rockhampton district, and 12 tanks were constructed in the Ipswich area.

Another service which has proved popular is the fertilizer spreader stationed at Cooroy. From the time of its purchase in October 1960, until August 1965, it has been loaned 140 times and applied 280 tons of fertilizer.

Examination of the efficiency of milking machines was continued on an individual request basis and approximately 900 machines were examined. A group approach to milking machine testing was adopted in the Dayboro district, where two officers co-operated with the local Q.D.O. branch in a planned programme embracing 50% of local dairy-farmers.

Spray washing of butter was investigated under field conditions in three butter factories. Grading results on fresh butter indicated that using one-tenth the normal water quantities it has been possible to maintain comparable initial grade score and obtain a slight increase in curd content.

Factory sampling procedures have been investigated in two milk processing plants and one butter factory to assess the validity of composite sampling. Where due care has been accorded to homogeneity and proportional sampling, the use of composite samples for determining butterfat content has been established as a suitable alternative to daily sampling.

Cream processing efficiency studies were made on two processing units new to Queensland and reports issued to the equipment suppliers concerned.

A moisture dispersion meter operating on changes in electrical conductivity was examined for suitability as a commercial unit to evaluate the degree of moisture distribution in butter. The studies revealed that for butters where moisture distribution was good the meter was reliable. However, when moisture was not adequately dispersed through insufficient working instrument readings were variable.

The results of a survey of the ripening of raw farm creams at various temperatures have been collated and a technical paper has been submitted for publication.

The nitrate-reduction test on raw cream supplies has now been extensively studied. This has been shown to be a suitable test for detecting deterioration of cream due to growth of contaminant organisms and to differentiate such creams from those in which degrading is due to other factors not associated with bacterial growth.

Following previous work identifying the source of and the chemical substance responsible for the main weed taint defect in manufactured butter, a serious industry problem, current research is designed towards its isolation and identification in butterfat. The magnitude of the problem is apparent when it is realised that even heavily tainted butterfat contains only about 20 to 50 parts per billion, so that one 56 lb. box of butter will yield no more than 1 milligram of the substance. Precise attention to detail with respect to the extraction of the substance and its identification is obviously very necessary and requires skilful chemists with considerable experience.

An investigation of the role of copper and ascorbic acid on linoleic acid emulsions at varying pH was continued. Results confirmed the pro-oxidant role of ascorbic acid in lipid emulsions as suggested by numerous workers. The pro-oxidant activity of ascorbic acid was found to be inversely proportional to copper concentration and this was accentuated at low pH. It is suggested that, at low stability of ascorbic acid, it effectively competes with the oxidising fatty acid for oxygen (acting as an antioxidant), while at high ascorbic acid stability (low copper, low pH) it is more effective as a pro-oxidant.

A possible major investigation may be required to solve the cause of the almost continual degrading of butter manufactured in several factories from factory separated cream. It is hoped that success in isolating and identifying the responsible substance in the laboratory might follow manufacturing trials planned in association with the factories concerned.

Under the Butter Improvement Service, 20,298 tests on 2,596 samples of butter were performed. Included in work undertaken under this service is an estimation of the copper content of Queensland butters. It is well known that copper has a catalytic action in fat oxidation and, following perfection of a time-saving method for copper estimation during the previous year, it has been possible to undertake estimations on a routine basis. Results show the average copper content of Queensland butter to be 0·08 p.p.m., with 57·5% of samples complying with the provisional advisory standard of less than 0·08 p.p.m. copper content.

An advisory service with respect to the chemical composition and bacteriological standard of pat butter from various parts of the State is also provided. Of 158 samples examined, 1·9% were over moisture (standard 16·0%). The results also show that the "working" of pat butter is still below the standard of bulk butter, while 5·1% of samples contained sufficient extraneous matter to warrant classification as "dirty".

Examinations of butters packed for local sale were continued during the year, a total of 148 samples being obtained from 13 plants. Grade scores showed that 97% of samples complied with the regulations for quality.

Assistance with waste disposal problems has continued to be a feature of technological services. A further series of recordings has been continued in the Maleny plant, where casein and butter factory residues are disposed of, and advice is being provided to the Gympie, Biloela and Butter Marketing Board processing plants on their particular problems. It is anticipated that these studies will be expanded during future years and prove of value to the industry as waste disposal problems become more acute.

Details of methods for manufacturing a wide range of cheese varieties under local conditions have been made available to factories as a result of investigational and experimental work carried out.

Advice and guidance have been given to associations and individuals concerning the manufacture of non-cheddar varieties of cheese in Queensland and in other States. Quality and compositional control work has been carried out for those Queensland factories engaged in the manufacture of Blue Vein, Edam, Gouda and Cheshire cheese.

The regular implementation, on a 6-monthly basis, of the bacteriological scheme for assessing the standard of hygiene at cheese factories has been beneficial in promoting a better observance of hygienic practices. The scheme involves a very thorough survey of the bacteriological state of equipment, water supplies, pasteurized milk, starter cultures and finished curd.

There has been an improvement in the average Cheese Factory Hygiene Index as compared to when the scheme was first introduced last year. The initial average figure was 363, whereas the average for the whole of this year was 382.

The control of cheese composition has proved difficult during the past year. The somewhat abnormal nature of the season no doubt played a part in this. Both moisture content and fat content were found to be less satisfactorily controlled and the proportion of cheese containing more than 38% moisture or less than 50% fat in the moisture-free substance was approximately doubled.

Studies of mechanical cutting of the coagulum and pH control in cheese manufacture have been carried out with a vertical cheese vat especially designed for this work. These studies are aimed at developing a fully automated method for the manufacture of the stirred curd variant of cheddar cheese.

Bacteriological work carried out has included official sampling and testing of cheese from factories registered to supply the Japanese market and preliminary testing of cheese manufactured from six other factories which may export to Japan. Cheese from all factories showed a high incidence of coliforms (82%), although the incidence of *E. coli I* was much less (31%). Factories are being encouraged to improve their manufacturing techniques.

It has been possible to reproduce fermented and other defects of cheddar cheese by the addition of representative type bacterial isolates obtained from such cheese at the start of cheese manufacture. A method whereby five small cheese can be made at the one time has been developed.

Investigation of methods of lactose estimation in cheese has shown, firstly, that reducing substance estimation bears little relation to lactose content, and, secondly, that there appears to be other carbohydrate material in cheese which interferes with methods of estimation not based on copper reduction. Thin layer chromatography has been found to be inadequate for quantitative estimation but is quite useful for identifying compounds which react with a particular reagent. Efforts are being made to identify interfering carbohydrate materials with a view to estimation of total carbohydrate using an anthrone reagent, while monitoring the reactive compounds by thin layer chromatography.

Large-scale extractions of non-cheddar cheeses have been undertaken in an attempt to elucidate and solve the problems associated with the development of undesirable flavours and the acceleration of maturity with this newly developed dairy manufacturing activity in this State.

An analytical service on behalf of the Brisbane Milk Board for advisory purposes and conformation of market milk and cream to prescribed standards under the Dairy Produce Acts is a feature of routine Departmental work. During the year, 4,006 samples of milk and 699 cream samples were analysed. There were 113 instances of sub-standard tests with respect to milk samples submitted, while 33 milk samples contained extraneous water.

A survey on the incidence of penicillin on milk samples from bulk milk tankers, raw milk vendors and individual suppliers is another industry service undertaken. This work is carried out in association with the Brisbane Milk Board, whose officers are responsible for the taking of samples and their delivery to the laboratory. During the year 8,530 samples were examined; 3·4% showed the presence of an inhibitory substance and the presence of penicillin was confirmed in 1·6% of the samples.

A major survey to study the scope, importance of and factors connected with the incidence of abnormal milk was continued.

Valuable guidance in the orderly conversion from refrigeration and transportation of milk in cans to refrigeration and transportation of milk in bulk was given to the industry during the year. This scheme has now become firmly established in 11 districts, with the possibility of an additional five commencing within the near future. Close liaison has been maintained with distributors of bulk farm milk tanks, and in accordance with new regulations, control has been exercised over bulk milk tankers. A new Certificate has been necessary under the Dairy Produce Acts for persons associated with the grading and sampling of these farm milk samples.

Despite advances in detergent usage and the introduction of new equipment, the bacteriological condition of commercially cleaned milk bottles has remained extremely variable. To identify causal factors, a series of bacteriological examinations have been pursued in five milk processing plants during the year. While satisfactory results have been obtained in several instances, the degree of variation which has occurred in this survey indicates that all factors are still not adequately understood. The studies will continue in the coming year.

Growth rates of mixed flora in raw milk samples have been studied at 3°, 5° and 7°C. Isolates from these samples have been identified, and tested for growth rates at various temperatures. The ability to form colonies on plates at various incubation times and temperatures is being related to growth rates of the organisms in milk.

Studies have been made of the effect of storage at 5° and 10°C on the bacterial flora and keeping quality of market milk. Particular attention has been paid to organisms detected on agar containing penicillin and to psychrophilic organisms.

PIGS

Planning of a survey into the pig industry has commenced. This survey will cover the overall cost structure, marketing methods, quality and presentation of pigmeats and consumer preferences.

A feature of the year's work has been the very strong demand from farmers for advice on piggery building designs. Standards of recommended space allowances for various types of pigs in intensive housing were drawn up. Basic principles in design of housing were set out, including pen shapes, drainage, ventilation, roof designs, and materials.

Problems associated with disposal of liquid manures by the manure pond system are under investigation. Co-operating in this work are the Departments of Health and Local Government.

The utilization of soybeans and soybean products, either on their own or in conjunction with other protein-rich ingredients, as supplements to cereals in rations for pigs was studied. During the year the relative economy of imported fish and soybean oil meals, as protein supplements, was reversed by a 50% increase in the price of the former product. The Department was able to give prompt advice on feeding under the changed conditions. The work with processed or cooked soybeans also forms a sound basis for advice on the use of locally grown soybeans (fat unextracted).

Results of work demonstrating the superior performance of pigs fed fishmeal, in comparison with meat-and-bone meals, were published.

The use of bloodmeal in conjunction with both fish and high-protein, low-ash meatmeals was also studied and work in progress is designed to assess the influence of supplementary lysine on these products.

Pig testing was continued at the Pig Testing Station. Seven boars from five breeders qualified during the year. The progeny of another 10 boars from nine breeders were undergoing tests, while seven breeders had nominated another seven boars for testing.

POULTRY

The 8th Layer Random Sample Test concluded in November 1965 and a full report has been published in the Egg Marketing Board Bulletin. A significant increase in both rearing and adult mortality and a decline in hen housed average (H.H.A.) egg production were noticeable features of the test. The increase in mortality was due to a greatly increased incidence of leucosis. Despite the low H.H.A., profitability increased in this test compared with R.S.T. No. 7, due partly to an improvement in feed conversion and partly to a higher net return from eggs marketed through the Egg Marketing Board during 1965.

The production section of R.S.T. No. 9 commenced in December 1965 and is due to terminate in November, 1966. The average rate of lay during the first 17 weeks of this trial was slightly higher than for the comparable period during R.S.T. No. 7. Once again losses from leucosis have been heavy in the rearing stage of this trial.

Broiler Random Sample Tests No. 2 (Autumn) and 3 (Summer) were concluded during the year. The average hatchability for all commercial entries reached 69·6% in the Autumn test, but fell to 64·3% in the 1966 Summer test, showing once again the effect of hot weather on hatchability. Average body-weight in the Autumn test was approximately 3·4 lb. and average feed conversion was approximately 2·50. Average body-weight was comparable with that being obtained under commercial conditions, but feed conversion was rather high. In the Summer test the average body-weight was approximately 3·1 lb., with average feed conversion of 2·34. The lower average body-weight obtained in this test was probably due to the effects of hot weather. The feed conversion achieved in this test compares more than favourably with feed conversion being obtained under commercial conditions.

As a preliminary to an investigation into the effect of pre-incubation formaldehyde fumigation on the hatchability of fertile eggs, the Harry method of estimating formaldehyde gas concentrations was tested at the Rocklea Poultry Research Farm and was found to be satisfactory.

When Newcastle disease virus was discovered in Queensland it was thought that measures may have to be undertaken by the State Egg Marketing Board in southern Queensland to disinfect egg cases and fillers. It was decided that formaldehyde gas fumigation would probably be the most effective method of disinfection and a test conducted at the Rocklea Poultry Research Farm gave results that suggested that fumigation of egg cases would be effective in disinfecting the cases and fillers.

The pullorum testing figures for the year show that 451,453 fowls were tested for 74 registered stock suppliers. Twenty-three flocks had reactors amounting to 0·53% of the total number of fowls tested in the State. The main source of *S. pullorum* appears to have been meat-type chickens emanating from interstate breeders. On two occasions where the reaction was found to be excessive, a temporary embargo was placed on the introduction of day-old chickens from certain interstate breeding organisations until an assurance was obtained from the State Department of Agriculture concerned that pullorum infection no longer presented a problem. The Animal Research Institute has shown that variant and intermediate strains are present in addition to the standard strain, and the presence of variant strains provides one reason for difficulty in eliminating infection using the rapid whole blood test.

An experiment involving three levels of protein in the grower ration (11, 13 and 15%), two levels of protein in the layer ration (13 and 15%) and two housing densities (2 and 4 sq. ft. per bird) is in progress. Sexual maturity was delayed by the 13% protein layer ration and by the 11% grower ration. No final conclusions on egg weight and production can be made until the end of the experiment, but of particular interest at this stage is the performance of birds fed 13% protein during the grower stage and then transferred to the 15% protein layer ration. Egg weight and production are comparable with and rearing costs are lower than those fed 15% protein throughout. At this stage there appears to be no difference between housing densities.

The effect of the tannin content of sorghum on the growth rate of chickens from 0 to 4 weeks of age was studied in rations containing 70% sorghum, with tannin content varying from 0·2 to 2·5%. These rations were supplemented with one, two or three times the normal levels of methionine and choline. Depression of growth decreased as tannin content decreased and as methionine and choline content rose, but none of the groups grew as well as those receiving a ration containing equal parts of maize and wheatmeal to replace the sorghum.

The inclusion of dried brewers yeast, produced in North Queensland, at levels of 3, 4½ and 6% to replace on a comparable protein basis either buttermilk powder or fishmeals in broiler ration for young chickens resulted in comparable growth rates.

As little experimental information is available on the effect of saline drinking water on performance of poultry, it has been difficult to advise producers on the suitability of their water supply. In experiments with chickens at Rocklea, 4,500 p.p.m. of sodium chloride significantly depressed body-weight and feed consumption to 4 weeks of age. The next lowest level tested, 2,860 p.p.m., did not affect these criteria, and neither did the highest tested levels of calcium chloride (940 p.p.m.) and magnesium chloride (1,050 p.p.m.). All levels of sodium chloride tested (1,310, 2,860 and 4,500 p.p.m.) and 1,050 p.p.m. magnesium chloride increased the ratio of water to feed consumed.

The first occurrence of Newcastle disease in Queensland was reported early in 1966. The virus was isolated by the Animal Research Institute from chickens *ex* flocks at Hemmant and Belmont. A survey to determine the incidence of the disease was undertaken at once. Flocks sampled included 43 in Brisbane division, 2 in Toowoomba, 2 in Maryborough, 6 in Rockhampton and 3 in Cairns division. Sera from New Guinea and sera from flocks submitted for other purposes were tested also. Apart from one positive in 113 sera from a Mt. Morgan flock (considered to be non-specific), all positive reactors came from 14 Brisbane flocks, four of which had ties with franchise flocks in New South Wales. Four others drew stock from infected local flocks and the remainder were so-called closed flocks, although they had introduced day-old cockerels for cross-breeding purposes. A search for a common factor in spread of infection revealed that an abattoir truck called at most of the infected properties.

Avian tuberculosis was diagnosed for the first time in Queensland in backyard flocks at Yelarbon. Testing of these flocks has commenced and 288 fowls on seven farms revealed 32 reactors in five. No commercial farms are involved. All infected farms are quarantined.

A survey of markets and trends in the broiler industry is under way and a report on developments in this rapidly expanding sector of the rural economy will be issued in the coming year.

An economic study of hen egg production in North Queensland was carried out in an attempt to evaluate the effects of the proposed change in egg marketing.

During April and May, 1966, the Department in association with the Egg Marketing Board conducted an egg quality survey at retail outlets in the Brisbane metropolitan area. The objects of the survey were:—to assess the overall quality of eggs being sold at retail outlets; to compare the quality of Board eggs with those obtained from other sources; and to assess storage conditions, methods of presentation in retail shops and frequency of purchases by retailers. The analysis of the data obtained in the survey has not yet been completed, but it is evident that the quality of eggs available at retail outlets leaves much to be desired.

CROPS

Wheat.—Under relatively rust-free conditions, Gamut, Gamenya and Mendos performed well in varietal trials during the 1965 season. Festiguay has proved to be a useful wheat and is the best of the slower maturing varieties. Difference in varietal susceptibility to Petrobia mite has been demonstrated, as has variation in varietal behaviour to conditions of the zinc deficiency complex on the Downs soil.

Over three hundred wheat varieties and hybrid lines were tested for resistance to crown rot. Of these, several have been selected for further detailed field testing.

In association with A.C.F. & Shirleys Ltd. and the University of Queensland, studies designed to predict the most efficient rate of nitrogenous fertilizer to apply to wheat crops were continued, 50 trials being conducted. A preliminary collation of data shows a relationship between nitrate nitrogen level in the top 4 ft. of soil and yield response which may have promise of commercial application in the prediction of nitrogen requirements. Correlations between soil phosphate determinations and yield response are being further elucidated for the prediction of phosphate requirement; tentative phosphate fertilizer recommendations based on laboratory tests have already been issued by the Wheat Research Institute.

Correction of zinc deficiency in the field has been obtained from the application of zinc sulphate, either drilled (1 cwt./ac) at planting or as spray applications (1·0%) 2-4 weeks after emergence.

Field work on an economic survey into the use of plant and machinery on Darling Downs wheat farms, begun in 1964, has been completed.

Barley.—Judicious usage of nitrogenous fertilizer has been demonstrated to increase yields of barley grain without detracting from malting quality; too heavy an application increases protein to an unacceptable level. A supplemental irrigation of 4 in. at flowering doubled grain yield in one trial.

Oats.—An Oat International Rust Nursery has been introduced to assist in the breeding programme for rust resistance in both prostrate and erect varieties. From varietal trials conducted in 1965, Bentland and Saia appear to be the top performers among current varieties. The introduced variety Minhafer is being evaluated and should prove useful, since it incorporates both crown rust and stem rust resistance.

Grain sorghum.—Extremely dry conditions restricted yields in most of the season's trials. Texas 610, Texas 626 and Pioneer 846 were among the top performers in varietal trials, while Texas 671 appears particularly suited to irrigation. Yields have been increased from 2,482 lb./ac. dryland to 5,556 lb./ac. with one 4 in. irrigation at flowering. Yield responses and protein levels of hybrid grains under different nitrogen levels are being determined. The breeding programme and the subsequent testing of hybrids and of commercial strains continues, three new releases being made in 1965.

Forage sorghum.—The breeding and varietal testing of new material is in progress. Zulu and Sudax remain prominent in forage varietal trials, while several new hybrids show promise; in trials at Biloela the Piper hybrids have shown up particularly well. The red-seeded Sorghum almum has been shown not to differ in performance from standard lines.

Maize.—The first series of prospective commercial tropical rust resistant hybrids from the Kairi breeding programme has yielded significantly higher than the popular GH128. On the Darling Downs and at Kingaroy the De Kalb Shand hybrid D.S.65A has shown high yield potential despite susceptibility to lodging and in spite of poor husk covering; it has yielded 152 bus./ac. under irrigation and has also performed well under extremely dry conditions.

Fertilizer trials on the Atherton Tableland are providing information on critical levels of nutrients in soils and plants by which it is hoped to be able to predict the type and quality of fertilizer needed to improve yields of this crop.

Work has been carried out on a production function study with the object of combining fertilizer response data for different years into an average response curve. This will permit greater precision with recommendations for the level of fertilizer application in relation to profit maximisation. Such an optimum level will be of more general application since it allows for variation between seasons.

A commercial method of correction of zinc deficiency is indicated from results on the Darling Downs, where considerable success has been obtained in trials from the application of a zinc sulphate spray 4–5 weeks after plant emergence. Trials to ascertain district fertilizer requirements are being pursued. Irrigation trials on the Darling Downs indicate that under some circumstances yields can be doubled by applying one irrigation at flowering.

A virus disease of sweet corn, maize and sorghum in southern Queensland has been identified as a strain of sugarcane mosaic. Johnson grass is an important perennial weed host of the virus.

Tobacco.—At the request of industry representatives, nutritional studies have been intensified and have been concentrated on foliar diagnosis techniques as a possible means of assessing fertilizer requirements. Eight district trials have been established in the first year.

Field trials have shown that fertilizers containing chloride as an impurity can greatly influence the chloride content of leaf.

Leaf sponging, which was very prevalent in the Beerwah area last season, was thought to be possibly due to a low uptake of calcium occasioned by seasonal conditions. This hypothesis is being further tested.

Tobacco growers now use sucker control oils on a wide scale and research work has clarified specific district requirements. Results suggest that substantial yield and quality improvement may result where these oils are efficiently used.

A programme has been commenced to restore stability to Queensland seed lines of the variety Hicks and to evaluate the performance of imported strains of this variety. In conjunction with C.S.I.R.O., field testing is in progress on the blue mould resistant material bred by C.S.I.R.O.

Trials showed a new product, "Cyolane", to have both a quick knockdown and residual action against loopers. The only other material in the same bracket is endrin.

A series of control trials proved the continued outstanding ability of DDT to cope with Heliothis in tobacco.

Cotton.—Breeding to produce varieties suitable for local environments is in operation and has been aided by the availability of cotton fibre testing equipment supplied by the Cotton Marketing Board. Selections within the variety Miller for increased staple length and yield and within Deltapine Smooth-leaf for reduced variability of staple length have been largely successful. In the past season significant improvement in weed control has been demonstrated by the use of pre-emergence herbicides such as trifluralin, diuron and prometryne. Efficient weed control doubled cotton yields in one trial.

Stunting or death of cotton seedlings in Darling Downs crops was caused by larvae of the cotton tipworm. Biological studies showed that where a larva became established in a cotton seedling terminal, the growing point was killed in 24 hours. Damage to seedlings within a week of germination is either fatal to the plants or causes a direct reduction in yield and the loss is accentuated by incomplete machine picking of lint from the resulting low, bushy plants.

Detailed studies have been made of the economics of cotton ginning at various centres in Queensland, including country centres in Central Queensland and on the Darling Downs. These studies show that provided there is adequate throughput the best place for a cotton gin is in the centre of production.

Peanuts.—It was shown in the 1966 season that peanuts may be grown satisfactorily with no tillage of the growing crop provided weeds are otherwise controlled. It has been demonstrated also that hilling of crop rows and the use of rotary weeders can be expected to increase disease incidence. The varietal situation is being constantly studied and introductions made for comparison with current varieties.

Oilseeds.—The soybean varieties Burke, Wills and Leslie have given high yields in trials and exhibit favourable agronomic characteristics; under irrigation at Biloela, yields in excess of 1 ton/ac. have been obtained. The variety Arcadian appears promising for the Atherton Tablelands, realising 1,925 lb./ac. in a trial at Walkamin. General cultural practices involving time of sowing, plant population, &c., are being studied. Weed control by herbicides has been demonstrated and could have important implications for producers.

Successful nodulation of soybeans has been obtained on the Darling Downs with selected strains of Rhizobium, thus overcoming a difficult problem.

Linseed varietal testing continues on a regional basis; trial data suggest that the Victorian variety Bonnydoon remains suitable for Queensland conditions.

Deciduous fruits.—Rootstock trials in apples have been featured in the pome fruits research programme for a number of years. The initial trials compared certain Merton stocks with Northern Spy, which was widely used when the apple industry was established at Stanthorpe. These indicated that trees on Merton 778 were superior to those on Northern Spy in tree growth, earliness of bearing and total yield. Since the Merton stocks were released, another series known as Malling Merton (MM) have attracted attention throughout the world. Two trials with these stocks are now in their fifteenth year and tree performance over this period has been evaluated. The results leave no doubt that MM109 will find a permanent place in the industry.

Measles, a bark disorder, is becoming increasingly important in both pome and stone fruits at Stanthorpe. Recommended control measures involve the use of boron. The symptoms can be induced by injection of manganese into the tree and there is therefore a possibility that, on some properties, manganese toxicity may be a contributory factor. The effect of boron and manganese levels in the soil on tree growth and performance is therefore being studied at the Granite Belt Horticultural Research Station. Analytical data are currently being examined. It appears doubtful if measles is a simple boron deficiency; a nutritional disbalance in which two or more trace elements are involved may be implicated.

A breeding programme has been initiated in apples, plums and peaches. In apples, the objective is to obtain an early-maturing, red-skinned variety of acceptable dessert quality. In plums, the primary considerations are evenness of cropping and times of maturity. In peaches, varieties which are less susceptible to brown rot and, in the case of early maturing types, less susceptible to bud shedding, are needed. Crossing techniques have been established and are now being successfully exploited.

In coastal Queensland, berry quality in grapes is sometimes poor, particularly when overcast weather occurs in the later stages of fruit development. Methods of correcting this fault have been further investigated at the Redlands Horticultural Research Station. The results indicate that an application of a potassium sulphate spray at cap-fall, followed by the removal of surplus laterals and excessive foliage around the bunch, hastens fruit development and minimizes the risk of sub-standard fruit being harvested when the season opens.

Container trials with stone fruits (plums and peaches) indicate that bruising is greater in pattern packed than in loose-fill containers. This is due mainly to injury when lids are nailed to pattern packed wood cases in the packing shed. Pattern packed containers hold 14% more fruit than the equivalent containers with a loose-fill pack. The peach container trial highlighted the merits of a $19\frac{3}{4}$" x $11\frac{7}{8}$" x $5\frac{1}{2}$" (or $5\frac{3}{4}$") carton which accommodates two or three layers of fruit (according to size).

Transfer of the deciduous fruit pest investigations to the new research laboratories at Applethorpe has facilitated the studies of these pests in the Stanthorpe district. Experiments with new materials for the control of major pests, particularly codling moth and red spiders on apples, have shown two new materials, phosalone and methidathion, to have advantages over some of the standard materials and these are included in recommendations for the coming season.

Grapes in the Stanthorpe district suffered a sudden population pressure of the grape vine blister mite in 1960. This pest, previously absent or inconspicuous, has continued to be troublesome. The reasons for this sudden dominance are being studied over a wide range of vineyards, particularly to determine the influence of changes in the control programmes. Controlled insecticide studies have proved the value of the semidormant lime sulphur spray followed by summer and post-harvest applications of carbaryl. This spray programme has been highly effective where used in commercial vineyards.

Investigations into the cool-storage behaviour of apples have been continued. Work has been concentrated on the establishment of optimum storage requirements for each of the major varieties grown in the Granite Belt. Studies of the role of pre-harvest sprays containing calcium salts in controlling bitter pit in apples indicate that the disorder is not the result of a simple calcium deficiency. There is some evidence to suggest that the amount of control obtained results from physical rather than chemical means.

More apple juice is canned in Queensland than in any other State and to assist further in the development of this industry a study is being made of the effect of harvest date and storage conditions on the canning quality and recovery of juice.

Further studies in the canning of Williams pears grown in the Stanthorpe district have demonstrated the importance of carefully controlling ripening to obtain maximum product quality.

Pineapple.—Nutritional work carried out at the Pineapple Research Laboratory during the past few years has led to the formulation of a balanced fertilizer schedule based on a preplanting 0·5:5:38 mixture at 85 lb. per 1,000 plants followed by side-dressings of sulphate of ammonia during

the summer and urea sprays during the winter months. The potassium component in the preplanting fertilizer is, however, insufficient to carry the plants through the whole crop cycle. In the second 12 months, therefore, side-dressing fertilizers are of the 12·5:2:15 type applied at 60 lb. per 1,000 plants. The work has demonstrated that fertilizer applied after the commencement of flowering has little effect on fruit size; it does, however, materially increase sucker growth for the ratoon crop.

Traditionally, zinc and copper are included in fertilizers applied to pineapples at or shortly after planting to offset any risk of crookneck symptoms developing in the crop. Nutritional investigations have confirmed the role of a zinc deficiency in outbreaks of the disorder. They have also established that, on some soil types, the amount used (0·4%Zn) is insufficient to eliminate leaf spotting, one of the typical symptoms. In practice, it will probably be necessary to either increase the amount applied in the fertilizer or, alternatively, use supplementary zinc foliar sprays. Work in both Queensland and Hawaii has failed to implicate a copper deficiency in this disorder.

BOH (betahydroxyethyl hydrazine) has now become available commercially as a flower inductant for pineapples. The value of this material was demonstrated by work at Nambour over the past three years. It should find a place in the industry, particularly during the wet season when results obtained with NAA and/or acetylene as flower inductants are often poor. The recommended treatment is a 2,500 p.p.m. solution applied at a rate of 30 c.c. to the heart of each plant. The 1965-66 research programme suggests that BOH may be used as an overall spray at least to produce a plant crop. The spray cannot be applied to plantations in which fruit is likely to be harvested within three months. Residues may then exceed the permissible tolerance (0·001 p.p.m.).

NAA at 200 p.p.m. is being used more extensively to increase fruit size in the harvested crop. The effect of treatment on fruit quality has recently been investigated. The data available indicate that when the spray is applied as prescribed, i.e. 9 weeks before the anticipated time of harvesting for a summer crop, the effect on fruit quality is negligible. However, application of the spray closer to the time of harvest tends to decrease the TSS content of the juice and to a lesser extent, its acidity. Timing is a precise operation and misuse of the recommendation may have an adverse effect on the quality of the canned pack. Further investigations are planned. At the moment, the recommendation is restricted to crops in which flower induction treatments are used and the pattern of fruit development can be forecast with reasonable precision.

A greater monetary return to the pineapple industry should result from investigations into the canning suitability of selected pineapple clones. A close study of physical and chemical characteristics of the fruit has permitted the selection of high-yielding types which can be processed into high quality products.

The concentration of pineapple juice at the comparatively high temperature of 60°C instead of 32°C did not affect product quality. This finding could mean a smaller capital outlay for commercial evaporators, as low temperature plants are normally more complex and expensive.

It has been shown that the unpalatable pineapple juice left in cannery skin residues can be converted to a pineapple vinegar by means of a submerged fermentation process and the product used successfully in the canning of beetroot.

Bananas.—Of the several Cavendish banana clones included in screening trials on the North Coast, three (S, C and N) have distinctive characteristics which may be of value to the industry. Strain N is outstanding for both fruit size and fruit quality. However, fruit size is above optimum market requirements and close spacing is being investigated as a possible method of correcting this fault.

For many years, fertilizers have been used as side dressings in the banana crop. The occurrence of the disorder known as yellows is, to a great extent, associated with potassium deficiency during the early life of the plant. Accordingly, the merits of applying potassium as a basal fertilizer are being investigated. Growth measurements indicate that plant height and stem girth are consistently greater in plants receiving potassium as a basal dressing than in plants receiving the normal side-dressing schedules. Such growth differences could be reflected in heavier bunch weights.

It has been shown that ethylene dibromide .when used to sterilize bananas against fruit fly induces a ripening response in green fruit. Extreme care will be necessary if fumigation with this compound becomes a commercial practice, particularly if bananas have to be transported long distances after treatment. As part of Queensland's contribution to the research programme of the Banana Research Advisory Committee on the mixed ripe problem, investigations have been commenced to study the effect of time-temperature relationships on the post-harvest life of green bananas.

Chemical investigations of changes in acid, carbohydrate and ethylene production during maturation and ripening of bananas are also in progress.

The Marketing Division at the request of the Australian Banana Growers' Council is to co-operate with the New South Wales Department of Agriculture in a Farm Management Research study in the industry. This project is aimed at delineating practices and pointers to economic efficiency on commercial plantations. Subject to agreement with the New South Wales Department, a uniform Farm Management Accounting Scheme is to set up embracing a sample of the most financially successful and efficient growers in representative districts on both sides of the border. This study, which is expected to continue for 3 years, should provide accurate financial and related physical data. These data should provide bench marks that will enable extension officers and farmers to plan needed adjustments in farm and district practices.

Citrus.—Citrus budwood and seed from approved sources were again supplied to nurseries for the propagation of commercial trees. The pattern of demand was much the same as in previous years, with sweet orange and Emperor mandarin stocks encroaching into the market formerly held by citronelle. Minor quantities of Troyer citrange were released; this stock has considerable potential for use on replant land. At present, budwood is of two types—virus-free and accredited. Virus-free wood comes from trees on Trifoliata stock which are free from symptoms of scaly-butt virus and therefore suitable for working onto that stock. Accredited budwood comes from mature bearing trees which are apparently free from symptoms of virus infection and have a good production record. The virus component in trees from which budwood is cut is currently being investigated. When the results become available, the Scheme will be reviewed. Seed production in 1965 was: citronelle, 80 lb.; sweet orange, 57 lb.; Emperor, 45 lb. Budwood produced in 1965-66 was Washington Navel, 14,945 buds; Valencia Late, 10,430 buds; Joppa, 9,215 buds; Ellendale, 16,457 buds; Glen Retreat, 8155 buds; Emperor, 12,650 buds; Villa Franca, 7,520 buds; Lisbon, 3,630 buds; others, 13,165 buds.

The Glen Retreat mandarin is a problem variety because of its tendency to overcrop. Effective tree management therefore involves heavy pruning to reduce the bearing surface of the tree and/or hand-thinning of the crop itself. Various thinning treatments have been investigated at Gayndah during the past three seasons, using 2, 4, 5-T at 8, 10 and 12 p. p.m. when the mean fruit diameter is ½ in. The results have been variable and in some seasons all treatments over-thinned the crop. When this happens, the increased size of the fruit harvested may not compensate the grower for the reduction in the volume of fruit placed on the market; large fruit does not command an adequate premium. Heavy winter pruning may similarly reduce fruit numbers without an adequate increase in the value of the crop. Nevertheless, thinning is essential to maintain tree vigour and lessen the risk of tree decline.

Leaf tissue analyses in the Howard district have demonstrated that small fruit size in the Emperor mandarin is associated with a deficiency of potassium in the tree. The experimental data show a positive correlation between potassium levels in the leaf and fruit size. In orchards, potassium readings from leaf samples are about 0·19%, which is well within the deficiency range. Fertilizer schedules in the area are being adjusted accordingly.

The mandarin breeding programme has been revived because of the market potential for this type of fruit, and the suitability of Queensland as a producing area. Particular emphasis is being placed on the production of early-maturing varieties with better internal quality than those currently grown (Imperial and Wallent). The work to date indicates that seeds of the variety Imperial are monoembryonic. Progenies from crosses with this variety should therefore yield a range of plant types from which promising material can be obtained. On the other hand, seeds of the variety Wallent are typically polyembryonic, the majority of the seedlings being nucellar in type.

Because of the large increase in the utilization of oranges for processing in Queensland during the last 6 years, investigations have been continued to study the suitability of this State's oranges. Fruit originating from rough lemon rootstock often exhibits bitterness early in the season but the problem can be virtually eliminated by leaving the fruit on the trees for a longer period; in fact, most aspects of processing quality are improved by delaying the harvesting rate.

Mango.—The mango industry is hampered by the fact that the main variety grown, Kensington, though of first-class quality, has a short cropping season. Any expansion of the industry is therefore contingent on the establishment of other varieties which have comparable fruit quality but crop earlier or later in the season. The latest acquisitions have been introduced from India, and include plant types with diverse climatic requirements and different times of maturity.

An extensive market exists in the United Kingdom for sliced mango for chutney manufacture and this is normally imported in brine from India and the West Indies. It has been demonstrated that mango slices can be successfully dehydrated and reconstituted for use in manufacture. When

adopted commercially, this procedure, which is now being refined, could result in significant saving in freight and container costs as well as open up new markets for Queensland mangoes.

Strawberry.—Two selections (M7 and M9) from the strawberry breeding programme are currently under grower appraisal. Both are derived from Missionary x Majestic. The results obtained in commercial plantings have been promising, and one or both of these selections could find a place in the industry. Another selection (D1) has a short but heavy cropping season with a harvesting period restricted to the months of September and October. It could be of value to growers who are mainly interested in supplying fruit to factories.

The Strawberry Runner Approval Scheme is a joint project in which the production of virus-free runners is supervised by the Department and financed by C.O.D. Production commenced in 1963 and involved the bulking-up of (*a*) elite runners, (*b*) special runners, and (*c*) approved runners for commercial planting in successive stages. The rate at which the material can be bulked is greater than originally anticipated, and, in 1965-66, special runners were released direct to industry. Orders placed for March delivery were 158,000 (126,000 Phenomenal and 32,000 Majestic) and exceeded the targets placed by C.O.D. with collaborating growers. The performance of the virus-free planting material has been good; the plants made vigorous growth early in the season and appear to be better able to withstand cool weather than field-run plants.

Passion-fruit.—In the passion-fruit breeding programme designed to produce plant types with acceptable agronomic characters and inherent resistance to root rot and other diseases, 20 of the 300 seedling progenies derived from *Passiflora edulis* x *P. edulis* f. *flavicarpa*, show desirable characteristics and have been retained for further investigation. However, none of these is sufficiently outstanding to replace the two hybrids 3–1 and 3–26, which now have an established place in the industry. These two hybrids have proved highly productive and disease resistance is sufficient to prolong the commercial life of plantations. The fruit is attractive in appearance, has a high pulp content and is readily accepted on the fresh fruit market.

Peas.—A considerable area of peas is planted each year under contract to processors. Unlike crops grown for the fresh vegetable market, peas grown for processing are planted in rows 7 in. apart with plant spacings in the row ranging from 2 in. to 8 in. Recent work at the Redlands Horticultural Research Station indicates that a 4 in. spacing in the row is desirable, at least for crops harvested in August. Plant density influences evapo-transpiration, and the soil moisture deficit at a soil depth of 10 in. reached a maximum in plots established at a 1 in. spacing. Soil moisture deficits appear to be correlated with the oven-dry weight of the plant.

Beans.—The bean breeding programme is concerned with the production of stringless bean varieties to meet the range of climatic conditions encountered in southern Queensland, where the crop is grown virtually throughout the year. Pioneer and Autumncrop, which were released in 1964 from the Redlands Horticultural Research Station, are now in commercial production, but both lack sufficient cold tolerance for crops harvested during the winter months. Two new lines, 1118 and 1119, with greater cold tolerance were placed in regional trials in 1965, but pod quality was not consistent. All of the above varieties and strains are flat-podded types, similar in appearance to the string Brown Beauty. A later selection with round pod and stringless characteristics shows promise but it has not yet been thoroughly screened.

Seed size in beans varies with both the variety and the season of the year in which the crop is grown. In general, large seed is preferred by growers even though the cost of planting is greater. Recent work at the Millaroo Research Station with seed graded for size indicates that the grower preference for large seed is technically sound. In a July-harvested crop, plant growth for some 3 weeks after planting was directly correlated with seed size but the differences were less conspicuous as the crop matured. Nevertheless, the highest yields came from plots established with large seed.

In the Bean Seed Approval Scheme, the Department controls the mother seed used for planting, arranges inspection of the growing crops, and approves crops which comply with certain specifications for trueness to type and freedom from disease as sources of seed for the green bean industry. Plantings in 1965 totalled 989 acres, from which some 509,000 lb. of seed were harvested. Mean yields were below normal following abnormally cold weather during the winter in North Queensland, where the bulk of the seed was produced. Seed stocks are low and production targets set for 1966 by the collaborating firms show a substantial increase over those for 1965.

Six races of bean rust have now been detected in Queensland and interstate collections. Weekly spraying with dithiocarbamate fungicides has controlled rust infections of the leaves and pods and has significantly increased yields.

Potatoes.—Sebago constitutes the most popular variety grown and remains the top yielder in varietal trials; Sequoia and Pontiac give good yields under favourable conditions at particular planting dates. Possible centres for seed potato production in Queensland are being investigated. The commercial practices of seed cool storage and seed slicing have been studied and suggest no significant benefits for the industry.

The utilization of potatoes for processing is increasing, and to ensure that the most suitable types are grown for this purpose, processing trials based on chip and crisp manufacture as well as specific gravity determinations have been carried out on a number of varieties. Sebago and Kennebec were the best from both spring and autumn crops either before or after storage at room temperatures.

Tomatoes.—The varietal position in tomatoes is currently in a state of flux, largely because established varieties such as Grosse Lisse and its various strains which have climatic adaptability and acceptable fruit quality lack sufficient disease resistance for commercial production in some districts.

No significant developments have occurred in the tomato breeding programme; progenies with the requisite disease resistance invariably produce fruit which is inferior to that required on existing markets. However, some recent introductions show promise, and in particular certain lines from Florida. One of these (Florida 64–8) performed very well at Bowen in 1965 and could be the main variety grown in that area during 1966. It is, however, rather prone to catface.

Further work on tomato nutrition has confirmed the marked defect of a phosphorus deficiency in the seedling stage on fruit set and the incidence of catface. The critical phosphorus level in the tissues is about 4,800 p.p.m. When values drop below this level, the plants tend to become excessively vegetative and show abnormalities in fruit development and cropping. Fertilizer schedules for both the seedbed and the field have been modified accordingly. However, it is apparent that fertilizer schedules must be adjusted to particular soil types. In soils with a low buffer capacity, e.g. the granitic sands at Stanthorpe, permissible rates of application are below those required, for example, in the red-brown loam of Redlands. When fertilizers are used in excess, ion concentrations rise to dangerous levels and the plants may be injured.

Nutritional disorders such as blossom-end rot in tomatoes are due to a calcium deficiency in the affected tissues though not necessarily in the plant as a whole. Little response is obtained from applications of foliar sprays containing calcium nitrate or calcium chloride. Isotope studies have therefore begun in an attempt to define the factors affecting the movement of calcium within the plant. These indicate that the transfer of calcium from the leaves to the developing fruit is negligible. However, there is some evidence that calcium sprays applied to the young fruit are taken up in measurable quantities. Times of application and accurate placement may therefore provide a solution to this problem.

A loose-fill carton with a guaranteed net weight of 24 lb. is attracting interest in the tomato industry. The performance of this container is affected by transport conditions and a trial was therefore undertaken to determine the amount of bruising induced by road transport. The results demonstrate that bruising is directly proportional to the distance carried, and is greater in a pattern-pack container than in the loose-fill carton. Vibration injury, a mottle skin colour which develops as the fruit ripens, can be a problem in the loose-fill pack.

Beetroot.—In 1964, nutritional problems were acute in beetroot crops grown in the Lockyer Valley under contract to processors. Typical symptoms were reddening of the foliage, restricted top growth and sub-standard root size. Pot trials indicate that the disorder is due to a multiple element deficiency in which nitrogen, boron, sulphur and possibly copper are involved. Nitrogen and sulphur have shown a marked interaction effect, with growth increases ranging from 300% for nitrogen alone and 1,800% for nitrogen + sulphur. A similar but less pronounced interaction has been recorded with nitrogen and boron. The addition of copper to the soil improves leaf colour but has no apparent effect on the oven-dry weight of the plant. Fertilizer and foliar spray treatment schedules have been revised and on present indications should overcome the field problem.

Weed control is difficult in irrigated beetroot. Investigations have demonstrated that chemical weedicide mixtures can be useful. A monuron + C.D.E.C. mixture controls weeds effectively but may reduce yields if the crop encounters high temperatures during the growing period. A new formulation, which is just as effective and safer to use, contains P.C.A. (6 lb. a.i./ac.) + E.P.T.C. (1·5 lb. a.i./ac.).

Ginger.—The preparation of ginger planting material is a costly and tedious job. As mechanical planting is currently under investigation, the performance of various types of equipment which might be used to cut the rhizomes into "seed" pieces has been investigated. Of these, a potato seed cutter which slices the rhizomes into pieces weighing from 0.70 oz. to 0·87 oz. seems promising. Shoot development after planting

appears to be directly correlated with the size of the "seed" pieces. Small "seed" is either incapable of growth or produces weak shoots which lack vigour.

Research has shown that the new bacterial wilt of ginger is caused by a distinct biotype of the disease. Strains affecting other crops are not serious in ginger. A disease-free "seed" scheme is warranted to prevent further spread of the wilt.

To increase the efficiency of the Queensland ginger industry and thereby enable it to compete with other countries on local and overseas markets, the intensive research programme into processing methods has continued. A technique for processing syruped ginger in 80 hours instead of the 8–10 day commercial method has been developed. Promising results have also been obtained with new quality grading methods based on specific gravity.

SOIL CONSERVATION

On the Darling Downs, farmers are showing keen interest in the wider use of agronomic practices for erosion mitigation. This is evident on the Jondaryan, Dalby and Jandowae plains areas, where crop rotations on a strip-cropping pattern, use of legumes, contour working and special erosion-reducing tillage practices are finding much wider application.

Stubble retention is now being accepted more widely on the Western Darling Downs and crop slashers are finding a place on many farms as a means of avoiding certain mechanical problems associated with this practice.

In North Queensland there is an increasing use of Rhodes grass in tobacco rotations as the soil protection and restoration value of this grass becomes more widely accepted. In the Atherton maize areas, more cultivation land is being sown to *Glycine javanica* for seed production or to the Glycine-grass mixture for hay.

There has been a marked increase in informal soil conservation group activity on the Eastern Darling Downs, and in these groups increased emphasis has been placed on the integration of soil conservation needs with farm development or re-development based on land capability and land use. A total of 80 units, aggregating about 620 farms (14% of all farms in the intensely developed sector of the Eastern Darling Downs), have held at least one meeting on a joint planning basis. More than 50 of the units are already active in the implementation and/or planning of projects.

Soil conservation has been an important part of the activities of the numerous Rural Science Discussion Groups on the Darling Downs. In these groups the emphasis has been on discussion and general education. It is envisaged that ultimately small informal joint planning units will stem from the Discussion Groups as the farm action level approaches.

During the year landholders applied soil conservation measures to 120,355 acres of erosion-prone cultivation land and this included 97,643 acres on which earthworks aggregating 3,160 miles were constructed.

Some 529,501 acres of State lands have now been treated by the application of soil conservation measures and this is more than 400,000 acres above the cumulative total of 122,443 acres applicable in 1959-60. A total of 4,600 landholders is now applying soil conservation measures on their properties.

Despite drought conditions the main upsurge in application of measures is in the newly developing districts. In Central Queensland there is an increase of 12,000 acres in the protection rate, to give a total of 40,000 acres treated during 1965-66.

Conservation plans were prepared for almost 145,000 acres of land during the year, bringing the total planned area to over 1,160,000 acres. A start was made in adopting detailed land capability classification as the basis for soil conservation planning and a move was made towards the farm development or re-development plan as the soundest basis on which to determine farm soil conservation programmes.

Topographic mapping work was expanded and ground control surveys were completed for 500,000 acres of land in the Burnett and Darling Downs areas, bringing the progressive total to 2,054,000 acres now covered. Contour maps on a 10-chain scale with 10-foot contours are now available for over one million acres in south-east Queensland.

Four catchment run-off measuring projects are now in operation and measurements made during the year have confirmed the extreme variability of run-off from small catchments under Queensland conditions. After 23 months without significant run-off, there were 11 run-off flows, including two major discharges, in the following five months.

Water-spreading trials on the Darling Downs have shown that wheat, barley and canary seed can tolerate extensive inundation from the late vegetative to the grain yellowing stages. Linseed was affected by inundation, particularly in the mid-vegetative stage.

During the year 13 applications were received from landholders for finance under the provisions of the Soil Conservation Act. Eight applications totalling $13,523 were approved, and advances totalling $4.348 were made.

PROJECT INVESTIGATIONS

Economic investigations of a number of proposed irrigation projects were carried out during the year by the Department.

A study of the economic feasibility of a proposed irrigation area at Emerald was undertaken as part of a Joint Report prepared in conjunction with the Irrigation and Water Supply Commission. Linear programming and benefit-cost analysis were used to assess farm size, optimum enterprise combinations and overall project benefits (with allowances being made for soil variability), and labour, water and feed requirements for a large range of possible crop and livestock enterprises.

Field work was commenced on a project to assess the present economic position of existing farmers in the St. George Irrigation Area. Information collected from this survey will be included in a Joint Departmental-Irrigation and Water Supply Commission Report on the possibilities of increasing the number of farms and expanding the irrigated area. At present the basic industry on the existing farms is fat-lamb raising supplemented by grain and lucerne production. Research is proceeding to determine optimum enterprise combination for farms in the proposed extension area, which is adjacent to the existing farms.

The irrigation potential of the lower Lockyer Creek and the Brisbane River Valley is currently being assessed. A reconnaissance survey of soils and land usage of the Lockyer Valley east of Kentville was conducted to determine whether further investigation was warranted. This work has shown that approximately 4,600 acres of suitable land are not irrigated at present, a further 1,500 acres have restricted pumping, and the remaining area of 5,500 acres, which is frequently subject to restrictions, would benefit from an assured supply of water. The wide range of crops which can be grown and proximity to markets favour expanding irrigation in this area. Investigation of the Brisbane Valley is still in progress.

Following the report on priority 1 (Kolan River) in the Lower Burnett Irrigation proposals, economic investigations were carried out in priority areas 3 and 4 (Burnett River and Sharon). This information, together with soil survey data, is being presented as a joint Departmental report on the possibilities of irrigated cane production in the lower Burnett region.

An investigation into possible changes on the farms of a number of settlers in the Gibber Gunyah Irrigation Area was carried out. This aimed at increasing the net farm income of these settlers and included on-farm interviews and the preparation of budgets in an assessment of the proposals. The results have been incorporated in the recommendations made to the Government by this Department, the Agricultural Bank and the Irrigation and Water Supply Commission.

MARKETING

A major survey of markets for rural products in North and Central Queensland was continued during the year. A detailed analysis of population distribution by zones, regions and extent of urbanisation, with projections to 1980, has been completed and interim reports on dairy products and potatoes are almost ready for publication. Work on trends in production and supplies is well advanced.

Monthly reports have been issued on production trends in the State and detailed forecasts of likely production have been issued during the appropriate seasons for wheat, barley, maize, oats, grain sorghum, linseed, canary seed, white french millet, panicum seed, potatoes, onions and peanuts. Quarterly reports on trends in egg production have also been issued.

During the year forecasts on the potato crop were extended to cover the expanding potato industry in North Queensland.

Intelligence reports on overseas grain markets have been issued monthly. These reports give growers a current picture of movements in world grain and seed prices.

Daily and weekly market reports were issued throughout the year on prices for fruit, vegetables and produce at the Brisbane market. Daily reports were also issued for the fish market. The popularity of these reports amongst both producers and the general public is indicated by the fact that additional broadcasting stations in Queensland and New South Wales are now carrying this service.

In April 1965, initial moves were made by fruit and vegetable agents at the Brisbane Market to impose a special handling charge on all produce sold on behalf of growers to offset increased cost claims involved in the move to the new Market. The Minister for Primary Industries ordered an immediate investigation. This investigation was carried out by Marketing Services Branch officers and the report disclosed

that although cash costs had increased this increase had been offset by increased turnover except in the case of some lines. Further investigations are programmed for 1966-67.

At the request of the Deciduous Sectional Group Committee of the Committee of Direction of Fruit Marketing, a departmental committee was appointed by the Minister for Primary Industries to investigate a proposal for the erection of a cannery in the Stanthorpe district. During the course of its investigations the Committee reviewed present and projected district production and visited a number of processing establishments in southern States. The conclusion reached was that the needs of the industry would be best served by negotiating with an existing processor or processors to handle any Granite Belt deciduous fruits available for processing.

FARM MANAGEMENT

Primary producers generally are starting to take advantage of the farm management services now offered in country centres and an increasing number of individuals are seeking advice of this nature. Instruction in farm management techniques has also been sought by producer organizations and during the year schools were conducted at Crows Nest, Gatton and Malanda. Farm management sessions were also included in other producer schools held at Chinchilla and Muttaburra. Individual addresses on the subject have been given at field days, meetings and conferences.

The position held by this Department in regard to farm management is indicated by the invitations extended by two professional bodies for addresses to be given at their annual conferences held in Melbourne and Adelaide respectively. In addition, the report of the Joint Committee on Farm Management Accounting (now in the hands of the printers) is expected to form the basis for a national conference in August of representatives of Australian institutions concerned with standardization of farm management accounting.

The Farm Management Accounting Groups Scheme, a system of comparative accounting analysis aimed at helping farmers in their business management and providing a continuous source of economic data for research, has been continued and expanded. Six groups comprising over 100 farms were recording at the end of the year and arrangements had been made for a new group of some 40 farmers in the Lockyer Valley to commence recording for the 1966-67 year. Interest in the Scheme is spreading and several new groups are in the process of formation. Analysis of the results is carried out on the computer installed at the Treasury Department and each farmer is provided with a summary of his results. Averages for each group are prepared in report form and during the year five reports, covering the South Burnett Group for the years 1962-63, 1963-64 and 1964-65, the Bell Group for 1963-64 and 1964-65, and a Poultry Group for 1963-64, were issued.

FARM REQUIREMENTS

The Marketing Services Branch of the Division carried out special surveys on marketing prospects for protein meals in Central and South Queensland. These surveys were designed to provide up-to-date data on markets for the developing oilseeds industries and the consuming livestock industries. The results show that there is an increasing demand for good quality protein meals and emphasise the need for regular supplies.

A survey of Queensland's superphosphate requirements undertaken during the year indicates that by 1970 the State will need some 134,000 tons per year to meet rural industry's needs.

Assistance was given to the meat industry by a close examination of registration of tickicides in order to minimise the incidence of chlorinated hydrocarbon residues in beef. This work included a study by the Agricultural Requirements Board of the efficacy of a new tickicide.

Controlling the unit strength of veterinary penicillin proved to be a direct assistance to the dairying industry in that the destruction of bacterial starters in cheese factories was prevented.

Attention was given to the proper use of antibiotics as additives to stock foods. Dosage rates were regulated to promote growth efficiency in poultry, pigs and calves.

Three new grain sorghum hybrids—Texas 671, Texas 6264 and Pioneer 846—were sown in order to study yield performance as a basis for inclusion in the seed certification scheme.

Plans for an Approved Oats Seed Scheme were formulated, and a seed increase area was planted to produce foundation seed of Callide Rhodes grass, which has now been included in the seed certification scheme.

PLANT QUARANTINE

The plant quarantine commitment continues to increase with expanding imports from overseas. Servicing problems were acute at centres such as Cairns, Townsville and Brisbane, where incoming planes touch down. It will soon be necessary to provide an around-the-clock service at Brisbane airport. The number of vessels berthing at the port of Gladstone increased substantially during the year.

Nursery stock regulations have been tightened up with the establishment of an official post-entry quarantine facility at Indooroopilly. All planting material other than orchids is now channelled through this quarantine house. Steps are being taken to duplicate the existing glasshouse and install heating equipment to handle tender species arriving in Queensland during the winter months.

Improved port handling facilities made possible some relaxation of the conditions governing the importation of sawn timber. Townsville has been cleared as a port of entry and consideration is currently being given to permit the entry of sawn timber through Port Alma, which services Rockhampton and Central Queensland. Quarantine hazards at both ports are now little, if any, greater than those at the port of Brisbane.

To date, grains and stock meals have been consigned to Queensland in bags. Commodities of this kind lend themselves to bulk handling but bulk cargoes present special quarantine problems. During the year, bulk cargoes of fertilizer and soybean meal, on examination, were found to be heavily contaminated with prohibited whole grains, which, on test, proved viable. Some of the contaminants were prohibited species which are permitted entry only in small lots under special permit and are subject to exacting post-entry screening procedures. If bulk shipments continue to increase, and this seems unavoidable, commodity treatments prescribed for both cargoes may have to be applied as a matter of routine.

MEAT INSPECTION

Inspections were carried out at all licensed premises. Some (the large abattoirs) were given full time inspection, and the smaller country slaughter-houses only part-time inspection as staff availability and cost warranted. Standards of butchers' shops and meat delivery vehicles continued on an upward trend.

Table 1 sets out the slaughterings for local consumption at various establishments in the State. In addition, considerable quantities of meat from export slaughterings were diverted to local consumption.

There were no major changes in disease incidence, with tuberculosis in beef cattle continuing to be a major cause of economic loss to the industry and arthritis in pigs to that industry. Owing to prevailing drought conditions, condemnations for emaciation were heavy.

Grading according to standards set to meet consumer preference for young, lean meat was continued at all places at which it was operating last year. Seasonal conditions prevailing caused some fall in the availability of quality cattle, but generally only good quality cattle were supplied to the local market, with the export demand for the older and poorer quality continuing.

Classification of lambs and hoggets with distinctive marking of such was continued.

In conformity with modern requirements, changes were made at some abattoirs in procedures necessary to ensure hygiene at slaughtering, to prevent contamination of edible product and also to ensure correlation of all edible parts of a carcass until final inspection, when a decision is made as to whether it is disease free and wholesome.

Agreement was reached with the Commonwealth Department of Primary Industry that State Inspectors are fully recognised for all tasks of basic inspection on slaughter floors.

TABLE 1

STOCK SLAUGHTERED FOR LOCAL CONSUMPTION, 1965-66

——	Cattle	Calves	Sheep	Swine
Brisbane Abattoir	105,876	77,177	619,945	44,108
*District Abattoirs	79,138	26,508	447,748	36,203
*Bacon Factories and Abattoirs	367,697	161,405	441,272	380,959
Other Centres	130,762	39,449	372,436	63,031
Totals	683,473	304,539	1,881,401	524,301

* Includes some export kill.

By Authority: S. G. REID, Government Printer, Brisbane—1966