1951.

QUEENSLAND.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE AND STOCK

FOR

THE YEAR 1950-51.

PRESENTED TO PARLIAMENT BY COMMAND.

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ORGANISATION OF THE DEPARTMENT AS AT 30TH JUNE, 1951.

SECRETARY FOR AGRICULTURE AND STOCK .. .. Hon. H. H. Collins, M.L.A.

CENTRAL ADMINISTRATION—

Under Secretary	A. F. Bell, M.Sc., D.I.C., A.R.A.C.I.
Assistant Under Secretary (Technical)	R. Veitch, B.Sc.Agr., B.Sc.For.
Assistant Under Secretary	W. T. Gettons, A.I.C.A.
Special Administration Officer	H. Barnes.
Officer in Charge, Information Services	C. W. Winders, B.Sc.Agr., A.C.I.S.
Accountant	E. C. Sadler, A.A.U.Q.

DIVISION OF PLANT INDUSTRY—

Director of the Division	W. A. T. Summerville, D.Sc.

Agriculture Branch—

Director of Agriculture	D. O. Atherton, Q.D.A., M.Sc.Agr.

Reginal Experiment Stations—

Director of Regional Experiment Stations	W. G. Wells.

Horticulture Branch—

Director of Horticulture	S. A. Trout, M.Sc., Ph.D.

Bureau of Sugar Experiment Stations—

Director of Sugar Experiment Stations	N. J. King, Dip.Ind.Chem.

Science Branch—

Officer in Charge	J. H. Simmonds, M.B.E., M.Sc.

Chemical Laboratory—

Agricultural Chemist and Biochemist	M. White, M.Sc., Ph.D., A.R.A.C.I.

DIVISION OF ANIMAL INDUSTRY—

Director of the Division	W. Webster, B.V.Sc.
Assistant Director	A. L. Clay, B.V.Sc.

Veterinary Services Branch—

Director of Veterinary Services	C. R. Mulhearn, B.V.Sc.

Animal Health Stations—

Director of Research	J. Legg, B.Sc., D.V.Sc., M.R.C.V.S.

Sheep and Wool Branch—

Director of Sheep Husbandry	G. R. Moule, B.V.Sc.

Cattle Husbandry Branch—

Officer in Charge	R. D. Chester, B.V.Sc.

Pig Branch—

Officer in Charge	F. Bostock.

Poultry Branch—

Officer in Charge	P. Rumball, R.D.A.

DIVISION OF DAIRYING—

Director of Dairying	E. B. Rice, Dip.Ind.Chem.

Field Services Branch—

Director of Field Services	R. A. Paul, B.Sc.Agr.

Research Branch—

Director of Research	L. E. Nichols, B.Sc.Agr., A.R.A.C.I.

DIVISION OF MARKETING—

Director of Marketing	H. S. Hunter.
Assistant Director of Marketing	C. H. P. Defries, H.D.A., B.Com., A.F.I.A.

Standards Branch—

Standards Officer	F. B. Coleman

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REPORT OF THE DEPARTMENT OF AGRICULTURE AND STOCK FOR THE YEAR 1950-51.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

DEAR SIR,—I have the honour to submit herewith the Annual Report of the Department of Agriculture and Stock for the year ended 30th June, 1951.

A change has been made in the form of presentation of this year's report; this introductory section is followed in turn by the reports of the Directors of the production and marketing divisions so that a conspectus of Departmental activities may be obtained by reading these five consecutive sections. The detailed Branch reports then follow.

The year 1950-51 fell into two periods of adverse extremes. Through the spring, and until the end of January, 1951, conditions were abnormally wet; soils were waterlogged and unseasonal flooding occurred in many parts of the State. Then the normal monsoonal wet season failed to develop and from the beginning of February the weather has been abnormally dry throughout the length and breadth of the State.

All indications point to a severe drought ahead and if this proves to be the case the State will enter upon it less prepared than for many years: The number of sheep is already more than a million below the 60-years average; although most country carries a heavy cover of dry grass it is low in nutritive value and dangerously inflammable; preparation of the land was delayed by waterlogging of soils and the subsequent dry weather reduced fodder production to very low levels; there are no reserves of grain for stockfeed and the 1951 wheat crop may well be a complete failure.

Attention has been unduly focussed upon the high, or relatively high, prices obtained for primary produce in the post-war years and the actual volume of production has usually escaped notice. The accompanying table of recorded production of staple products, and their estimated value on the basis of current and pre-war prices, is accordingly well worth study. (See Table 1.)

Though the monetary value of the products enumerated increased from an average of £37,023,647 for the three-year period 1936-39 to the vast sum of £172,507,000 in 1950-51, yet, if the same price levels had obtained, the value in 1950-51 would have been only £41,663,000.

Much of the advance in nominal values has, of course, been due to the phenomenal prices for wool, but here also the fact that production was only 70 per cent. of the 1941-42 peak has been submerged in the realisation of monetary returns seven times as great. It is obvious that the overall increase in the production of food in Australia is not keeping pace with increase in population and unless more farms can be brought into production shortages of this and that commodity will become increasingly frequent. This was exemplified during the year by acute shortages and demands for luxury prices in both potatoes and onions—once humble items in the weekly household order.

Australia is, unfortunately, the driest of the continents while, in addition, the unreliability of rainfall is considerably greater than the world average. Under such climatic conditions it is essential that greater attention be paid to the conservation of water, the conservation of soil, and the conservation of fodder. There is increasing interest and achievement in the first two. But, at least as far as Queensland is concerned, fodder conservation is practised by only the very few; losses from drought seem to be regarded as inevitable.

THE WOOL INDUSTRY.

The average price of nearly 12 shillings a pound realised for wool during the 1950-51 selling season was more than twice that of the previous season and the year's offering of 554,705 bales returned nearly £100 million to the State's wool growers. The monetary value of the wool clip was therefore approximately equal to that of all other avenues of primary production. At the same time, it is very disturbing to realise that the number of sheep in the State at 31st March, 1951, was 17,477,578, or 104,574 less than the figure for the previous year. Recovery from the 1946 drought has been very slow and, as stated above, Queensland's flocks are still more than a million below the 60-years average of 18·5 millions. The expected increase in 1950-51 was more than nullified by the high losses caused by floods and parasitic attack.

Experience during the two bad blowfly years of 1949 and 1950 showed that graziers working to a plan can reduce the incidence of strike very considerably, and every effort is being made by the Department to bring this home to graziers in general so that the immense losses of sheep and wool which are sometimes experienced can be reduced to small proportions. Hundreds of demonstrations of the Mules operation, which is an essential part of the blowfly control plan, have been given annually by Departmental officers in the western districts, and it is hoped that after the losses of the past two years all appropriate steps to combat the fly will be taken by increasing numbers of sheep raisers.

Fleece weight and fleece quality are two criteria used as measures of the influence of breeding or environment on wool production. In the past the Queensland wool-grower has had no readily available source for determining precisely the quality characteristics of his wool. It is therefore gratifying to be able to record that a wool biology laboratory at Head Office was completed and equipped during the year. The laboratory is now "tooling-up" in preparation for fleece-testing work which will enable stud masters to make a better assessment of the value of their rams.

The millions of sheep depastured in tropical districts of the State are subjected to rather extreme environmental conditions which adversely affect both fertility of the breeding

PRODUCTION AND VALUE OF CHIEF AGRICULTURAL, PASTORAL AND DAIRYING PRODUCTS. AVERAGE 1936–37 TO 1938–39, AND YEARS 1948–49, 1949–50, AND 1950–51, ALSO SHOWING LAST THREE YEARS' PRODUCTION VAULED AT 1936–39 VALUE.

Source—Queensland Government Statistician except where otherwise indicated.

Commodity.	Unit of Quantity.	Average, 1936–37 to 1938–39.		1948–49.			1949–50.			1950–51.		
		Production.	Value.	Production.	Value.	Value at (e) 1936–39 Prices.	Production.	Value.	Value at (e) 1936–39 Prices.	Production.	Value.	Value at (e) 1936–39 Prices.
1	2	3	4 £	5	6 £	7 £	8	9 £	10 £	11	12 £	13 £
Sugar Cane	Ton	5,215,199	8,520,741	6,433,556	16,942,615	10,511,327	6,518,042	17,359,728	10,649,363	6,696,000 (c)	17,500,000 (b)	10,940,000
Wheat	Bushel	4,783,138	804,775	14,317,422	7,172,220	2,408,942	11,778,495	6,688,519	1,981,761	8,500,000 (b)	5,400,000 (b)	1,430,000
Sorghum	Bushel	1,410	755	899,136	314,698	481,452	2,157,717 (d)	851,390 (d)	1,155,378	3,500,000 (d) (b)	1,500,000 (a)	1,874,000
Maize	Bushel	3,170,232	717,144	2,451,207	1,197,011	554,492	3,392,817	1,467,608	767,495	3,500,000 (b)	1,500,000 (a)	792,000
Potatoes	Ton	17,191	168,460	27,511	502,076	269,589	30,681	690,322	300,653	20,000 (b)	490,000 (b)	196,000
Tobacco Leaf	Pound	2,173,112	182,449	1,625,792	390,529	136,497	2,539,592	766,428	213,218	2,130,000 (b)	935,000 (b)	179,000
Sub-Total		..	10,394,324	..	26,519,149	14,362,299	..	27,823,995	15,067,863	..	27,325,000	15,411,000
Butter	Pound	121,114,921	7,312,881	107,029,157	12,726,071 (f)	6,462,387	109,277,620	14,280,000 (f) (a)	6,598,148	107,500,000 (b)	15,690,000 (b)	6,491,000
Cheese	Pound	11,840,626	379,867	21,041,425	1,366,052 (f)	675,044	20,276,357	1,483,000 (f) (a)	650,499	19,450,000 (b)	1,507,000 (b)	624,000
Eggs	Dozen	10,347,113	614,950	12,197,842	1,092,215	724,943	11,171,431	1,160,000 (b)	663,941	10,800,000 (g)	1,165,000 (b)	642,000
Sub-Total		..	8,307,698	..	15,184,338	7,862,374	..	16,923,000	7,912,588	..	18,362,000	7,757,000
Wool	Pound	169,325,412	9,247,067	147,766,519	30,772,214	8,069,710	153,395,880	40,000,000 (a)	8,377,136	155,000,000 (b)	96,000,000 (b)	8,465,000
Beef	Pound	434,950,056	5,943,934	369,168,879	10,539,451	5,044,983	378,019,744	13,282,800	5,165,937	418,000,000 (h)	17,000,000 (h)	5,700,000
Veal	Pound	14,472,039	192,431	13,682,342	396,739	181,931	14,023,366	532,633	186,465	16,000,000 (h)	750,000 (h)	210,000
Mutton	Pound	41,831,114	635,803	36,811,895	1,193,553	559,514	37,899,385	1,218,037	576,044	30,000,000 (h)	1,200,000 (h)	450,000
Lamb	Pound	2,439,493	66,280	3,101,731	165,155	84,273	3,251,227	203,016	88,334	2,000,000 (h)	170,000 (h)	50,000
Pork	Pound	24,104,228	659,305	20,579,642	1,370,098	562,900	21,198,139	1,670,102	579,817	19,000,000 (h)	1,800,000 (h)	520,000
Bacon and Ham	Pound	19,763,084	859,908	20,277,716	1,872,490	882,300	21,258,600	2,241,991	924,979	20,000,000 (h)	2,500,000 (h)	870,000
Canned Meat	Pound	14,262,301	397,662	48,779,105	3,642,686	1,360,061	60,895,554	5,085,408	1,697,892	60,000,000 (h)	6,000,000 (h)	1,700,000
Small Goods	Pound	14,658,263	319,235	21,515,681	896,284	468,579	23,677,749	1,170,383	515,666	24,000,000 (h)	1,400,000 (h)	530,000
Sub-Total		..	9,074,558	..	20,076,456	9,144,541	..	25,404,370	9,735,134	..	30,820,000	10,030,000
Total		..	£37,023,647	..	£92,552,157	£39,438,924	..	£110,151,365	£41,092,721	..	£172,507,000	£41,663,000

(a) Preliminary Estimates by Queensland Government Statistician.
(b) Estimated by Division of Marketing.
(c) Estimated by Sugar Bureau.
(d) Includes Queensland-British Food Corporation.
(e) Computed by Division of Marketing.
(f) Includes Subsidy.
(g) This estimate is based on the Government Statistician's figures of recorded egg production in previous years and is not considered very reliable.
(h) Tentative estimates by Division of Marketing.

animals and the survival of lambs. These two matters have been under investigation by Departmental officers for some time, and while the problems can now be stated in fairly exact terms, their solution will require a good deal of painstaking work. With the financial assistance of the Commonwealth Wool Fund a lease of some 37,000 acres has been acquired in the Julia Creek district and staff and facilities for the conduct of this important experiment station are now being assembled.

The Merino dominates Queensland flocks and only a minor development of crossbreds has taken place, mainly on the Darling Downs. With increasing population, and increased competition and prices for meat, there is an excellent market for prime quality mutton and lamb. Hitherto the incidence of internal parasites has prevented fat lamb raising in the coastal agricultural areas but with improved control measures available this difficulty should be greatly minimised. With the object of fostering coastal mutton and lamb production an extension officer has been detailed to these areas.

For the purpose of facilitating the application of research findings to practice, and to permit the interchange of views between research and extension officers, the Commonwealth Scientific and Industrial Research Organisation, in co-operation with this Department, has arranged to hold an all-Australian Wool Research Liaison School in Brisbane during September.

BEEF AND DAIRY CATTLE.

The good seasons of 1949 and 1950 assisted considerably in building up beef herd numbers which were depleted by the drought of 1946, as is evident from the rise in numbers of calves recorded by the Government Statistician, namely:—

As at 31st March.	Calves under one year of age.
1947	591,661
1948	702,199
1949	766,351
1950	844,263
1951	985,603

The number of beef cattle at 31st March, 1951, was 5,293,350, and the number of dairy cattle 1,440,198.

Methods of production in the beef cattle industry have made little change in the past 60 years and, by the same token, the number of beef cattle has remained static or even declined. It is true that the best lands have been alienated for agriculture and dairying but nevertheless some very material improvement might have been expected.

In older countries there has been a pronounced change in production methods in the alignment of cattle raising with agriculture. Such a change, although to a less extent, must eventually take place in Queensland and officers of the newly-formed Cattle Husbandry Branch are now exploring the economics of crop, stubble, and pasture feeding. The seasons of 1949-50 and 1950-51, although far from typical, nevertheless yielded some useful information both on the Department's exploratory farm at Wrotham Park and on various cattle stations, but experience over a normal range of seasons will be necessary before answers to many pertinent questions will be available.

Some interest is being shown in the provision of irrigation for pastures and fodder crops on cattle-fattening properties. Investigations of irrigated pastures which have been in progress at Gatton Irrigation Research Station and at Theodore have indicated that the rate of pasture growth is much greater in Queensland than under the cooler conditions of the southern States. Irrigated pasture experiments are also now being conducted on the proposed irrigation area in the Burdekin Valley.

The development of a satisfactory animal husbandry service is impeded by the lack of an experiment station where an adequate number of cattle can be maintained and where pasture, cropping, irrigation, and other investigations can be furthered. Moreover, such a property is essential for the proper training of young officers. To date, no success has attended efforts to obtain suitable properties for the Australian Meat Board's proposal to establish two cattle research stations in conjunction with C.S.I.R.O. and this Department.

Queensland has an imposing array of pests and diseases which constitute hazards to the production of animals and livestock products, and each year a good deal of the effort of the Department is directed towards ameliorating the effects of these drawbacks to production.

The policy of building up the State's veterinary services, by appointments and by the granting of University scholarships in Veterinary Science, is now producing tangible results. During the past two or three years the cause of several baffling diseases has now been determined and development of remedial measures made possible. Such diseases include coastal staggers in horses, Georgina River disease, Birdsville disease in horses, and red water (leptospirosis) in calves.

It is probably far from generally appreciated that, with current values, the saving of 30 fat cattle of average weight from death by disease would more than pay the salary of a Veterinary Officer; an average increase of but 20 lb. weight in a herd of 1,000 bullocks would more than pay the salary of an Adviser in Cattle Husbandry!

Though the ultimate objective in the case of some of the pests and diseases is their eradication from Queensland, it is usually necessary to concentrate on preventing their spread before mobilising resources for eradication. In the livestock field this is the case with cattle tick, which is being confined as far as possible to its present limits of occurrence, with some ultimate hope of tackling eradication when the opportunity offers. Owing to the recent extraordinary climatic conditions both the cattle tick and buffalo fly moved far beyond their usual boundaries but it is expected that vigilance and a return to normal climate will soon restore the former position.

Five years' experience of systematic tuberculin testing and destruction of reactors on a regional basis in dairying areas has shown that it is possible in most districts to reduce the incidence of the diseae to a negligible level and to hold it there at comparatively little cost.

The heavy incidence of contagious pleuropneumonia in beef cattle during the past year prompted the Department to assign a special

investigator to the problem of how the spread of the disease from original outbreak centres in the north-west may be prevented with the least possible dislocation of stock movements. Resistance to the disease is conferred by inoculation but there is much evidence to show that on the large poorly-fenced runs (particularly) the inoculation is often not well done. Nevertheless the appointment of trained Stock Inspectors in the north-west is having a beneficial effect.

One question which is exercising the minds of scientific workers at the present time is that of apparent mutations in various parasitic organisms which confer upon them increased resistance to measures adopted for their control. Such changes have been observed in the fungus causing stem rust of wheat, with the result that varieties bred for resistance to the form of the organism most prevalent during the years of breeding have become susceptible to forms of the rust which have subsequently appeared or built up. Possibly much the same thing has happened in the case of the bacterium causing blackleg of cattle. Some vaccines which have been accepted as conferring resistance to the organism concerned now appear to have lost most of their power and it is possible that this is due to the appearance of a new form of the causal organism.

The possibility of more virulent forms of various organisms making their appearance calls for constant vigilance by those charged with animal and plant protection, whether they be pathologists, entomologists, or breeders. The organism causing anaplasmosis (one of the types of tick fever) is a case in point. The form occurring in Queensland is apparently a rather weak one. African forms are much more virulent. It is therefore necessary to watch for any increase in virulence of the local organism on the one hand and, particularly in these days of air travel, to guard against the introduction of more virulent types from overseas on the other.

The Officer in Charge of the Animal Health Station at Oonoonba (Townsville) is now on an extended visit to the Union of Africa to make a study of livestock pests and diseases and animal nutrition in that Dominion. He will later take the opportunity to visit a number of other countries on the African continent. The knowledge so gained will greatly strengthen forces for the interception of new pests and diseases, or their early detection and treatment, should they penetrate the quarantine barriers.

DAIRYING.

Butter production in all months from July to February was above that for the previous year, but with the onset of dry conditions in February production began to fall and the remaining four-month total of about 25¾ million pounds was only 74 per cent. of that for March-June, 1950. The output of both butter and cheese was slightly below the 1949-50 levels. The dry weather also affected milk supplies to whole milk distributors and cheese factories; Brisbane consumers had their first experience of winter milk rationing during the month of June when supplies fell to some 6,000 gallons below the daily demand.

The shortage of dairy products has been vigorously presented by some persons and organisations as evidence of a serious decline in the industry due to inadequate returns to producers. It is somewhat difficult to reconcile this claim with the small decrease in the number of dairy farmers and the slight increase in the number of dairy cattle during the year. Membership of the Queensland Dairymen's Organisation decreased by only 1·5 per cent. to 21,020, while dairy cattle (at 31st March) had increased in a year by 7,428 to 1,440,198.

It is apparent that there has been no large-scale retirement of farms from dairying within the past year and that shortage of feed is the main factor contributing to the current low production of dairy products. A long dry period beginning in February is unusual, but it cannot be said that dry periods are unexpected, and it is a fact that few dairy farmers make adequate provision for feeding stock when pasture is scarce. Whether this be due to lack of finance, labour, machinery, or initiative, it is highly desirable that the position be rectified, as an assured and adequate supply of dairy products depends on proper feeding. At the same time, it is evident that there is room for many more dairy farmers in Queensland if the State's increasing population is to be fed while, at the same time, the dairy industry continues to contribute its quota to the exports so necessary to pay for imports of essential commodities.

A greatly extended programme of pasture improvement experiments has been carried on. Demonstrations under the Commonwealth Dairy Industry Efficiency Grant have also been continued and the excellent attendance at field days has been evidence of the interest taken by dairy farmers in these demonstrations.

The dairy farm competitions conducted by the Department under the Grant have revealed a reluctance on the part of most farmers to pit their own farms and practices against those of farmers generally acknowledged to be the best in the district. Though entries in the competitions have fallen short of expectations, the competitions have created interest among farmers and many hundreds have attended field days to observe the strong points of prize-winning entries.

The Department's considerable technical assistance to the industry has been continued and expanded. Following the rapid increase in staff in recent years it was found necessary to create two distinct component Branches within the Division—namely, Research and Field Services. Mr. L. E. Nichols (formerly Assistant Director of Dairying) and Mr. R. A. Paul (formerly of the Western Australian Department of Agriculture) were respectively appointed Directors of these two Branches. Two scholarship-holders who had completed their dairy courses at the Massey Agricultural College of the University of New Zealand also took up duties.

It must be acknowledged that the objective of a high proportion of choice-quality manufactured dairy produce has yet to be achieved. There appears to be an inadequate appreciation by farmers and factory operatives and managements of their responsibilities in this regard. There is too great a tendency to regard factory

equipment as something for converting second-grade milk or cream into a choice-grade product, and frequently insufficient control over individual manufacturing operations is exercised. It is also apparent that cream grading is often too lenient.

PIG AND POULTRY INDUSTRIES.

Production for the year showed a moderate decline in both pigmeat and poultry meat, and a slight decline in the overall egg production; the decrease in egg production was of the order of 20-25 per cent. in central and northern Queensland. In both industries the scarcity and high prices of grain and concentrates have accentuated the difficulties of steady production.

Pig raising in Queensland is almost entirely an adjunct to dairying and consequently pig production fluctuates in sympathy with the wide fluctuations in milk production. Stabilised output is dependent upon alignment with grain production rather than dairy production but this is impeded by the relatively high prices of grain and concentrates. The ratio of unit meat prices to unit grain prices is much greater in overseas countries than in Australia, where grain prices tend to be related to world parity and meat prices to the domestic or United Kingdom contract levels.

In egg exports the year saw a further trend towards export to overseas countries other than the United Kingdom, growers having become dissatisfied with British contract prices.

The Poultry Industry Act was amended during the year; *inter alia,* the constitution of the Advisory Board was altered to meet changed circumstances, while the principle of direct industry contribution to the cost of poultry investigations was introduced. Provision has been made in the Act for the Government to meet the first £10,000 expended and, in addition, to contribute a further sum of £5,000 as subsidy on a similar amount contributed by the industry. This principle is sound in every way; there is no reason why the general taxpayer should bear all costs, while sharing in responsibility makes for better co-operation and co-ordination between growers and Departmental officers.

SUGAR.

The Royal Commission on the Sugar Industry appointed in March, 1950, proceeded throughout the year in its enquiries with a view to the formulation of a policy for industry expansion during the next 25 years. It is anticipated that the Commissioners' report to the Government will be presented very soon.

The disposal of export sugar beyond the 1953 season has not yet been clarified. The draft Empire agreement drawn up by the United Kingdom following the 1949 and 1950 conferences has been examined by the parties concerned, but the agreement has not yet been formally signed and will be the subject of further discussions at the end of this year. Meanwhile bilateral agreements with Cuba entered into during the year by both the United Kingdom and Canada have caused some concern to Australian growers, but the full effect of these agreements cannot be assessed until the Empire agreement has been finalised.

Dry seasonal conditions during the first half of 1951 and subsequent severe frosts in central and southern districts reduced the prospect of a high cane yield during the 1951 crushing season. The estimated cane harvest of 5,600,000 tons is very substantially below that of last year, which at 6,691,731 tons was a record; production of 94 net titre sugar is estimated to be 767,000 tons, compared with 880,649 tons for 1950. It is thus expected that the sugar yield per ton of cane will be higher than in 1950, when the sugar content was low because of constant rains and greatly delayed harvesting.

Two officers of the Bureau of Sugar Experiment Stations visited the Central Highlands and other parts of New Guinea this year to collect both canes for testing as possible commercial canes in Queensland and wild canes which might be of use in the Bureau's breeding programme. Some 163 varieties have been planted in quarantine in the Brisbane area before being propagated for testing or for use in breeding. Improvement hoped from the use of this new material will include early maturity, as this is a necessary feature of new varieties if the economic harvesting and crushing season is to be extended over a longer period than at present.

In furtherance of the policy of intensifying the search for new and better varieties of sugar cane, a travelling scholarship in sugar cane genetics was granted to Mr. J. C. Skinner last year. Mr. Skinner commenced his two-year studies at the University of Manchester in October and will visit the West Indies, United States, and Hawaii before returning to Australia.

The Bureau of Sugar Experiment Stations, which has been a unit of the Department since the passing of the Sugar Experiment Stations Act in 1900, became a separate entity at the end of the year, following amendment of the Act in the first Parliamentary session of 1951 which placed the Bureau under the direct control of a Board. Membership of the Board comprises the Minister for Agriculture and Stock (as Chairman), the Under Secretary, one representative of the growers of sugar cane, and one representative of the millers of sugar cane. Under the new set-up the Board is empowered to manage the whole affairs of the Bureau, including the determination of salaries, which has long been a matter of contention by the industry.

The Bureau has long been a noteworthy section of the Department and has made a very substantial contribution to the technical advances and welfare of the sugar industry.

TOBACCO.

Plantings of tobacco were substantially increased in the 1950-51 season, the acreage being 3,870, compared with 2,900 in the previous season. This was brought about by a 20 per cent. increase in acreage in southern Queensland and a 40 per cent. increase in the north. Portion of the southern increase was accounted for by additional plantings in coastal districts under both irrigation and natural rainfall conditions. The new industry in the Lower Burdekin district, represented largely by ex-servicemen growers, increased plantings from slightly over 100 acres to 300 acres.

In this generally abnormal year floods, waterlogging, blue mould, and wet weather at harvest time played havoc with the crop in most districts, and the State yield was only approximately 1,180 tons, compared with 1,535 tons in the previous season. Though competition for the smaller amount of leaf marketed resulted in higher prices, and permitted some growers a reasonable return for their year's work, quite a number lost very heavily. Despite the abnormally wet year, irrigated crops generally yielded more heavily than non-irrigated crops in the same district.

Though the acreage planted to tobacco has shown gratifying increases in recent years, it is apparent that further substantial expansion depends on the provision of more irrigation facilities. The development of local schemes is playing a part in building production, but large-scale expansion awaits the development of extensive water-storage schemes such as those of the Burdekin, the Barron-Walsh, and the Border Streams.

Queensland growers are strengthening their economic position by undertaking the processing of portion of their crop. The State Government has been sympathetic towards this move and has guaranteed finance to the co-operatives concerned. The northern growers' co-operative has now been manufacturing tobacco at its Mareeba factory for three and a-half years and the demand for its output is keen and sustained; the public is evidently well satisfied with the quality of the product.

WHEAT.

The 1950 wheat planting of approximately 660,000 acres, while slightly smaller than in the previous year, still occupied over a quarter of the cropped land in the State and wheat was by far the most important grain crop. The harvest of 8½ million bushels was considerably lower than in recent good seasons and well below the State's domestic needs.

Marked fluctuations in the yield per acre from season to season emphasise the effect of weather conditions on the wheat crop. Though fallowing systems designed to conserve summer rainfall for the use of the crop in the succeeding winter and spring have played a big part in overcoming the disability of light winter rainfall, mechanisation of planting permits advantage to be taken of scattered planting rains, and mechanised harvesting enables the crop to be harvested quickly if wet harvest conditions threaten, nevertheless the crop remains a vulnerable one. If the State's domestic requirements are to be assured from local sources some carry-over is essential and greater acreage than is now planted will be needed. With a population increase of 3 per cent. per year an additional area of some 10,000 acres per year would be required for flour purposes alone.

Under the present system of marketing the price of wheat is fixed at port and the cost of shipping supplies from southern States to meet any deficiency is a steep charge on the local consumer.

Technological advances might perhaps be expected to raise the average yield per acre and thus reduce somewhat the acreage necessary to keep Queensland independent of other sources of wheat. While it is true that the breeding of varieties possessing greater resistance to drought and rust is moving towards this end, the possibility of the rust fungus keeping abreast of plant breeders by developing new types to which the varieties are susceptible must not be entirely overlooked. The development of such new rust biotypes during the past two seasons has vitiated a good deal of painstaking work by plant breeders, and the same situation is likely to arise with other bred material. Fortunately, the Departmentally-bred variety Lawrence, which was grown extensively in 1950, showed a high degree of resistance to the rust types which seriously affected many leading varieties.

To date, there is no very firm evidence that substantial increases in yield from the use of fertilizers can be expected on the soil types contsituting the bulk of the Darling Downs wheat areas, and it is unlikely that for some time to come fertilizing will become widespread, though it is probable that the correction of as yet undetermined nutrient deficiencies may be the key to improved quality.

Storage and transport facilities are inadequate for the disposal of an export surplus while, at the same time, local supplies can only be assured each year by building up an export potential. The State Wheat Board and the Director of Marketing have accordingly given considerable attention to surveys of costs and requirements in the provision of bulk handling facilities for export wheat.

COTTON.

The vicissitudes of cotton growing entitle it to be regarded as the cinderella of crops. Though this State has done its best to promote the industry by providing good investigation and extension services there has never been developed any national concept of the desirability of a cotton industry. Yet cotton and cotton goods to the value of 15 or 20 million pounds are imported into Australia annually.

During the year the Commonwealth Government gave a guarantee of a minimum price of 9½d. per lb. of seed cotton for the next five years. This guarantee, plus current world prices for cotton, stimulated interest and this crop took an upward turn; the 1951 harvest exceeded 4,000 acres, compared with 2,500 acres in 1950.

The key to the successful production of cotton in Queensland would appear to be in mechanical harvesting and the greater development of irrigation. Five mechanical harvesters satisfactorily completed the harvest of more than a thousand acres this season and an additional seven harvesters have been ordered by the Cotton Marketing Board.

GRAIN SORGHUM AND MAIZE.

These two crops have been competing with one another for the summer grain crop acreage for a number of years; the greater adaptability of grain sorghum to marginal areas, and as an alternative or rotation crop on wheat farms, gives it a considerable advantage over maize in the drier agricultural areas. As the trend in summer grain cropping is towards an increased area in still drier regions than are now being farmed, the area under grain sorghum is likely to be extended.

With certified seed of hybrid maize suitable for various southern districts now available, an improvement of maize growing in districts such as the eastern Downs, the South Burnett, the Lockyer, and the Fassifern can be expected. Farmers in these districts are showing great interest in hybrid maize, and the Department's seed-certification scheme assures them seed of hybrids of proven performance, grown under close supervision. Growers using the seed appropriate to their particular districts have a greater assurance of a profitable crop than those using hybrid maize seed from outside sources, though some of these hybrids may do quite well in certain localities.

Growers who co-operate with the Department in growing hybrid maize seed for certification are rendering Queensland agriculture a very useful service as well as assuring themselves of a profitable seed crop. Nearly 3,000 bushels of certified hybrid maize seed were produced from the 1950-51 crop, compared with 306 bushels in 1948-49, when certification began.

HORTICULTURE.

Fruit and vegetable production in Queensland has been maintained at a high level, though losses occurred from time to time during the year because of excessive rainfall, high winds and frosts.

The pineapple holds its position as the leading fruit crop. As it is the basis of the fruit-canning industry in Queensland and is also suitable for processing in other forms, its future appears to be quite bright, despite some uncertainty as to the effect of increased supplies of canned pineapple from Malaya and South Africa on overseas markets. Processing plants now operating in the north, and the cannery which it is proposed to establish at Rockhampton, will encourage the expansion of pineapple growing in the northern and central coastal districts.

The Department's special pineapple team has devoted a good deal of time to improving cultural practices and advising new growers. A school for young pineapple growers was conconducted during the year. Superior planting material to serve as a foundation source of supply for the needs of various districts is being built up at the Department's Maroochy Horticultural Experiment Station.

Banana growing remains somewhat static so far as acreage is concerned, but changes in the variety position have been occurring, with Cavendish being replaced in some situations by Mons Mare and Lady Finger. The increasing popularity of the latter variety has meant that a good deal of attention has had to be given by the Department to sources of planting material in order to prevent the spread of Panama disease to clean areas.

Departmental papaw improvement work has been proceeding steadily. The relative merits of the first two improved varieties released—Bettina and Improved Petersen—are now being more fully assessed as growers and field officers in numerous districts report on their performance. These two varieties are not regarded as the ultimate and in the light of Departmental and grower experience with them steps to correct the known deficiencies are being taken by plant breeders.

The papaw disease position is not particularly encouraging. Both dieback and yellow crinkle continue to cause losses. While an endeavour is being made to incorporate resistance to dieback in material now being bred, it is a moot point whether this will be achieved. Other avenues of approach are being followed and extensive plantings of seedlings have been made for the purpose of investigating the cause and control of these diseases. Ripe fruit rots are also under investigation, though the position here has been much improved by the application of artificial ripening, which enables coloured mature fruit to be marketed before the rot organisms develop sufficiently to cause trouble.

The potato, the basic vegetable in the diet of most Queenslanders, was virtually unobtainable for periods during the past year. Local crops planted during 1950 suffered from excessively wet conditions and the sub-normal yield widened the gap which normally exists between local production and local consumption. Shipping and other difficulties contributed to a rather erratic supply of potatoes to the public. As suggested in last year's report, facilities to enable the conduct of cool-storage trials are urgently needed. It is highly desirable that the practicability of economic storage of potatoes in Queensland be more closely examined so that marketing may be effected in a more orderly fashion than in the past. The Potato Marketing Board cold-stored 11,000 bags of the 1950 spring crop for several weeks under Departmental supervision and useful information was obtained, but the problem merits attention from many angles.

NEW CROPS.

While it is manifestly impossible for Queensland farmers to provide every agricultural and horticultural product required by consumers and processors in the State, it is obvious that a greater degree of diversification of agriculture is possible and desirable.

It is not often that a crop becomes established in a new environment without being nursed to the stage at which it can be released to stand on its own feet. In the initial stages it may have to be adapted to new environmental conditions by the elimination of non-adaptable varieties and the elaboration of suitable cultural techniques. Effective pest and disease control measures may have to be devised. Machinery for its culture and harvesting may have to be designed. The cash return of the crop under commercial conditions may have to be assessed.

In the past this work has been assigned to officers with commitments connected with the improvement of established crops. It is considered that the potential of new crops could be more rapidly and accurately assessed if their introduction and early testing were the responsibility of a special section devoted to work with such crops and staffed with officers with time to devote to studies of all the environmental factors—soil, climate, husbandry, sociology, &c.—of the regions where the crops concerned are grown successfully and to prosecute vigorously the task of establishing adaptable crops in Queensland.

When reports of the progress of current Departmental trials with rice, tea, and fibre crops are made one is occasionally reminded that rice was grown at Pimpama and elsewhere 50 years ago or that good tea was produced in the north before the turn of the century. However correct these comments may be, it must be realised that an entirely new set of circumstances now exists. Economic conditions do not permit the farmer to gamble too heavily with new crops, and rigid testing conditions must now be observed to ensure that when a new crop is put into a farmer's hands he has a good chance of succeeding with it.

Departmental tea trials during the year embraced tests with a new experimental mechanical harvester. They showed that the harvester is capable of harvesting a good sample and suggested that trained operators can reduce the cost of harvesting by hand very considerably. These tests are being continued. The adaptability of tea varieties to elevated conditions in the north is to be tested initially in plots, at East Palmerston and Kairi, at greater elevations than the South Johnstone station.

Trials with rice under non-irrigated conditions in North Queensland have not yet revealed any consistently high-yielding variety which can be recommended with confidence to farmers. Seed of some of the best performers has been gathered from Departmental plots and made available to farmers wishing to test the crop on their farms.

Fibre crop testing has reached the stage at which it can be said that jute and kenaf can probably be grown without any great difficulty, though a good deal of regional testing would be necessary in order to determine the limits of successful cultivation. The utilisation of these crops depends, however, not on problems of culture but on those of fibre extraction. The Department of Labour and Industry has had this aspect under consideration and a decorticating machine designed by that Department has already been tested. Further modification is necessary, but while attempts to design an efficient machine are proceeding this Department is continuing its investigations into the culture of various fibre crops.

Although kenaf has been grown here to a less extent than jute it perhaps looks to be the more promising, particularly in view of the prominence it has achieved in other countries investigating fibre production. Extensive trials with kenaf are being carried out in New Guinea while large-scale plantings in Cuba are being made by United States and Cuban interests.

PLANT PROTECTION.

One the main activities of the Division of Plant Industry is the fight against insect, fungous, and other pests and diseases of crop plants.

The post-war years have seen a marked expansion of the variety of materials used for pest control, and a tremendous amount of work is involved in sorting out which of a large number of new insecticidal materials can be incorporated into control programmes for the main pests of local crops and in devising suitable procedures.

DDT, which was acclaimed as a wonderful insecticide when first released a few years ago, has proved itself extremely useful in Queensland agriculture, but for some purposes the more recently developed benzene hexachloride (BHC) is even more valuable. Systemic insecticides, which may be introduced into the sap stream of the plant and kill sapsucking insects, offer a new tool to the entomologist in his fight against harmful insects.

The exigiencies of war dictated the release of DDT before its likely health hazard to livestock and humans had been determined, and there has since been a tendency for overseas manufacturers to release new insecticidal materials before they have been adequately tested for possible cumulative deleterious effects and to release materials which are dangerous to the users. Health authorities have during the last two or three years been tightening up on the use of insecticides which present some hazard to human health, and this Department has maintained close contact with the Department of Health and Home Affairs when considering the registration of new insecticidal materials and recommendations for their use.

Developments in fungicides have been along more conservative lines, but there is a very impressive list of new organic and inorganic materials with proved fungicidal properties on the testing lines of various overseas institutions. These materials are gradually becoming available for local testing and some are expected to prove useful in combating plant diseases in the State.

QUALITY OF PRODUCE.

While health standards for foodstuffs are fixed and policed by the health authorities, certain quality standards are laid down under regulations controlled by this Department and these standards are policed as far as possible in the interests of both growers and consumers.

Regulations under "*The Fruit and Vegetable Act of* 1947" specify grade standards for a few fruit and vegetables and it is intended to set up standards for a wider range of farm products with which farmers must comply when offering their products for sale. This will at least ensure that when a retailer buys a package he may expect to receive produce conforming to the grade standard marked on the package. There is no obligation on the retailer to sell on the basis of specified grades, but if the customer demands it he must be supplied with fruit or vegetables of the same quality as those displayed for sale. Under the Diseases in Plants Acts, moreover, it is an offence to sell diseased or otherwise unwholesome fruit and vegetables.

Growers and consumers sometimes complain that Departmental inspectors condemn small or lightly-marked fruit and vegetables that are fit for human consumption. The regulations governing this matter are designed to ensure a reasonable standard of quality for the consumer and to avoid depressed markets for the producer. The rejection of lines which do not conform to the minimum requirements has the effect of reminding the offending grower of his obligation to consumers and his fellow growers and of keeping substandard produce from the retailer.

While grading of meat has hitherto been obligatory to some extent in Brisbane, it has not been operative in other districts and on the whole the producer has had no great incentive to raise the type of beast which will give carcase cuts favoured by the consumer. In anticipation of the eventual adoption of quality-grade standards the 1951 amendment of the Slaughtering Act has provided for State-wide grading of meat when required.

Milk quality standards under public health regulations are of particular concern to this Department, inasmuch as the cows, the farmer, the carrier, and the processor may all contribute to a substandard product. Field advisers, research workers, and laboratory technicians are constantly engaged in detecting faults, devising means of correcting them, and assisting the individual concerned to apply corrective measures. A case in point is the low fat content of morning milk received from some districts in winter and spring. Investigations have shown that unequal milking intervals and inadequate feeding are contributory factors. Trials are now being conducted to ascertain what ration is neecssary, with equal milking intervals, to correct fat deficiency.

INCREASING DEPARTMENTAL FACILITIES.

It has been stressed in previous reports that the investigational work of many branches is hampered to some extent by inadequate facilities, and it is pleasing to report that within the near future additional facilities will have been developed for some of these branches.

With the assistance of the Commonwealth Wool Fund, a property in the Julia Creek district was acquired during the year and will be utilised by the Department for investigations into problems of sheep raising in the north-west, one of the most difficult sheep areas in Australia, and particularly the problems of seasonal infertility of rams and neo-natal mortality of lambs.

Owing to portion of the Animal Health Station at Yeerongpilly being required for power-house purposes the Government has decided to purchase a farm in the vicinity. This will relieve the pressure on the existing station and will also permit the establishment of an animal husbandry centre. Particular attention will be paid to the growing needs of the pig and poultry industries.

Livestock work on regional experiment stations is beginning to take shape as buildings, equipment, and animals have been acquired, and the overall plan of integrating crop and livestock research on these stations will soon be put into effect on a reasonably extensive scale.

Seasonal conditions have delayed proposals for the Queensland-British Food Corporation to establish facilities to be operated by this Department with the object of a thorough enquiry into various aspects of crop feeding of cattle in summer rainfall areas.

The Department's Wool Biology Laboratory has begun to operate and as the staff recruited becomes familiar with problems and methods the laboratory will provide a service which should benefit the stud breeder as well as the flock master.

GENERAL.

In these days, unfortunately, no report appears to be complete without reference to staff difficulties.

Reduced outturn by Universities, and low rates of recruitment, during the depression years and the war have created inescapable difficulties for all organisations employing professional personnel. The consequent acute competition for experienced trained technologists has naturally reacted strongly against any organisations which have not maintained competitive salary rates.

Though there are still very material deficiencies in the professional staff it is the strength and calibre of the clerical staff which is at present the chief cause for concern: The staff, scope, and activities of the Department have very greatly increased in the last five years but the male clerical staff which stood at 86 on 1st July, 1946, had been reduced to 72 at 30th June, 1951. Although 37 new appointments were made during the period, 51 officers retired or transferred to other activities.

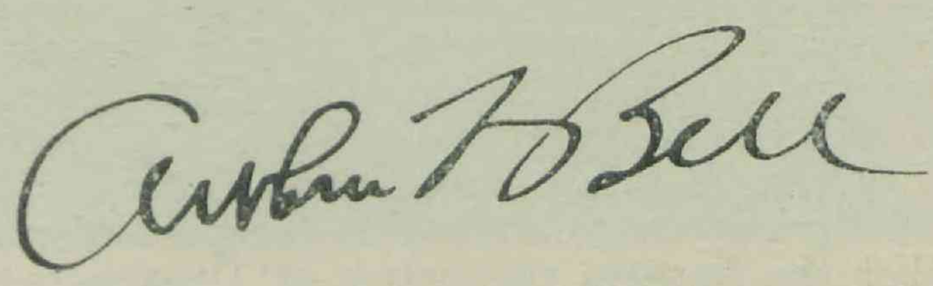
Perhaps more serious than the current loss of administrative effectiveness is the prospect for the future. Whereas in 1946 there were 61 unclassified or relatively junior clerks gaining experience and available for subsequent promotion there are at present only 30 unclassified clerks. The immediate prospects of (frequently) dead-end jobs have for some years lured youths away from jobs with better ultimate prospects but which demand orderly progression and training.

During the year the writer served as a member of the Royal Commission on Pastoral Lands Settlement. This Commission, appointed by the Government to enquire into methods of increasing pastoral production, will present its report towards the end of 1951.

The crop reporting and forecasting service was this year extended to peanuts and tobacco leaf and preliminary surveys were made on methods of forecasting pig and egg production; wheat, maize, grain sorghum, barley, and potato crop forecasts are already established. The reliability and utility of this service is widely appreciated and compliance with the demand for its extension is limited only by availability of staff.

The staff has worked industriously and effectively. As a result of my own diversion to other activities during the greater part of the past year an additional load has been placed on the shoulders of senior officers, particularly Mr. Robert Veitch, Assistant Under Secretary (Technical).

Yours faithfully,



Under Secretary.

DIVISIONAL DIRECTORS' SUMMARIES.

DIVISION OF PLANT INDUSTRY.

Dr. W. A. T. Summerville.

As the picture of the post-war world develops it is becoming increasingly clear that earlier warnings of the growing importance of producing more and more food were amply justified. It is becoming increasingly clear also that if more food is to be produced the application of science to agricultural production must be exploited to the full.

Over the past century the "eyes" have been "picked out" of the land in Queensland for agricultural production, and, while it may be true that the production potentialities of the State are little more than tapped, it is also true that any extension of agricultural activities must take place on lands not so favoured either by geographical position or by natural potential. Geographical position is, of course, of some concern to the agriculturalist, but in so far as the Division of Plant Industry is concerned its officers can do no more than advise on the provision of such facilities as roads and railways. On the other hand, the production potential of the land of itself is the field in which the Division has its essential activities.

Production potential depends not only on the intrinsic qualities of the soil but also on those complex climatic factors which quite commonly constitute the real and ultimate controlling influence. While abnormally low temperatures cause crop losses from time to time, in Queensland it is the severe high temperatures in conjunction with uncertain and often inadequate rainfall which constitute the limiting factor in agricultural production. However, in respect of climate there can be no mere acceptance of fixed status, and in Queensland the modification of climatic influence is perhaps the most important field in which the agricultural scientist must engage, and is certainly the one which constitutes the greatest challenge.

Knowledge of the basic soil resources of the State is quite well advanced, but knowledge of how to exploit, and at the same time preserve, those resources is far from complete. The most obvious method of modifying climate is, of course, by the use of irrigation, and the intensive developmental programme for the use of this actual and potential method of overcoming climatic deficiencies brings with it immediately many problems which are actively engaging the attention of officers of the Division.

Before land can be justly and efficiently subdivided an accurate assessment of the disposition of soil types and the probable potentialities of each must be undertaken. There can be no short-cut methods in this, though every care is taken to avoid wasting time with unnecessary detail. As these surveys progress the soils can be roughly divided into (*a*) those which can be safely allocated to farmers with working knowledge already in the possession of either the farmers themselves or Departmental officers in a position to teach, and (*b*) those which, mainly on account of their physical structure, offer some problems which must be solved before either their use or economic subdivision can be determined. At this stage the agronomist and agrostologist enter the field and from their experience advise on the crop potentials on the one hand and on the investigations which must precede settlement on the other.

While the value of irrigation must not for one moment be under-rated it should be remembered that in Queensland, in common with virtually all other countries, dry farming will always be the most important method of food production. As has been stated, the climate of much of Queensland is such that, as a controlling factor in agricultural production, it requires some modification in its effects if the violent and frequent fluctuations which characterise it are not to be directly reflected in the income of the farmer, the output of his farm, and consequently the stability of his industry.

In respect of dry farming and the modification of the effects of climate in the broad sense, there are a great number of avenues of approach being exploited. These include all those operations designed to conserve rain falling at one time but not actually useful as soil moisture until perhaps several months have elapsed. Thus methods of tilling the soil so as to trap the maximum amount of water in the soil and storing it there to be drawn upon by the plants as they grow is of particular importance. Time of ploughing, number of workings, row spacing, and general methods of farm tillage, including such operations as pasture furrowing, all relate to this purpose. Even the addition of fertilizer quite frequently constitutes a modification of climatic effect in that a plant food such as nitrogen, which may be washed out by heavy rain, may be replaced, or the plant be so stimulated in its growth that it is able to take advantage of moisture conditions while these are favourable.

Another avenue of approach is the production by breeding or selection of varieties more suitable for the particular environment than those available from other parts.

Perhaps the outstanding approach to the overall problem is in connection with the North, where by planting crops out of what is considered the normal season, the growing period may be shifted into a time of more favourable climatic conditions. This has been outstandingly successful in the case of tobacco, and there is reason to believe that the same technique will be successful with other crops. At least that is the basis of a most important attack on some of the purely agronomic problems associated with areas such as the Burdekin. This work demands very careful study and is made more difficult by the variability of the climate in the first place, for this means that the results of one year's work cannot be conclusive, and the only way in which a trustworthy answer can be obtained is by repetition over a period of years.

Plate 1.

A Stand of a Tropical Legume, Puero, Suppressing Wild Tobacco and Other Weeds on the Department's Utchee Creek Pasture Investigation Area in North Queensland.

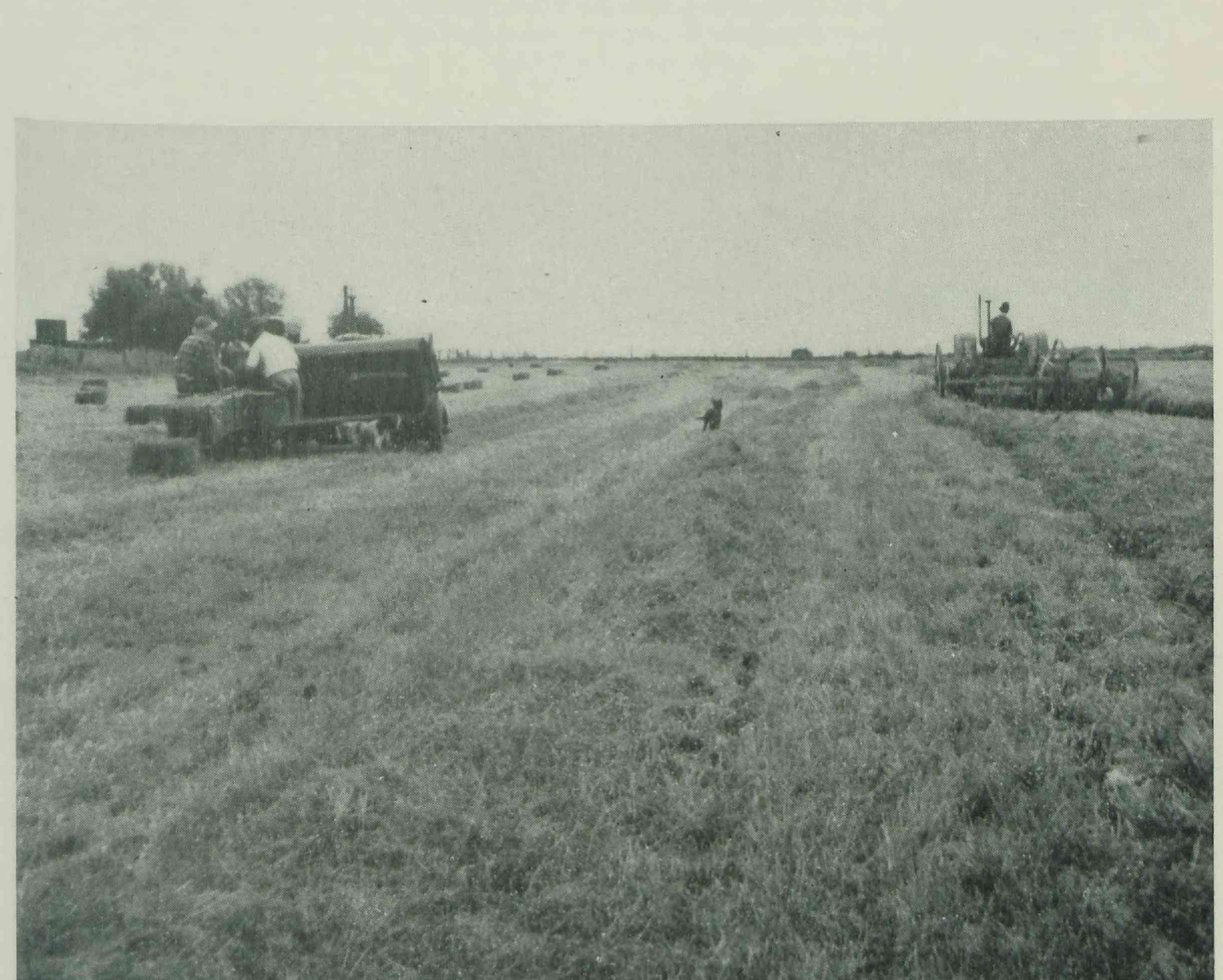


Plate 2.

Fodder Conservation in Practice on a Darling Downs Farm. A Four-Year-Old Stand of Lucerne Cut on the Previous Day is Being Windrowed by a Side Delivery Rake and Then Baled With a Pick-up Baler.

Plate 3.

Grain Sorghum Plantings on the Department's Wrotham Park Exploratory Farm, on the Lower Cape York Peninsula, Where the Growing, Harvesting and Utilisation of Supplementary Fodder Crops for Beef Cattle are Being Investigated.

Plate 4.

A Dense Stand of Flinders Grass Which Volunteered Following Cultivation of Virgin Native Grassland on Wrotham Park Exploratory Farm.

STAFF.

The application of science to agriculture, which is, of course, the basis of the whole approach to the subject by the Division of Plant Industry, is dependent almost entirely on the provision of personnel trained in the fundamentals and at the same time possessing some degree of experience. It is in the latter field that staff problems present themselves at this time. During the past year 23 technical officers were lost to the Division. About half of these were men with considerable experience. In their place 17 men were recruited, but almost all of these recruits, while possessing very sound training which will ensure that they will eventually make very valuable officers, are at present lacking in experience, and the strain on remaining experienced men has consequently been very considerably increased. It is indeed pleasing to be able to report that these older men have responded very well indeed to the extra burden, and while work must remain in abeyance on many problems that could with some advantage be given immediate attention, so far it has not been necessary to lessen investigational work.

With the sudden death of Mr. C. T. White in August last the Division, and it is felt the State, sustained a very heavy loss. Mr. White had been Government Botanist since 1917 and had become recognised throughout the world for his wide knowledge of the flora of Australia and, indeed, a considerable part of the Pacific region. His place has been taken by Mr. W. D. Francis, who, apart from his wide general knowledge, is a recognised authority on the rain forests of these parts.

Mr. C. J. McKeon, formerly Director of Agriculture, who had been on secondment to the Queensland-British Food Corporation, resigned his Departmental post during the year and the office was filled by the appointment of Mr. D. O. Atherton, who had been acting in that capacity during Mr. McKeon's secondment.

With respect to the future on the technical side, some provision is being made through the training of cadets, of whom there are at present 24 on the staff. Of these, 18 are engaged part-time in university studies, while the remainder are stationed in the country, where they are being further trained in agricultural practices.

In the clerical staff there have been a number of changes; as was stated last year, each change is followed by at least temporary embarrassment until a replacement can be found and become familiar with new duties.

APPROACH TO GENERAL FARMING PROBLEMS.

The work on regional experiment stations in many respects represents the consummation of investigations by the various technical officers. This is so because on these stations the essential nature of the work is to farm as a comprehensive operation rather than to test out a modification of one particular phase of operations.

The report of the Regional Experiment Stations shows that in connection with dry farming the limiting factor in yields is essentially subsoil moisture. This is a very simple statement of a by no means simple problem. In order to achieve a satisfactory subsoil moisture status during the growing season for most crops it is necessary in the first place to build the structure of the soil, or to work it in such a way as to preserve the existing state of affairs, so that penetration of rain in the first place will be satisfactory. Then, having provided conditions for optimum penetration of rain, there follows the holding of that moisture over a sufficiently long period. In general, it may be said that, provided initial preparations are carried out at the correct time, the holding of the moisture does not present great difficulties. However, bound up with the supply of subsoil moisture is the availability of plant nutrients, and in particular, in places such as the Callide Valley, the nitrate nitrogen status in relation to subsoil moisture is of special importance. The work of the regional experiment stations has shown that the best and most economic way to achieve a satisfactory balance of nutrients is by rotation farming, and it is felt that the farming results obtained at Biloela point the way very clearly to the technique of efficient exploitation of much of the brigalow country in the 30-inch rainfall zone.

At this station over a period approaching 20 years the relationship of soil moisture and nitrate nitrogen has been given much attention, and the importance of soil structure, earliness of ploughing, and nitrate status has been revealed very clearly. There seems little doubt that lands in the 20 to 30-inch rainfall belt must eventually be put to far more intensive use than is the case at present, and it is considered that the results obtained at Biloela in respect of the aspects mentioned above have given the basic information from which to proceed to the efficient exploitation of many of these soils.

On the regional stations, too, in conformity with the policy of actually farming the land, the inter-relationships of plants, soils, and animals is being studied. The Division of Plant Industry merely provides the facilities in so far as the animal work is concerned, and the results of animal studies will therefore be reported upon by the Division of Animal Industry.

BURDEKIN RIVER PROJECT.

Work in connection with the development of the Burdekin Irrigation Scheme may be considered the largest single project at present being handled by the Division. While the investigation is of the nature of a comprehensive whole it may be dealt with under the following specific headings.

Soil Surveys.—The initial broad reconnaissance surveys of the area were carried out by the Queensland Bureau of Investigation and the C.S.I.R.O. Soils Division and Land Research and Regional Survey Section. Following this it is necessary to have a much more detailed knowledge of where the soil types occur so that subdivision can be made. To this end the Division's Plant Nutrition Section has soil surveyors mapping the area; at the present time these parties are working in the vicinity of Landers Creek, some 40-50 miles upstream. The area of country to be surveyed is very large, and it is anticipated that the whole job will not be completed for nearly two years.

Tropical Pasture Investigations.—In collaboration with C.S.I.R.O., a Committee has been set up to plan and supervise investigations on the management of tropical grasses and legumes under irrigation. The species being used are mainly those which have been found to be successful under rainfall conditions in the wet tropics. This work is located at Ayr Regional Experiment Station. The production of a pasture sward with these grasses under irrigated conditions has presented a number of problems, but these now appear to have been overcome and the stage has been reached at which measurement of results based on beef produced will be the next step.

General Agronomic Investigations.—At Ayr Regional Experiment Station and at Clare Tobacco Experiment Farm some 23 miles further upstream, investigations are in progress with many species of crop plants. These include cotton, potatoes, maize, sunflowers, linseed, sorghum, jute, and pineapples. The individual results are reported upon by the appropriate branches. Tobacco has not been mentioned in this category because already by both experiment and commercial practice the potentialities of this crop are well known. However, with respect to tobacco, an intensive series of experiments covering both the agronomic and entomological fields constitutes an important portion of the overall crop investigations.

Investigations of Problem Soils.—Apart from the levee types of soils, for which no investigation is needed to establish intrinsic agricultural potentialities, there is a very considerable area of other soils, particularly those known as the Barrattas and Oaky series, which because of their physical structure present some problems. These are essentially fertile soils, but no one has had experience of how to handle them under irrigation so the establishment of crops or pastures and the working of the soils to ensure penetration and efficient use of water must be investigated before recommendations on subdivision and economic usage can be made. To achieve this, pilot plots have been laid down on which some 25 species of pasture grasses and legumes and 11 crops have already been sown or will be planted in the coming spring.

CEREAL AND OIL CROPS.

Grain crops, including wheat, maize, oats, and grain sorghums, are being given much attention by officers of the Agriculture Branch, Regional Experiment Stations, Chemical Laboratory, and Science Branch.

Breeding work is probably the most important activity of the Division in so far as wheat is concerned, and a heavy programme of breeding and varietal testing is in progress. This is centred on Hermitage Regional Experiment Station, but relies for ultimate interpretation on the results obtained on many privately-owned farms on the Darling Downs, and to some extent on performance in districts further north, particularly at Biloela Regional Experiment Station. Last year a new Departmentally-bred variety, Lawrence, was liberated and performed very well. The widespread occurrence of a new biotype of rust fungus severely tested all varieties last year and it is pleasing to report that the overall performance of Lawrence, with particular reference to its resistance to this rust, compared more than favourably with that of the standard varieties. It is anticipated that a second new variety will be named this year ready for release for commercial planting. In the field of the agronomy of this crop particular attention has been given to the grain mottling which is causing concern particularly to millers. While some leads as to possible causes of this trouble have been obtained, no proof can as yet be given of any of the theories adduced and further work is necessary. In this connection there is close liaison between the field agronomist and the Chemical Laboratory, in which branch a cereals section is being developed.

There seems little doubt that grain sorghum is destined to play an outstandingly important role in Queensland agriculture and through this in the field of animal production. With this in mind a great deal of time has been devoted by the Agriculture Branch to the production, through breeding, of varieties suited to Queensland climatic conditions; by the regional experiment stations to soil factors and by the Science Branch to combating pests and diseases. Indicative of the importance which the Division attaches to this crop is the geographical distribution of the work, which embraces investigations on the Darling Downs, in the Callide and Dawson Valleys, on the Burdekin, and at Wrotham Park near Chillagoe. It is felt that the potentialities of grain sorghum are so great that it would be profitable to employ full time on this crop a team of scientists representative of agronomy, plant breeding, entomology and soil science, and it may be foreshadowed that such a team will eventually be developed.

With respect to oil crops, the report of the Agriculture Branch shows a comprehensive series of experiments in connection with linseed, soybeans, sunflowers and peanuts. Of these crops, special mention might be made of linseed, which continues to increase in importance. As the acreage expands the normal development of problems follows and work has been called for on production of pedigreed seed, which must be preceded by studies of strains and varieties and diseases. In the latter category pasmo disease caused appreciable losses during the past season, and from the report of the Science Branch it will be seen that the main line of attack on this disease will probably be through the production of resistant varieties.

TOBACCO.

The abnormally wet season, particularly towards the time of maturity, caused very heavy losses to tobacco growers in several districts in the 1950-51 season, and the stability of the industry was rather severely tested in some parts. However, while the individual losses must be deplored, the way in which production was maintained and the evidence of determination to expand are most pleasing. Owing to the somewhat peculiar requirements of tobacco in respect of water and nutrients, much remains to be learnt concerning the practice of irrigation and the general culture of this crop, particularly in North Queensland under irrigation conditions, and the work of the two tobacco experiment farms is therefore of great significance. It would appear that, apart from irrigation practices, greatest insistence must be placed on rotation farming for this crop. From results obtained to date monoculture of tobacco has no future in Queensland.

Plate 5.

A Section of the Cultivated Area on the Redlands Horticultural Experiment Station, near Cleveland. Strains of French Beans, Disease-resistant Tomatoes, and Papaws are Shown.

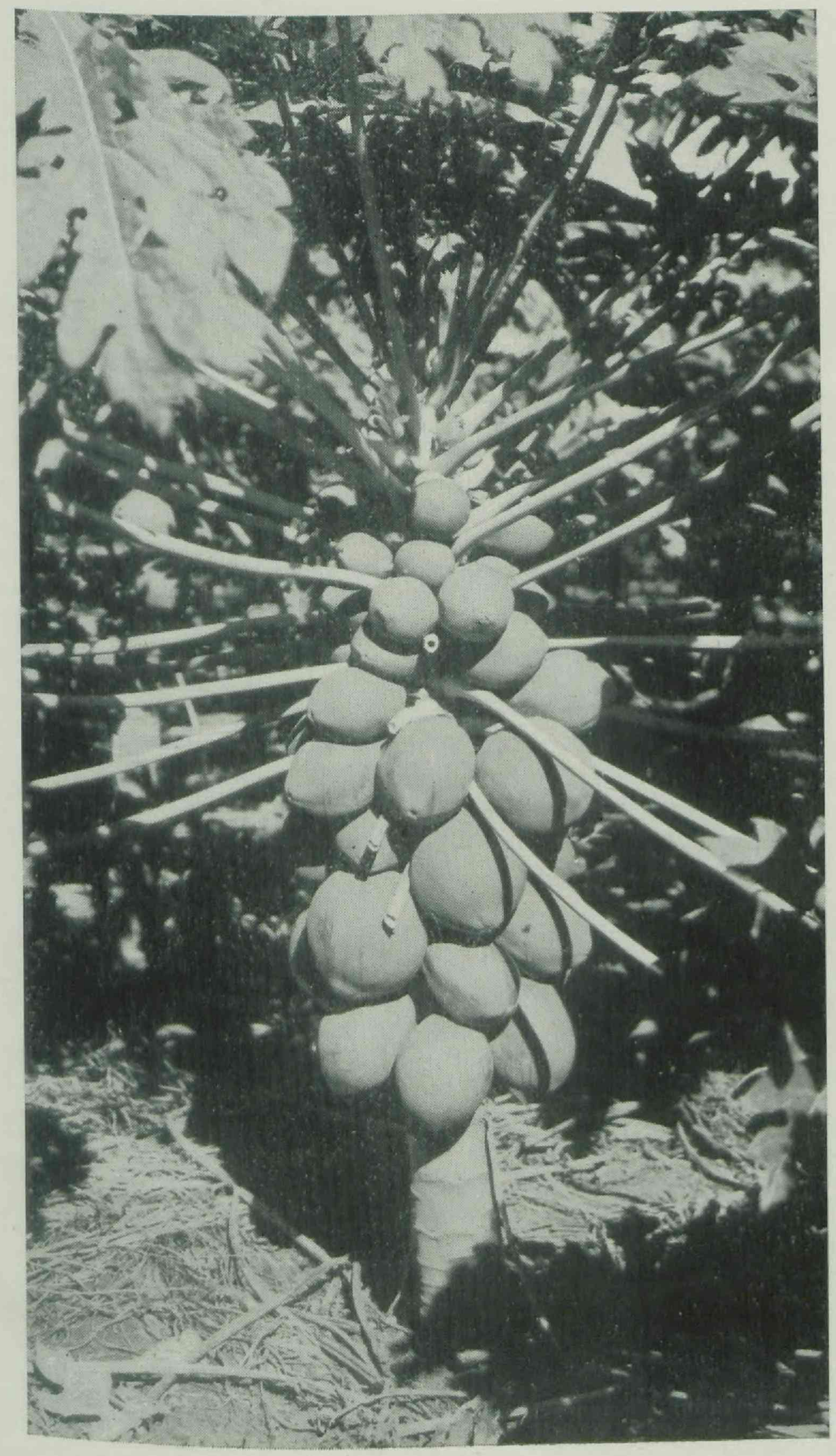


Plate 6.

A Hybrid Semi-dwarf Papaw Bred by the Department and Grown for Testing Purposes at the Redlands Horticultural Experiment Station.

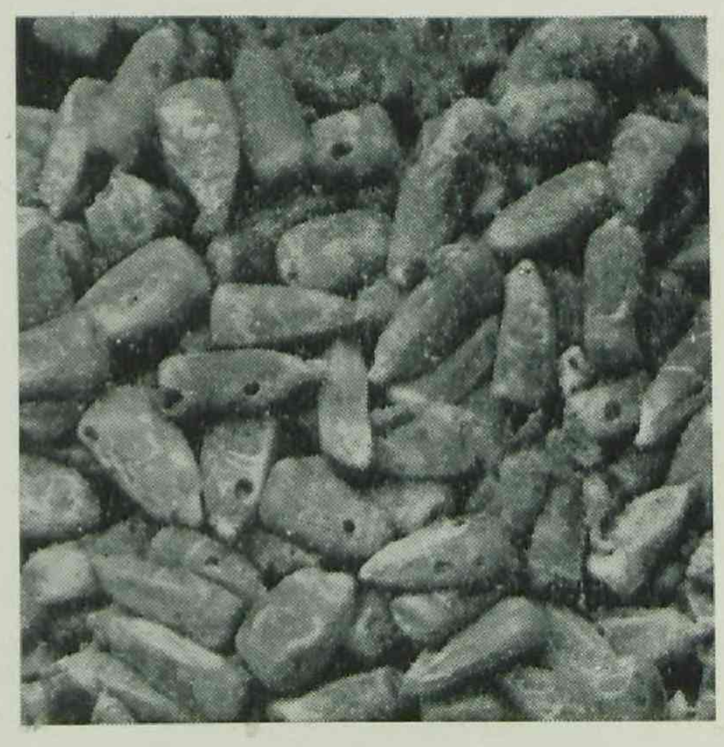


Plate 7.

BHC Protects Stored Grain Against Insects. Top, treated grain after 6 months; centre, untreated grain after 3 months; bottom, treated grain after 16 months. Treated grain should not be used as poultry feed.

PASTURES AND FORAGE CROPS.

Officers of the Agriculture Branch, Regional Experiment Stations and Chemical Laboratory are devoting particular attention to problems associated with animal fodders. Where required, close liaison is maintained with the Division of Animal Industry, particularly animal husbandry personnel. Altogether some 80 field experiment plots are being conducted, apart from direct feeding trials, while chemical work on the determination of food values and entomological investigations aimed at protection of stored fodders, particularly grains, are also being conducted. The bulk of this work naturally concerns pasture plants and in this respect some 250 species of grasses and legumes are under investigation. This work is being pursued over a wide range of climatic conditions, plots being located from the New South Wales border to Cape York Peninsula.

The final test of pastures is, of course, the effect on the animal and short-term results are often not reliable. However, indicative of what has been obtained, the following example might be quoted. In a trial with 2½ acres of paspalum-white clover pasture in the Nambour district, fertilizer costing less than £4 per acre for material was applied and the paddock grazed for three hours daily for eight to ten days approximately every two months. Milk yields were compared with those obtained from the same herd over a similar period on unimproved paspalum pasture immediately prior to each trial grazing. Using this method of comparison the increase for the five grazing periods of 40-50 days was 186 gallons. Efforts are now being made to separate out the various factors, such as fertilizer application and protection from continuous grazing, which might have contributed to this result.

For some considerable time the use of grazing oats has been restricted by the susceptibility of the available varieties to disease, particularly rust. However, with the introduction of new varieties and crosses this picture is changing. It is now possible to make recommendations for the planting of oats in virtually all dairying districts of the State, and it may be said that the introduction of such varieties as Victoria x Richland, Fulghum x Victoria, and Klein has been a most noteworthy step towards the better nutrition of dairy cows in the winter.

While the value of lucerne as a crop is widely recognized, the potentiality of this plant as a component of pastures is not well appreciated, and there seems no doubt that far greater use could be made of it in many dairying districts. With a view to improving the yields of lucerne as a crop and prolonging its life for use in grazing, a comprehensive study has been initiated. Perhaps the most interesting point which has emerged so far is the response obtained, particularly in the Lockyer Valley, to applications of gypsum. From results obtained by this Department, and elsewhere by C.S.I.R.O., it appears that it is the sulphur content of the gypsum which is producing the effect.

As the work at the Bureau of Tropical Agriculture at South Johnstone proceeds, clearer pictures are being obtained of the potentialities of various pasture mixtures, and now that it has been possible to provide facilities at Utchee Creek more extensive work can be undertaken. Details of this work are given in the report of the Agriculture Branch, and it will be seen that during the period September 1950 to the end of May 1951 bullocks grazing at the rate of a beast to 1¼ acres made an average daily gain of 1·3 lb. The potentialities of various mixtures are discussed in that report.

TEA.

Of all the tropical crops with which experiments have been recently initiated, tea gives greatest promise of establishment on a stable basis. In assessing the quality of the manufactured article the Division has been materially assisted by officers of the Oriental Tea Company Ltd., Brisbane, and the Robur Tea Co. Ltd., Melbourne, and reports on quality from these firms have been most encouraging. Towards the end of the period under review a Tarpen mechanical tea cropper has been tested, and the results, while needing much confirmation, indicate probable success. The tea cropper is operated by electric power provided by a portable petrol-driven generator. The machine consists essentially of a small reciprocating saw-toothed blade and an arrangement of revolving paddles which sweep the pluckings into a container at the rear. It is planned to extend this work on tea, particularly by testing out the effects of different altitudes and by studying the type of bush required for most efficient mechanical harvesting.

COTTON.

Following the guarantee of a higher price for seed cotton, the officers of the Division carried out an intensive advisory drive to stimulate interest in the crop and this was followed by gratifying results at the 1950 planting. There are indications that a still larger acreage will be planted this year. There is no doubt that in and adjacent to the 25- to 30-inch rainfall belt cotton can be most valuable not only for the crop itself and its byproducts but for the important part it can play in the better farming of the soils.

The cotton pest position is now comparable with that of most other crop plants, mechanical harvesting offers potentialities for the removal of the greatest labour worries, and apart altogether from considerations of the importance of Australia growing its own cotton it will undoubtedly be sound agronomic practice for growers in districts such as the Dawson and Callide to include cotton in their rotations. Increased grass yields and through this improved milk production can be confidently expected from cotton-grass rotations.

FIBRE PLANTS.

The shortage of fibres, and jute in particular, is causing concern to the great bulk of primary producers. It is difficult to foresee what the future world supplies of these materials will be. Obviously, should Asia return to its pre-war supply potential the future of any fibre industry in Queensland would be jeopardised. On the other hand, if mechanical methods can be introduced into certain phases of the industry, the lessening disparity in wages as between Australia and Asia might mean the possibility of stabilising a reasonably-sized industry in this

State. Experimental plantings to date show that jute can be grown and that a number of other plants, particularly kenaf and *Urena lobata,* have potentialities. It is felt that the manufacturing side holds the key to success or failure.

SUGAR.

The work of the Bureau of Sugar Experiment Stations embraces all aspects of cane growing and the manufacture of the raw sugar, and the usual comprehensive programme was carried out in all branches. What will probably prove to be the most important undertaking of the year was the despatch to New Guinea of an expedition to search for canes, both varieties with commercial possibilities and ones for incorporation in the breeding programme. Of 165 new types secured, 163 were successfully transported and are now being grown in isolation. These include both noble and wild canes.

Perhaps the major progress in agricultural practice has been in the direction of plant dipping in organic mercurial solutions to ensure against "pineapple" disease. Control has been so widely accepted that dipping is now being practised from Bundaberg to Cairns, and in particular in the Lower Burdekin. Chemical control of weeds has been extensively adopted by cane growers.

The weather conditions, which were unfavourable for production of a heavy crop in any part of the sugar belt, were also conducive to heavy flights of cane beetles and at the same time unsuitable for control measures. In consequence, much grub-infested land was not treated with benzene hexachloride and the damage was severe in many localities. However, where treatment was practicable and correctly carried out, it was quite successful.

The forecast for the 1951 crushing season is 5,600,000 tons of cane, a drop of approximately 1,000,000 tons on that of the previous year.

FRUIT.

The report of the Horticulture Branch discloses that a comprehensive programme of investigations is in progress in respect of all major fruits of the State. This programme covers both production problems and some associated with marketing.

During the year the opening up of new areas, generally north of the present main producing ones, particularly for pineapples, has been noteworthy. This is a wholly acceptable movement for two main reasons. The first of these is that anything which tends to develop new country, particularly in the north, is most desirable. Secondly, there is no doubt that not only is first-class land for fruit production becoming more difficult to obtain but in the more closely-settled areas there has been some tendency to choose fruit farms because of proximity to market rather than for any basic qualities such as suitability of soil or even climate. Such unsuitable areas may create problems not only for the landholder himself but also for many others engaged in the same industry. Thus, with diseases such as water blister and black heart of pineapples, which are undoubtedly favoured by certain climatic factors, poor shipments of fruit can produce a market reaction detrimental to the whole industry.

Probably the most potent beneficial factor has been the C.O.D. cannery, which has not only stabilised the industry by allowing of more orderly marketing, but also has solved quite a few problems associated with distance. It is felt that while there are quite a number of other factors operating, the cause of the movement lies to a considerable extent in the better knowledge of plant requirements which growers generally now possess. They are applying that knowledge not only to the actual production but in the selection of their farms in the first place.

In the cultural sphere the emphasis of the investigational work is on soil management, while in respect of the plants themselves efforts are being made to eliminate deficiencies by plant-breeding methods, especially selection. This latter work is undoubtedly meeting with success, particularly in the case of pineapples, strawberries and citrus fruits.

VEGETABLES.

The work on vegetables parallels that on fruit, with perhaps greater emphasis on plant breeding. Some idea of the importance of this may be gained from the fact that within the one commercial variety of beans the plant breeder has selected a large number of strains the best of which give yields double or more those of the worst. Short reflection on this gives a conception of the waste of effort which can go on when poor strains or bad type seed are subjected to even the most efficient cultural methods.

As important as receiving good yields from the land is the receipt of good returns from the market, and the wastage which occurs between harvesting and consumption is often a deciding factor as to whether a profit or loss will be made. Apart from the purely growers' point of view there is, too, the consumers' interest, since wastage means actual loss or inferior quality and higher prices. The work of the preparation and transport section of the Horticulture Branch is therefore very important, and with newer techniques both in the commercial field and in the laboratory, the field for research is continually widening. Difficulties are being experienced in the setting up of the cold storage laboratory and until these are overcome many of the problems cannot be solved. However, during the past year much progress was made and there is now reason for hoping that modern facilities will be available in the comparatively near future.

WEEDS AND POISON PLANTS.

The abnormally heavy and in many districts protracted rains of 1950 were reflected in the abnormal behaviour of many crop plants and in the methods of farming which had to be adopted, but probably nowhere else were the effects of the rain so marked as in the prolific growth of unwanted plants such as weeds and poisonous species. There can be few single factors which frustrate the farmer's endeavours more than weeds, whether they be in cultivations or those species which reduce the value of pastures. Accordingly a good deal of attention has been devoted to the eradication or at least control of these noxious species.

The most popular method of combating many of the pests is by the use of hormones and other new weedicides, and officers of several branches have been actively engaged in the investigation

Plate 8.

A Grain Sorghum Varietal Trial at Biloela Regional Experiment Station.

Plate 9.

Portion of a Jute Trial at Ayr Regional Experiment Station.

of control by the use of these materials. Horticulture Branch officers have achieved much success both in control of growing weeds and in the use of pre-emergence sprays, particularly in pineapple plantations, and Agriculture Branch officers have paid particular attention to cleaning pastures, using both cultural and spraying techniques. Behind all this work there lies a great deal of basic information, the determination of which is largely the work of the botany section of the Science Branch.

SOIL CONSERVATION.

During the year a change in the intra-Divisional handling of soil conservation administration was made with the appointment of a Chief Soil Conservationist and the transference of the soil conservation staff from the central administration of the Division to the Agriculture Branch. This change was made in conformity with the well borne out conviction that soil conservation is essentially an agricultural practice, or perhaps it might be better stated that soil erosion is most frequently the result of agricultural malpractice. The administrative change was made so that the closest collaboration of all officers associated with agriculture would be assured. As work on conservation progresses it becomes increasingly clear that while mechanical methods are often called for there are times when they can be omitted, and virtually in no instances will they supply the full answer.

The fact that assistance has now been sought for the protection of some quarter of a million acres of land is indicative of the reaction of farmers to the Departmental services and educational programme. This is a reasonable total considering the short time active work has been going on, but it will have to be multiplied several times before there can be any sense of complacence. While the bulk of the farmers in severely eroded areas are willing to co-operate, there are still the few individuals, sometimes in key localities, who apparently will not be interested until there is some degree of compulsion.

TECHNICAL CONFERENCES AND ASSISTANCE.

During the year seven technical officers of the Division made interstate visits for the purpose of studying developments in other parts. The subjects covered were cereal chemistry, irrigation practices, soil conservation legislation and practice, citrus fruit culture, and plant pathology techniques.

During the year, too, there has been very close collaboration with a number of other Departments and outside bodies. Flour milling firms, the Peanut Marketing Board, the Irrigation and Water Supply Commission, the Department of Public Lands, the Sub-Department of Forestry, and the Bureau of Investigation are bodies with whom close contact has been maintained, from whom assistance has been received, and to whom it is felt some assistance has been rendered in return.

The work on dairy pastures has been made possible by the assistance provided by the Australian Dairy Produce Board. This help is greatly appreciated, not only because of the funds provided, but because leaders of the industry closely connected with that Board are very co-operative members of the Departmental Dairy Pasture Improvement Committee.

DIVISION OF ANIMAL INDUSTRY.

Mr. W. Webster.

Since the re-organisation of the Department only six years ago there has been a big expansion in both type and extent of the services made available to the farmer and grazier. This has been particularly noticeable on the extension side of the activities of the Division of Animal Industry. For example, the Sheep and Wool Branch, which was previously a small branch of only minor importance, is now one with a comparatively large well-trained and experienced staff represented in most of the important wool-growing districts of the State. The Cattle Husbandry Branch, which came into existence since the 1945 re-organisation, has had difficulty in recruiting suitable staff, but some progress was made during the year and the branch is slowly moving towards its goal. It can be said with confidence that this branch is destined to play a most important role in the work of the Division.

Worthwhile increases in the number of veterinary officers in the Veterinary Services Branch as well as at the Animal Health Stations have at last been effected, this being clearly due to the operation of the scholarship scheme whereby the Department selected suitable young men and facilitated their passage through veterinary schools by means of scholarships.

While field investigatory and extension staff can do very useful work, the scope can be greatly increased as the result of research work. Excellent research has been done during recent years at the Animal Health Stations at Yeerongpilly (Brisbane) and Oonoonba (Townsville). This has been mainly concerned with disease problems, with some emphasis on the cattle tick, but a number of problems which are of importance not only to Queensland but to the whole of the Commonwealth have been solved.

Disease investigations have been seriously restricted, however, because of lack of pen and paddock space. Laboratory findings require testing and checking on the animals to which they are considered to have an application, using sufficiently large numbers to ensure the acceptability of the experimentalist's conclusions. It is, of course, possible to carry out some tests of this sort on private properties, but it is often found that despite the general willingness of the more progressive stock owners to allow experiments to be carried out on their properties, there eventually arrives a time when such work interferes with normal management practices to such an extent as to make it difficult or impossible for owners to carry on.

The accommodation available for animals at the Animal Health Stations for the important service of immunisation against tick fever was, until recent years, quite adequate, but with enhanced values for cattle there has been much more interest in and demand for high quality purebred bulls. This, coupled with the fact that no increase has so far been made in the charge for "hospitalisation" (animals have to be accommodated, fed and kept under continuous observation for five to six weeks), has occasioned a steep increase in the number of animals for which admission to the Animal Health Stations is sought. During the year bulls had for the first time to be turned away because of insufficient accommodation, even though makeshift arrangements were made use of to the maximum possible extent.

The most serious accommodation deficiency, however, has been in connection with experimental work in animal husbandry, as opposed to disease control. Such work calls for a much larger area of land than suffices for disease investigations, the number of animals required being in general many more. Further, the interference with normal management practices involved in husbandry research is usually far greater than is the case with disease control research. These considerations make it especially desirable for the Division to have its own facilities, the more so as it is becoming plain that husbandry research must be intensified in the years to come if the problem of increasing production in the livestock industries is to be solved. While the past position has been unsatisfactory, the future is bright, as can be seen from a perusal of the remainder of this section.

Negotiations are now in progress for the purchase of additional land, close to Yeerongpilly Animal Health Station, on which animal husbandry investigations will be put in train.

During the year a property of some 36,850 acres in the Julia Creek district was taken over with the assistance of finance from the Commonwealth Wool Fund. Special investigatory work on sterility in sheep and mortality in very young lambs, both of which are serious problems affecting the sheep industry in the north and north-west of Queensland, will be carried out on this station.

With the assistance of the Australian Meat Board, and in association with C.S.I.R.O., two stations are to be established, one in northern and one in south-eastern Queensland, for the purpose of research into breeding and husbandry problems associated with the beef cattle industry; it is expected that disease investigations will also be possible, particularly into those diseases that are common to the districts surrounding the stations.

Some progress has been made in establishing facilities for animal research on the Department's regional experiment stations. Cattle, pigs and poultry are now established and experimental work is in progress at Kairi, on the Atherton Tableland, and animal establishments are planned for Biloela and Hermitage.

Beef cattle experimental work has been planned in conjunction with the Queensland-British Food Corporation on its Cullin-la-ringo property in Central Queensland. Cattle weighing scales have been installed, paddocks selected, and staff appointed. The long-range plan is to carry out detailed feeding experiments at a Departmental research station and extend these experiments into the field on such places as the Corporation's properties, in an endeavour to ascertain the mechanics and the economics of summer crop grazing, as well as the feeding of harvested grain. While the work contemplated

is mainly concerned with production of prime young chiller beef, it is hoped to extend these feeding trials to include lamb and pork production. It is unfortunate that grazing trials planned for 1951 cannot be undertaken this year because dry weather prevented germination of sorghum seed in the experimental paddocks. Some work associated with the feeding of sorghum grain has been commenced, however, and while it is not expected that results will be conclusive, the work will afford valuable experience to the staff in the detailed organisation of experiments involving supplementary feeding.

SEASONAL CONDITIONS.

Though it is becoming somewhat trite to say that seasonal conditions have been unusual, the year under review must surely rank as one of the most remarkable on record. Severe flooding, extensive bush fires, and near drought conditions occurred in some districts within the space of 12 months.

Conditions were generally favourable for the whole State during the first half of the year, but production gains were offset in some districts by stock losses as a consequence of flooding. A feature of the second half of the year was the early and rather sudden termination of the summer rains in January. Hot weather followed and standing feed rapidly dried out to become a bushfire hazard. Livestock was lost and fencing damaged in fires which occurred in the Maranoa, Warrego and Mitchell pastoral districts. Destruction of feed over large areas, followed by dry cold conditions, brought about a serious state of affairs in these districts.

The dairying industry is generally regarded as being most sensitive to changing seasonal conditions and production in the autumn months declined steeply in sympathy with the dry and cold weather. The effects of the adverse autumn were much less noticeable in the beef cattle industry, the excellent conditions prevailing earlier being more lasting in their effect. The heavy loss of breeders during the 1946 drought affected the productive capacity of the beef industry during the next four years, but as all subsequent seasons have been good, particularly 1949 and 1950, the beef industry is at last virtually back to normal; in fact, the 1951 stock returns show that cattle numbers at 5,293,350 are higher than for many years past.

In the sheep industry, though good lambings were general (and in fact well above average in some districts) there were heavy losses in sheep of all classes from the combined effects of worm infestation, blowfly attack, flood and fire. Production in the industry showed only little improvement on the previous year. Sheep which were moved to New South Wales in drought periods during recent years found a ready market in that State and have not been returned. In addition, infertility of sheep and heavy mortality in lambs during the first few days of life in the northern sheep areas of the State have prevented the building up of flock numbers to earlier totals.

Pig production in Queensland is closely tied to dairying and consequently showed a decline.

Egg production again showed a falling off, but the decline was not nearly so great as in the previous year.

MEAT PRODUCTION.

It is becoming obvious that a change is taking place within the beef cattle industry in Australia, for increasing population is reducing the amount of beef available for export. When considering this matter broadly, it should be remembered that, up to the present, the type of beef required from Australia by the British wholesaler has for the most part been that obtained from the mature bullock and this has been sent to Britain as frozen beef. While the British market would in normal times absorb a very big percentage of high quality chiller beef, which is produced from the young prime animal, this type of carcase has been procurable from sources other than Australia, including the British livestock industry. On the other hand, the beef that is most sought after by the Australian consumer is the small prime carcase produced from a younger animal. As the local market is absorbing more and more of the Australian production it is to be expected that the beef industry should become increasingly interested in the production of this type of beef. This trend is becoming more pronounced as the price of beef increases, for though the spending power of the public may also have increased, the higher retail price may well influence the purchaser to demand a high quality article.

There are already indications in the southern parts of the Commonwealth, where the bulk of the population is concentrated, that some form of supplementary feeding will be practised in an endeavour to fatten the young growing steer, and it is expected this will slowly develop in Queensland. It seems quite likely that in favoured areas the Australian beef industry will ultimately follow the example of the industry in some other parts of the world, particularly the United States of America. Starting as an industry producing cattle entirely on open range, fattened on natural pasture, the industry in that country slowly changed to one in which a large percentage of the cattle were bred on open range but were sent as young stores to fattening areas, the fatteners being agriculturalists and dairy farmers who fattened the cattle on crops and grain produced on their own farms and fed to the young steers in "feed lots."

It is anticipated that this type of fattening will gradually develop in Queensland, particularly amongst agriculturalists and dairy farmers in the more favoured areas. With this in view the Department has stationed field officers of the Cattle Husbandry Branch in suitable districts, among other things to encourage, in a limited way at first, the production of young prime beef by the dairy farmer, agriculturalist or grazier, on crops and grains produced on the same properties as the cattle. If the production of young prime beef is a success, and there appears every indication that it should be, a more intensive drive will be undertaken to increase this type of production, for not only will the quality of beef be improved, but the marketing of younger animals is calculated to increase the overall production of beef.

It is realised that production of this type can only be successful if producers are assured of an incentive payment for a high quality article, and in order to help bring this about a provision was made in the new Slaughtering Act to allow of grading and branding meat according to quality. A prime quality grade can be instituted if such meat is produced.

The movement of cattle by transporter, or what has been frequently referred to as "road train," has shown some increase. This new type of movement, being greatly dependent on financial considerations, has developed along sound lines. It has been largely confined to the movement of types of stock that cannot be moved on the hoof to the railhead. On the outlying breeding properties far removed from the railhead, aged fat cows, while no longer of use as breeders, are of considerable value as meat if they can be marketed. This class of cattle cannot stand up to long droving but can be transported by road train to the railhead and thence by rail to the killing centre. This relieves the property of useless animals and makes available beef that would otherwise be wasted; it is being successfully exploited by at least one large grazing company. The fattening of limited numbers of young steers has been developed by wool growers in the south-west and a valuable market for prime steers has been developed at Cunnamulla. Motor transport has been found to be ideal for the movement of these cattle, as it enables the owner to draft off regularly the few prime steers available and send them with little loss of condition to be sold at the railhead.

At the same time, an effort is being made to encourage the production of high quality lamb for slaughter, sale and consumption in the more heavily populated areas of Queensland. This State has the highest percentage of Merino sheep in Australia, and as would be expected produces the smallest amount of high quality lamb. It has been shown in a small way that quality lamb can be produced close to Brisbane, and it is felt that limited numbers of sheep for the production of fat lambs could be run in association with dairying in the country close to Brisbane and perhaps later extended to certain other favourable areas close to the large cities of this State. With this in view, money to subsidise the purchase of suitable rams has been made available during the last few years, and an officer has been appointed to encourage the establishment of this industry in the Brisbane Valley and the South Burnett. The new Slaughtering Act can also assist this industry, as it will be possible to create prime quality grades which with suitable branding will make the consuming public amenable to premium payments.

The difficulty of assessing the quality of a slaughtered carcase by the examination of the live beast has long been recognized for all animals, but is probably greatest in the pig. While it is comparatively easy to determine that a pig is overfat before slaughter, it is in most cases less easy to determine what will be the proportion of lean meat to fat, and practically impossible to say whether the lean meat will be best developed in those parts of the carcase where it is most favoured by the consumer. Even after slaughter the quality of the carcase remains largely a matter of opinion and processors and consumers still differ about what is the most suitable type of carcase.

Some years ago a system of judging was evolved which enabled the dressed carcase to be measured, not only as to size but also as to the proportions of meat, fat, and bone in the carcase. A scale of points was laid down, and while it is likely that some minor changes will be made in the allotment of points, the system generally has been most helpful to the specialist extension worker and through him to the industry. By this system of judging it has been possible to demonstrate effectively to pig farmers the intimate relationship that exists between quality and feeding and breeding. The system is in addition changing the entire face of experimentation in the field of pig husbandry, as it provides a means of accurately interpreting results obtained, a measure which was previously unavailable to the experimentalist.

LIVESTOCK DISEASE SITUATION.

It may be thought that during good seasons, with stock on a high plane of nutrition, disease is not a matter of any great moment. This is not the case, however, and it can truly be stated that in Queensland there is far more loss from disease in good years than in bad. In the Queensland beef cattle industry the most serious troubles are cattle tick, tick fever, pleuro-pneumonia, and buffalo fly. The propagation of cattle tick and buffalo fly is dependent upon heat and humidity and the normal habitat of both is consequently the coastal belt and adjacent hinterland. In wet years infestation spreads further inland and in 1950-51 the infested area was greater than had been the case for more than 30 years. Tick fever transmitted by the cattle tick is not serious in country normally infested by this parasite, as the cattle in these areas develop an immunity to the blood parasite involved. It is serious, however, in the marginal country, where irregular infestation is not conducive to the maintenance of immunity, and a sudden extension of infestation often causes heavy mortality. Such mortalities occurred during the summer and autumn of 1950-51, but drier conditions in the early half of 1951 seem to be adversely affecting tick life in the newly infested areas, and loss of production and mortality are decreasing.

In good years when pastures are abundant and water supplies assured, fat cattle are plentiful and stock movements on the well grassed stock routes are heavy. Contagious pleuro-pneumonia, which is dependent for its spread upon contact between susceptible animals, develops more easily when stocking is dense and may spread extensively in good years when stock movements are great. Thus in 1950 and 1951, outbreaks of this disease were more serious than for some years previously.

Cattle tick and pleuro-pneumonia were responsible for much interference with stock movements, this being sometimes an even greater disability to the owner than actual losses of animals. Restriction of movement is necessary to prevent spread of both ticks and pleuro-pneumonia, but the aim has been to effect control with the minimum interruption to travelling schedules.

Additional measures taken were the stationing of staff in the far west and on the Northern Territory border, the charging of dips with more efficient dipping solutions, and inoculation.

Cattle tick and pleuro-pneumonia have long been common in the Northern Territory north of latitude 20°. The expanding disease control staff of the Territory, however, is now exercising stricter supervision over stock movements and disease affected mobs of cattle are likely

to be detected before arriving at the Queensland border. There were, of necessity, serious restrictions of movement during 1950-51, particularly at Lake Nash, the busiest crossing place, but with the stationing of stock inspectors at Lake Nash and Boulia, and the charging of the Lake Nash dip with DDT, it has been possible to limit the spread of these diseases and eliminate long delays.

STAFF.

To cope with the expanding demands on the Division, additional staff is essential. Staff members, when appointed, must have the qualifications required for their particular work. In common with other Divisions, difficulty is being experienced in recruiting trained staff, though 25 appointments were made during the year. As against this, 13 officers resigned, one died and one retired. The resignations were particularly unfortunate, as it has to be recognised that though new appointees have the required qualifications they still lack the special knowledge necessary for them to function to best advantage. This position is met to some extent by giving them special courses of training subsequent to their appointment. Even then some years of experience must be acquired before an officer reaches a stage where he can be given responsibility in large measure.

In the Veterinary Services Branch, six new veterinary officers were appointed, this being the largest intake for any one year. Other appointments to the technical staff were three inspectors and one cadet. Resignations comprised the Director, one veterinary officer and one inspector. A further veterinary officer transferred from this branch to the Sheep and Wool Branch. There are vacancies for two divisional veterinary officers and seven inspectors.

In the Sheep and Wool Branch, one assistant husbandry officer was appointed (ex the Veterinary Services Branch), also two advisers, one senior technical assistant and three laboratory assistants. Resignations comprised one senior adviser, one adviser and two laboratory assistants. The position of adviser at Dalby was vacant at the year's end.

The Cattle Husbandry Branch was able to balance new appointments and resignations (one assistant husbandry officer and one field assistant), but the newcomers are as yet lacking in experience. An experienced assistant husbandry officer was transferred from Head Office to Emerald and will make a special study of the use to which summer growing grain crops can be put in the beef cattle industry. The Cattle Husbandry Branch is still in the developmental stage and recruitment of further staff is necessary.

The staff position in the Pig Branch remained stationary from the standpoint of numbers, but a new district was opened up by the transfer of an adviser from Head Office to Warwick.

The Poultry Branch, which has not a large staff, suffered severely by the resignation of three inspectors, who have not yet been replaced.

In the Research Branch there was no change at Yeerongpilly Animal Health Station, but a Veterinary Officer was added to the staff of Oonoonba Animal Health Station to assist the Officer-in-Charge, this being a long felt want. Of two cadets appointed during the year with a view to overcoming the problem of technical assistance at Oonoonba, one resigned.

LEGISLATION.

"*The Slaughtering Act of* 1951," assented to on 30th March, 1951, replaces the act promulgated in 1898. The new Act has not yet come into operation, as a great deal of detailed work is necessary in drawing up a new set of regulations.

Much wider powers are provided for inspectors under the 1951 Act, a need which has been in evidence for some years past. Provision has also been made for the licensing of butchers' shops and vehicles and the grading of meat according to quality, these being innovations which it is anticipated will effect a substantial improvement in general standards.

"*The Poultry Industry Act Amendment Act of* 1950," assented to on 23rd November, 1950, provided for the appointment of an advisory board to the Minister which is much more truly representative of the industry than the old board. Under this Act the industry is required to contribute financially towards the cost of maintaining the Poultry Branch of the Department. This is in accord with legislation relating to some other branches of primary industry. The Act also provides for much firmer control over the slaughtering of poultry, and regulations will be drawn up when circumstances permit.

"*The Diseases in Stock Acts Amendment Act of* 1950" was designed primarily to remedy the unsatisfactory position of the Stock Diseases Fund. Expenditure from the fund has for some years heavily outweighed receipts. In addition to alterations in the rate of assessment, some minor changes were effected in the basis on which an assessment is made.

VETERINARY SERVICES BRANCH.

Action was taken during the year with respect to 58 outbreaks of pleuro-pneumonia, as against 35 during the previous year. Outbreaks occurred in every division of Queensland, including Moreton.

Blackleg in cattle was very prevalent during the winter, spring, and autumn, and losses in calves and yearlings were exceptionally heavy in central and southern districts. Though vaccination was extensively used for preventive purposes, it failed to control the disease. Special investigations have been made in an effort to determine the reasons for this state of affairs.

Measures for tuberculosis control, using the services of veterinary practitioners, increased in dairying districts in the Brisbane Valley and on the Darling Downs, and were extended to the South Burnett, Brisbane Valley and Rockhampton areas.

The tuberculosis free cattle herd scheme was extended and 30 herds are now accredited.

Control of bovine brucellosis was effected chiefly by Strain 19 inoculation of heifer calves. The swine brucellosis testing scheme was extended during the year; 37 herds now hold certificates and a further 16 are under test.

Diseases which showed a high incidence during the year included leptospirosis in calves, urinary calculi in sheep, and footrot in cattle.

Trichomoniasis in cattle, resulting in severe sterility, was recorded for the first time in Queensland, while black disease of sheep (generally regarded as non-existent in the State) was suspected of being present in the Stanthorpe district.

During the period of very heavy cattle tick infestation difficulty was experienced in controlling the tick with standard arsenical solutions, and this, in addition to the fact that arsenic has been in short supply, resulted in extensive use of the newer insecticides, DDT and BHC.

A large number of dips situated in strategic positions in the tick infested country extending from Helidon to Laura were charged with DDT and operated by the Department in association with the owners. These dips were used to minimise infestation in travelling stock and to clean cattle prior to moving from infested to clean country. The Director of this branch is again able to report that there were no tick outbreaks in clean country which could be ascribed to cattle that had passed through these dips. Arrangements for the establishment of a further series of DDT dips around marginal country in the vicinity of the Darling Downs are being completed.

Minor tick outbreaks due to illegal and irregular stock movements again occurred in clean country on the Darling Downs and there was some extension of the tick infested area in gazetted infected areas.

Ticks were introduced from the Northern Territory into north-western Queensland in July, 1950, and became established over a large area of country extending from Camooweal to Mt. Isa, Dajarra, Urandangie and Lake Nash. This necessitated the imposition of special control measures within this area.

Buffalo fly control measures were continued in coastal districts, but the fly extended as far south as Gympie. It also spread in a south-westerly direction and appeared at Roma, Miles and Chinchilla. Temporary staff was appointed and control measures undertaken in these areas. The prospects of preventing the periodic spread of buffalo fly in the coastal country south from Gympie are not good owing to the impossibility of keeping cattle in wallum country under control.

Losses from plant poisoning were again recorded. In cattle the most important were associated with yellow daisy, yellow-wood, lantana, poison peach, Noogoora burr and paspalum ergot. In horses losses due to the ingestion of *Indigofera enneaphylla* (Birdsville disease) and gomphrena (coastal staggers) were reported.

ANIMAL HEALTH STATIONS.

Work on the control of cattle tick by the new synthetic insecticides was continued and extended. Two dipping vats charged with toxaphene have been working satisfactorily and biological tests have shown that there has been no loss of efficiency in these vats. Toxaphene ranks high as a tick destroying agent and if more material were available other vats could be charged for observational purposes.

Toxaphene, chlordane and dieldrin applied with a portable power spray plant all proved satisfactory in the control of cattle tick in field trials with dairy cattle. The combination of power spray plus insecticide has proved to be ideal in tick control in small herds.

Work in connection with poison plants has been largely confined to plants poisonous to horses. A curious disease of horses in North Queensland associated with the formation of extensive areas of ulceration of the mucous membrane of the oesophagus and stomach has been under investigation. Feeding trials with a species of *Crotalaria* suggest that it is the cause of the condition.

Observations on the seasonal fluctuations of the adult worm burdens of cattle have been continued in association with C.S.I.R.O. Veterinary Parasitology Laboratory. These studies have shown that clinical parasitism is most prevalent in dairy calves 4-12 months old and in beef herds a few months after weaning. Cattle develop a strong resistance to infestation during the first 18 months of life and adult animals are rarely found heavily parasitised. This resistance appears to be specific in nature; it is strongest against the hookworm (*Bunostomum phlebotomum*) and weakest against the large stomach worm (*Haemonchus contortus*). If calves are exposed to only small numbers of larvae they build up a resistance which tends to protect them against parasitism later in life when exposed to heavy larval intake.

Clinical symptoms of parasitism often occur some time after the period of maximum worm burdens and this delayed onset of symptoms has proved confusing in the interpretation of faecal egg counts as a diagnosis of parasitism. It appears that faecal egg counts are a reliable method of diagnosis provided they are based on the herd and not on individuals. Drenching at strategic times has been suggested to reduce the parasitic burden before clinical symptoms of parasitism develop.

Work with leptospirosis, a disease of calves causing redwater and diagnosed by the staff of Yeerongpilly Animal Health Station for the first time in Australia, continues. Techniques for tests of blood serum and the microscopic examination of urine have been improved, so they are now being used for routine diagnosis. Because of the Queensland work it has been suggested by other States that Yeerongpilly Animal Health Station be the central laboratory for this work.

The existence of copper deficiency in cattle in Queensland was established for the first time in 1950. It has now been found in 17 herds—13 in the Moreton Division, and one each at Kilarney, Southbrook, Gympie and Thangool. Unthriftiness was present in all herds, but the appearance of other symptoms—diarrhoea, anaemia, and soft bones—was variable. Diagnosis was confirmed in all cases by analyses of liver and blood made in the Department's Chemical Laboratory. It is clear now that copper deficiency is the cause of an unthrifty condition of cattle recognized for many years, but hitherto never satisfactorily explained, in many parts of south-eastern Queensland.

Plate 10.

Floodbound Sheep on the Bank of a Dam During the Floods of 1950, When Many Flocks Were Fed From the Air.

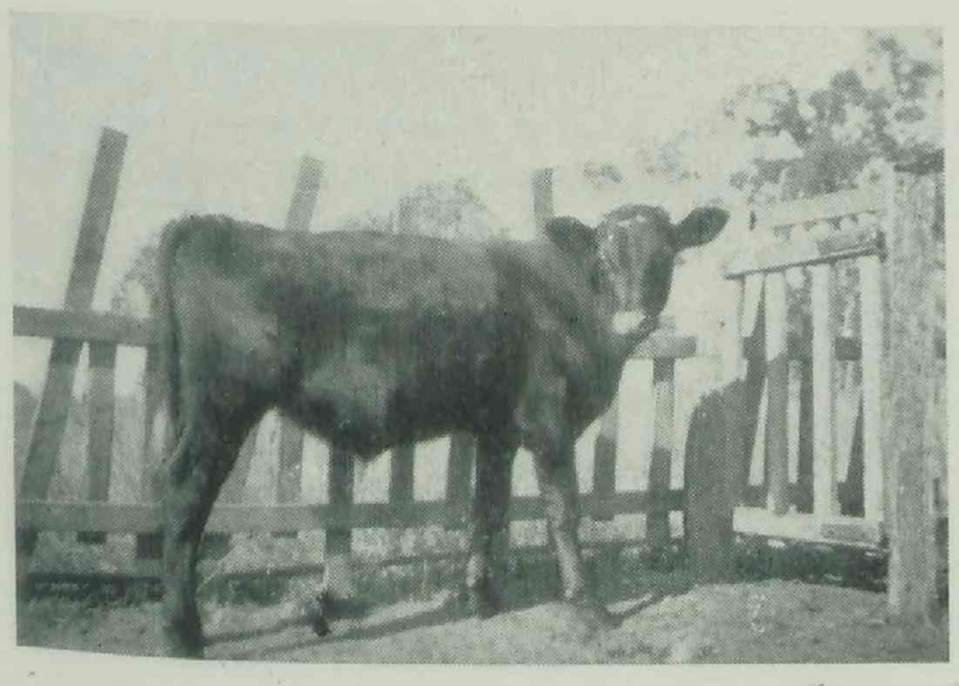


Plate 11.

An A.I.S. Steer Calf Raised on Whole Milk for Ten Days, Skim Milk for Ten Weeks, Plus Grain. Weight at 8 months 454 lb.

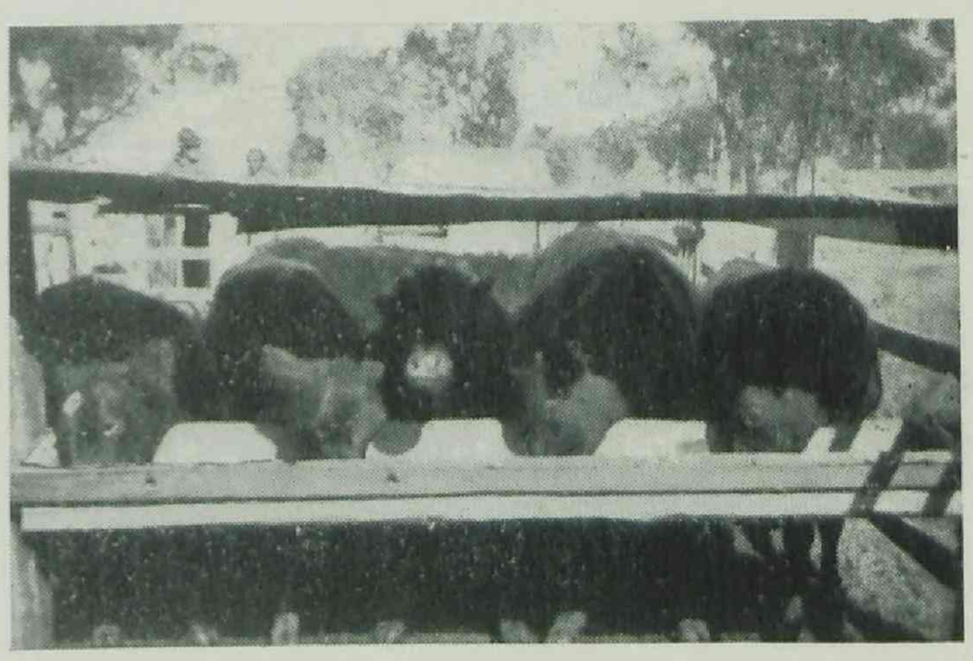


Plate 12.

A.I.S. Calves in a Monto Calf Rearing Demonstration Conducted by the Department.

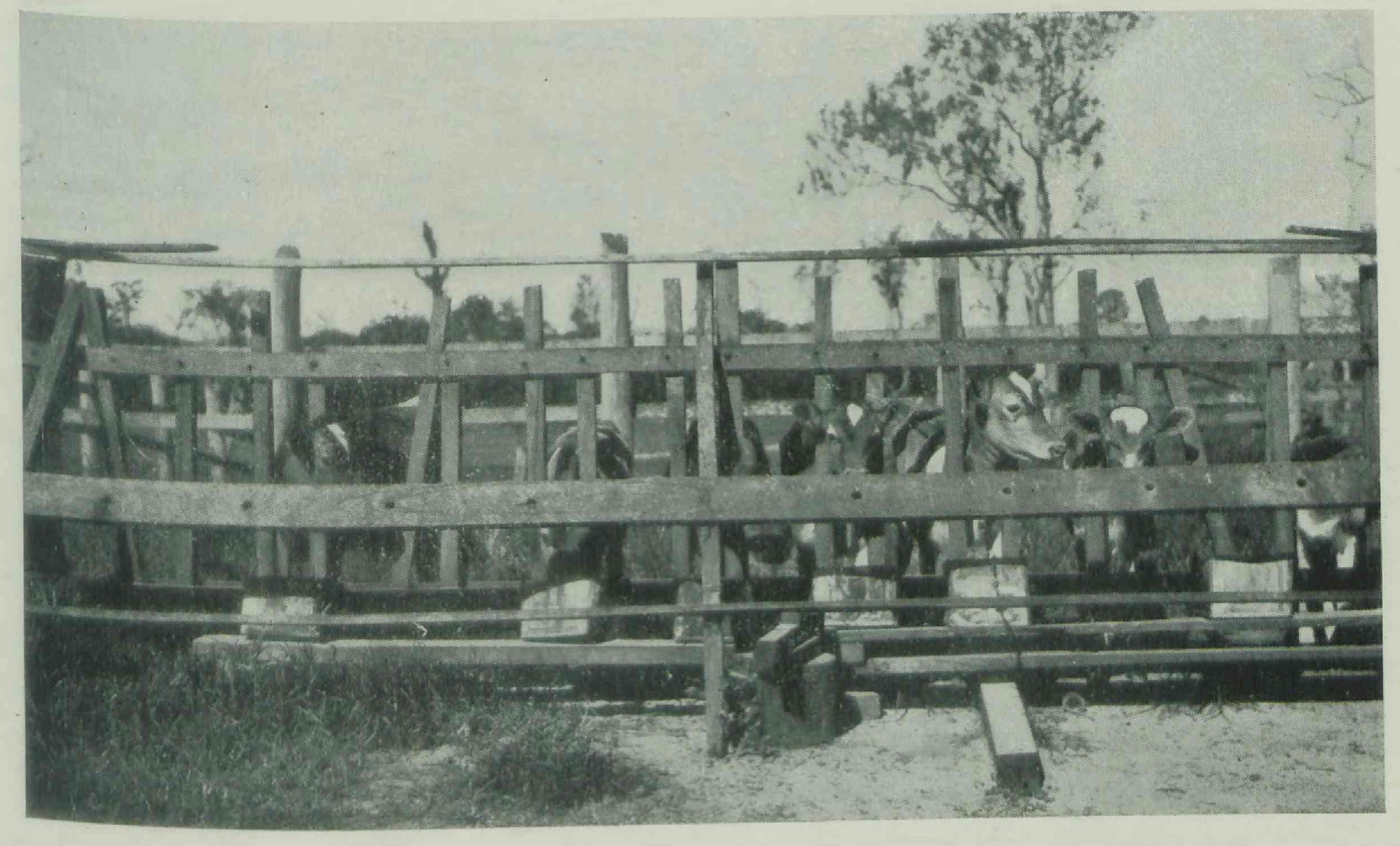


Plate 13.

Guernsey Calves Reared on Twenty Gallons of Milk Plus Concentrate, Weight at Four Months, 145 lb.

Bovine trichomoniasis is one of the causes of infertility and abortion. It was identified for the first time in Queensland in July, 1950, in a dairy herd at Moggill. The disease is possibly present in other herds but the few specimens examined have not yielded any positive results. The organism is readily identified if present in a specimen, but as it is confined to the reproductive organs and only irregularly present in the discharges, diagnosis is difficult and repeated examinations may be necessary.

Epididymitis is an important cause of infertility in rams. An organism has been recovered from affected tissue and is now being studied to determine whether it is, in fact, the cause of the common naturally occurring form of the disease.

Abortions and stillbirths are common in sheep but have received little attention from sheep owners or veterinarians in this State (or elsewhere) in the past. Three foetuses from an outbreak of abortion in a flock at Texas were found to be infected with the bacillus *Listeria monocytogenes*.. This organism had not previously been found in Queensland, though it had been found to be a cause of encephalitis and abortion in sheep in both New South Wales and South Australia.

Many outbreaks of urinary calculi in wethers occurred during the year and in some the mortality was heavy. All outbreaks occurred in fat sheep and were associated with high intake of soluble oxalate and calcium from the pasture. From experiments at Yeerongpilly it was concluded that ingested soluble oxalate may be excreted in the urine as carbonate—and thus provide the first prerequisite for the formation of carbonate calculi—or it may be dealt with by the body in some entirely different way, possibly depending on the diet of the sheep.

SHEEP AND WOOL BRANCH.

While extension services of the Sheep and Wool Branch previously in operation have been maintained, further developments have been permitted by the establishment of a wool biology laboratory. This provides facilities for accurate measurement of the diameter of wool fibres, the determination of staple length, and the computation of clean scoured yield of greasy wool. In addition it is possible to examine sections of sheep skin under a microscope to determine the nature and activity of the follicles present.

Some measure of the value of the extension service rendered by this Branch in the past was obtained as the result of a survey conducted to determine the protection afforded by the Mules operation in the control of blowfly strike in sheep. This method of control has been publicised a good deal during the last 10 years, and as the fly wave of the autumn of 1950 was very severe opportunity was taken to determine the opinions of wool growers about its value. Over 100 property managers and owners replied to a questionnaire seeking this information. They were located in practically every sheep growing district and, in all, they controlled about 1,000,000 sheep which had been treated with the Mules operation. Reports indicating general satisfaction were obtained from all wool growers. Detailed comparisons between treated and untreated sheep quoted by 22 growers indicated average strike in treated sheep of the order of 2·9 per cent. as against 16·0 per cent. in untreated sheep.

A programme of research work has been actively prosecuted, the subjects investigated including lowered reproductive rates of flocks in tropical areas and the aerial transport of fodder to floodbound stock. As a result of the heavy rains in June and July of 1950, severe flooding occurred in the Macintyre and Condamine River systems, and groups of sheep were isolated on restricted areas. As the prices of sheep and wool were high, and as many ewes were in lamb, wool growers decided to feed their stock on fodder dropped from freight planes. In all about £19,000 was spent on the purchase and transport of fodder. Of this about £15,000 resulted from charges for air freight. Investigations carried out by the branch showed that it would be possible to halve the transport costs should a similar emergency occur in the future.

CATTLE HUSBANDRY BRANCH.

The feeding of concentrates such as grains and protein meals has long been practised by some dairy farmers, particularly those supplying whole milk for sale. It is a matter of general acceptance that maintenance requirements of dairy cows in this State are for the greater part of the year met by grazing on pasture. When pastures are especially good they may also meet the full production requirements of cows. Except under these special circumstances, however, some supplementary feed is required to obtain from a cow its maximum production. Meals and grains are used for this purpose.

To show the potentialities of supplementary feeding, a number of demonstrations are being made by this branch. The results so far have been rather surprising, as they suggest that for some months pastures are not sufficient to maintain a dairy cow in good bodily condition without some supplementary feed, and as still further amounts are required for production of milk, the economics of supplementary feeding require careful consideration. The results of these trials should help in determining the soundness of winter dairying, particularly in marginal areas.

The increasing price and shortage of supply of meals and concentrates lends great importance to this work.

Because of the shortage of protein-rich concentrates, a small experiment was undertaken to ascertain whether urea can be substituted for concentrates such as meatmeal. The indications are that urea can be so used without affecting the appetite or digestion of dairy cows.

Concern has long been felt at the slaughter of young male dairy calves, and it has been suggested that the feeding of these calves, even if only for short periods, would build up the meat production of the State. A number of preliminary calf feeding trials have been undertaken, and while this work has not yet been completed it would appear that the feeding of calves from the smaller dairy breeds for the production of vealers may not be sound and that the fodder used could be much more efficiently converted to human foodstuffs by dairy cows and pigs. On the other hand, the rearing of heifer calves on foodstuffs other than milk, particularly in the milk zones, appears to be worth while, provided such heifers are retained for milk production and not slaughtered for veal.

Along the eastern coast of Queensland, particularly in the southern half, are areas of land, many of them close to fertile dairying country, from which milk production has been very low, and the cattle bred therein have been well below average in quality. It had long been suspected that this was due to mineral deficiency, particularly calcium and phosphorus, but it would now appear that there is an added deficiency of copper. Trials are in progress in which copper and other minerals are being made available to cattle in the area. Results so far have been very encouraging and there are grounds for hope that production can be stepped up in quite large areas of country by the use of these deficient minerals. This work is being undertaken in conjunction with officers of the Division of Plant Industry.

Temporary sterility in dairy cattle is perhaps responsible for greater loss of production than any other single factor. While it is widely known that this complaint can be due to disease, it is not generally realised that the condition is just as often associated with bad husbandry. The extension staffs of this branch and the Veterinary Services Branch have devoted quite a lot of their time to this problem and it is likely that further work will be developed in the near future in collaboration with C.S.I.R.O.

PIG BRANCH.

A decrease of approximately 10 per cent. in the number of pigs slaughtered for the year is expected, this being attributed mainly to lack of protein supplements and the high price of cereal grains.

The quality of the pigs marketed has been satisfactory, though in all districts except the Northern Tablelands the overfat pig is still causing some concern. In the north the system of grading in operation, together with the co-operation of the bacon factory, the Northern Pig Marketing Board, and the Branch Adviser stationed in the area, has reduced the incidence of the overfat pig and today over 80 per cent. of pigs marketed in the area are graded first quality.

Baconer carcase competitions (cured bacon) continue to gain in popularity and are assisting producers and stud breeders to a better understanding of trade requirements.

The Australian Meat Board carcase competition was again a success, with an increased number of entries and improvement in the quality of the carcase judged.

A preliminary trial to study the effect of slowing down the finishing-off stage of baconers on the quality of the resultant carcases has been undertaken. The results suggest that improved quality is obtained by feeding increased fibre. The test is at present being repeated in more detail.

The health of pigs has been generally satisfactory throughout the State. However, salmonella infection continues to be responsible for moderate losses on many properties. On the Downs an unusual complaint which caused a number of sows, spread over a wide area, either to lose their litters or give birth to dead suckers, was reported. The cause of the trouble has not been determined, but it gradually disappeared with an improvement in seasonal conditions.

There is a continued interest taken in the pig industry in all districts and a better understanding of improved methods of feeding and management as a result of the work being carried out by officers of the Pig Branch. Close co-operation has been maintained with all organisations interested in pig production.

POULTRY BRANCH.

The sharp decline in egg production that was evident last year in southern Queensland has been arrested, but in central and northern Queensland the downward trend continues. The 1950-51 intake of eggs by the Central Queensland Egg Marketing Board was approximately 25 per cent. below that of the previous year, and the commercial production in northern Queensland is estimated to be down by 20 per cent.

There was approximately a 12 per cent. reduction in the slaughter of poultry in the Brisbane area, due largely to a decline in production of duck meat following the sharp fall in prices during the later part of 1950. Cockerel raising for slaughter for the overseas market was maintained at the previous year's level and it is anticipated that the recent increases in poultry meat prices will materially increase the output of this class of bird.

Over 250,000 birds were blood tested for pullorum disease by officers of the branch. This work, because of shortage of staff, took almost six months to complete. Repeated testing of flocks has reduced the incidence of pullorum disease. On the last test it was found that 101 flocks had less than 2 per cent. reactors; of these 40 had less than 1 per cent. and 19 were clean.

The branch conducted experiments at Kairi Regional Experiment Station and Yeerongpilly Animal Health Station. Those at Kairi were designed to ascertain to what extent maize may be successfully fed to chickens, growing birds and layers. It was found that when the maize content of a chick starter mash was increased above 40 per cent. growth rate was retarded, but from eight weeks of age onwards growth was satisfactory, being comparable with that obtained using rations containing less than 40 per cent. of maize.

Laying birds were fed all-mash laying rations containing 55 per cent., 62.5 per cent., and 70 per cent. of maize. No significant differences in egg production between rations were noted during the first 12 months' laying period. Birds on 55 per cent. maize averaged 196.8 eggs per bird, those on 62.5 per cent. maize 204.7, and those on 70 per cent. maize 200.3.

Some of the materials used to protect grains against weevil infestation impart a distinct flavour to these grains. One such insecticide is benzene hexachloride (BHC), which is used particularly for protecting grain intended for sowing. With the object of determining whether the feeding of grains treated with BHC would taint either the flesh or eggs of fowls, an experiment designed in collaboration with officers of the Division of Plant Industry was carried out at Yeerongpilly Animal Health Station. Though the work is not completed, there is sufficient evidence to indicate that BHC treated grain is not well suited for feeding to poultry as it can taint both flesh and eggs.

DIVISION OF DAIRYING.

Mr. E. B. Rice.

STAFF.

Expanding activities of the Division, especially in connection with the Commonwealth Dairy Industry Efficiency Grant, necessitated action being taken during the year to appoint a director to control each branch of the Division, and accordingly Mr. R. A. Paul, formerly of Western Australia, was appointed Director of Field Services and Mr. L. E. Nichols was promoted to Director of Research. There were eight additions to the permanent and temporary staff.

Two scholarship holders who graduated from the Massey Agricultural College of the University of New Zealand returned and took up duties in the Department. Having received training of a kind not available at any Australian University, they should prove a distinct acquisition to the Department.

The staff is generally applying itself zealously to the many duties which it is called upon to perform, and factory directorates, managements, and farmers have given unsolicited praise of the services rendered.

SEASONAL CONDITIONS.

In the first seven months of the year, good seasonal conditions enabled production to be at a higher level than in 1949-50. Below average monthly rainfalls from February to June caused a sharp fall in production for the last four months of the year. However, sufficient dry paddock feed and surface water supplies during these months enabled stock generally to remain in fair to good condition.

DAIRYING STATISTICS.

Statistics reveal that during recent years dairy cattle numbers, butter production, and total milk gallonage have been well maintained and discount suggestions of any marked trend away from dairy farming in Queensland. It is appreciated, however, that increasing demands for dairy produce, owing to the increasing world population and improving living standards, justify raising production as far as economically feasible. This could be accomplished by a more widespread use of better practices already demonstrated on progressive farms.

THE BUTTER INDUSTRY.

The production of butter for the year was 106,179,781 lb., which was 1.65 per cent. below that of the previous year. Official gradings were 39.49 per cent. choice, 54.79 per cent. first, 5.24 per cent. second and 0.48 per cent. pastry grade.

In the first quarter severe weed taint caused heavy downgrading. During the summer months defects typically associated with warm weather were responsible for a serious drop in quality. During the autumn and winter quality did not recover to the extent usual at those times of the year; this was partly attributable to the prevailing drought conditions and lenient cream grading.

The average pay-out to farmers by butter factories was 25.8d. per lb. commercial butter.

Under Queensland conditions intensive vacuum treatment of cream during pasteurisation assists materially in obtaining choice-grade butter. A survey of official gradings at 42 factories showed that the butter packed choice which remained true to grade was directly proportional to the intensity of processing given the cream during pasteurisation.

Many companies made good progress during the year in carrying out structural alterations and improvements to their buildings and in providing new or replacing obsolete equipment. At various times during the year the industry was faced with difficulty in obtaining adequate quantities of essential manufacturing requisites, such as boxes, salt, parchment, and sodium bicarbonate.

THE CHEESE INDUSTRY.

Cheese production was 19,430,199 lb., compared with 20,272,556 lb. in 1949-50. The decrease was mainly accounted for by the closure of the Theodore factory and diversion of milk from two large factories to supplement falling normal supplies for Brisbane during the dry winter.

Cheese quality was somewhat below that of the record for the previous year. The dry weather was detrimental to cheese quality.

The average price for milk supplied to cheese factories was 3s. 6½d. per lb. butterfat compared with 3s. 3d. in the previous year. That the cheese industry is aware of the necessity for greater efficiency is indicated by the fact that two more factories installed whey separators, several provided improved starter facilities and further progress was made in certain aspects of mechanisation.

THE MARKET MILK INDUSTRY.

In addition to the pasteurisation plants in Brisbane, there are now 16 in operation in other parts of the State. Pasteurised milk became available during the year at Maryborough and Warwick. Divisional officers have been energetic in efforts to ensure the supply of milk of high quality and its efficient treatment at the factories so that consumers will receive a safe, clean milk of good keeping quality, which is under constant inspection and laboratory control.

Further steps were taken by several companies towards the drying of buttermilk and skim milk and the drying and condensing of wholemilk.

UTILISATION OF MILK BY-PRODUCTS.

A committee investigated the prospects of the better utilisation of milk by-products and submitted its report to the Minister. The potential supplies of raw material available for processing were estimated and the view was expressed that ultimately circumstances are likely to

enforce the diversion of a considerable proportion of milk by-products away from the feeding of live stock to use in human nutrition. Taking the long view, pig raising should be concentrated in grain-producing areas.

HERD PRODUCTION RECORDING.

Grade herd recording could have been considerably expanded beyond the 42 groups in operation if equipment had been available. A total of 22,392 cows in 715 herds completed lactations for an average production per cow of 152 lb. butterfat, and 135 pedigree herds were recorded under the scheme for purebred dairy cattle.

Surveys of data available from herd recording were continued. The information already published has been most useful to the industry and other branches of the Department and in defining problems for research.

DAIRY INDUSTRY EFFICIENCY GRANT.

The funds made available under the grant from the Commonwealth Government enabled a considerable expansion of the work of the Division, and results now being shown, especially on the demonstration farms in which the owner is co-operating by carrying out projects under the guidance of Departmental officers, are gratifying. Keen interest was aroused at Field Days held on seven of these farms during the year.

Other activities under the scheme are the mobile film unit, dairy farm and shed design competitions, and surveys of herd recording data. In addition, one-third of the cost of grade herd production recording is met from the grant. In the implementation of these activities there has been close liaison between the three production Divisions of the Department. Ten additional demonstration farms were selected and work commenced on them during the year, making the present total 58. On most of the properties, production per cow has already shown a marked upward trend, better milking practices are leading to more rapid and cleaner machine milking and the standard of dairy hygiene is of a high order.

LABORATORY CONTROL SERVICES.

A total of 1,596 churnings of butter was examined under the Butter Improvement Scheme. The average bacteriological index of 277 was the best achieved since the inauguration of the scheme. Control of the composition of butter has been noticeably improved in recent years; the average moisture content during the year was 15.6 per cent. and salt 1.38 per cent., which reflect a creditable standard.

Cultures of starter bacteria distributed to cheese factories from the Toowoomba laboratory numbered 877. The co-operation of the laboratory and field staffs has resulted in a gratifying improvement in the facilities for starter propagation at factories and in the technique of propagation. Regular analyses were made of samples of cheese obtained by field officers. Apart from the immediate use to the factory and the field officer, data are being accumulated for a study of the factors affecting variations in composition and quality of Queensland cheddar cheese.

A comprehensive laboratory-control programme, including factory bacteriological surveys, was carried out with a view to ensuring satisfactory standards of production of milk on farms and its treatment and handling at pasteurisation and other milk factories.

The branch was closely identified with certain technical aspects of projects being developed on demonstration farms throughout the State, such as methods of softening farm water supplies, dairy hygiene, cooling of milk and cream, and milking practices. Samples of dairy produce, water, and miscellaneous materials totalling 717 were analysed and advice given on chemical engineering problems.

INVESTIGATIONS.

Interesting results were obtained in trials in which the normal washing with water of butter granules during manufacture was omitted. Provided the butter was well made, no significant differences were noted between bulk lots and hand-cut pats of unwashed and normally-washed butters. However, pats from unwashed butter treated in a vacuum patting machine developed a "condensed oxidised flavour." The omission of washing cannot, therefore, be generally recommended, though it would be justified in the event of a breakdown in the refrigeration machinery.

Studies on the keeping quality of butter in cold storage and its microscopic appearance as a guide to the efficiency of manufacture will shortly be completed.

Investigations were continued on cheese starters and bacteriophage; the latter is a troublesome virus-like phenomenon which interferes with starter activity during cheese manufacture. It is commonly believed that milk cans used to carry whey back to the farms are an important source of "phage," but experiments have failed to substantiate this. Methods have been worked out for the effective cleaning of whey tanks to minimise the effect of quality-affecting micro-organisms in whey on milk and cheese quality.

A paper on seasonal variations in the composition of milk produced on typical southern Queensland milk supply farms was submitted for publication. A marked depression in the fat percentage of milk occurs during the months July to September, inclusive, and work is in progress to ascertain if this is due to a low fibre content in the cows' diet at this time.

Penicillin is widely used for the treatment of mastitis in dairy cattle, and investigations are proceeding to ascertain if residual penicillin in the milk of treated cows affects the methylene blue test for the quality of milk or the cheese-making process.

Field trials are being carried out with various detergents and chemical sterilants to evaluate their respective performances and to obtain factual information under Queensland conditions of the relative importance of various sources of contamination of milk during production.

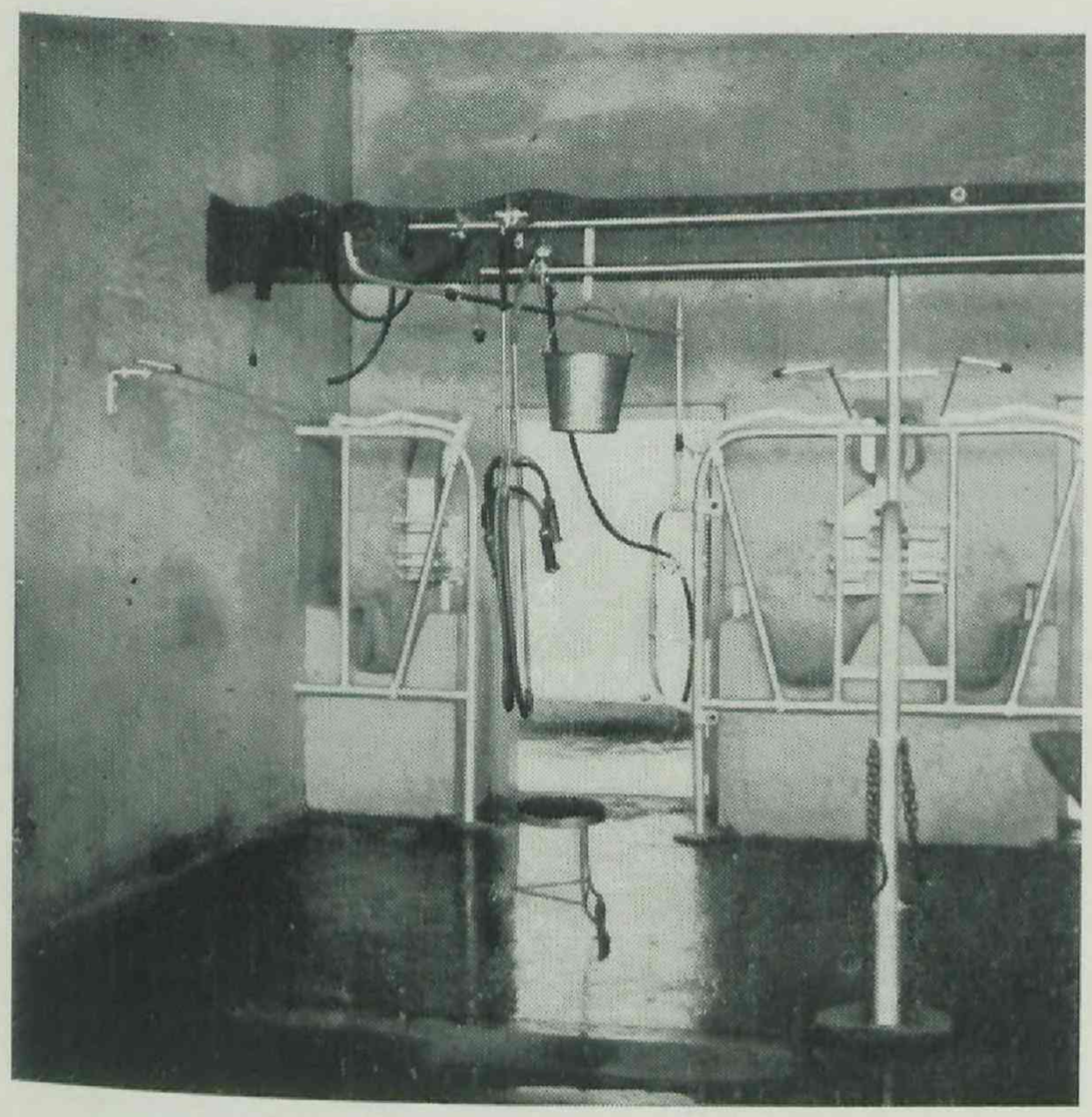


Plate 14.
A Corner of a Well Kept Milking Shed With Metal Bails.

Plate 15.
The Separator Room at a Modern Dairy Shed.

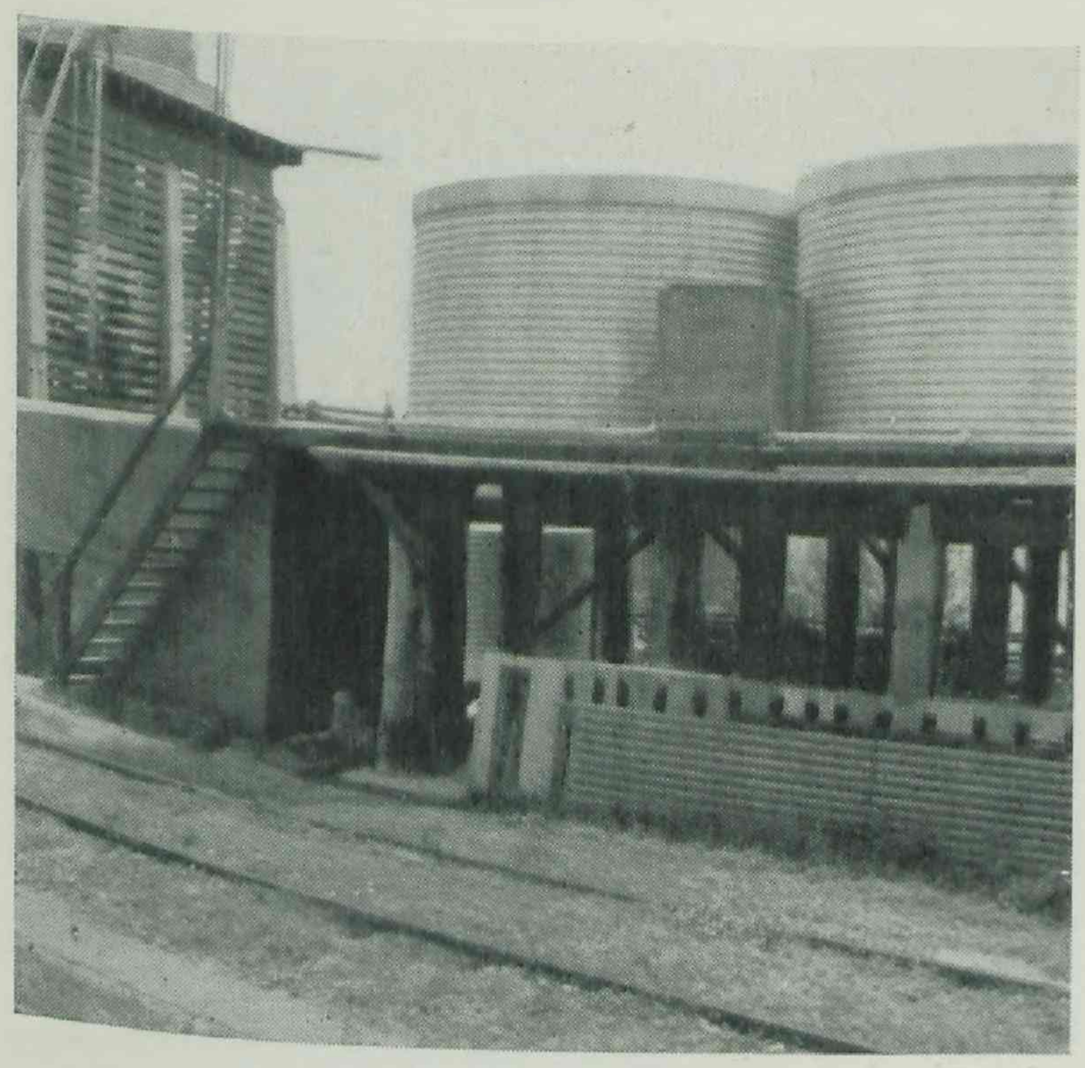


Plate 16.
Water Treatment Plant at a Butter Factory, Showing Settling and Chlorination Tanks.

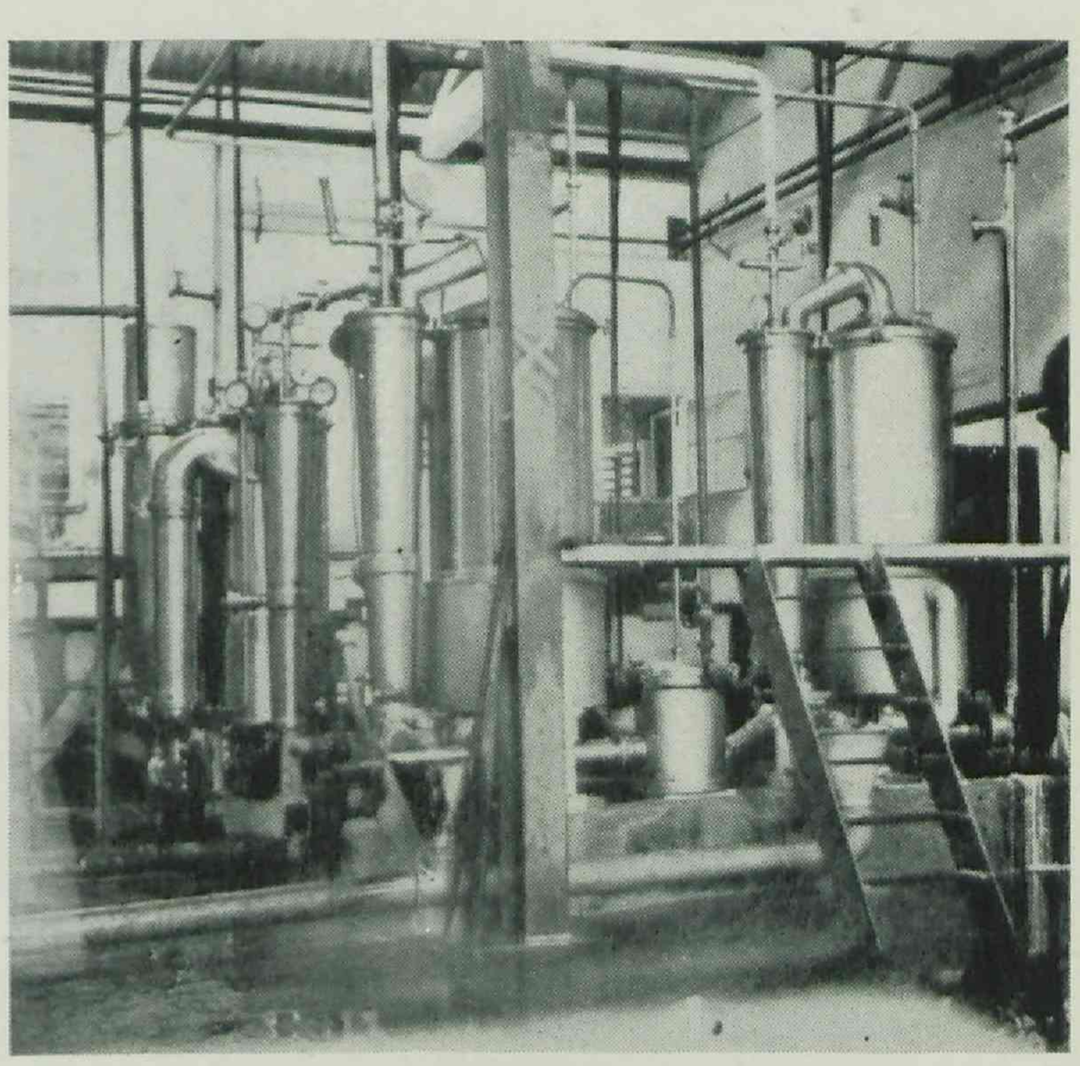


Plate 17.
Triple-unit Cream Pasteurising Plant at a Queensland Butter Factory.

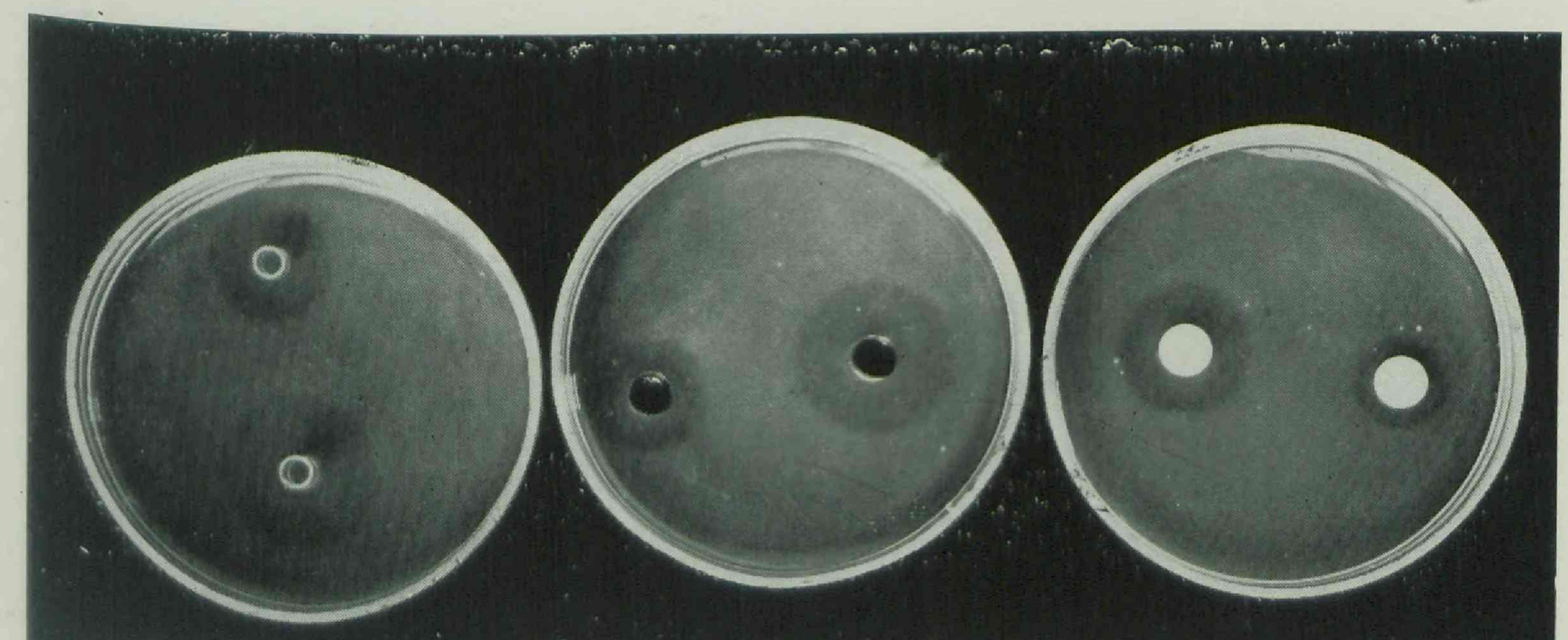


Plate 18.
Penicillin Assays by the Cylinder, Cup and Disc Methods.

DIVISION OF MARKETING.

Mr. H. S. Hunter.

In its work with statutory bodies established for the organisation of primary producers or for the marketing of the commodities grown by them, the Division is actively associated with 21 commodity marketing boards and connected in greater or lesser degree with the activities of three non-marketing organisations. The efficient marketing officer must have an expert knowledge of the marketing problems confronting the various industries for which marketing boards operate and a thorough appreciation of the needs of the State as a whole in respect of those industries and the commodities they produce.

The fact that the current world-wide inflationary trend has developed to a lesser degree in Australia than in overseas countries has reversed the traditional relationship of Australian agricultural prices to overseas prices for similar commodities. This change and the increasing domestic demand, already in excess of available supplies of some agricultural commodities, have fundamentally changed the character of the marketing problems confronting most of the commodity marketing boards. Shortages have resulted in price fixing, and price fixing in turn has sometimes been followed by black marketing, and sometimes, where fixed prices differ in the various States, by the flow of a commodity outside of marketing board control to a higher priced market in another State.

Evasion by growers of their obligations to a co-operative marketing scheme has been facilitated by the provision of freedom of trade between the States contained in section 92 of the Commonwealth Constitution, in that it relieves the grower of his obligation under the State's marketing laws to deliver his commodity to the marketing board.

Marketing officers acting as members of a grower-controlled board must, in such circumstances, give attention to the welfare of the consumer in so far as this lies in their power. Grower members of such boards are placed in a difficult position. On the one hand they are elected by growers to a position of trust to sell their produce to the best advantage. On the other hand, as members of statutory boards they must have some regard to the consumption needs of the State. Unless a marketing board pays due regard to a higher priced market, that market will tend to be supplied by secondary traders or, alternatively, growers will by-pass the marketing board and sell direct to interstate buyers. This has happened with commodities, such as potatoes and onions, which do not require processing.

The Division has actively assisted as a liaison between the State Wheat Board, The Barley Marketing Board, and Northern Australian Breweries Ltd. in negotiations for the reopening of the Black Gully Malthouse at Toowoomba, one of the two malthouses in Queensland. Renovation is taking place and the building, which has been used for some years as a wheat store, will in 1952 revert to its proper function of converting barley into malt. As Black Gully is the larger of the two malthouses, the local market for barley for malting will be more than doubled. The additional malt is required as a preliminary to the overcoming of a beer shortage in the north and north-west of Queensland.

DEMAND FOR FEEDING GRAINS.

The home market demand for grain for stock and poultry feeding continues to increase. Of a wheat consumption in Queensland of 9,684,000 bushels for all purposes (the annual average for the cereal years 1948-49 and 1949-50), the average annual usage for stock and poultry feeding amounts to 3,951,000 bushels. In 1939-40 wheat used for stock and poultry feeding totalled only 1,143,000 bushels.

The 1950-51 maize crop, estimated at 2,750,000 bushels, is in such a strong demand for industrial purposes in Australia that, nothwithstanding the retention of the whole of the crop in Australia, prices are so high that it is uneconomic to use maize for feeding in the poultry, pig, and dairying industries. This position has been aggravated by the shortage of other feeding grains—wheat because of the short crop in 1950, and grain sorghum, the other principal feeding grain, because 44,000 tons out of a total crop estimated at approximately 67,000 tons have been earmarked for export (in accordance with export permits granted by the Commonwealth Government).

Sorghum prices have risen comparably with the price of maize. Total stocks of coarse grains held for disposal on the local market are unknown, but nevertheless it is apparent that with the dwindling wheat stocks the supply position will be precarious until the next wheat harvest and could become serious if a drought were experienced in the spring.

EXPANSION OF WHEAT AREA NECESSARY.

The State's requirement of wheat for bread flour is increasing also in conformity with the population rise, an increase of nearly 31,000 in 1950, or 2.6 per cent. of the 1949 population of 1,191,245 persons. Maintenance of this rate of population increase would indicate an annual increase in flour consumption corresponding to 148,000 bushels of wheat.

Such a rate of increase requires that the area planted to wheat should be increased by 10,000 acres each season. This does not provide for any increase in the demand for wheat for stock feeding. The report of the Marketing Branch indicates that the rate of expansion of the wheat area in the immediate post-war period has not been maintained in recent years.

The high cost of jute bags and the uncertainty of supplies have continued to focus attention upon the question of bulk handling of wheat. The information gained on this question as a result of visits to other States was supplemented during the year when the Director visited the wheatgrowing areas of Victoria and Western Australia.

In Victoria, particular attention was paid to the bulk-handling systems installed on wheat farms, and in Western Australia the bulkhead system peculiar to that State was examined against the possibility that emergency measures for the moving and storing of grain in bulk may have been forced upon the Queensland industry by the non-arrival of enough bags from India. Fortunately, it now appears Queensland has secured sufficient bags for a normal wheat crop in 1951.

Preliminary investigations into the establishment of a terminal elevator for wheat at Pinkenba have been continued by the Department and the State Wheat Board. With the co-operation and assistance of the Co-ordinator-General of Public Works engineers have been engaged in making tests for foundations.

As members of inter-departmental Committees, officers of the Division were engaged in investigations to assist the development of co-operation by farmers for the processing of their primary products. The Division has been associated also with the activities of the Council of Agriculture.

Reports on Production Trends and those issued under the Crop Forecasting and Market Price Reporting Services have been in good demand by Government Departments, trading and commercial houses, banks, and growers' organisations.

STANDARDS ENFORCEMENT.

Efforts to raise the standards of purity and germination of agricultural seeds offered for sale have been intensified. This is regarded as a prime duty, since the quality of the seed planted has such an important influence on the efficiency of the farmer. The Standards Officer has not hesitated to seize and destroy seed which does not comply with minimum grade standards.

Abnormally wet seasonal conditions militated against the production of good-quality seed and induced conditions of heat and humidity most unsuitable for the safe storage of seed. In addition to exercising powers of inspection and seizure, efforts have been made to induce seedsmen and merchants to install the more efficient types of machinery for seed cleaning which are now to be procured from overseas, and to adopt up-to-date methods of storage and insecticidal treatment as a means of preserving the germination qualities of seeds.

The effects of the adverse season were reflected in the lower general quality of Rhodes grass seed, with the result that the germination standard could not be restored to the prescribed 30 per cent. from the 20 per cent. to which it had been temporarily lowered in the previous season.

Considerable advancement has been made in efforts designed to overcome problems associated with the testing for germination of Townsville lucerne and green panic grass seed, which present difficulties in seed testing because of the prevalence of hard seeds and uneven maturation, respectively.

Schemes for the certification of seeds have been continued in co-operation with the Division of Plant Industry. Seed certification is an effective though somewhat long-term method of improving seed quality for the farming community. Schemes are in operation for hybrid maize, sorghums, French beans, tomatoes, and papaws. In all, 83 farmers are co-operating with the Department in this work.

The farmer is protected also by requiring that fertilizers, stock foods, veterinary medicines, and pest destroyers conform to prescribed standards. In granting registration under the appropriate Acts, the Division gives effect to decisions of the Veterinary Medicines and Pest Destroyers Boards in relation to the eligibility of individual preparations. The contemplated consolidation of the various Acts into one Act will assist administration.

Fertilizer supplies have continued to be adequate for State needs, but shipping services for fertilizer cargoes have at times caused anxiety that shortages could occur.

Owing to a high proportion of low-grade wheat in the 1950 crop, it was found necessary during the year to gazette grade standards for feed wheat under the Stock Foods Act.

STAFF.

Though the Division has functioned satisfactorily and, in fact, with increasing efficiency in so far as the work attempted is concerned, the extension of its activities has not kept pace with the expanding economy of the State.

This has been due entirely to staffing difficulties. The necessary junior staff for expanding activity has been unobtainable. The services of three experienced officers were lost by resignation or transfer. During the year a further effort was made by advertisement throughout Australia to secure the services of a suitable officer to fill the vacant position of Production Statistics Officer, but without success. The Director and Assistant Director have not, therefore, been able to give time to other duties to the same extent as would have been possible with such an officer on the staff.

Fortunately, existing staff members have accepted increasing responsibilities for which they have demonstrated their capabilities. Of five Divisional officers pursuing University studies, two (Messrs. H. Spring, Assistant Marketing Officer, and E. O. Burns, Assistant Statistical Officer) graduated in the Faculty of Commerce during the year.

In the policing of Acts administered in the Standards Branch, numerical deficiencies in the inspection staff have been to some extent counterbalanced by the availability of more efficient means of transport.

REPORTS OF BRANCHES.

DIVISION OF PLANT INDUSTRY.

AGRICULTURE BRANCH.

Mr. D. O. Atherton, Director of Agriculture.

The rainfall during the year under review was distributed in a most unusual manner. The widespread rains of early spring were responsible for losses in wheat crops but they made possible the early establishment of summer crops and produced an early flush in pastures at a time when fodder supplies are generally at their lowest. The wet season ended early, however, and from January to June below average rainfalls were experienced in most parts of the State. This severely affected yields of summer crops but permitted the harvesting of produce of good quality.

SOIL CONSERVATION.

Heavy soil losses were experienced during the period of abnormally high rainfall in the spring and early summer months. Though in general the intensities of the falls were lower than usual, some exceptionally heavy 24-hour falls were recorded. On the Atherton Tableland a record December rainfall of nearly 24 inches caused serious soil erosion, especially during a three-day wet spell, when nearly 10 inches fell on the third day. Serious soil losses were reported also throughout the Darling Downs. These, besides doing extensive damage to farmlands, also caused siltation on roads and in watercourses, thereby intensifying the flood problem on low-lying areas. Only minor erosion losses were recorded in the South Burnett district, where rainfall intensities were low.

The appreciation by farmers, not only of the seriousness of the erosion menace, but also of the effectiveness of recommended soil conservation measures in combating it, is shown by the increasing number of applications for advice and technical assistance. Nearly 650 farmers have now asked for Departmental assistance in protecting over 250,000 acres of land from the effects of soil erosion. Over 400 farms have been inspected; conservation work using either mechanical or agronomic methods has been initiated on 377 of them and farm plans have been completed for 175 farms.

Demonstration Areas.—Work on the soil conservation demonstration farms was continued and on the Darling Downs the construction of contour banks and other mechanical control structures is now nearing completion. Twenty demonstration areas have been established throughout the State, and it is gratifying to report that, during a year when conservation measures were severely tested, the loss of soil from these was negligible. The owners of demonstration areas are showing an increasing interest in improved systems of land use and management; stubble burning has been eliminated and sections of arable land have been sown to improved pasture as an important phase in the planned system. It is to be expected that such practices will lead the owners and their neighbours to a clearer appreciation of the fundamental principles which form the basis of permanent agriculture, as it is already evident that the demonstrations are being followed with keen interest by neighbouring farmers.

Field Investigations.—The programme of research and investigation was continued at four main centres—the regional experiment stations at Kairi and Hermitage and the Maroochy and Redlands horticultural experiment stations. In addition, a considerable amount of exploratory work was initiated on soil conservation demonstration areas.

At Kairi, a testing rain of 942 points in 24 hours after 270 points in the previous 48 hours provided some useful information in the bank spacing and land use trials. Water diversion structures proved adequate in both trials, but interbank soil movement was noted in finely fallowed borders; the volume of soil moved was not directly related to bank spacing widths.

Exploratory work with stubble mulch equipment at Atherton is yielding some promising information, particularly in regard to presowing cultivation work. The mulching technique is based on the utilisation of 30-inch V-sweeps attached to a cane grubber for breaking-up and general cultivation.

At Hermitage Regional Experiment Station an experimental waterway was planted in sections with a wide variety of grasses and legumes with a view to gaining information concerning their ease of propagation, persistence, and general suitability for waterway purposes.

The land use experiment proceeded a stage further; land levelling is now complete and a soil uniformity trial will shortly be established. A considerable amount of effort has been devoted to the study and development of portable run-off measuring equipment for use in the experiment.

At Maroochy Experiment Station further observations were made concerning the suitability of various soil conservation treatments for the control of erosion and the effect of each treatment on the productivity of pineapple lands.

Various aspects of the application of soil conservation methods to small crop areas are to be investigated at Redlands Experiment Station, and in the past year a waterway and contour banks were constructed there in preparation for the application of experimental treatments.

Erosion Control Works.—Contour banks were constructed on about 2,500 acres of arable land during the year and this work has conferred part or complete protection on a much larger area of lower land. Numerous other protective structures were installed, including the construction and planting of 50 waterways as a prerequisite to the later construction of contour banks. All these structures have performed effectively, despite maximum falls of rain from five inches to 20 inches in 24 hours.

This satisfactory performance of soil conservation measures during recent years, and particularly in a very wet year, has focussed farmers' attention on the practicability of countering the problem on their own farms. Such increased interest by farmers in the protection of their farms is gratifying, but it must be emphasised that the area to which protective measures have been applied so far represents less than 1 per cent. of the total area subject to moderate or severe erosion. This total does not include a much larger area of plains country which is being indirectly affected by erosive influences on upper catchments.

In the early stages of work on the Darling Downs it was necessary to test a variety of soil conservation structures, such as contour, diversion and other banks, to determine their suitability under prevailing conditions of soil type and climate. This work has proved that the black soils do not present any insuperable obstacles to the application of soil conservation measures, provided care is exercised in the design of mechanical control structures and careful land management is practised.

Shire councils are co-operating with the soil conservation staff in matters of mutual concern, such as the effect of farm drainage schemes on public roads and the use of shire equipment for earthmoving work on farms. The Main Roads Commission and the Irrigation and Water Supply Commission have also given active and effective co-operation.

AGROSTOLOGY.

The main feature of the pasture work in the past year was the establishment of large trials capable of providing grazing for co-operators' herds. They have been planned to show whether increased production at an economic level can be obtained by the treatments used. These trials range from 21 acres to three acres in area and are based on results obtained from smaller exploratory plots. There are now 83 plots with a total area of approximately 200 acres established on dairy farms, while some small trials are located on cattle raising properties.

District Pasture Survey.—A general survey of the pastures of the Warwick district and their correlation with soil type was commenced. This study will provide a clearer picture of the pasture problems of the area and is a necessary prelude to the development of more productive sown pastures.

Pasture Introductions.—Seed of exotic species was harvested from Departmental plots grown in various parts of the State, and seed was also collected from natural stands of various summer-growing legumes.

Single plant selections were made from old established paddocks of white clover in the Gympie and Brisbane areas. These will be compared with crops grown from commercial seed to ascertain if any improvement has resulted through natural selection.

Exploratory Plots.—Twenty-one small pilot plots were maintained in 10 agricultural districts from Atherton to the southern border. Information is being obtained on the suitability of various species for each district. There is some indication that an introduced fine-stemmed Guinea grass may prove a heavier yielder than green panic and at least equal to it in other good qualities.

Grazing and Persistence Studies.—Sixteen large-scale farm grazing trials have now been established, but it will be some considerable time before results from these are definite. The most detailed pasture work is being carried out at the Bureau of Tropical Agriculture and this is discussed elsewhere in this report.

Fertilizer Trials.—Based on marked responses to fertilizers in preliminary trials at Gympie, Conondale, Peachester, Eungella Range, and Chilverton, six new trials combining fertilizers with sown species have been planned. Four of these involving an area of 48 acres have been planted and another 36 acres remain to be treated.

On the Blackall Range, marked increases in milk yields were recorded following renovation and top-dressing of paspalum-white clover pastures. The individual treatments must now be studied separately to determine their contribution to the increased yields. Minor element trials have also been laid down in various districts, but no results can be expected for some time.

A large-scale trial planned with the Division of Animal Industry and the Chemical Laboratory was initiated on the Near North Coast in an attempt to overcome copper deficiency on grazing lands.

Contour Furrows.—Approximately 64 acres of hillside pastures have been contour furrowed in the Gympie, Beaudesert, and Brisbane Valley districts, with marked responses in favour of the furrowed fields. This method involves ploughing contour furrows at vertical intervals of two to three feet and should be widely used, as it is applicable to much of the sloping forest country used for grazing.

Pasture Irrigation.—Extraordinarily heavy rains during early summer and midsummer delayed the establishment of permanent pastures on the irrigation plot at Mackay. Plans for further irrigated pasture trials in the Brisbane and Lockyer Valleys are being considered. Interest in the establishment of irrigated pastures is increasing rapidly.

Pasture Weed Control.—The initial observations on the distribution of molasses grass and blady grass in hillside pastures at the Bureau of Tropical Agriculture were completed. The records taken will serve as a basis for future observations to determine whether or not molasses grass under controlled management is capable of checking the spread of blady grass or of invading blady grass pasture. Two motor mowers have been provided in the Brisbane and Atherton districts for investigating the value of mowing blady grass on steep slopes as a means of encouraging better grasses.

Results from Pimpama and Peachester indicate that on arable land blady grass can be controlled satisfactorily by ploughing, cropping, and resowing to pasture. Discing and resowing will also be effective in some areas.

Mat-grass infestation remains a serious problem of pastures in the coastal areas of south-eastern Queensland, particularly on steep slopes where cultivation is impracticable. Seven trials are directly concerned with this pest. These trials suggest that the practice of cultivating infested areas and resowing the pastures is most likely to be effective in preventing the reintrusion of mat grass if a tall-growing pasture species is used.

Aerial Sowing and Topdressing.—The use of aircraft in field-scale pasture improvement has been followed with considerable interest. It was possible, with the active co-operation of the commercial interests involved, to observe the application of fertilizer and the sowing of pasture seeds from the air. Reports from field officers already indicate that this method of sowing pastures may be most useful in some circumstances, particularly in rough country immediately after scrub burns.

FIELD CROP INVESTIGATIONS.

Wheat.

The heavy rains of the end-season period reduced yields well below earlier expectations. While farmers were inclined to attribute this reduction in yield largely to stem-rust attack, the major cause of the decline was undoubtedly root drowning in the waterlogged soils. Stem-rust did account for some serious losses in yield, but many instances were recorded of crops which were relatively free from rust producing low yields of very pinched grain.

It was verified that new forms of stem-rust capable of attacking such hitherto resistant varieties as Yalta, Charter, Kendee, and Gabo were prevalent in Queensland in the 1950 crop. This alteration in the stem-rust flora has necessitated certain modifications in the breeding programme. Fortunately, however, the change in the rust situation has not affected the excellent field resistance of the new Queensland variety Lawrence, which was probably the most rust-resistant variety on the Darling Downs during the season. Other varieties whose resistance remains unaffected are Celebration and a number of cross-bred selections with resistance derived from the Kenya parent 6041 or from similar sources to that of Lawrence.

Other modifications of the breeding programme are necessitated by a change in the baking quality requirements of wheats for local consumption. Where previously the highest possible gluten strength was sought in new releases, present indications are that wheats of medium strength but better general elasticity and balance would be more acceptable to local industry.

In replicated yield trials on the Darling Downs, a wide range of new rust-resistant crossbreds proved markedly superior to any of the standard varieties tested. The new cross-bred selection TS. K. PF-4601, which is scheduled for naming this year, maintained its standards in yield, rust resistance, and quality during a very unfavourable season. Yield comparisons with three standard varieties in the three trials in which the new variety was included are shown in Table 1.

TABLE 1.

WHEAT YIELDS IN BUSHELS PER ACRE.

—	Hermitage, 1.	Hermitage, 2.	Evanslea.
TS. K. PF.–4601 ..	38·5	45·6	26·6
Gabo	22·6	22·2	20·0
Puora	15·4	17·9	19·7
Puno	6·5	7·7	17·3

In the Burnett, Callide, and Dawson districts, neither excessive rainfall nor rust was a serious factor in limiting wheat yields. In a series of six trials covering these districts, Puseas was the most consistent yielder, followed by Charter, Seafoam, and Gabo.

In one early-planted, dual-purpose trial at Irongate, excellent grazing was provided for sheep over a five-weeks' period by Lawrence, Celebration, Ford, Warput, and Kendee. At maturity, growth was very heavy and severely lodged. Under these conditions, only three varieties out of seven were capable of being harvested for grain; these yielded respectively, in bushels per acre: Lawrence, 26.9; Celebration, 12.3; and Ford, 8.6.

Though fertilizer usage on the Darling Downs is very low because of the general belief that no substantial benefit is obtained even on soils that have been growing wheat for decades, the Department has from time to time conducted fertilizer trials in various parts of the region. One was laid down in 1950 in the Mount Tyson district to test the effects of nitrogen, phosphorus, and potash on wheat grown on old cultivation. Stoppages because of rain interfered with the harvesting of this experiment and confused the resultant yield data. It was evident from the figures obtained, however, that none of these major plant foods had given a marked

response in yield; there was some indication of a slight increase in yield due to nitrogen applied as sulphate of ammonia at 75 lb. per acre.

Wheat quality studies continued with particular reference to agricultural practices as they affect the mottling problem. Little headway has been made in determining why mottled grain occurs, though it seems that the condition reflects the general level of soil fertility on which the wheat plant is grown. Pelshenke tests in the variety Puora have indicated that completely mottled grain is of lower quality than sound unblemished grain, but not markedly so. In fertilizer trials, the effectiveness of readily available nitrogenous fertilizers in reducing the incidence of mottled grain appears to be bound up with the stage of plant growth at which applications are made. Mottled grain decreased progressively with the later applications of sulphate of ammonia.

Oats.

During a season of excessive winter and spring rainfall, crown-rust was a most important factor affecting palatability and productivity of grazing oats. Thus, in grazing trials conducted in many of the State's dairying districts, the crown-rust resistant varieties Fulghum x Victoria and Victoria x Richland showed up to considerable advantage over the older standard varieties. In two such trials, the check variety (Mulga) was actually killed by crown-rust early in the season; under these conditions Victoria x Richland was the outstanding variety, showing good palatability, good recovery, and freedom from crown-rust.

In a detailed experiment conducted in the Gympie district, oats were compared with selected wheat varieties for grazing by dairy cows and proved definitely superior in both palatability and grazing potential. The best performance, in terms of cow grazing hours per acre, was provided by a mixture of equal quantities of Victoria x Richland, Fulghum x Victoria, and Klein oats. Brief details of the grazing data from this trial are set out in Table 2.

TABLE 2.

WHEAT AND OATS SOWN FOR GRAZING.

Treatment.	Cow Grazing Hours.	Number of Grazings.
	Per Acre.	
Oats—		
Mixed	566	8
Fulghum x Victoria ..	528	8
Victoria x Richland ..	508	8
BVH	488	8
Klein	460	7
Algerian	400	7
Wheat—		
Composite	374	8
Warput	348	6
Lawrence	304	6

Three of the best selections from the cross Bond x Victoria x Hajira (BVH) are now being increased for further testing, with a view to liberating the best as a new crown-rust resistant variety.

Maize.

Seed selection within open-pollinated maize varieties is being reduced in scope as hybrid maize comes more to the fore in all southern maize districts. During the 1950-51 season such seed selection has been restricted to Star Leaming and Improved Yellow Dent in southern Queensland and Durum on the Atherton Tableland. In addition to the activity in this field, all officers in the southern maize districts have been engaged as seed certification officers in the certification of considerable quantities of hybrid seed produced within their districts.

Green manurial and crop rotation trials with maize on the Atherton Tableland produced results comparable with those from previous seasons. On both "scrub" and "forest" soils, highly significant yield increases were shown by maize following a cowpea crop ploughed under, as compared with maize following maize. These differences are shown in Table 3. On the "scrub" soil the benefit of a green manure crop was also evident in the second following maize crop, while on the "forest" soil this benefit did not carry over beyond the first maize crop.

TABLE 3.

MAIZE FOLLOWING GREEN MANURE—ATHERTON TABLELAND.

—	Yield in Bushels per Acre.	
	Scrub Soil.	Forest Soil.
Maize after green manure	64·2	50·6
Maize after maize ..	51·0	32·0

In fertilizer trials conducted on the Atherton Tableland, the main significant effect was that from nitrogen applied as sulphate of ammonia. This effect was particularly marked on the poorer "forest" soils.

In a fertilizer trial conducted on "forest" soil in the South Burnett district, no response was obtained to nitrogen, phosphorus, or potash, while in a similar trial in the Mary Valley yields were only improved 10 per cent. by an application of sulphate of ammonia at the rate of 2 per cwt. per acre.

Sorghums.

Plant breeding work on grain sorghum at Kingaroy was advanced a stage during the 1950-51 season. Small increases have now been made of some 11 fixed selections from the cross Day Milo x Dwarf Kalo, and seed of these selections will be available for replicated tests next season. It is anticipated that sufficient seed will be harvested from two of these selections to enable them to be introduced to the Darling Downs for field-scale testing there. Another cross from which promising uniform progenies are now developing is the back-cross Wheatland x (Wheatland x Betty). The best selections within this group comprise stocky dwarf plants with large heads ranging from mid-compact to relatively open in structure.

Progenies of both Roma Sudan and Sweet Sudan grass varieties still show a very considerable range in variability, indicating ample scope for selection. Prussic acid determinations have been made on all such progenies, and those showing a moderate or high poison content are being eliminated from further consideration. While selection is being continued within these two varieties, initial steps have already been taken towards building up seed increases of both R.S.3 and S.S.6, which are low prussic acid selections of Roma Sudan and Sweet Sudan grass respectively.

The results of grain sorghum varietal trials established during the 1950-51 season are not yet available, but the data from a series of five trials completed during the previous season are presented in Table 4.

TABLE 4.

GRAIN SORGHUM YIELDS (1949–50) IN BUSHELS PER ACRE.

Variety.	Hermitage.	Bongeen.	Brookstead.	Kingaroy.	Biloela.
Alpha ..	31·0	95·9	41·5	36·7	30·7
Martin ..	30·0	92·1	43·5	21·4	31·0
Kalo	19·5	89·6	44·4	22·4	33·2
Early Kalo ..	14·2	89·1	52·6	20·1	30·2
Plainsman ..	28·2	87·9	29·0	19·7	37·7
Caprock ..	32·0	74·9	25·8	25·5	37·1
Capricorn ..	..	71·2	24·3	27·6	33·6
Wheatland ..	..	43·5	18·9	21·4	28·4

The Queensland-bred variety Alpha was outstanding in overall performance, thus corroborating the results of testing in previous years. During the 1950-51 season some 300 bushels of seed of this variety were distributed throughout the major sorghum districts of the State. These plantings should provide ample seed for farmers' requirements during 1951-52.

Preliminary results of a test carried out in the Gympie district during the 1950-51 season indicate that strains of Coastland were superior to the compact headed standard varieties in yield and much superior in freedom from caterpillar attack.

Further testing of sweet sorghums was carried out on two farms in the Gympie district. In contrast with the previous year, the season proved exceptionally dry, and weights of green fodder averaged only five to seven tons per acre. Under these conditions, however, as during the more favourable season of 1949-50, the

varieties Jones, Sugardrip, and Honey showed marked superiority over the commercially available Saccaline used as a check.

For purposes of seed certification, mother seed of six grain sorghums, three sweet sorghums, and one Sudan grass was produced. This seed is intended to supply the planting requirements of certified seed growers during the 1951-52 season.

Sunflowers.

Following on previous varietal testing of sunflowers, the opportunity was taken to test two new dwarf varieties, Jupiter and Pole Star, received from the Queensland-British Food Corporation. In one such trial (at Toowoomba) these varieties were compared with a range of locally-available varieties, while in a second trial (at Hermitage) comparison was made with the standard dwarf variety Sunrise. Results of the first trial are not yet available, but in the second trial the two new introductions (808-825 lb. per acre) consistently outyielded Sunrise (444 lb.) during a season of very inadequate rainfall.

Linseed.

As considerable variability had been noted in a number of rust-resistant linseed varieties under test by the Department, a pedigree selection programme was initiated at Westbrook in 1949, and continued at Hermitage Regional Experiment Station in 1950. Strains differing markedly from each other in general habit and period of maturity have been isolated from each of a number of varieties. Nineteen such selections are now being tested in replicated strain trials against the commercial variety, Walsh. New varieties have also been introduced from Canada and New Zealand for trial under Queensland conditions.

A linseed fertilizer trial planted at Bongeen gave a mean yield of 23·4 bushels per acre. Though the yield data showed small increases for both nitrogen and phosphorus treatments, such increases were not significant. In a rate of seeding trial at Pittsworth there were no differences in yield from sowing at 14 lb., 20 lb., or 26 lb. per acre (average yield 11·5 bushels per acre). A nearby bulk planting at 10 lb. per acre resulted in a yield of 12 bushels per acre. The results indicate that when using seed of good germination, sowing rates may well be reduced below the 20 lb. per acre which is now widely used.

Soybeans.

Some stimulus was given to soybean production during the 1950-51 season by the offer of a price of 30s. per bushel by a local processor. Based upon the results of previous seasons' trials, all available seed of the varieties Clemson Non-shatter, Tokio, Nanda, and Rose Non-pop was liberated to growers for commercial plantings. While the season was excessively dry for summer-planted crops, moderate returns are anticipated, and useful experience is being obtained in the direct mechanical harvesting of such crops.

Results of trials conducted during the past season indicate that the above four varieties (with the possible addition of Pelican) are the best at present available for use for seed production. Yields ranging from 1,500 to 1,750 lb. per acre were recorded for this group of varieties in trials established in the South Burnett district during the 1949-50 season.

Cowpeas.

Reeves cowpea has now been re-selected and sufficient seed of the elite selection has been harvested to plant 10 acres next season. It is aimed to use this stock to replace existing stocks and to serve as a possible foundation for certified seed of this variety. Bulk seed of another new hybrid selection from the cross (Victor x Large White) x (Skewbald x Poona) will also be available for testing as a green manure crop in sugar-cane districts next season.

Peanuts.

Fertilizer requirements of peanuts have been studied on both "scrub" and "forest" soils in the South Burnett. No responses were obtained in the 1949-50 season in two such trials designed to test the effects of potash and various forms of phosphate. During the following season two additional trials were established with the object of investigating the effect of increased soil calcium on nut formation and development. Results of these trials are not yet available.

Replicated strain trials within the varieties Virginia Bunch and Red Spanish were established in conjunction with the Peanut Marketing Board. Seed increases from the best strains in these trials will be used to supplant the current commercial stocks. Assistance is also being given to the Board in the selection of peanut seed farms in each of the major peanut districts.

Tobacco.

During the past season pure seed production areas were devoted to the proven varieties Gold Dollar, Hicks, Kelly, and Mammoth Gold. It is anticipated that seed production will exceed 2,000 oz. of Gold Dollar and 1,000 oz. each of Hicks and Kelly—i.e., more than two years' normal requirements of each of the varieties in greatest demand.

Tobacco growers in the Texas-Inglewood district have been inclined to favour some of the heavier varieties which are not the most suitable for producing the type of leaf demanded by buyers. After an intensive advisory campaign this year it is gratifying to note an appreciable swing to the more generally acceptable lighter varieties.

A small exploratory plot was grown in the Mount Garnet district, using tin dredging sludge for such irrigation as was necessary, and good saleable leaf was produced.

Other work on tobacco is discussed under the heading of "Tobacco Experiment Farms."

Cotton.

Under the stimulus of a higher guaranteed minimum price for seed cotton, an increased area was planted during the 1950-51 season. The yield from this crop is now estimated at 1,500 bales of raw cotton, almost double the production in the preceding year. Plantings generally were made on excellent subsoil moisture and this factor, together with the incidence of good early rains, ensured good average yields throughout the State. The dry end-season markedly reduced the top crop, but provided excellent harvesting conditions and ensured better than average grades. Mechanical harvesting was extended considerably during the season, with generally satisfactory results.

Pedigree selection and strain building were satisfactorily continued within jassid-resistant selections and the commercial varieties Miller, New Mexico Acala and Triumph. New introductions were also further tested and excellent results were recorded for irrigated areas of Acala 1517 and Coker 100 and a dry-farmed plot of Empire. A yield of one ton of seed cotton per acre was obtained from an irrigated area of Acala 1517 at Gayndah.

In a varietal and time of planting experiment conducted at Ayr during the winter of 1950, early March planting provided higher yields than late April planting; the mean yields of seed cotton per acre for these two planting periods were 758 and 700 lb. respectively. The leading varieties in this experiment were Coker 100 and the Queensland Miller selection 43·9·0.

Potatoes.

Heavy rains severely handicapped the establishment of trials in the Lower Burdekin and the only results obtained were from late planted trials on Ayr Regional Experiment Station, where yields were low because of the unfavourable growing season. In the combined varietal and spacing trial, Brownell (4·3 tons of first grade potatoes per acre) and Katahdin (3·9 tons) performed best, but there were no yield differences for the sett spacings of 9 in., 11 in. and 13 in. Again there were distinct responses to applications of sulphate of ammonia, 2 cwt. (2·9 tons of first grade potatoes per acre) and 4 cwt. (3 tons) exceeding the untreated plots (2·1 tons). These results are similar to those shown in the two previous years and the application of 2 cwt. of sulphate of ammonia per acre can be recommended to potato growers in the Lower Burdekin as a profitable practice on this and allied soil types.

A spring planted fertilizer trial at Tent Hill, near Gatton, confirmed previous results that 2 cwt. of sulphate of ammonia was a profitable level of application, producing 7·7 tons of first grade potatoes per acre, compared with 5 tons on untreated soil. On the other hand on a heavier soil type represented at Gatton Irrigation Research Station, no increases have been obtained from nitrogenous fertilizers.

In a winter green manure-potato rotation trial it was again demonstrated that the potato crop following a bare fallow is equally as good as that following the ploughing in of a leguminous green manure. Non-leguminous green manures, however, depressed yields, apparently due to the creation of a temporary deficiency of available nitrogen in the soil.

An autumn planted varietal trial at the same centre, designed to examine the merits of three new varieties from New South Wales (Moona, Adina, and Monak) and one new Victorian variety (Exton), compared with Sebago was spoiled by excessive rain and poor germination.

Dry weather severely reduced yields in the autumn planted fertilizer trial at Merlwood in the South Burnett, but there were responses to both nitrogenous and phosphatic fertilizers.

Onions.

Analysis of the yield data from the 1950 trial at Rockhampton showed the clear superiority of the three early strains of Brown Globe obtained from growers in the Lockyer Valley. Yields were 6·2, 6·0, and 5·8 tons of first-grade onions per acre respectively. This trial in conjunction with the previous year's trial has shown that onions can be grown profitably under irrigation on the dark-brown clay loams near Rockhampton. Because of the extreme scarcity of reliable seed due to severe disease in the seed crops of the Lockyer Valley in 1950, the varietal work in the Rockhampton district could not be continued in 1951.

Though the variety x time of planting trial at Gatton Irrigation Research Station was so affected by waterlogged soil during the growing and harvesting season as to render yield data of no value, some interesting data were obtained on varietal characteristics. Some varieties gave a higher percentage of seed stems and split bulbs than others. There were significant differences in the percentages of seed stems occurring between the planting dates (March 20, April 4, April 24, and May 8). Generally there were fewer seed stems and fewer split bulbs with the later plantings. Further work along these lines is expected to be useful in sorting out the relative merits of strains of onions which have been developed locally by Lockyer onion growers.

Sweet Potatoes.

In a trial in the Boyne Valley, White Maltese (13·4 tons of saleable tubers per acre), Porto Morado (10·2 tons), and Abundance (9·5 tons) were the best varieties under test. In a similar trial located in the Mackay district, Porto Rico (13 tons of tubers per acre), White Maltese (11.2 tons), and Abundance (11·2 tons) were the most productive varieties. In another trial at Mackay both Porto Rico and Abundance again performed well and were superior to White Maltese. A local unnamed variety, however, gave the best yields.

White Maltese has proved to be a very reliable variety in the Central District and is used for feeding direct to pigs or for grazing by these animals. In culinary properties, however, it is inferior to Porto Rico, Porto Morado, and Abundance, all of which are preferred for table purposes.

The variety Australian Canner was introduced from Hawkesbury Agricultural College in New South Wales and propagated for the purpose of testing it next season against those already being grown locally.

Lucerne.

The lucerne fertilizer trials at Boonah and Beaudesert were discontinued without any useful results being obtained.

A further series of trials was commenced at Toowoomba and Boonah and in the Lockyer Valley. These trials cover rates of sowing, inoculated versus uninoculated seed, and fertilizer applications. To date the most significant result has been the pronounced response in some plots of lucerne in the Lockyer Valley to applications of gypsum. It appears that the significant element in the gypsum is sulphur and the method of action is being studied further.

Cowcane.

This fodder crop, though low in protein, is widely used by dairymen and can serve as a very useful fodder reserve for dry times. Observations were continued on the two exploratory trials established in 1949 at Beenleigh and Caboolture respectively. The objects of the trials were to examine the palatability and general suitability, yields, ratooning and standover performance of 14 varieties, including types which are commonly used.

The first cutting on each trial was made in August, 1950, and yields as high as 88 tons of green material were obtained. N.Co. 310, C.P. 29/116, and P.O.J. 234 showed complete arrowing in the first year of growth and have been discarded as standover types. The first two varieties, however, are capable of very vigorous growth and are worthy of consideration as annual fodder canes. The 11 varieties which have stood-over in good condition will be cut and used shortly—approximately 21 months after planting.

From results to date, the varieties which appear to offer best prospects as fodder canes are Oramboo, Co. 290, A. 130, and C.P. 29/116. Oramboo, though lower yielding than the others, is soft, palatable, and very suitable as a fodder cane. Co. 301 yielded extremely well and ratooned vigorously but was otherwise less suitable than the four varieties previously mentioned. Varieties commonly accepted as standard cowcanes, such as China x China, China x Java, 90 Stalk, and Improved Fodder Cane, did not impress in these trials.

BUREAU OF TROPICAL AGRICULTURE.

Pastures.

The past year was marked by the unusually early commencement of the wet season and the rather dry period from March onwards. The early rains prevented the normal drying off of the pastures, the dry periods during the early part of 1951 were not sufficiently severe to depress pasture growth, and the stock have developed well.

Over the period of 251 days from September 18 to May 28, the bullocks made an average daily gain of 1·3 lb. Rotational grazing based on an annual carrying capacity of a beast to 1¼ acres has been followed for five years. The area, which now totals 20 acres, is subdivided into five treatments of four acres each.

The five pasture mixtures—(*a*) purple top Guinea grass and centro, (*b*) molasses grass and calopo, (*c*) common Guinea grass and stylo, (*d*) molasses grass and puero, and (*e*) a mixture of puero, calopo, centro, stylo and other tropical legumes—are each grazed for seven days and then spelled for 28 days.

Valuable information concerning these pasture mixtures is now available. It is apparent that puero is the most palatable of the legumes used in the mixtures and is grazed readily. Stylo seems to be more palatable at certain times of the year than others, but both this legume and centro are freely grazed once stock become accustomed to them. Calopo is the least palatable of the legumes under test.

The extremely palatable purple top Guinea grass cannot compete successfully with the vigorous legume centro where they are planted together. In the molasses grass-calopo mixture, the legume tends to dominate the grass and one of the two paddocks sown to these species is now a dense stand of the legume. Centro has invaded the mixture of common Guinea grass and stylo with marked effects. Where the centro has become the dominant legume the pasture is a darker green and the grass carries more flag than where it is growing alone or is associated with stylo. These more luxuriant patches are the first to be grazed by the stock. The mixture comprising molasses grass and puero, which is very palatable to stock, had previously shown marked signs of deterioration and weed intrusion, but it has now recovered well.

Puero has shown marked ability to combat weed growth at Utchee Creek, where it was established following a burn, and this legume is now suppressing all other plants in that field. The areas being prepared for grazing at Utchee Creek carry a heavy growth of grass, which, unchecked by grazing or burning, is dominating the legumes.

Rice.

The swamp variety Pachchaiperumal (18·6 cwt. of paddy per acre) gave the highest yield in the varietal trial grown under non-irrigated conditions in 1949-50.

Seed of several varieties suited to Queensland conditions and obtained from 1949-50 bulk plantings was distributed to farmers for seed increase planting. This has provided nucleus seed stocks which can be built up on farms by any interested growers.

A rate of seeding trial and another varietal trial were grown and harvested during the 1950-51 season. Rainfall was adequate during the first half of the growing period but unusually low in the second half and overall the season was poor for rain-grown rice.

As might have been expected under the seasonal conditions experienced, the early-maturing varieties gave best results and the late-maturing types failed. The average yield was only 5·5 cwt. of paddy per acre, Pachchaiperumal (11·8 cwt. of paddy per acre) again being the best variety, followed by Prelude (8·3 cwt.). Unfortunately, experience over several seasons has shown that

Pachchaiperumal lodges badly even under reasonably good harvesting conditions, and it has been eliminated from further consideration. Prelude, on the other hand, does not lodge, has attractive grain and has shown promising yielding ability in trials over recent years.

In the rate of seeding trial, which averaged 9·1 cwt. of paddy per acre, there were no significant differences in yields when rates of sowing varied from 62 lb. to 172 lb. per acre, though the results may have been very different in a better season.

The very poor yields of the 1950-51 trials emphasise the hazards of growing rice under non-irrigated conditions in North Queensland, even in a district which is within the highest rainfall zone in Australia.

Tea.

The second year of the trial designed to examine the costs of harvesting tea by hand was completed in February and since then the bushes have been subjected to a mechanical versus hand harvesting experiment, using an electrically driven Tarpen tea cropper, manufactured in England.

The results of the hand-harvesting trial indicated that it would cost about 7s. to pick the equivalent of 1 lb. of black tea, based on hand-plucking a bud and two leaves and an annual yield of 300 to 400 lb. of black tea per acre. The cost was reduced to about 5s. per lb. using the standard of a bud and three leaves based on an annual yield of 400 to 500 lb. of black tea. The quality of the tea was well maintained, as shown by regular trade tests. Throughout the two years of the trial, quality has been surprisingly good despite the fact that the plantation is located on low flat land.

Few data are available yet from the mechanical harvesting trial, but early results are promising. One man with a Tarpen tea cropper has harvested leaf at about three times the rate that can be maintained by hand plucking. The quality of the few mechanically harvested samples tested so far has been good and of the same standard as hand-harvested material. The best method of managing the bushes for mechanical harvesting and the quality of the tea made from green leaf harvested at different periods of the year are to be studied next season.

Additional areas of tea are being established on higher elevations, at East Palmerston and on the Atherton Tableland, for future investigations.

Fibre Crops.

The 1950-51 programme was confined mainly to jute plantings, but observation plots of kenaf (*Hibiscus cannabinus*) and pink burr (*Urena lobata*) were also grown. Treatments in the jute plantings were designed to obtain information on the best way to grow high yielding crops. Later in the season trials were carried out, in co-operation with officers of the Department of Labour and Industry and of Walkers Ltd., Maryborough, to examine the possibilities of an experimental ribboning machine built by the engineering firm.

The purpose of the machine was to separate the inner portion of the green jute stalk from the bark, leaving bark ribbons only for retting, thus mechanising a part of the fibre extraction process which in India and Pakistan is normally done by hand.

The trials with the machine on jute were disappointing, mainly because much of the jute planted made poor growth due to low rainfall in February, March, and April. Furthermore the best jute available was overmature by the time the machine arrived. *Urena lobata* tested on the machine was handled somewhat better.

The results of the trials with fibre plants may be briefly summarised as follows:—

Fertile soils are required for jute and fertilizer applications are needed on poor soils. Good soil moisture throughout the growing season is essential for best jute growth. Young plants do not thrive in waterlogged soil but once the plants are well established and growing vigorously this factor is of minor importance.

Reasonably good land preparation is required to reduce weed competition with the seedlings. Close spacing is necessary to prevent branching. November and December appear to be the best months for planting jute.

The species *Corchorus capsularis* (white jute) is much more vigorous and less susceptible to pests and diseases than the other species, *C. olitorius* (Tossa jute). *Urena lobata* is comparable with *C. capsularis* but takes longer to mature. It grows better on infertile soils than the latter. Kenaf is a hardy plant and will grow fairly well on comparatively infertile soils. It is very susceptible to attack by a leaf eating beetle (*Rhyparida. discopunctulata*) and the material is unpleasant to handle because of sharp spines and irritating hairs on the seed capsules.

While it has been shown that good growth of jute can be obtained by the liberal use of fertilizer and the maintenance of adequate soil moisture, it yet remains to be seen whether jute can be grown in North Queensland as well as it is in Bengal. The behaviour of the two jute species used indicates marked differences. In Bengal, *C. capsularis* is apparently about five months of age before it is cut and *C. olitorius* is stated to be even later maturing. In North Queensland, however, the former species is ready for cutting, according to fruit formation, in about three months, while the latter species matures about a month earlier. This is a very marked variation in behaviour, and it is probable that in addition to temperature and humidity, length of day is an important factor in the development of the jute plant.

Seed of jute and kenaf was collected from various trials for further work next season.

TOBACCO EXPERIMENT FARMS.

The 1950-51 season was generally unfavourable to the best development of tobacco in the Mareeba-Dimbulah and Lower Burdekin areas. In common with the experience of local farmers, considerable difficulty was encountered in carrying the tobacco crops on the Mareeba and Clare tobacco experiment farms through to harvest. Blue mould in the field at both farms caused a serious check to plant growth, and late rains, by waterlogging the soil, caused a further deterioration in the position at Clare. A hailstorm at Mareeba as the crops were maturing badly damaged portions of a number of experiment plots.

The reaction of tobacco plants to excessive soil moisture was studied on several soils regarded as being potentially suitable for tobacco in the Lower Burdekin district. Tobacco-growing on shallow soils with subsoils heavy enough to impair drainage seriously wilted badly and ultimate yields were low or negligible.

TABLE 5.

TOBACCO YIELDS FOLLOWING NITROGEN FERTILIZER.

Treatment.	Yield of Leaf in lb. per Acre.	Appraisal Value.	Auction Price.
		£ per Acre.	£ per Acre.
12lb. nitrogen per acre	1,210	332	474
24lb. nitrogen per acre	1,431	388	556
36lb. nitrogen per acre	1,545	411	598

TABLE 6.

TOBACCO GROWN BY DIFFERENT IRRIGATION METHODS.

Treatment.	Yield of Leaf in lb. per Acre.	Appraisal Value.	Auction Price.
		£ per Acre.	£ per Acre.
Spray irrigation ..	1,363	395	499
Spray irrigation followed by furrow ..	1,304	362	457
Furrow irrigation ..	1,275	341	435

Complete data for the 1950-51 trials have not yet been received but the final results for the 1949-50 season are now available. The value per acre figures quoted below and in Tables 5 and 6 are based on the prices paid at auction for the leaf. In assessing experimental results, appraisal values have been used, but, in fact, the trend of appraisal values has been followed very closely, at a higher level, by the prices received at auction sales. Auction prices are often considerably in excess of appraisal values and therefore it is felt that a more precise picture is obtained if they are used when showing the returns per acre represented by the different treatments.

Mareeba.

The best results in the varietal trial were obtained with Kelly (1,775 lb. of leaf per acre; sale value £697), Hicks (1,468 lb; £646), Yellow Mammoth (1,593 lb; £634) and 402 (1,457 lb; £605) compared with the standard variety Gold Dollar (1,439 lb; £574). Overall Hicks was of slightly better average quality than the other varieties.

In the rotation trial, the highest yield, (1,592 lb. per acre) was obtained from tobacco grown after Gambia pea (*Crotalaria goreensis*), closely followed by the treatment in which tobacco was grown after Rhodes grass (1,528 lb.). The respective auction values of the leaf were £618 and £606. Tobacco after maize yielded 1,446 lb. per acre, worth £538.

In the fertilizer trial the main result was the improved yields from increasing amounts of nitrogen, as shown in Table 5.

Clare (Burdekin River).

The irrigation trial was designed to examine the merits of spray versus furrow application from the point of view of yield. Also included was the use of spray irrigation for the establishment and early growth of the crop, followed by furrow irrigation until maturity. Differences were small, as shown in Table 6.

TABLE 7.

ROTATIONAL CROPPING—TOBACCO AFTER OTHER CROPS.

Treatment.	Yield of Leaf in lb. per Acre.	Appraisal Value.	Auction Price.
		£ per Acre.	£ per Acre.
Tobacco following peanuts	1,872	492	692
Tobacco following maize	1,769	455	640
Tobacco following weeds	1,836	439	615
Tobacco following Rhodes grass ..	1,737	430	603
Tobacco following Gambia pea ..	1,946	395	564

The results from the rotation trial are summarised in Table 7. The most striking result was the heavy yield of tobacco following Gambia pea turned in as a green manure. Unfortunately, this leaf was too coarse, showing the effects of too much nitrogen, and the lower value was a fair and reasonable reflection of leaf quality.

Burdekin Fine Sand is the soil most highly favoured at present for tobacco in the Clare Soldier Settlement Area, but pilot plots of the crop were grown on several other soil types in comparison with Burdekin Fine Sand, and the results are shown in Table 8. It is evident that the Clare Sandy Loam and the Landers Sandy Loam are suitable tobacco soils.

TABLE 8.

TOBACCO GROWN ON SEVERAL BURDEKIN SOILS.

Soil Type.	Yield of Leaf in lb. per Acre.	Appraisal Value.	Auction Price.
		£ per Acre.	£ per Acre.
Clare Sandy Loam ..	1,771	452	579
Burdekin Fine Sand	1,600	403	523
Landers Sandy Loam	1,466	372	481
Clare Loam	1,487	309	406

The Clare Loam is a shallow soil over a subsoil which does not drain freely. In the 1950-51 season, soil of this type became waterlogged following unusually heavy rains and the tobacco on it died. For this reason, though the rain in 1950 was abnormally heavy over the period when tobacco was maturing the Clare Loam must remain suspect for the time being.

GULF EXPLORATORY FARM.

The 1950 April planting of grain and fodder sorghums made excellent progress, largely because the subsoil moisture stored from the previous wet season was supplemented by an unseasonable fall of over three inches in June. In addition, the extra workings required in land preparation for this planting controlled weeds so well that the late planted crops were little troubled by weed growth. The grain sorghum, harvested on September 13, gave an average yield of over 40 bushels per acre. The fodder sorghums, however, made spindly growth, much inferior to the December, 1949, and January, 1950, plantings. The best was Sudan grass, with a green weight yield of 5½ tons per acre, equivalent to 2¼ tons of dry hay.

Some of the grass-infested December planted grain and fodder sorghums was mown in July and, as a result of the good soil moisture from the June rains, made surprisingly good regrowth. Hegari grain sorghum when harvested in late October averaged 15 bushels per acre, while two tons of green material, equivalent to 1¾ tons of dry hay per acre, were cut from the Sudan grass regrowth.

Prior to ploughing for the 1950-51 season a number of beef cattle were turned in to graze the crop residues in October. Although not accustomed to the cultivated feed, the cattle grazed it fairly readily and a good clean-up of all crop stubble was effected. Only the April planted crops and the regrowth of the crops mown in July retained any succulence, but even the dry and apparently unattractive remains of the December and January planted crops were eaten.

The 1950-51 planting plan could not be carried out because of the heavy and continuous rainfall from November to February inclusive. Land preparation was well in hand by early November, but the wet season commenced in mid-November and continued until early March without a break long enough to permit the use of implements. The registrations were:—November, 1,305 points, 9 wet days; December, 866 points, 21 wet days; January, 1,965 points, 25 wet days; and February, 977 points, 14 wet days, giving a total of 5,113 points distributed over 69 wet days.

By the end of February, weeds were prevalent on the 80 acres to be planted with crops. This growth was mowed and burnt and the land hastily cultivated for planting, which was carried out in April. All plantings failed.

Three major points have emerged from the season's agricultural work:—(1) Crops sown towards the end of the wet season can provide good grazing later in the year when the natural pasturage has dried off, but a successful late planting may not be achieved if suitable breaks to permit land preparation do not occur during the latter half of the wet season; (2) To meet the risk of not being able to plant during early summer because of excessive rainfall, dry sowing before November would appear to be essential. Unfortunately, this involves another hazard—the smothering of the sown crop by weeds and grasses; (3) The soil type represented by the farm itself provides an intricate problem in cultivation. It is very difficult to work when wet, being tight and sticky, and when dry becomes hard and compact, breaking up into large clods. This means that the period during which cultivation can be carried out efficiently and without difficulty is restricted to a short time after rain.

The past year's experience confirms earlier observations that cultivation of pastures originally dominated by a species of blue grass (commonly called Mitchell grass) has resulted in a Flinders grass dominant pasture. Despite this variation in composition, the yield of air-dried hay from each type of pasture was approximately the same, reaching nearly two tons per acre. In contrast to the change in botanical composition following cultivation is the stability reported for a blue grass pasture near the farm which has been mown annually for 15 years.

FODDER CONSERVATION.

Despite widespread publicity by Departmental officers, exhibits at country shows, and items in the country papers circulating in a number of dairying centres, the demand for the silo construction services provided by the Department has shown no appreciable increase.

Many reasons for not building permanent silos to conserve fodder are given by farmers, but difficulties and costs of obtainable suitable labour and the problem of handling the growing and harvesting of silage crops are explanations commonly advanced. More interest is being shown in hay crops and in providing summer and winter grazing crops for dairy cattle. Silage, however, is a first-class fodder reserve for droughts and with increasing prices for dairy products and wider experience in silage harvesting and storing equipment it is hoped that more dairy farmers will adopt silage conservation practices.

During the year under review, the Silo Construction Officer of the Department supervised the building of nine concrete silos, both pit and tower types, the latter including three for grain storage. Little interest has been exhibited by farmers in group machinery pools for fodder conservation.

REGIONAL EXPERIMENT STATIONS.

Mr. W. G. Wells, Director of Regional Experiment Stations.

A comprehensive programme of investigations was conducted on the regional experiment stations during the period under review. The more important findings are either presented in the following summaries or are included in the reports of the branches conducting the investigations. The monthly precipitations are presented in Table 1 to indicate the rainfall experienced for the 12 months at each centre.

TABLE 1.

RAINFALL, 1950–51 SEASON (IN INCHES).

Month.	Hermitage.	Biloela.	Ayr.	Kairi.
July	3·28	2·82	10·23	2·30
August	·42	1·32	·01	·24
September ..	1·22	1·09	·12	1·54
October	6·86	3·00	·13	·41
November ..	4·80	4·85	7·35	1·61
December.. ..	·22	1·19	2·52	19·67
January	10·03	6·43	38·70	8·10
February	·28	2·71	2·50	4·85
March	1·10	·48	·97	1·94
April	1·12	·16	·02	1·34
May	1·07	Nil	1·31	·82
June	2·94	·09	·55	·62
Total.. ..	33·34	24·14	64·41	43·44

HERMITAGE.

The extremely irregular weather experienced during the season markedly affected crop production, with the excessive January rainfall of 10.03 inches providing many cultural problems. The following summaries present the more important results.

Crops.

Oats.—The satisfactory performances of Victoria x Richland, Klein and Fulghum x Victoria during the previous two seasons' trials at this centre were not realised under the exceptional weather experienced. All three varieties lodged badly in the seed production areas and were affected by rusts resulting through the occurrence of 13 wet days in November during which 4.80 inches were recorded. The resultant grain, while of sound quality, lacked the plumpness of that grown in previous seasons. Analyses of material collected when these varieties were at full grazing stage indicated that the crude protein content ranged from 15.6 per cent. for Fulghum x Victoria to 18.8 per cent. for Klein.

Wheat.—The outstanding rainfall of 8.17 inches in June necessitated considerable replanting of a comprehensive programme of wheat investigations during July and early August. Satisfactory progress was made in most experiments during the early stages of growth but the wet November seriously affected many and reduced yields well below those of the previous season. A trial of the merits of growing maize, Sudan grass and Poona pea singly and maize and Sudan grass in combination with Poona pea, as a short-term green manure between crops of wheat, once more did not produce differences in yields of wheat, though in the fourth year of repetition on the same soil. The application of 180 lb. superphosphate to stimulate growth of the green manures also increased the yield of the following wheat crops by an average of 1.5 bush. per acre with up to 3 bush. following maize and Poona pea. It would appear that rotations of longer duration are required on this soil type to obtain worthwhile differences and work on this aspect has been commenced. In another trial on less fertile soil, an overall tendency to improved yields was obtained following cowpea, both with and without the application of 57 and 113 lb. of sulphate of ammonia at the planting of the wheat. The application of 190 lb. superphosphate also tended to increase slightly the yield of wheat. The results of a more complex experiment involving various amounts of sulphate of ammonia and superphosphate failed to produce significant differences, though there was again a trend towards increased yields from the application of both fertilizers. Soil influence on wheat yields under such wet weather conditions was clearly indicated by the results obtained on less fertile slight slopes compared with fertile alluvial flats, a range of varieties producing satisfactory crops of good quality on the former but very poor returns on the latter.

Grain Sorghum.—Owing to lack of timely rains delaying the planting of the standard varietal trial of grain sorghums until mid-January, the crop did not reach maturity before the occurrence of killing frosts. Earlier plantings on isolated well fallowed land for seed multiplication indicated the suitability for the district of a strain each of Kalo and Alpha, two varieties developed at Biloela, which yielded respectively 60 and 75 bush. per acre, with one acre of the latter producing 93 bush. of sound seed.

Miscellaneous Crops.—Land and facilities were made available to the Agriculture Branch to conduct a comprehensive programme of varietal and strain testing of wheat, oats, linseed and sunflower, the more important results of which are referred to in the report of that branch.

Pastures.

The testing of the comprehensive range of species of grasses and legumes established in the nursery was continued satisfactorily and certain conclusions can now be drawn as to the merits of the species which have been under investigation for two or more seasons. The brome grasses show promise of being useful, especially *Bromus inermis, B. carinatus* and *B. uruguayensis,* which are being multiplied for more extensive testing alone and in combination with lucerne. The South African Kafue strain has again performed better than all other strains of Rhodes Grass. The local strain of this grass continues to do well, however, and as a result of its ability to seed heavily is becoming well established on pondage banks and waterways on the Station. Some strains of *Panicum* may have possibilities in the district but no species of *Paspalum* has shown promise. Of the legumes, several strains of lucerne have done well, especially under row cultivation, and field trials of this method are being established. Burr and barrel medic appear to be well suited to the district and the former is becoming an important component of the native pastures. Auburn woolly pod vetch, which was multiplied during the season for more extensive district testing, continued its promising performance of the previous two seasons. Unfortunately, its ripening habits make efficient seed harvesting difficult.

The value of grazing management on hillside native pastures in restoring good pasturage on overstocked areas has been well demonstrated on the upper slopes of the Station. This area had been so badly overgrazed while leased during a series of dry seasons that it was retired from grazing on the resumption of departmental operations in the 1946-47 season Within two years a marked improvement in the density of cover on even badly eroded "scalded" areas was obtained; it consisted mostly of inferior grasses but had a sprinkling of Queensland blue grass and several native legumes and burr medic. The area was therefore withheld from grazing for a further two seasons; this has not only given an excellent mixture of desirable grasses and legumes but also has provided such a dense cover of old and new growth on the surface that runoff of storm waters occurs only after the soil is saturated following prolonged heavy rainfall. Undoubtedly pasture management on hillside pastures is an important soil conservation measure.

Soil Conservation.

During the season, graded banks and waterways were installed in the remaining cultivated areas requiring such protective mechanical soil conservation measures. All areas withstood severe mid-season rainfall satisfactorily and it would appear that with suitable cropping rotations to maintain the permeability and fertility of the soils effective soil conservation can be satisfactorily obtained over the whole of the Station.

BILOELA.

Broadly speaking, favourable conditions for good crop growth were experienced until mid-February, after which exceptionally dry weather prevailed until the end of June. The results as a whole confirmed previous findings of the value of ample subsoil moisture at planting time in maintaining satisfactory growth of the resultant plants during short periods of stress conditions.

Crops.

Oats.—The abnormally mild wet winter emphasised the tendency of the old standard varieties to head early compared with Klein, Fulghum x Victoria and Victoria

x Richland, which remained in the green leaf stage much longer. The last-named variety once more produced the greatest amount of grazing material but was not as attractive as Fulghum x Victoria, which, under the favourable conditions, produced a high yield of fine-leaved, very palatable material and made good recovery after grazing throughout the season in contrast to the previous season when it checked very quickly in a dry spring.

Wheat.—A varietal trial of eight standard wheats and two Queensland hybrids yielded results which indicated again that satisfactory varieties are available for grain production in the Callide Valley provided suitable cultural operations are practised to supply ample subsoil moisture at planting time. Planted on soil wet to a depth of 40 inches, the leading variety Gabo produced an average of 40 bush. per acre during a growing period in which 7.35 inches of rain were experienced. Trials of hay types of wheats indicated also the merits of planting on a good depth of subsoil moisture, the new commercial dual purpose Queensland variety Lawrence yielding at the rate of 3.11 tons of good hay per acre.

Linseed.—The mild moist conditions experienced throughout the growing season favoured the production of better yields of most of the standard varieties of linseed under trial at Biloela than had been obtained in the previous two seasons. The leading variety, Morocco, which yielded 803 lb. seed per acre, has averaged 721 lb. per acre in the three trials.

Grain Sorghum.—The combination of ample subsoil moisture and favourable weather during the main growing period provided suitable conditions for the production of very satisfactory yields of grain sorghum. The highest yield (82 bush. per acre) was obtained with Alpha, a variety evolved at this centre. The results obtained during the past three seasons indicate clearly that ample subsoil moisture at planting contributes materially to satisfactory yields of grain sorghum under a wide range of climatic conditions.

Determination of the prussic acid content of grain sorghums was continued, weekly sampling of four varieties being made during the main growing period. Though all varieties contained more than the permissible 20 milligrams per 100 grams of green material in the early stages of growth, the content dropped rapidly to a safe level at least four weeks before flowering and remained so for the rest of the season. The content of all varieties was considerably lower throughout the season than at the corresponding stages in the previous season, when very irregular weather was experienced.

Sunflowers.—A varietal trial of the main varieties grown in Queensland produced an average yield of 1,580 lb. seed per acre. There were no significant differences between yields, but Advance was easily the most uniform variety and appeared to be the most suitable for mechanical harvesting.

Cotton.—The season was favourable for cotton until mid-February, after which all new growth ceased under the very dry conditions. Insect damage was not a limiting factor during the season and yields obtained reflected the merits of the various treatments and varieties under examination. The general results may be summarised as follows:—

(1) Excellent rainfall during October and November not only provided good supplies of subsoil moisture to supplement that resulting from the winter rains but also leached the nitrate-nitrogen content of the surface soils sufficiently to provide a suitable balance of this plant food and the soil moisture. All crops responded satisfactorily to such favourable conditions and developed excellent yields, which averaged around 1,200 lb. seed cotton per acre in rain-grown experiments, with irrigated areas approximating an additional 200 lb. per acre.

(2) Cultivations in the first year following Rhodes grass once more outyielded older cultivations, yields up to 1,800 lb. seed cotton per acre being obtained in both rain-grown and irrigation experiments.

(3) Cotton following grain sorghum also yielded well, one 10-acre area of October-planted rain-grown cotton averaging more than 1,600 lb. seed cotton per acre.

(4) Comparisons of machine-harvested and hand-picked areas indicated that the machine harvested 92 per cent. or more of the open bolls, with the resultant cotton having less spot and being of a higher lint percentage. In the first picking more dry leaf was contained in the machine-harvested cotton, the grade being one to two grades lower than comparable hand-picked cotton. The exceptionally dry weather preceding and during the harvesting operations made the leaves very dry and brittle, and this may have contributed to the results obtained, as in previous seasons little if any reduction in grade had resulted from machine harvesting.

Pastures.

The testing of the merits of growing *Paspalum scrobiculatum* (scrobic), blue panic, green panic and Rhodes grass in row cultivations was enlarged into the field-scale stage. All species grew better and were of a darker green colour in row cultivations than in the broadcast areas. Analyses of Rhodes grass material cut at hay stage from broadcast areas indicated that though moderately good yields had been obtained under the wet conditions the crude protein content of oven-dried hay did not exceed 4 per cent., compared with 8 per cent. or more in material off the same soils in normal seasons. Both the grasses and lucerne produced outstandingly better during the long dry autumn where grown in cultivated rows spaced 3½ ft. apart.

The introduction and testing of new species and strains was furthered by the addition of some 30 lots during the season, making the total 116 now under investigation. The establishment of several of the most promising species in seed multiplication areas under irrigation is in hand preparatory to more extensive district field trials. The testing for a suitable drought resistant grazing type of cowpea was continued with promising results, Cristaudo, a new variety to the district, having shown outstanding resistance to dry conditions, even to the extent of maintaining greenness in the stems and leaves at the expense of the maturing seed.

AYR.

The marked irregularity of the weather made implementation of the season's programme extremely difficult. In spite of such handicaps, however, considerable progress was achieved in developing the irrigation pasture experiment conducted in conjunction with C.S.I.R.O., in expanding the pineapple production investigation, and in carrying out a comprehensive programme of experiments relating to annual crops. The more important results are reported herein or by the appropriate branches actually responsible for the investigations.

Crops.

Sunflower.—A varietal trial embracing Advance and the same varieties that were tested in the previous season was planted in April, 1950, and once more yields were obtained which indicated that this crop has definite possibilities for the district when grown with irrigation during the normal mild winter. Advance, with an average yield of 1,988 lb. of seed, not only outyielded the other varieties but also was of a plant type well suited to mechanical harvesting.

Linseed.—In a very dry winter and spring in 1949 two new introductions—Punjab 47 CI.1115 and Imperial CI.1114—showed promise of being very well suited to the Ayr district and markedly outyielded the best of the varieties grown commercially in Queensland. Under the very wet conditions of the current winter the two varieties mentioned were destroyed by rust at both Ayr and Biloela. The standard varieties yielded substantially better than in the previous season at Ayr, Bolly Golden again being the leading variety with an average yield of 26·84 bush. per acre and an estimated oil production of 538 lb.

Maize.—The moderate results obtained with autumn-planted maize in 1950 led to a trial of four hybrids and Star Leaming planted early in August, 1950. The experiment received a pre-planting application of 160 lb. of a 10:10:0 fertilizer, a side dressing of 140 lb. sulphate of ammonia six weeks after the appearance of the plants and two light spray and two furrow irrigations plus a total of 10·71 inches of rain in November and December. The leading variety, a Queensland-bred hybrid Q717, yielded at the rate of 93 bush. per acre. The results confirm the hypothesis that the non-impressive yields obtained in the previous season from autumn-planted maize reflected the adverse effects of low winter temperatures.

Sorghums.—Following the satisfactory performance in 1949 at this centre of strains of Coastland, an open-headed type of grain sorghum developed in Queensland, further observations of the same strains and the standard varieties Kalo and Capricorn were conducted in 1950. All strains with the exception of Capricorn performed well and selfed seed of the most promising strains was

obtained for more intensive testing. The results as a whole indicated that Coastland may be suitable for planting in the early winter to provide grain supplies during late October and November.

The possibility has not been overlooked that the taller growing kaffir type of sorghum, which produces good crops of grain and heavier tonnages of both stover (the material remaining after harvesting the grain) and silage than the shorter growing grain sorghums, may be more suitable for districts such as the Burdekin Valley, adjacent to large cattle fattening areas. Accordingly plots of a wide range of kaffirs were grown for both observation and seed production. A considerable range of types performed very satisfactorily and sufficient selfed seed was obtained to conduct a yield trial in the coming season. This crop matured in time to test the possibilities of these varieties to ratoon satisfactorily during the wet season. Three of them made excellent regrowth that produced a good bulk of succulent forage by the end of March.

Cotton.—Results obtained in varietal trials planted early in March and early in April indicated the merits of planting as soon as possible after the wet season ceases so as to obtain good growth of plant before the onset of the cool winter temperatures. The leading March planted variety yielded at the rate of 1,021 lb. per acre and produced a satisfactory type of plant for mechanical harvesting.

Jute.—The results obtained in the previous season at Ayr in several exploratory plots of jute were so encouraging that a comprehensive programme of investigations embracing several northern centres was conducted in 1950-51. Promising results obtained at Ayr involved testing two varieties, *Corchorus capsularis* and C. *olitorius*, in times of planting, row and plant spacing and fertilizing trials under both rainfall and supplementary irrigation.

Pineapples.—The extremely variable weather provided more problems related to cultural practices in this crop than in any other grown during the season. The valuable information obtained under such conditions early in the investigation is referred to in the report of the Horticulture Branch.

Miscellaneous Crops.—Land and facilities were made available to C.S.I.R.O. for a tobacco mosaic trial of a comprehensive range of plant breeder's material, to the Agriculture Branch for a potato fertilizer and varietal trial, and to the Horticulture Branch for investigations in papaws and bananas. Trials of varieties of castor beans for mechanical harvesting were conducted for the Agriculture Branch.

KAIRI.

Rainfall was sub-normal for the season, with the exception of December and January, and as a consequence crop yields and pastures were adversely affected. Considerable expansion in the activities of the various branches conducting investigations at this centre occurred during the season and the more important results are reported either herein or by the appropriate branches.

Crops.

Winter Cereals.—The dry spring seriously reduced yields of both oats and wheat planted for hay production. The promising development made until the dry weather checked growth indicated that under more normal conditions Victoria x Richland, Fulghum x Victoria and Klein oats and Lawrence wheat can be expected to produce satisfactory yields of hay of good quality.

Maize.—The growing of maize in rotation with short-term pastures consisting of lucerne oversown with Rhodes grass appears to give promise of materially increasing yields of grain of good quality. The application of side dressings of sulphate of ammonia may also be beneficial as the percentage of stalks bearing two ears was markedly increased and the plants grew more vigorously where this fertilizer was applied when the plants were 12 inches high. Harvesting had not been completed by the end of June, so yield data are not yet available. The provision of silage for the dairy herd was met by ensiling some 55 tons of maize and sweet sorghum.

Miscellaneous Crops.—Land and facilities were made available to the Horticulture Branch for establishing a trial plot of coffee, and to the Agriculture Branch for continuing a maize-green manure trial and preparing for a tea investigation. Rice and jute were also tested.

Pastures.

The results obtained in areas of lucerne grown alone or in combination with Rhodes grass once more demonstrated the suitability of this legume for the drier section of the Tableland. An area of 19 acres in the fourth year of establishment made good growth through the long dry period in late summer and autumn, and two cuttings of hay of satisfactory quality were obtained. Lucerne was an important component of the mixed pastures through most of the season and as a pure stand provided considerable grazing in rotation with pure stands of Rhodes grass. Scrobic in its fourth season of establishment continued to provide much attractive grazing after the start of the wet season. Para, common Guinea and kikuyu grasses also performed remarkably well for such a dry season. Trials of sugar cane varieties offering possibilities of being suitable as fodder yielded several very promising types which have been multiplied for field tests.

Soil Conservation.

The results obtained with the soil conservation measures in operation at this centre indicate that soil erosion can be satisfactorily prevented on cultivated farms in this district by the use of appropriate cropping practices judiciously supplemented by economical mechanical installations.

Animal Investigations.

Facilities were provided for the Division of Animal Industry to conduct a comprehensive programme of investigations dealing with feeding dairy cows and calves, feeding suspected poisonous plants to calves, testing the need for mineral nutrients and fibre in rations fed to pigs, feeding young chickens, pullets and hens, and progeny testing of two Jersey bulls and two Tamworth boars. The more technical findings appear in the reports of the appropriate branches conducting the investigations. The scope of operations is indicated by the fact that the number of animals involved was up to 76 cattle, 157 pigs and approximately 1,000 fowls inclusive of chickens.

The value of providing the herd with good pastures throughout the year and feeding dry hay to supplement very lush pastures was indicated by the production of the Jersey herd, which was comprised mostly of young grade cows. Overall production of the herd averaged 200 lb. butterfat for a 270-day lactation period compared with an estimated district average of 150 lb.

The strain of Tamworth pigs appears to be suitable for the district and one young boar bred at the experiment station sired the baconer with which was secured first place in the Australian Meat Board Carcass competition for the North Queensland district and third position in the competition for the whole of the State.

An average production of 200 eggs per bird was obtained for the older flock of fowls, which compares favourably with the average results of laying competitions of pens of selected birds in southern Queensland.

HORTICULTURE BRANCH.

Dr. S. A. TROUT, Director of Horticulture.

The year 1950-51 was a difficult one on the farm, the rainfall being heavy and often unseasonable. As a result, production schedules in vegetable growing areas were upset and weeds got out of control for some months on most properties. Cyclonic rains during July caused serious damage in the Brisbane area and also destroyed a substantial part of the tomato crop at Bowen. Tree crops such as citrus which promised well in spring shed fruit heavily later on and matured rather unevenly. Fortunately, price levels for many fruit and vegetables were good and grower returns for the year were generally satisfactory.

Some horticultural industries are attracting new growers in considerable numbers. Many are new to the work and they make heavy claims on the field advisory services of the branch. Buying pressure has inflated land values and many farms are changing hands. Many of the larger growers are moving north to country which still awaits horticultural development and their experience should hasten the decentralisation of horticultural production in the State.

The labour position causes anxiety, for the amount of hand work required in horticultural crops is high. The scarcity of labour may accelerate mechanisation in some crops, particularly pineapples.

Processing plants have been opened at Cairns, Townsville and Ormiston, and large additions are being made to the Northgate Cannery, where quick-freezing equipment is being installed. A considerable increase in the volume of canned and quick-frozen foods can, therefore, be expected.

PINEAPPLE.

The pineapple maintains its place as the major horticultural crop in Queensland and approximately 1,800,000 tropical cases are expected to be harvested this year, compared with 1,900,000 cases during the 12 months of 1950. If the high prevailing prices for market and cannery fruit are maintained, a considerable expansion in acreage can be expected, particularly in central and northern Queensland. In the southern portion of the State there is considerable interest in mechanisation, particularly for weed control.

Cultural Practices.—The value of sodium pentachlorphenate (PCP) for the control of weeds has been further investigated and firm recommendations were issued to growers. This weedicide has been used extensively on the North Coast at 15-20 lb. per acre. When applied to bare ground in an aqueous solution, it suppresses most weeds for approximately 11 weeks. Current interest lies in PCP-diesel oil emulsions, which are better suited for use on growing weeds during the summer months when weeds are most troublesome.

In some areas, the pineapple crop does well on new country but replant crops are less satisfactory. On the grey loams of the North Coast, an intercycle planting of Poona pea has improved yields substantially in the following pineapple crop. Fertilizer trials have been established on distinct soil types at Beerwah, Nambour, Flaxton and Dagun and may lead to more efficient fertilizer usage.

The hormone alpha naphthalene acetic acid, which is already used for flower induction, can both delay ripening and increase fruit size when applied to the maturing fruit. Yield increases up to 17 per cent. have been obtained with a .05 per cent. solution. Precise timing is, however, necessary and the costs of treatment are high. Methods of application which may reduce costs are now being investigated.

Two points of importance in farm practice were cleared up during the year. A marked improvement in the rate of plant development was obtained when base leaves were stripped from suckers before planting and this practice should therefore be adopted by growers wherever practicable. It has also been established that the undesirable double and multiple top characters which commonly appear during a good season are not hereditary.

Plant selection has been the main theme of the advisory campaign during the year, for elimination of inferior planting material must be practised by growers if the industry is to develop on sound lines.

Handling Practices.—Experiments have been carried out in conjunction with officers from the Northgate Cannery to determine the most efficient method of transporting factory pineapples. Delays in transport make planning of cannery operations difficult and may result in considerable losses in the summer months through the development of water blister. Experiments indicated that bulk handling in crates holding 12 cases of pineapples reduces handling costs without affecting factory yield. Rail transport is satisfactory provided there is no undue delay in transit.

Wastage.—Approximately 70 per cent. of the summer crop was diverted to canneries and expeditious handling and transit resulted in little loss from water blister. Growers are also practising to a greater extent Departmental recommendations for the control of water blister in fruit packed for market. A film showing the methods recommended for the harvesting, handling and packing of pineapples for the fresh fruit market and for the factory is in the course of completion and should be of considerable interest to new growers.

Further investigations have been made on factors associated with the development of black heart, which causes approximately 5 per cent. loss in the winter crop. The application of a 1 per cent. borax spray in the spring significantly reduced its incidence in a crop harvested the following winter from a plantation in the Brisbane district.

Processing.—Technical advice on canning and quick-freezing has resulted in a considerable improvement in the quality of the packs. Shortage of tinplate and the entry of frozen pineapple into the United Kingdom without restriction or price control, if maintained, should result in a considerable expansion in the volume of frozen pineapples exported. The preparation of frozen fruits for export is now subject to the same rigid control as the preparation of canned fruits. In the carriage of frozen foods over long distances, the temperature should be maintained at 0 deg. F. but it is doubtful whether this can be done in many of the refrigerated cargo spaces. Arrangements are therefore being made with the Refrigerated Cargo Research Council to investigate transit conditions on ships.

Cannery Waste.—In Queensland approximately 15,000 tons of pineapple skins are dumped annually during the canning of pineapples and this material contains citric acid and sugar valued at approximately £25,000. Recovery processes used in overseas pineapple canneries are costly and the raw materials are not available in Australia. Departmental investigations have indicated that other processes are of promise and equipment is now being obtained for larger trials. The final dried residue can be compressed into a fibre board with properties similar to that made from cane waste.

BANANA.

Over 3,000 growers are employed in the banana industry, and the total acreage under bananas for the year ended March, 1951, was 12,362, compared with 12,862 in the previous year. However, the area planted in 1950-51 was 150 acres greater than in 1949-50. A greater increase in plantings is expected during the ensuing year.

Cultural Practices.—The arrest of decline in acreage is due in part to success achieved on areas formerly considered unsuitable for the crop and also to the good results obtained with modern methods of plantation management in which a single deep sucker is set for each ratoon crop and fertilizer applications are adjusted to the needs of the crop. If stability is to be reached in the industry, the banana must be fitted into a long-term crop rotation designed to conserve the soil and maintain its fertility. The associated problems are now being investigated at Maroochy Experiment Station.

The Mons Mare is gradually replacing the dwarf Cavendish in southern Queensland, for it is more tolerant of marginal soil and climatic conditions. As it is also immune to Panama diseases, it is attracting attention as a substitute variety for the Lady Finger, which is difficult to grow owing to this disease.

Injection of the plant with 2,4-D or its related compounds has proved effective in the destruction of old banana plantations and this method of eradication has already done much to simplify bunchy top control operations.

Work on the physiology of the plant has confirmed the belief that the size of the planting material has a considerable bearing on the success of a banana plantation, and that the deep follower provides the best plant for ratoon crops.

Handling Practices.—A survey of the methods employed in the handling and transport of bananas from the South Coast and Near North Coast districts to Brisbane has indicated that exposure of the fruit for any length of time to temperatures approximating the mean atmospheric maximum has a detrimental effect on the quality of the ripened fruit. The effect of temperature is being further investigated.

Processing.—Because of a limited storage life, bananas can only be exported overseas in the canned or frozen state. The quality of the canned banana depends largely on the type of fruit and the stage of ripeness, as the heat treatment of canning may cause undesirable changes in texture and a cloudy syrup. Samples of quick-frozen bananas have been forwarded overseas to determine market possibilities. Quick-freezing is more satisfactory in this respect provided an anti-oxidant is used to prevent discolouration during storage. The Lady Finger type when frozen retains its colour and texture better than the Cavendish and related types.

CITRUS.

Approximately 500,000 cases of citrus fruits are produced annually in Queensland from 4,500 acres. In the early part of the season it appeared that a very good crop would be harvested. However, a hail storm at Gayndah caused considerable injury to trees, and in coastal districts relatively heavy shedding occurred. The winter crop was therefore relatively light.

Cultural Practices.—The Department supplied nurserymen's requirements of seed and budwood as in previous years but good budwood of the Emperor mandarin and Marsh grapefruit is scarce because of the difficulty of obtaining trees free from brown spot and stem pitting respectively.

A range of mandarin seedlings has been propagated at Redlands Experiment Station and some useful varieties should be forthcoming. An increase in the production of mandarins is anticipated because this fruit is well suited to Queensland conditions and markets are available in the Commonwealth and overseas.

Nursery inspections indicate that pests and diseases are reasonably well controlled and that tree quality is improving. For some important citrus varieties sweet orange stock is preferred. Though an excellent stock in inland districts, it may not be the solution to the tree problem in coastal districts where brown rot gummosis occurs. The resistance of trifoliata stock to the disease has been established in New South Wales and disease-free trees have been imported into Queensland for observation purposes.

Handling Practices.—Mould wastage is still prevalent in citrus fruits marketed locally and overseas. Some measure of control has been obtained with fungicidal dips, and pre-packing treatment may have to follow the procedure adopted in many southern packing houses. The future of the Ausfralian citrus industry is dependent largely on overseas export and research investigations will have to be intensified if markets are to be retained and expanded.

Maturity Standards.—The withholding from sale of all early consignments of citrus pending tests on acidity and palatability has prevented the marketing of immature fruits. Experiments over three seasons indicate that revision of the present maturity standards may be necessary. Palatability, as judged by taste, depends on both the sugar and acid content. Queensland citrus fruits are palatable at a much lower sugar and correspondingly lower acid level than those grown in more southern latitudes.

Processing.—Canneries are now manufacturing larger quantities of cordials, while the preparation of pure juice at Buderim provides an additional outlet for coastal fruit. The importation by a New South Wales processor of equipment for the preparation of frozen citrus juices may considerably accelerate the production of citrus juices in Australia. In America, frozen orange juice comprises 40 per cent. of total frozen food production.

DECIDUOUS FRUITS.

The total acreage under apples steadily increased from 5,444 in 1944-5 to 6,688 in 1949-50. The size of the crop depends largely on seasonal conditions. The winter and spring months of 1950 were wet, and dormant pest and disease control programmes had to be omitted or were seriously delayed. The heavy rains caused waterlogging on many properties and attention is now being given to providing necessary drainage on the shallow soils.

The apple crop is expected to be 225,000 cases below last year's estimate. Future apple plantings are expected to be heavy and with favourable seasons production is expected to increase considerably during the next few years.

Imports of apples from other States are approximately equivalent to the Queensland crop but lack of suitable shipping space will restrict the volume of imports from Tasmania. The spreading of local supplies is, therefore, of greater importance than formerly and more attention will have to be given to controlling wastage and extending the storage life of Granny Smith apples, the main variety stored in Queensland. It is well known that the volatile constitutents of apples responsible for apple odour both accelerate ripening and cause the development of skin blemishes. Their removal can be effected by circulating the storage atmosphere through activated charcoal, and this method of air purification was used commercially for the first time in Australia in the Granite Belt last season. An additional storage life of six weeks over the normal duration of six months was claimed. This season observations are being made by Departmental officers to determine the merits of this method of storage, and there is considerable interest by growers in these trials.

Space is available in Brisbane and the Granite Belt for the storage of 260,000 cases of apples, or approximately half the normal crop. Future expansion can be anticipated.

There has been no increase in acreage of stone fruits during the last few years, but further plantings may be expected in districts such as the Warrego, where the soils are more fertile and the climate more suited to these crops.

Grape production has been constant and good crops were harvested. Useful information on the crop should be obtained from the experimental plot at Severnlea, where scions of Muscatel, Waltham Cross and Purple Cornichon varieties have been worked on to phylloxera resistant stocks.

Maturity work with grapes has been completed and a density value of 1·06 at 20°C. has been established as a satisfactory index of maturity for all varieties except the Muscatel. The sweetness of this variety is due to its rich flavour, the development of which is considerably influenced by seasonal conditions. If flavour is well developed this variety is palatable at a much lower sugar content than when flavour is lacking. Thus sugar tests alone are of no value in determining whether the variety is sufficiently sweet to be marketed.

PAPAW.

Approximately 270,000 cases of papaws are harvested from an area of 770 acres. Districts such as Yarwun and Redlands, which were severely affected by flood rains last year, are again in full production.

The future of the industry depends largely on the ability of the grower to place good fruit on the southern markets and on the suitability of the fruit for canning and quick-freezing. Ripening techniques have been devised which make it feasible to ripen fruit in the winter months, thus avoiding skin blemishes which develop if the fruit is allowed to ripen on the tree. The papaw should be one of the major horticultural crops in the State.

Cultural Practices.—Investigational work is concerned primarily with the varietal problem. Regional trials were established at Yeppoon, Yarwun, Brookfield and Sunnybank to compare the Bettina and Improved Petersen varieties bred by the Department with local strains. Results from the current crop should indicate whether these two varieties are suitable for all the major producing districts. Several varieties are also being studied at Redlands Experiment Station, where an excellent crop has been grown. Some hybrid types show considerable promise. They bear well-shaped, attractive fruit with some apparent resistance to ripe fruit rots.

Ripening and Processing.—Investigations are designed to determine the correct stage of maturity at which papaws can be picked and ripened artificially without the development of a bitter flavour. The suitability of material grown at Redlands Experiment Station for the market and for factory purposes is being determined. It is possible that some varieties which are particularly suitable for dessert purposes may not be satisfactory for canning or quick-frozen products, where a firm textured fruit is required. The low acidity and soft texture of papaws make canning a difficult problem and quick-freezing may be the better process. Samples of frozen Queensland papaws have received very favourable comment in England.

STRAWBERRIES.

Strawberry production valued at £53,000 is not sufficient to meet the heavy demands of the fresh fruit market and factories.

Successful strawberry culture depends mainly on planting disease-free runners and a good knowledge of methods of handling the crop, and expansion of the industry is limited by the availability of good planting material. Most crops now contain many strains of quite different characters and current work is, therefore, designed to select good type plants, the best of which will later provide planting material for the industry.

The approved strawberry runner scheme which is operated jointly by the Horticulture and Science Branches worked well during the year and its success indicates grower awareness of the need for high quality planting material.

Overseas markets are available for strawberries, which are the most popular frozen fruits in America. Experiments with the 1950 crop indicated that Phenomenal, the main variety grown in Queensland, does not retain its firm texture after thawing and other varieties may have to be developed for the quick-frozen trade. Further experiments are designed to determine whether changes in texture are related to rates of freezing and thawing and to sugar concentrations.

MANGO.

Mango production has remained constant at approximately 38,000 bushels but the crop in 1950-51 was reduced by faulty setting and a severe outbreak of anthracnose. New plantings are reported from Bowen and some other parts of North Queensland where the Kensington variety does exceptionally well. The industry can be expected to expand if new outlets are created and in this respect results of processing trials have been of considerable interest. The Kensington mango is very suitable for canning or quick-freezing, giving a very attractive and highly flavoured pack. Losses due to peeling, trimming and coring are approximately 30 per cent., compared with 65 per cent. for pineapples. If the storage tests indicate no undesirable changes with time, commercial processing should be possible.

The stringy texture of the common type of mango makes it less suitable for processing but it yields a very satisfactory juice.

MISCELLANEOUS FRUITS AND NUTS.

Approximately 30,000 cases of custard apples are produced annually, but variable setting makes commercial production hazardous. Most satisfactory results would probably be obtained if the habits of the tree were investigated and budwood supplies controlled.

Macadamia nut production remains stationary at about 40 tons. The fundamental weakness of the industry is the lack of good worked trees. In order to improve the position, stock and scion material has been selected for propagation and an orchard is to be established at Maroochy Experiment Station. Arrangements are also being made for the propagation of one or two selected scions on approved stocks for commercial growers.

Suitable stocks and scions of the avocado have been located for propagating trees which are to be grown at Redlands Experiment Station. Most of the tree failures recorded during the year were due to lack of adequate drainage, for the avocado is susceptible to excessive moisture.

TOMATO.

The Queensland crop, which is valued at over £700,000, is worth more than any other horticultural crop except the pineapple.

Conditions during the year were erratic in all tomato growing districts. Many crops in the metropolitan area suffered from cyclonic rains in July; the Bowen district was almost waterlogged when seedlings were being raised for the winter crop; and Stanthorpe packs clashed with late spring planted crops on the coast. Market prices therefore fluctuated sharply throughout the year.

Certified seed of the varieties Q1, Q2 and Q4 was again produced at Stanthorpe. The Q3 crop failed to meet the requirements of certification and only carry-over seed from the 1949-50 season will be available this year. At Stanthorpe, Q3 gives outstanding yields of good quality fruit but in other parts of the State it is somewhat unreliable if harsh conditions are encountered after flowering begins or temperatures are below the optimum for fruit setting. In the metropolitan area it cannot be recommended to growers, but crop records in the Bowen district are fairly good. Certified seed production for the season was Q1, 528 oz.; Q2, 450 oz.; Q3, nil; and Q4, 704 oz.

The faulty setting of Q3 and some other varieties in some coastal districts has focussed attention on the possibility of inducing fruiting by spraying the flower trusses with the hormone beta naphthoxy acetic acid. Earlier work had given rather variable results but substantial increases in yields were obtained at Stanthorpe from bi-weekly treatments with a 50 p.p.m. solution. Much of the fruit was quite marketable though partly or wholly devoid of seed.

Varietal trials included both Queensland-bred material and some introductions from overseas. Trials of this kind must extend over a number of years but it is already apparent that three new types will be of value in Queensland production in the near future.

Substantial increases in yield in metropolitan crops have been obtained by spraying the growing crop with ammonium molybdate. At Stanthorpe, nutritional deficiencies were largely associated with a lack of available phosphoric acid in the soil.

BEANS.

Beans continue to be one of the main horticultural crops and over half a million cases were harvested last season. Markets in the eastern States were undersupplied and prices rose to very high levels. Plantings in 1951 in irrigated areas were heavy but most of the non-irrigated crops were late owing to the lack of suitable rains at normal planting time.

Field production methods are on the whole efficient. The main disability of the industry is the lack of good quality, disease-free seed. The selection programme in the variety Brown Beauty will, however, soon supply mother seed for certified seed production programmes.

All the certified seed crops grown in the Kingaroy district failed to comply with the prescribed standards. Steps have been taken to build up the limited reserve stocks of certified seed on hand in the Far North and sufficient seed should be available for the 1951-52 certified seed production programme.

Nutritional troubles have occurred in the winter crops during the last few years and during 1950 two field experiments were carried out in conjunction with the Chemical Laboratory. Comparable experiments were again laid out this year on land where abnormal leaf symptoms have been recorded, and these should indicate whether or not iron and/or molybdenum deficiencies are involved. Somewhat similar symptoms in the Sunnybank district have been due to manganese toxicity.

LEAF VEGETABLES.

The production of cabbages, cauliflowers and lettuce has shown little increase during the past few years. Much of the experimental work in progress is concerned with field studies of the several available types. Most varieties contain numerous plant types, and plant selection and the production of seed will have to be undertaken to meet the reasonable demands of experimental work.

All three crops show symptoms of minor element deficiencies in the metropolitan district. Though molybdenum and boron are now being generally used by growers as corrective measures, there is need for investigations on cropping programmes and fertilizer usage.

PROCESSING OF VEGETABLES.

Cauliflowers, beans, peas and carrots have been successfully frozen following a preliminary steam blanching treatment. The quick-frozen article has been rated as almost equal to fresh and is superior to the canned product in texture, colour and flavour. Costs of stringing French beans are approximately 6d. per lb. and any development of the quick-frozen trade largely depends on the production of stringless varieties. Tests will be made on several stringless varieties now being grown at Redlands Experiment Station.

TROPICAL PLANTATION CROPS.

High prices and erratic supply position have focussed attention on the possibilities of pepper and coffee as horticultural crops in Queensland. Suitable climatic and soil conditions can be found for both, but in the past the lack of payable outlets has ruled them out as commercial crops. At present prices, economic production should be possible and experimental plantings have been made at Kamerunga Experiment Station. For the pepper planting, material was obtained from Malaya and New Guinea; the coffee plants were raised from seed of selected trees already established in Queensland. Both areas should prove useful as sources of plants if the industries are to become established.

EXPERIMENT STATIONS.

The range of projects handled at Horticulture Branch experiment stations has been expanded to meet the more urgent requirements of the industry. Grower organisations take a very close interest in the work and an annual field day at each station is now supplemented by special field days for growers who are interested in a particular crop.

Maroochy.—The main crops under investigation are pineapples, papaws, bananas and citrus. Attention will be given to small crops such as beans when irrigation facilities are installed.

The more important projects in the pineapple crop are plant selection, crop management and soil management. The crop is now planted on the contour with an intercycle green manure crop such as pigeon pea. Drainage is a problem in some of the pineapple blocks and both tile and mole drains have been installed in the area planted this year.

The already large stock of genetic material used in the papaw breeding programme has been supplemented by additional plant types from the Americas.

The banana project is designed to assess the relative merits of various cultural practices. Fruit from the plant crops is of excellent quality in spite of the fact that much of the land had previously been cropped with pineapples.

The two citrus orchards, containing a wide range of stock and scion material, are now coming into bearing and all should provide budwood in the near future.

Redlands.—This 21-acre property is still in the developmental stage but eight acres are either under crop or being prepared for cropping. About three acres are under vegetables and one acre under papaws. Two acres which are to be used for soil management studies have been planted with green manures.

The main vegetable crops are tomatoes, beans, crucifers and carrots, but others are included in the cropping sequence for rotation purposes. Three crops are grown each year, two of these being catch crops and the third a summer green manure.

Packing and machinery sheds have been erected and a manager's residence is expected to be built in the near future.

Kamerunga.—This station provides facilities for the investigation of crops which are important in the horticultural economy of North Queensland. In the pineapple, papaw and banana, the main object is to improve production methods, for current practice in southern Queensland where these crops are grown on a large scale is not a valid guide to northern growers. The station also gives a lead to vegetable growers who supply tomatoes and greens to an expanding northern market from both coastal and Tableland areas.

Ayr.—At Ayr Regional Experiment Station, land has been assigned to the Horticulture Branch for pineapple production under irrigation. Of the four acres so far planted, three represent a commercial area from which full costing data are being compiled. A planting of approximately three acres is to be made each year.

Seasonal conditions were very wet and weeds got out of hand in midsummer. Heavy machinery was, therefore, introduced into the commercial blocks and the results obtained confirm the view that mechanisation of an irrigated crop should present no major difficulties. It is therefore proposed to adopt single row plantings in future so that farm machinery which would normally be available in the district can be fully used.

The present outlook for pineapples in the North is particularly bright, for crop yields are high, fruit quality is excellent and cannery outlets are available locally.

Hamilton.—Plans have been completed for an experiment laboratory at Hamilton, Brisbane, to investigate problems associated with the storage and transport of fruits and vegetables. The short storage life of tropical fruits makes the problem of distribution in the fresh state difficult, but canning and quick-freezing offer alternative means of exporting these highly perishable foods. Scientific research at Hamilton should considerably assist the development of commercial enterprises concerned with the distribution and processing of horticultural crops.

EXTENSION WORK.

Several field days on the culture of pineapples and bananas were held during the year. A special series of field days was also held on the North Coast to emphasise the importance of plant selection in pineapples.

Weekly advisory articles released to "Queensland Fruit and Vegetable News" and other papers provide a seasonal coverage for horticultural crops and keep growers in touch with current problems on the farm.

A Pineapple School for farmers' sons was conducted at Nambour and attracted a full quota of students. In conjunction with the Department of Public Instruction, pupils in four North Coast schools have been instructed in the packing of citrus fruits.

TRANSPORT.

Investigations made in conjunction with C.S.I.R.O. on the cooling capacity of insulated railway wagons used for the transport of fruits and vegetables have now been completed. A summary of the work over the last few years is being prepared and the data will be used to design wagons capable of cooling consignments during transit.

Cardboard cartons of half-bushel dump capacity have proved a suitable alternative package for soft fruits, grapes and tomatoes. In some instances the condition of the consignments has been better than that of similar lots packed in wooden cases. The carton is also very suitable for air freight, being several pounds lighter than the equivalent wooden container. It is anticipated that 150,000 cartons will be used in 1951.

MARKET INSPECTION.

At times market condemnations were heavy, due mainly to mould development resulting from wet conditions prior to harvesting.

Attempts were made to market undersized and immature fruit, but the majority of growers are complying with regulations. Instruction on packing requirements was given to new growers.

There has been a marked improvement in the quality of potatoes and few lines have been condemned. However, the quality of fruit and vegetables generally is not entirely satisfactory and as quality standards are set for a wider range of products it is expected that greater attention will be paid by growers to selection on quality.

OVERSEAS EXPORT.

Approximately 14,000 cases of apples and 5,000 cases of citrus were exported to Singapore and Hong Kong during the year ended 30th June, 1951. Lack of shipping space has seriously curtailed apple shipments and large quantities passed for export are being held in cool store pending shipment. Close co-operation between exporters and inspectors has been maintained, with the result that all shipments of apples have arrived overseas in very good condition. Citrus consignments have not been entirely satisfactory and more information is required on the potential keeping quality of this fruit. A small consignment of pineapples forwarded direct from Brisbane arrived in New Zealand in good condition. Pineapples can now be imported into New Zealand under private treaty and a substantial premium is being offered to growers with approved export establishments.

QUARANTINE.

Inspection of increasing imports of plant material, particularly pre-fabricated houses and sawn timber, is placing a heavy burden on the inspection staff. Close supervision of all imports has to be exercised to ensure as far as possible that foreign pests and diseases are not imported to Queensland. The discovery, in wooden crates containing agricultural machinery, of the American wood wasp, which could cause untold damage to Queensland forests, emphasises the extreme vigilance which must be maintained by quarantine inspectors. Whole shipments of timber have had to be suitably treated because of the presence of foreign pests. Importers have co-operated in implementing the drastic measures which have been necessary to ensure complete destruction of these pests. Additional safeguards have been provided in the case of nursery stock, which can only be imported by Government Departments or by firms with facilities and equipment to carry out post-entry quarantine. Certain quarantine procedure has been prescribed for pre-fabricated houses, in which live borers have been detected. The various State Departments in conjunction with the Commonwealth Department of Health are taking active steps by radio, posters, films and exhibits at shows to publicise the necessity for stringent quarantine precautions.

A summary of regulations covering the interstate movement of plants has been prepared by this Department and circulated to all transport authorities.

INTERSTATE TRADE.

The following quantities of fruit and vegetables were exported to and imported from other States during the year:—

EXPORTS.

Commodity.	Quantity.
Apples	65,065 cases
Avocadoes	3,185 cases
Bananas	103,435 cases
Custard Apples	4,862 cases
Grapes	45,694 cases
Lemons	3,481 cases
Mandarins	3,318 cases
Mangoes	31,305 cases
Melons	13,530 cases
Oranges	9,538 cases
Papaws	49,921 cases
Passion Fruit	2,766 cases
Pears	1,898 cases
Pineapples	426,991 cases
Strawberries	437 trays
Fruit (Various)	16,744 cases
Plums	5,238 cases
Peaches	6,635 cases
Citrus (Various)	28,869 cases
Beans	114,645 cases
Beetroot	23,669 bags
Cabbages	12,555 bags
Carrots	7,331 bags
Chillies	1,913 cases
Chokos	1,224 bags
Cucumbers	66,500 cases
Ginger	1,946 bags
Marrows	22,756 bags
Onions	79,606 bags
Peas	8,581 bags
Potatoes	99,357 bags
Pumpkins	262,397 bags
Seeds	34,017 bags
Sweet Potatoes	52,577 bags
Tomatoes	479,697 cases
Vegetables (Various)	20,184 bags
Peanuts	45,277 bags

IMPORTS.

Commodity.	Quantity.
Apples	465,141 cases
Apricots	39,388 cases
Cherries	8,701 cases
Grapes	11,467 cases
Lemons	11,217 cases
Nectarines	3,299 cases
Oranges	164,315 cases
Passion Fruit	1,027 cases
Peaches	40,354 cases
Pears	186,226 cases
Plums	32,456 cases
Fruits (Various)	67,724 cases
Quinces	3,445 cases
Citrus	13,093 cases
Bananas	10,365 cases
Bananas	10,927 bunches
Beans	13,812 bags
Beetroot	1,920 bags
Celery	4,827 cases
Carrots	28,109 bags
Nuts (Various)	193 bags
Onions	87,400 bags
Peas	41,812 bags
Potatoes	390,375 bags
Seeds	7,310 bags
Sweed Turnips	6,471 bags
Tomatoes	11,083 cases
Vegetables (Various)	1,301 bags
Parsnips	1,060 bags

BUREAU OF SUGAR EXPERIMENT STATIONS.

Mr. N. J. King, Director of Sugar Experiment Stations.

The 1950 crushing season, which started with an estimated crop of 7,000,000 tons of cane, was one of the wettest on record and crushing consequently became so extended and difficult that the mills closed down after processing 6,691,731 tons, the remainder being left to stand over. The season extended from May 17 to February 5, the first and last mills to crush being Macknade and North Eton respectively. The tonnage crushed was a record but constant rains reduced the sugar content and the amount of sugar produced was only 879,228 tons in terms of 94 net titre. The acreage approximated 256,700, giving a record yield of 26.9 tons of cane per acre. The sugar yield was 3·42 tons of sugar per acre.

The proportion of the harvested crop grown from Queensland bred canes rose to 64·2 per cent., a rise of 5 per cent. on the previous year's figures. This trend is likely to persist with the further anticipated extension of Q.50 and Pindar plantings.

TABLE 1.

COMPOSITION OF THE 1950 CROP ON BASIS OF COUNTRY OF ORIGIN.

Country of Origin.	Tonnage Harvested.	Percentage of Crop.
Queensland	4,293,420	64·2
New Guinea	1,052,969	15·7
United States	916,203	13·7
Java	292,348	4·4
India	55,574	·8
Mauritius	54,698	·8
Fiji	14,177	·2
West Indies	12,342	·2
	6,691,731	100·0

VARIETAL TESTING.

In a varietal trial at Mossman, Q.50 outyielded the next best cane, Trojan, by 1.72 tons of sugar per acre in the aggregate of two crops, and at Gordonvale it outyielded Cato and 41 M.Q.779 by 0.9 ton of sugar per acre over the same period. These performances illustrate the versatility of this variety, the natural environment of which is the Mackay district.

In one trial at Proserpine, the aggregate of two crops placed Q.50 ahead of Pindar, P.O.J.2725, Eros, Comus, and H.Q.426, while another trial in the same area showed Trojan, Q.49 and Pindar as superior to Q.47, Q.45, and Badila. At Mackay, C.P.29/116 performed well to produce 8.8 tons of sugar per acre in two crops and was exceeded only by Q.50 and Pindar. The valuable features of C.P.29/116, particularly its high red-rot resistance, make it a good type for late harvesting in Mackay and it is being propagated for distribution at an early date.

In the Bundaberg area, C.P.29/116, the district's standard variety, was outyielded by a new seedling, F.60. It is, nevertheless, too early to consider this locally-bred variety as a successor to the standard. In another trial under irrigated conditions, Q.47, in an aggregate of two crops, produced 17.31 tons of sugar per acre. It was followed by Q.49, Atlas, and Trojan, with P.O.J.2878 a bad last with only 12.76 tons of sugar. The plant and two ratoon crops in another trial proved that M.1900 cannot compete with modern varieties. It produced 6.89 tons of sugar per acre, compared with 10.69 tons from C.P.29/116 and over nine tons from Q.28 and Q.47. In other trials C.P. 29/116 was the best cane, but in an Isis trial Q.51 and Q.50 outyielded C.P.29/116, Pindar and Q.47. Q.50 was the best in a trial on the Maroochy River, outyielding Pindar and several others in the plant crop.

DISTRICT EXPERIMENT STATION ACTIVITIES.

At all four experiment stations the normal procedure of raising and planting seedlings, selecting and replanting in the various progressive trials, and transferring on to farms was followed. In addition, the usual numbers of seedlings were planted at Bartle Frere, Landsdowne road, and Beerwah, which function as sub-stations on different soil types. From the Beerwah sub-station the first introductions were made to the Nambour area in 1950 and selections will be made in that environment in the current year.

The emphasis of the entomological work centred at Meringa was moved from greyback to frenchi cane grub control and an extensive series of trials gave indications of effective control by correct placement of benzene hexachloride. The success of this insecticide in controlling this two-year cycle grub pest would solve the last of North Queensland's major pest problems. The addition of another entomologist to the staff has allowed extended investigations into less-pressing problems and the opportunity will be taken to carry out insect vector investigations relating to both leaf scald and chlorotic streak diseases. Auxiliary investigations concerning BHC include its effect on fertilizer uptake if applied in a mixed form and its toxicity to minor soil insects. At the same time, all recently discovered insecticides which show promise of success are being tested against the grub pests.

Work on the Lower Burdekin station has been severely restricted by labour shortage. In consequence, only limited areas have been planted, but the seedling programme is now developing along conventional lines. Until the glasshouse arrives from England, seedlings are being raised at Meringa and forwarded in flats for potting. A considerable acreage has now been ploughed and graded in preparation for planting when labour supply allows for expansion. Certain timbered areas have also been cleared.

At none of the stations did any seedling variety with the exception of B.174 perform so oustandingly as to show promise of becoming a standard commercial cane. Certain "G" and "H" seedlings at Meringa look very attractive under the conditions of the station but still have to prove their value on district farms. At Mackay, B.174 (now Q.56) possesses characters which make it desirable as a second cane to Q.50 and as a particular purpose variety on some soils, while at Bundaberg the only likely challenger to C.P.29/116, Q.47 and Q.50 is F.60.

The three permanent trials on Bundaberg station were carried on. No significant increases are being obtained from the trash conservation trial which was inaugurated in 1933. Total crops to date are 347.9 tons from the trash plots and 346.4 from the no-trash areas. There is no suggestion of a build-up of organic carbon in the soil. A deep placement nitrogen trial in which the sulphate of ammonia was placed below the plant showed no difference in yield to the normal topdressing practice, though overseas good results for this method have been claimed.

SOIL INVESTIGATIONS.

Some 546 soil samples from farm properties were analysed during the year and fertilizer recommendations were forwarded to the growers concerned. In addition, 248 soils were tested from experimental plots relating to soil aggregation studies and fertilizer trials. A further 34 samples representing irrigation waters, cane leaves, &c. were analysed.

Table 2 shows the soil fertility trend in various cane areas as assessed from the phosphate and potash contents of the samples analysed. As much as 70 per cent. of the samples contained only fair or less amounts of available potash, thus indicating the importance of maintaining an adequate supply of essential potassic fertilizer to the industry. On the year's figures, which might be taken as reasonably representative of many districts, it would appear that phosphate deficiency is less pronounced than that of potash. Such a trend was previously observed and commented upon in the reports for 1948-49 and 1949-50.

TABLE 2.

SOIL FERTILITY TREND IN VARIOUS CANE AREAS, SHOWING PERCENTAGE OF SOIL SAMPLES AT EACH FERTILITY LEVEL.

District.	Phosphate.			Potash.			No. of Samples.
	Low.	Fair.	Good	Low.	Fair.	Good	
	%	%	%	%	%	%	
Babinda–Mossman	10	3	87	28	25	47	60
Innisfail ..	34	5	61	58	18	24	146
Ayr	0	0	100	15	15	70	27
Mackay	11	46	43	32	57	11	28
Bundaberg ..	30	23	47	47	22	31	206
Southern ..	21	4	75	60	24	16	70
Total ..	26	13	61	47	23	30	537

Fertilizer Trials.--Seven fertilizer trials, embracing both plant and ratoon crops, were successfully completed during the year. These were situated in the Mossman, Moresby, Proserpine, Isis, and Maroochy districts and covered a wide range of soil types. The results indicated the necessity for using complete fertilizers. The universal response to sulphate of ammonia again revealed the marked nitrogen deficiency of Queensland sugar cane soils. It is essential that adequate supplies of this fertilizer be made available to the industry annually if production is to be maintained.

In order to investigate the possibility of using finely-ground raw rock phosphate to replace superphosphate, a series of trials were put down in the Babinda-Tully area. These experiments were considered to be of some importance in view of the probability of the curtailment of sulphur imports. It was thought that rock phosphate might become available to the cane plant if applied as fertilizer on the more highly-acid soils which occur under the very wet conditions of the area. Though only one of the plant crop harvests of the several trials gave definite results, the figures obtained from this particular trial indicated that finely-ground rock phosphate applied at planting is not a satisfactory substitute for superphosphate in supplying phosphate to the plant crop. Whether the former material will become sufficiently available to supply the requirements of the ratoon crops remains to be seen, and the ratoons of these trials will be watched with a great deal of interest. Another series has already been set out to further observe the suitability of rock phosphate for plant cane.

Routine observations for the detection of minor element deficiencies were continued but with the exception of the two copper-deficient areas previously recorded (Maroochy and Mount Ossa, Mackay) no further nutritional defects were reported. A pot trial to more closely define the exact nature of the Maroochy occurrence is in progress at Nambour. In the Mount Ossa area the spectacular recovery of cane to which about 56 lb. of copper sulphate was applied in the plant crop has persisted into the second ratoons. Excellent cane is now being grown where harvestable crops could not be previously established, and growers in the affected areas are as a routine practice using fertilizer in which copper is incorporated.

Study of Rate of Decomposition.—Since the rate of decomposition of organic matter is important under normal farming conditions, laboratory studies were made on the behaviour of such materials as Poona pea, molasses, cane trash, bagasse, and filter mud when intimately mixed with soil. It was found that the rate of decomposition of molasses and Poona pea was much more rapid in the initial stages than that of the other materials. Approximately 200 days after turning the various types of organic matter into the soil the percentage decomposition was—molasses 82 per cent., Poona pea 77 per cent., bagasse 68 per cent., trash 63 per cent., and filter mud 58 per cent. The soil used in this experiment was the Bundaberg red volcanic loam. The work has been extended to include other major soil types.

Studies on Soil Physical Condition.—The 5 x 5 Latin square soil improvement trial conducted at Moggill and mentioned in last year's report was completed. The analytical data obtained during the regular sampling of the plots throughout a period of 380 days indicated that both the sorghum and molasses applications markedly increased the crumb structure of this clay loam soil. The most effective treatment was the 35 tons per acre sorghum dressing, which quickly increased the amount of water-stable aggregates from approximately 6 to 40 per cent. This occurred within 160 days of application, after which a gradual decline took place to 20 per cent. aggregation at the termination of the trial. The other treatments, which were 13.5 tons of sorghum, 12 tons of molasses, and 3 tons of molasses per acre, were less effective. However each of these was responsible for maintaining an appreciably better physical condition of the soil throughout the 12 months than that existing prior to the various applications. A most interesting feature of this experiment was the steady increase that occurred in the aggregation of the non-treated check plots. This was probably due to the year's fallow and the growth of grass and weeds which developed throughout the trial.

WEEDICIDES.

The use of 2,4-D for pre-emergence weed control has passed from the experimental stage to demonstration work. A considerable number of demonstration plots were therefore set out on farmers' properties in all areas and excellent results were obtained. Many growers are now showing great interest in this method of controlling weeds and a number of home-made power sprays driven by tractors are in operation.

During the year further investigations were made into the question of obtaining a suitable contact or post-emergence spray. A solution containing 70-80 per cent. creosote or mineral oil plus pentachlorphenol and 2,4-D has been found to be generally satisfactory, if used in the young stages of weed or grass growth. The percentage of pentachlorphenol incorporated has ranged from 3 to approximately 12 per cent., and the results indicate that the higher amounts are usually most effective. The 2,4-D content has been 3-5 per cent. For most purposes this mixture is used at the rate of four gallons per acre with satisfactory results and without damage to the cane plant. Higher rates will readily cause serious damage to young cane. When a pre-emergence effect is required in addition to contact killing, further 2,4-D is added to the solution to bring the amount of this ingredient up to the necessary 4 lb. per acre.

Sodium trichloracetate has been found to give a good control of Guinea grass when applied at the rate of 100 lb. per acre. Such an application is somewhat expensive and further trials are in progress to determine whether smaller amounts can be effectively used.

ENTOMOLOGICAL INVESTIGATIONS.

Weather conditions during the last season—largely one of extremes—played a most important part in promoting damage by pests, and in line with the experience of previous years grubs of the greyback beetle (*Dermolepida albohirtum*) were responsible for the devastation of many canefields throughout the several mill areas of North Queensland.

With appreciable populations already present in the soil the continuous rains during the last two months of 1950 provided ideal conditions for beetle emergence and survival, and the activities of this pest were maintained at a high peak. It was reported from some areas that certain feeding trees had suffered the severest defoliation on record. Eggs were laid and hatched under optimum conditions, and the survival ratio of young grubs was high. Thereafter the wet season terminated abruptly and large concentrations of grubs attacked the stools, denuding the plant of its roots and causing large areas of cane to die before crushing operations commenced. Fortunately, the early cessation of the wet season rains allowed many fields to be cultivated and prepared for early planting, and much of this damaged cane was salvaged for use as plants.

Losses would have been disastrous had it not been for the extensive use of BHC in protecting areas subject to infestation. It has been estimated that sufficient of this insecticide was supplied last year to treat 15,000 acres on a three-crop basis and to retreat a further 14,000 acres, but because of rainfall interruptions and shortage of labour many growers were unable to get their insecticide applied. As a result there were numerous instances of fertilized crops being completely ruined while BHC supplies remained in the barn. If nothing else has been learnt from the past unfavourable season, it will have been useful in bringing home to growers the salutary lesson that, where grub attack threatens, BHC treatments must take precedence over fertilizer dressings. In addition, it showed the weakness in making BHC applications too late after beetle emergence. There was also ample evidence in support of correct placement of the insecticide at a depth of 2-3 inches. Surface dressings which had been applied during lulls in rainfall and which had not been adequately incorporated in the soil were almost valueless, while deeper placement of the BHC some 6-8 inches below the surface allowed considerable pruning of the upper roots before the grubs eventually contacted the insecticide and died. In these latter instances only the deeper roots immediately beneath the stool served to anchor it and keep it supplied with nutrients.

Investigations into the cause of poor germination after the use of BHC disclosed in many instances that this was due to the large quantity of the insecticide required for grub control having been applied in contact with the setts at planting time, and a warning against this practice was issued.

Although a satisfactory kill of grubs had previously been obtained by the use of BHC-fertilizer mixtures, experiments during the year demonstrated that the BHC tends to inhibit root growth in the immediate vicinity of where the mixture is applied, thereby interfering with

the normal uptake of fertilizer. Accordingly, growers have been advised to adhere to the recommended practice of applying BHC in the half-open furrow after the cane has germinated and just before the field is levelled.

A number of trials which were harvested during the season gave clear indications that, in so far as a three-crop programme is concerned, no advantage is derived from applying a moderate initial dressing of BHC to the plant crop followed by a small supplementary dressing to the ratoon crop, in place of the recommended method of applying the full quota as a single dressing to the plant crop. One of the chief reasons advanced by the advocates of the split treatments was the danger of the toxic soil being eroded from the cane furrows, but in point of fact, the roots of the stool had kept the insecticide in place, and there was less danger by this method than by subsequently turning furrows on each side of the ratoon stools and applying a further dressing to these furrows.

Probably the most important progress was made against the frenchi grub (*Lepidiota frenchi*), which hitherto had been difficult to control in the third stage. Normally first-and second-stage frenchi grubs readily yield to the same treatment as that used against greyback grubs—namely, 75 lb. of 20 per cent. BHC applied in the furrow after the cane is established—but in the case of replant blocks third-stage grubs often prove troublesome. Experiments demonstrated that in such cases it was possible to effect control by applying the same quantity of insecticide about half-an-inch above the setts at the time of planting. It should be stressed that adequate fallowing and soil preparation is still considered the best means of reducing frenchi grub populations and control with BHC in preference to the control obtained with well-tried and desirable agricultural practices is not recommended. However, upsets in farm routine sometimes render necessary a harvest and replant, and in such circumstances where frenchi attack is anticipated, application of the insecticide immediately above the sett provides an effective means of circumventing damage.

Very few germination failures through wireworm attack were recorded, and altogether approximately 20,000 acres were protected with the appropriate BHC-fertilizer mixtures.

An increase was noted in the activities of the moth borer (*P. truncata*), armyworms (*Cirphis unipuncta* Haw.), mole crickets (*Gryllotalpa* spp.), and the black beetle (*M. vulgivagus* Olliff.), but in most instances their damage was localised.

Rat damage showed a slight increase over that of the previous year, but the chief cause for concern was the high incidence of the closely-linked Weil's disease in some of the wetter areas. Despite the abnormal conditions, rat populations were kept under effective control by the use of phosphorus baits and packeted thallium-coated wheat. Sulphur-crested cockatoos and wallabies also made sporadic attacks in some of the isolated cane areas.

PATHOLOGY.

The early summer rains of the 1950 season led to the development of a considerable amount of yellow spot in North Queensland during the first few months of 1951. With a view to establishing large-scale trials in the forthcoming season, some preliminary spraying experiments were initiated using copper and sulphur as the active principles. It was found that while copper oxychloride appeared to prevent the development of the symptoms, it was somewhat toxic to the leaf tissues. The widespread infection of yellow spot over large areas provided the opportunity for the evaluation of the relative resistance of the various commercial canes; it was found that Q.28, Q.42, and Trojan were more badly affected than Eros, P.O.J.2878, Clark's Seedling, Q.49, Q.50, and S.J.4, while Badila, Pindar, C.P.29/116, Q.44, and Q.47 were comparatively resistant.

For the first time on record not a single stool of downy mildew was found in any commercial canefield in Queensland. The Hambledon area has now been free for the second successive year, but the fact that this is the first disease-free year at Bundaberg leads one to be cautious in saying that the disease has been eradicated there.

The last stronghold of gumming disease, the Mossman Mill area, did not show any diseased stools during the year, but since the disease was also not seen in a previous year and then was found again it is still too soon to be certain that it has gone altogether.

Results from the ratoon stunting disease resistance trial planted at Mackay in 1949 showed that the disease is capable of infecting (by the medium of sett inoculation) a wide range of commercial and breeding canes, though there were many instances of apparent resistance. It was found that Q.28, while sufficiently susceptible to need carefully applied control measures, was not by any means the most susceptible variety tested. One seedling in particular was so very susceptible that it should be quite useful in future research into the disease.

Though mosaic disease has been common in many areas of South Queensland and though many Cane Pest and Disease Control Boards have made good progress towards its control, the opinion has persisted amongst growers in general that the disease is at worst a minor one and can be safely disregarded. The results of a yield trial at Moreton show that with Q.42, at least, serious losses can occur. In this trial the average of the plots planted with diseased setts was more than 20 per cent. less than that of the healthy flats. The variety Q.28 in the same trial did not show significant losses.

The control of pineapple disease by the treatment of the setts in a mercurial solution has become an established farm practice in the Burdekin area, but outbreaks of the disease at Mackay and near Cairns have now forced many farmers in these districts to consider buying dipping equipment. The method of sett treatment as evolved is 100 per cent. effective, but in its present form it does mean the abandonment of the cutter-planter, for as yet there is no proved method of combining this implement with the mercurial treatment.

Red-rot caused some severe losses in the Mackay area towards the end of the 1950 harvest and it is more evident that there is a definite risk in keeping any Q.50 for late harvest. The variety Q.28 is more resistant to the disease and should regain some of its former popularity provided ratoon stunting disease in it can be controlled.

The overall picture with regard to Fiji disease is good. Not a single diseased stool was found in either the Maryborough or Isis areas, and in the Bundaberg and Moreton areas only 133 and 193 stools, respectively, were rogued. These low numbers raise the possibility of elimination of the disease from the districts and a tightening policy with regard to the ploughing out of the remaining diseased fields has been adopted. The prohibition of the planting of P.O.J.2878 on diseased farms in the Bundaberg district has proved of assistance.

Chlorotic streak has shown a marked increase in the Maryborough area but surveys have shown that, though the disease is fairly widespread, there are adequate sources of clean seed available.

The Moggill disease trial area is now well established and results obtained during the past year have shown that it is quite suitable for Fiji disease resistance trials. Growth has been generally satisfactory and the hopper population high. The leaf scald trial planted there was not a success, but apparently not through any fault of the site: the planting was late and the planting material poor.

CANE-BREEDING ACTIVITIES.

In consequence of the good arrowing conditions during 1950, a total of 219 different crosses was set up at Meringa and all seed had ripened by August 2. Emphasis was laid on the desirability of using as many early-maturing varieties as possible in this cross-pollination work, and though further attempts were made to utilise Pindar this was the second year during which this variety produced no viable seed. The South African variety, N.Co.310, because of its early arrowing could likewise be used only to a limited extent. Except for the recognised profuse arrowers, arrowing amongst other varieties during the 1951 season was generally poor, and it was not possible to effect a number of crosses that had been set down for trial marriages. The first crosses were established on May 28 and it was expected that crossing would tail off gradually into early July.

An attempt was made to delay arrowing in a field of parent canes by the installation of powerful electric lights. These lights were switched on for an hour after midnight but it was considered that the experiment was commenced too late to influence this year's arrowing, and further investigations on the subject are to be carried out next year.

When making the 1950 fuzz plantings it was found that some of the seed which had been packed in painted tins had deteriorated appreciably, and since pliofilm containers had proved entirely satisfactory under similar temperature conditions a changeover was made to this form of packing, which has the added advantage of conserving space.

A refrigerator unit with a storage capacity of 28 cu. ft. has been installed at Meringa and will be utilised for storing all excess fuzz in the future. The provision of efficient cold storage on the spot should facilitate the problem of handling fuzz and supplying the other three experiment stations, and this section of the cane-breeding activities will no longer be dependent on commercial firms whose service was often unsatisfactory because of temperature fluctuations through the frequent changing of stored products.

As a result of the partial failure of some of the 1949 fuzz, fresh seed for the 1950 plantings had to be used at both Mackay and Bundaberg. At Mackay this necessitated autumn and spring plantings. Even in the normal course of events appreciable growth differences would have been apparent between the early and late planted seedlings; however, these differences were further augmented by adverse weather. It is doubtful whether the late-planted seedlings will be sufficiently advanced for selection this year and it is therefore probable that they will be ratooned and further selected next year. The current season marked the first occasion on which original seedlings were planted on the new Burdekin Sugar Experiment Station, and since no glasshouse facilities were available there, they were germinated at Meringa and forwarded in flats. In all, 8,582 seedlings were transferred to the field at Meringa, 3,199 at Brandon (Burdekin), 4,456 at Mackay, and 5,496 at Bundaberg. In addition, sett plantings of a further 978 varieties were made at Babinda and 723 on the scrub soil at Mackay, while 133 were sent from Bundaberg to Beerwah for testing in the Moreton area as possible standover types. The usual selections were carried out on all stations and probably the most advanced seedlings are B.174 (now Q.56) at Mackay and B.331, which shows promise on the Burdekin. The former has distinct early maturing characteristics but is inclined to lose cover at certain periods of its growth. Its yield approximates that of Q.50, but in view of the susceptibility of Q.50 to red-rot during the last few months of the year it is felt that a proportion of the Q.50 in the central districts could well be replaced by B.174, and possibly by some C.P.29/116 for very late harvest.

One of the most important phases of the year's plant-breeding activities was a search for new varieties of sugar-cane which was carried out in New Guinea from mid-April to early June. Several collections of sugar-cane had previously been made in the New Guinea lowlands, but the time involved in transporting the cuttings to Queensland was often so great that many of the canes were dead before arrival. In other instances when they did become successfully established, their susceptibility to either one or other of the many diseases present in Queensland was such that, with the exception of Badila, very few proved to be of outstanding merit. It was considered that, with modern air transport, very little difficulty would be met with in getting the canes established in a suitable quarantine area prior to their subsequent testing in all the major sugar-producing areas of Queensland.

The personnel of the expedition comprised Messrs. J. H. Buzacott (Senior Plant Breeder) and C. G. Hughes (Pathologist) and most of their time was spent in collecting in the central highlands of Papua. They had as their objective the collection of early-maturing canes which might prove of immediate benefit to the industry, while as a long-term project they were also interested in securing some of the more vigorous wild canes (chiefly *Saccharum robustum* and *S. spontaneum*) which would have a special value in future cross-pollination work.

In all, 165 varieties were collected and of these 163 reached Brisbane. Elaborate precautions were taken at both ends for the exclusion of pests and diseases. At the time of writing this report over half the number had successfully germinated. Their further progress will be watched with marked interest.

MILL TECHNOLOGY.

The major investigation during the 1950 season was that into the deterioration of raw sugar in storage and in transit. It included a survey of mill-storage sheds, drying tests at Babinda and Mulgrave mills, rapid deterioration tests with various micro-organisms, the sampling and analysis of sugar being loaded at three ports, and the spot sampling of sugar in several factories. Most of the work was of an exploratory nature and has provided information as to which aspects of the problem should receive more attention during the coming season.

Tests were conducted at Fairymead mill to study the effect of bentonite as an aid to clarification, and as the opportunity occurred at Mulgrave and Babinda mills pan and crystalliser tests were made. At the request of the manager of Mulgrave mill a thorough check of the factory work there was made. Investigations were made into the incidence of fly ash at Plane Creek, Proserpine, Millaquin, Tully, and Babinda mills, while brief series of boiler tests were made at the first three of these factories.

The mutual control scheme operated on a weekly basis during the season. Inkerman and Pioneer mills joined the scheme, so all mills outside the Colonial Sugar Refining Company Ltd. except Mourilyan and Rocky Point contributed.

Early in 1951 the work on the properties of molasses and massecuites was continued, use being made of the viscometer designed by the Bureau. The observations with massecuites differed somewhat from those made the previous year and further work is required before final conclusions can be made.

Extensive tests were made into the use of magnesium oxide instead of lime as a clarifying agent. The results have been so favourable that it is hoped shortly to carry out factory trials with the material. Coincident with the actual clarification tests, the manufacture of magnesium oxide in the active form has been studied. A satisfactory procedure has been developed, and this is being tried on a large scale.

The Mill Technology Division has been consulted by many mills in regard to new equipment, but more particularly in connection with the design of coil vacuum pans already on order or about to be ordered. As a result of the work of the last three years the Bureau has been able to make definite recommendations for the design of coil pans.

With the transfer of part of the mill technology operations to Bundaberg Sugar Experiment Station, it is hoped that much more attention can be given to factory investigations. At Millaquin mill, it is intended to attempt the manufacture of light magnesium oxide on a fairly large scale. Here, too, further clarification tests using magnesium oxide will be made. The sugar-deterioration work is proceeding. The wax-extraction plant has been moved to the Bundaberg station and further alterations have been made to the extractor. Trials with it will be continued as the opportunity occurs.

Suitable apparatus for bagasse-nuisance investigations was assembled during the slack season and tests were carried out during the crushing at Plane Creek, Proserpine, Tully, Babinda, and Millaquin factories. After the initial experience at Plane Creek it was decided that most satisfactory sampling could be obtained from the stack at a point some distance above the base. This necessitated the rigging of temporary platforms and the provision of access holes.

The experimental procedure and conclusions reached from the tests are covered in a paper, "Investigations into the Unburnt Bagasse Nuisance," submitted to the 1951 Conference of the Queensland Society of Sugar Cane Technologists. To briefly summarise, it may be said that complete elimination of the nuisance could only be obtained by the use of a suitable arrester and that, of the several types of arrester available, an inertia type consisting of a number of large cyclones would probably be most economical for sugar factories. At the same time the nuisance can be considerably mitigated by the use of water sprays and/or by the provision of large furnace volumes. Excellent results from the point of view of both bagasse nuisance and efficient steaming have been obtained with the large furnaces at Proserpine.

The opportunity was taken from time to time during the bagasse-nuisance investigations to study boiler operation and from this it would appear that, for the two types of grate which make up the large majority of Queensland installations, very different conditions as regards air supply must be guarded against if reasonable efficiency is to be obtained. There is a tendency to allow too much air into the furnace with sloping grates and too small an amount with flat grates. The correct amount can only be determined with a flue gas analyser.

SCIENCE BRANCH.

Mr. J. H. SIMMONDS, Officer in Charge.

The Science Branch consists of three Sections—Entomology, Plant Pathology and Botany. The work of these will be reviewed separately. In each case the section head has been largely responsible for the subject matter of the report.

BOTANY.

Work has proceeded along three main lines—identification of plants from outside sources, field investigations into particular problems of economic botany, and research in systematic botany.

The first half of the year was abnormally wet and many strange plants appeared, especially in agricultural areas. Consequently, the number of specimens received from primary producers was particularly large. Most of these were of weeds or suspected poisonous plants, and advice was given on their properties and methods of control. In addition, some thousands of specimens were identified for officers of this Department, the Departments of Public Lands and Public Instruction, the Sub-Department of Forestry, and C.S.I.R.O.

Field investigations included the study of weeds and poisonous plants as well as ecological surveys of particular areas. Of weeds investigated in the field, the following are the most important:—

Hoary cress (*Lepidium draba*): A small area of this aggressive weed on the eastern Darling Downs was treated with 2,4-D. Up to date, regrowth has been meagre.

Burr ragweed (*Franseria sp.*).—A field survey of a small area of this plant as made in the Burnett district. The plant was declared noxious under the *Stock Routes and Rural Lands Protection Act* and work on it was taken over by the Department of Public Lands.

Hemlock (*Conium maculatum*).—A survey revealed the presence of this poisonous weed along 20 miles of Blackfellow Creek and Tenthill Creek, which flow into Lockyer Creek.

Russian knapweed (*Centaurea repens*).—About 80 acres of this weed were located on the northern Darling Downs and preliminary spraying trials carried out. These yielded promising results and further work is planned for next spring.

Crofton weed (*Eupatorium adenophorum*).—In conjunction with officers of the Department of Public Lands, part of the Blackall Range area was searched for the presence of this weed. It was found to have escaped from a garden and to have spread along the banks of a small creek. Local action is being taken to deal with this infestation.

Clock weed (*Gaura parviflora*).—Though this plant has been in Queensland for more than 20 years, it has only recently begun to spread rapidly, mainly on stock routes, roadsides and silty creek banks. A survey showed appreciable areas in the Burnett district and the eastern Darling Downs as well as one small patch in the West Moreton district. A recommendation was made that the plant be declared noxious under the *Stock Routes and Rural Lands Protection Act*.

Lantana (*Lantana camara*).—A reconnaissance of some valleys in the West Moreton district showed that this plant was encroaching on good pasture land. The information gathered will be used in the planning of further research on the problem.

Groundsel bush (*Baccharis halimifolia*).—Spraying tests were carried out on this plant, using 2,4-D at high volume and low volume applications. Treatment proved effective provided plants were thoroughly wetted by the spray.

Artichoke thistle (*Cynara cardunculus*).—The presence of this plant was reported from two localities on the Darling Downs and action was taken to have any new plants dealt with as they appear.

Teucrium integrifolium: A report from the Peak Downs area stated that this native plant was becoming a very serious weed in cultivation on the black soils. Further investigation is planned.

One important experiment was connected with the aerial spraying of brigalow (*Acacia harpophylla*) with a 2,4-D/2,4,5-T mixture. Both suckers and mature trees were treated but it is still too early to assess the results.

Poison plant investigations were made in collaboration with veterinary officers. Of these, the most important was a survey of the area in south-eastern Queensland affected by Tallebudgera horse disease. The field evidence pointed so strongly to Crofton weed as the most likely causal agent that feeding tests with this plant were initiated by the Division of Animal Industry.

Botanists from the section assisted the Commonwealth Land Research and Survey Unit in an ecological survey of the Burdekin area, some weeks being spent in this field. Co-operation continued with C.S.I.R.O. in the Drug Plant Survey and several field trips were made for this purpose, the most important being one of three weeks' duration in the Mossman, Innisfail, Atherton and Evelyn Tableland region of North Queensland.

The Brisbane City Council sought the services of a botanist to name the large collection of native trees at the Sherwood Forest Park.

In the field of systematic botany, many groups of plants were critically examined in the herbarium and several papers were prepared for publication. These included a large paper on the eucalypts of Northern Australia, several smaller ones describing new species, and an account of the Cyperaceae collected by the Archbold Expedition in New Guinea. Examination of the 2,000 specimens collected in Cape York Peninsula by the 1948 Archbold Expedition was begun. This will help to fill in large gaps in the knowledge of the flora of Queensland and is expected to provide floristic links with New Guinea.

Specimens for critical examination were received from Denmark, Sweden and Holland as well as from Australian herbaria. Included among them were type specimens of several species of Queensland plants. Study of these is essential to a proper understanding of the nomenclature of these groups, and without it, much of the monographic work would have remained incomplete.

Many visiting botanists came to the Herbarium to do special work on particular groups of plants. They included C. G. G. J. van Steenis of Holland, Prof. Harold St. John of Hawaii, and botanists from Sydney, Canberra, Melbourne, Adelaide, Perth, New Guinea and New Zealand.

The results of a study of mulga regeneration in Queensland were published during the year and the manuscript for a handbook of Queensland weeds was completed. The latter gives descriptions and illustrations of the major weeds of the State, together with the latest information on control measures.

The second edition of *Australian Rain-forest Trees* was published under the auspices of the Commonwealth Forestry and Timber Bureau. This work, written by Mr. W. D. Francis, provides a much needed well illustrated book on the trees of the rain forests.

PLANT PATHOLOGY.

During the year the North Queensland pathology field station was re-established at Cairns and a new field station set up at Nambour. This has advanced the decentralisation of plant pathology activities and overcomes to some extent the difficulties associated with servicing a State of the size of Queensland,

Cereals.

Excessive rains during June and July caused severe waterlogging and root failure of wheat and favoured the development of various fungous diseases. Further rains towards the harvesting period added to these troubles. A general result was the development of much pinched and weakened grain.

The new biotype of stem rust proved to be widespread. Yalta and Kendee varieties were attacked severely, Gabo and Charter to a variable extent and Lawrence and Celebration only lightly or not at all. Other diseases more prevalent than usual were glume blotch (*Alternaria* sp. and *Helminthosporium* sp.), powdery mildew (*Erysiphe graminis*), leaf spot (*Septoria tritici*), and node blotch (*S. nodorum*). The last was not as conspicuous here as in some other States.

The root rot of wheat which had previously been localised in the Bongeen area assumed considerable economic significance. Two fungi likely to be implicated in the disease were isolated but their pathogenicity has yet to be proved.

A record of root rot (*Gibberella zeae*) of maize was of interest. This disease is regarded as serious in the southern States and the same organism is a common cause of cob rot in Queensland, but this is the first record of the foot rot phase of the disease here.

Special attention was given to the cataloguing of sorghum diseases, 14 of which are now recognised in Queensland. The bacterial and fungal leaf destroying diseases were active, but covered kernel smut was practically confined to untreated seed. An event of interest was the discovery of head smut (*Sphacelotheca reiliana*) for the first time. This disease is potentially a greater hazard than covered kernel smut because it is soil borne.

Miscellaneous Field Crops.

Potatoes received attention at Gatton Irrigation Research Station, where a scab resistance trial and an experiment to determine the effect of varying rotations on potato diseases are in progress.

Blue mould of tobacco was unusually prevalent and is still difficult to control in the field. However, the now well established method of treating seed-beds with benzol is effective. Mosaic continues to be the most widespread parasitic disease.

Onion downy mildew was severe during 1950, seed crops particularly being affected. As the economics and efficacy of spraying for this disease are uncertain, experiments are planned for field control experiments in the 1951 crop.

The 1950 linseed crop suffered serious losses from pasmo (*Sphaerella linorum*), a disease which had been recorded for the first time in Queensland the previous year. Where infections were advanced before the bolls were filled, discoloured, crimped, lightweight seed resulted. Complete loss of the crop occurred in some instances where replanting had been carried out on the previous season's linseed ground. Under these conditions a basal lesion commonly develops and kills the main stem before the flowering period. An experiment embracing 15 varieties of linseed with two times of planting was laid down in the Oakey and Westbrook districts. Disease ratings obtained from these plots will give a good indication of the resistance or otherwise which may be expected in the common linseed varieties.

A smaller acreage sown to peanuts last season resulted in better attention being given to suitable rotation of crops and consequently crown rot (*Aspergillus* sp.) was noticeably less prevalent. The growing of a succession of peanut crops on the same land is definitely conducive to excessive crown rot losses, with which seed treatment alone is unable to cope.

Temperate Fruits.

Black spot (*Venturia pirina*) of the pear and apple scab (*V. inaequalis*) are two diseases which normally affect Stanthorpe fruit very little compared with that in the southern States. In fact, it is usually difficult to find apple scab in Queensland. However, following the abnormal wet winter and spring of 1950 both diseases were prevalent, the former in epiphytotic proportions.

Seasonal conditions were also conducive to a heavy infection of brown rot of stone fruits. Experiments have shown that normal spray schedules do not give a satisfactory control in a bad year, and samples of some of the new fungicides are now being obtained for trial next season.

In conjunction with the Horticulture Branch the value of fungicidal treatments in prolonging the storage life of citrus fruit was investigated. A solution of 1 per cent. sodium salicylanilide and a mixture of 4 per cent. borax and 2 per cent. boracic acid gave fair control of blue mould, while the former also controlled stem end rot. The addition of a wax emulsion greatly improved the overall appearance after a month's storage.

In studies of prolonging the life of citrus seed by seed treatment, Tetroc (an organic fungicide) gave consistently better germination after 28 days' storage under both cool and room temperature conditions.

Strawberry growers are becoming increasingly conscious of the necessity for improving the quality of their planting material. The approved runner scheme has received good support and where availed of the incidence of virus diseases has been negligible.

Fig rust was particularly severe in the metropolitan area and is considered to be one of the causes of an early leaf fall which prevented the maturing of a considerable portion of the late crop. From a survey carried out it appears that in a bad rust season a copper spray applied prior to full leaf and again in early December is preferable to a single spray in November when the trees are in full leaf.

Experiments to find strains of passion fruit resistant to the species of *Fusarium* causing wilt have been continued. Individual plants exhibiting some resistance to one or more strains of the fungus have been found and the further performance of these is being followed.

Tropical Fruits.

Following on previous attempts to control top rot (*Phytophthora cinnamomi*) of pineapples by fungicidal treatment, a further experiment has been laid down at Maroochy Experiment Station, trying out several types of copper fungicides and methods of application.

Pineapple base rot (*Cerastomella paradoxa*) is controlled in a normal season by giving attention to drying out the planting material. However, in a wet season this practice does not always prove adequate. Consequently, attempts are now being made to ascertain the effect of superimposing a fungicidal treatment.

The attempt to limit the spread of Panama disease of bananas in southern districts by careful inspection of all plantations from which planting material is to be obtained is apparently meeting with success. Though this matter involves considerable work, the scheme is now running smoothly and should eventually prove of great benefit to the banana industry. There appears to be some field evidence that once a plantation becomes affected with Panama disease the cessation of soil cultivation will reduce the rapidity of subsequent spread.

A survey of banana leaf diseases in North Queensland has been commenced. These are of much more consequence in northern than in southern plantations and it is planned to experiment on their control by fungicides, keeping in mind the economics of the operation.

The investigation into custard apple fruit rots which was referred to in the last annual report was taken up again and further progress has been made in differentiating the three types of disease in the field and proving the pathogenicity of the associated organisms.

Papaw growing has long been seriously hampered by dieback disease, the cause of which is still in doubt. As the available evidence points to a virus origin, inoculation experiments were carried out on a field scale to see if one of the commoner viruses is implicated. Since dieback does not usually show up until the plants are well grown, results cannot be expected until next summer. As control of this disease is only likely to be achieved by the use of resistant varieties, a start has been made in attempting to locate such plants. A thousand seedlings comprising 11 different strains, of which nine are derived from apparently resistant parent trees, have been planted out and their reaction to the disease will be awaited with interest.

As the source of the various papaw fruit rots is considered to be largely the decaying leaf stalks, a trial was carried out to ascertain what degree of control of fruit spotting could be obtained by systematically removing old leaf stalks before they exhibited infection. This procedure definitely reduced the amount of fruit spotting, but it is doubtful whether the gain was sufficient to justify the time and expense involved.

Vegetables and Flowers.

Most of the common vegetable diseases were prevalent in the year under review. In beans, angular leaf spot (*Isariopsis griseola*) caused severe leaf drop in many crops in 1950 and large plantings had to be abandoned. Fortunately, non-irrigated crops growing under drier conditions prevailing in the 1951 season have been less affected. Halo blight and common bacterial blight have been widespread and have interfered with the production of an adequate certified seed supply.

A survey of market diseases of beans showed that nestiness (*Sclerotinia sclerotiorum*) was by far the most important source of loss in beans forwarded to southern markets, whereas anthracnose was most commonly seen locally.

An important feature of the year's activities was the commencement of tests of disease resistant strains of tomatoes and other vegetables. The work is a co-operative effort between the Science and Horticulture Branches, the former being responsible for assessing the disease situation while the latter determines the agronomic possibilities.

A further experiment dealing with the control of powdery and downy mildews of cucumbers was carried out last spring. None of the newer fungicides used was sufficiently outstanding to supersede Bordeaux mixture. The toxicity of sulphur to cucumbers was confirmed and was of such a nature that it is considered inadvisable to use sprays or dusts containing this ingredient on cucumbers.

There is an increasing interest in commercial flower culture in the metropolitan and other areas and the numerous diseases associated with these have prompted many inquiries. Several diseases proved to be new records for Queensland, for example, anthracnose (*Colletotrichum antirrhini*) and downy mildew (*Peronospora antirrhini*) of snapdragon and leaf scorch (*Staganospora curtisii*) and base rot of daffodil. One of the most destructive of these flower diseases was leaf spot (*Septoria dianthi*) of carnation. In one locality the majority of unsprayed carnations were destroyed by this disease and even with consistent spraying with copper fungicides it was found difficult to check the disease on susceptible varieties.

Forestry.

Severe losses amongst one-year-old hoop pine seedlings at Como Forestry Nursery were found to be due to a collar rot caused by *Sclerotium rolfsii*. Cheshunt mixture exerted no control of the disease and the stock was eventually lifted and burnt and the beds sterilized with copper sulphate.

Phytophthora cinnamomi was found associated with *Pythium* sp. causing extensive damping-off of seedlings of *Eucalyptus pilularis* at Beerwah, but the trouble was eventually checked by the application of Cheshunt mixture.

General.

The call for bacterial cultures for legume inoculum continues to increase from year to year. The position is vastly different from a few years ago and it would seem that the benefit of inoculation has proved sufficient to appeal to the farming community.

The appointment of a bacteriologist during 1950 made possible the investigation of a number of the bacterial diseases of this State the identity of which was previously in some doubt.

ENTOMOLOGY.

Excessive rain in many districts over the latter half of 1950 and in January, 1951, followed by dry conditions for the remainder of the half-year, caused breakdowns in some commercial pest control programmes and interfered with field experiments. Much valuable information was obtained, however, on controls and insect behaviour under the prevailing conditions, though in general no outstanding pest infestations were experienced.

Deciduous Fruits.

Trials and wide observations of farm routines over several years in the Stanthorpe district have resulted in the revision and stabilisation of spray schedules for codling moth (*Cydia pomonella* L.) and light brown apple moth (*Tortrix postvittana* Walk.). Recent attention has been concentrated on mites, though damage by these pests has not been as severe as in the previous two years. Population surveys have been carried out, and preliminary field trials suggest that the earlier standard sulphur and white oil treatment may be more efficacious than either BHC or E.605 (parathion).

Harvest results from field trials against red scale (*Aonidiella aurantii* Mask.) on figs in the Sunnybank district confirmed the conclusions of the previous season. Double applications of lime sulphur in winter, and of white oil in December and again where necessary in the autumn, have increased yields by some 20 per cent. in a bad crop year. This completes a project which conclusively demonstrates a sound economic spray schedule.

Fruit Flies.

These pests constitute one of the major entomological problems affecting horticultural production in the State, and during the past 12 months have been recorded as causing damage in widely separated localities. In deciduous and citrus orchards routine sprayings with DDT appear to give considerable relief, though randomised field trials with DDT and E.605 have yielded but inconclusive information. Field and laboratory studies of these pests have been intensified.

Citrus.

The bronze orange bug (*Rhoecocoris sulciventris* Stal.), usually considered a coastal species and rarely found west of the Dividing Range, was reported from many localities on the Darling Downs, and at Stanthorpe and Inglewood.

Preliminary inspections of the damage caused by moth larvae at Burrum and in other North Coast districts have been made.

The chief investigational work on citrus pests during the past year has been concerned with white wax scale (*Ceroplastes destructor* Newst.), and gall wasp (*Eurytoma fellis* Gir.), which is causing considerable apprehension in the citrus industry. Progress has been made against both these pests. The heavy white wax populations on groundsel (*Baccharis halimifolia*) are being used for screening a large range of insecticides. Early in January the reputed systemic insecticides were used against gall wasp in heavily infested grapefruit at Nambour. Outstanding kills of young wasp larvae by sodium fluoroacetate have indicated another approach to the problem of controlling this pest, and provide a foundation for further work next season.

Tobacco.

Extensive trials with DD against nematode (*Heterodera marioni* (Cornu) Goodey) in the Ayr, Bundaberg, and Miriam Vale districts were seriously affected by rain. Results from one of the trials, however, suggest that this work if continued should demonstrate results of economic importance. Although not strictly amenable to statistical analysis, yields of green leaf from double-line and normal over-all treatments did not differ appreciably, and both were twice those from untreated plots. At Ayr weather conditions also ruined a heavy programme of nematode-weed controls in seed-beds. Results of a third annual examination of pulled tobacco on crop rotation trials in this district did not favour any of the rotations as possible nematode controls.

Detailed trials with the looper (*Plusia argentifera* Gn.) were continued, but pest populations were not heavy at any time on the trial sites. The control of loopers is gradually becoming clearer, and for the present it

is a matter of balancing the best that can be attained economically with modern insecticides, which is more than a 90 per cent. kill, against the requirements of leaf quality. In some crops moderately high populations of *Prodenia litura* Walk. were present when spraying operations were impracticable.

Mite attacks were not severe in the south-western areas during the summer.

Potato.

Field infestations by tuber moth (*Gnorimoschema operculella* Zell.) were not severe in any of the recognized potato growing areas of the State. Large-scale experiments and commercial pilot trials covering field and storage protection against this pest were concluded successfully. In the field a combination of DDT spraying and cultural practices has proved economic, and tuber dusting continues to keep storage losses low.

Under both experimental and commercial conditions DDT-impregnated bags provide adequate protection against moth attack on bagged tubers.

Grain Pests.

Experiments on treating various kinds of stored grain with BHC and DDT dusts for preventing weevil (*Calandra oryzae* L.) and other insect damage were continued throughout the year. It is now obligatory to use strong BHC dusts with hybrid maize and other certified seed sold in Queensland, and these dusts are recommended for use when storing many other seeds.

The scarcity of carbon bisulphide has accentuated the problem of reducing insect pest damage in grain stored for food or fodder. Suitable BHC dusts for fodder protection have been suggested with the present proviso that grain so treated should not be fed to poultry or dairy cows. Grain treated with pyrethrin-piperonyl butoxide dusts has been under observation for some time, and these dusts may have a valuable, though limited, use in Queensland.

Vegetables.

The almost universal use of the wide range of insecticides now available and tested has in general greatly reduced insect damage to vegetable crops. Red spider (*Tetranychus urticae* Koch), thrips and aphids are still causing some concern, chiefly in early spring, and the control of these pests has been given prior consideration. Yield trials have shown the economic value of E.605 dust and spray schedules against these pests on cucumbers, and also against red spider on beans.

Six randomised trials with DD against nematodes in land used for summer planted vegetables were established in areas adjacent to Brisbane. To date, only the tomato trials have been harvested, and where the pest populations were moderate to heavy, phenomenal yield increases have been recorded. These results, as well as the possibilities of economic nematode control in tobacco, strongly support the contention that detailed investigations of nematodes and their control, which are difficult and specialised subjects, would be well worth while.

Systemic and other new insecticides were tested against onion thrip (*Thrips tabaci* Lind.). Results from these screenings will be the basis for larger scale trials during the coming season.

Green vegetable bug (*Nezara viridula* L.) was active in many crops on the Darling Downs. Though more prevalent on beans, tomatoes and vegetable crops in general, large numbers were present on Poona pea, navy beans, sunflowers and sorghum. This pest was also a nuisance on beans and tomatoes in the Brisbane area.

Two interesting records of locally serious insect damage are from the South Coast. A melolonthid beetle (*Diphucephala lineata* Bois.) practically defoliated large areas of vegetables, particularly carrots, at Currumbin, and a mirid bug (*Lygus gryllus* Gir.) ruined areas of mature and young lettuce at Southport.

Tropical Fruits.

Experiments with single applications of nicotine-white oil against the pineapple scale (*Diaspis bromeliae* Kern.) were completed in 1950. The percentage kill was not sufficient for a satisfactory control. A further trial combining E.605 and cultural treatments has been commenced, and life-history studies are being continued.

Attempts to incorporate the more modern insecticides into the controls for the banana weevil borer (*Cosmopolites sordidus* Chev.) have not been successful, but the wide commercial use of a DDT-BHC dust against the banana thrips (*Scirtothrips signipennis* Bagn.) is giving general satisfaction.

Miscellaneous Field Crops.

The grass grub (*Oncopera mitocera* Turn.) operated in large numbers in the Ravenshoe and Evelyn districts during early November. *Aphis leguminosae* Theob. caused considerable damage to developing Poona pea crops in the Cambooya-Pilton area. An armyworm (*Cirphis unipuncta* Haw.) was present until mid-November in localities from Warwick to Dalby, and another species also attacked rice crops in North Queensland. Infestation of linseed by *Heliothis armigera* Hubn. was at a low level, and conditions were unsuitable for implementing work as planned on DDT dosages.

The more extensive and wider growing of grain sorghums over the past few years has revealed a correspondingly wider distribution of sorghum midge (*Contarina sorghicola* Coq.) During the year this pest was recorded from all sorghum growing areas as far north as Rockhampton and west to Emerald and surrounding districts. Overall damage was light, but in some fields this pest again demonstrated its ability, when present in large numbers, to destroy a crop completely. The urgent necessity for some method of reducing losses caused by this midge was appreciated in a practical way. Large randomised trials using DDT in various dosages and timing schedules with regard to sorghum head development, and screening tests with several other insecticides, were completed. Careful observations were also made on some commercial sprayings. It is now obvious that DDT treatment, which has been so successful in the control of a number of field crop pests, is not the desired answer to the sorghum midge problem. Spraying with this insecticide in a heavily infested field doubled the yield but gave only a 60 per cent. control. BHC gives promise of improving this performance, and further trials will be undertaken at the first opportunity. An ecological study of the sorghum midge is in progress.

Apiaries.

Neither of the foul broods was recorded during the year. Dysentery was prevalent in many apiaries during the wet midsummer, and starvation was responsible for the loss of a number of colonies. In one locality two beekeepers lost 53 out of 271 hives in four apiaries, and circumstantial evidence suggests nectar or pollen poisoning.

At March 31, 911 beekeepers, 58 less than in the previous year, were registered. This decrease is due largely to the poor season, when many small-scale beekeepers lost their colonies.

The large number of inquiries receiving attention reflects the good relations between beekeepers and this Department, and a minimum of policing duties indicates the smooth working of *The Apiaries Act of* 1947.

Recently a wax mill commenced operations in the State, and is now processing wax foundation. This should provide regular and adequate supplies of this essential commodity to Queensland beekeepers.

Fauna Protection.

Four new sanctuaries covering 96,134 acres were declared, and 62 honorary protectors were appointed. A revised district register now lists 1,133 active honorary protectors throughout the State.

An intensive publicity campaign on fauna protection has been organised. This includes the preparation and placing of coloured posters, press notices, circulars and radio addresses. In four instances salutary action was taken against offenders shooting protected fauna.

Wild duck were kept under observation and as they were plentiful it was recommended that an open season be declared at a comparatively early date.

Flora Protection.

The honorary rangers under *The Native Plants Protection Act of* 1930 include one recent appointment. Attention has been given to the sale of protected plants and florists are now acquainted with the legislative requirements of this type of business.

CHEMICAL LABORATORY.

Dr. M. White, Agricultural Chemist and Biochemist.

Conditions which favoured insect pests of crops and parasites of stock over most of the year were also conducive to certain plant deficiency diseases. Some of these were reflected in the health of grazing animals.

The influence which these related problems had on the year's work can be seen in all sections of the Branch.

PLANT NUTRITION SECTION.

In last year's report attention was drawn to the increasing demand for the services of soil technologists in the field. The demand has been even greater in the year under review, and endeavours to satisfy this have, unfortunately, meant the curtailment of other important investigational work.

Field Work.

This may conveniently be grouped under the headings of (*a*) soil survey, (*b*) soil and plant, and (*c*) soil, plant and animal inter-relationship problems.

(*a*) *Soil Survey.*—Reconnaissance types have represented the main soil surveys in previous years, but recent developments in irrigation have increased the demand for detailed surveys.

Reconnaissance surveys were completed and reports compiled for areas in the Neumgna, Mooloolah, Burdekin, Balcomba, Foleyvale, Banana, and Wandoo districts.

Detailed surveys completed during the year were those of Moura, Redlands Experiment Station, portion of Foleyvale, and certain subdivisions at Clare; that of Hermitage Regional Experiment Station is almost finished. In addition, an area of approximately 8,000 acres at Landers Creek, in the Burdekin district, is at present being surveyed in detail.

(*b*) *Soil-plant inter-relationships.*—New areas showing boron deficiency in vegetable crops were recorded. Field evidence of this trouble is most clearly obtained with root crops. Bright-coloured foliage, the formation of multiple crowns, and cracking of the roots are characteristic and easily recognisable symptoms. From laboratory studies, a satisfactory confirmatory test was devised.

Another case of successful foliar diagnosis was that of magnesium deficiency in cotton, which is characterised by green veins and purplish colouration of the lower leaves.

As each case of minor element deficiency, or excess, is correctly diagnosed, a photograph in colour is prepared. These will form a teaching and demonstration library.

(*c*) *Soil, plant, and animal nutrition disorders.*—Co-operative work by the biochemical and plant nutrition sections in studying dietary problems of animals has been undertaken in several districts. At Neumgna it was demonstrated that cattle were probably suffering from a deficiency of copper, and that this, in large measure, was due to the inability of the natural pasture species to take up sufficient of this element to meet the requirements of a grazing dairy herd. Adjustment of the position is possible by (*a*) supplying the copper to the animal by means of a lick, and (*b*) putting a greater area of the farm under the cultivation of crops capable of taking up more copper.

Field Crop Investigations.

Analyses of numerous soil samples in connection with fertilizer field trials with both crops and pasture have been completed. The crops include potatoes, wheat, linseed, peanut, maize and jute.

In addition to the soil analyses, lucerne and wheat from fertilizer trials were analysed for nitrogen, calcium, magnesium, potassium, sodium, and phosphorus. No significant differences in the uptake of these major plant foods were obtained as a result of various fertilizer treatments.

Several fertilizer trials with beans, and one with pineapples, were laid down in collaboration with the Horticulture Branch. Soil checks on the fertility of the blocks in the case of the bean trials, and for acidity and soluble aluminium in the case of the pineapple soils, are being made periodically.

Profile analyses of soil samples were completed and interpretations made for the Bureau of Investigation of Land and Water Resources. The submissions were from Mareeba-Dimbulah, Hahn and McIvor Rivers, Logan-Albert districts, and Darling Downs.

Forestry Nursery Experiments.

Fertilizer Trials.—Two fertilizer trials (at Beerwah and Beerburrum), to compare the effects of applied nitrogen, phosphoric acid and potash on *Pinus caribaea* seedlings, were completed. Both experiments gave similar results, a marked increase in growth being obtained only from phosphate. Nitrogen, in the form of sodium nitrate, depressed growth, as did sulphate of ammonia in the previous year's experiment. This unexpected result will be examined further.

Minor element trials at Beerwah, Beerburrum, and Passchendaele, using copper, zinc, boron, and molybdenum, showed that these substances when applied to the soil were without influence on the growth rate of exotic seedlings.

Fertilizer trials on hoop pine seedlings, using nitrogen, phosphoric acid, and potash applications, with and without added animal manure, were carried out at Yarraman and Benarkin nurseries. Responses to phosphoric acid were obtained in all experiments, but the manure treated blocks were superior to those without manure. As ample nutrients were applied in all cases, the increase due to manure is thought to be associated with either an increase in the moisture-holding properties of the soil or an induced and more favourable microflora.

Parallel experiments were carried out at both Yarraman and Benarkin, using molasses and formalin as preplanting treatments on seedling beds which for many years had had heavy applications of sawdust. Increased growth in the seedlings was obtained with both treatments, the better being due to molasses, which also improved the soil structure by altering the percentage aggregation. Increases in percentage aggregation of 21 and 25 respectively were obtained at Yarraman and Benarkin.. Molasses was applied at the rate of 11 tons per acre. The molasses experiments have been repeated on the same plots this year, and the progress will be followed by height measurements on the seedlings and aggregate analyses on the soil.

The effects of green manurial treatments on soil structure are also being studied.

Watering of Flooded Gum.—An experiment designed to test the effects of saline water on flooded gum showed that this species is relatively sensitive to salt in solution, and the critical level is present in the Yarraman Nursery water at certain periods of the year. Hoop pine seedlings are quite unaffected by water of a similar salt concentration. The analyses are being continued, but they already show when use of this water would be dangerous.

Examinations of Soils and Water.

Fertility tests on soils, and water analyses to determine their suitability for stock or irrigation, are carried out free of charge for primary producers and reports forwarded to the senders. This service is very popular and approximately 200 samples of soil and 36 of water are being analysed monthly.

TOXICOLOGICAL SECTION.

During the year under review 455 samples were submitted to the section, either by officers of the Department or by the general public. In addition, routine tests for arsenic and nitrates were carried out on a number of waters whose quality for stock and irrigation purposes was being assessed.

Investigations.

Investigations of the assimilation of selenium and tellurium by plants, and the mechanism involved in the reduction of nitrate to nitrite in natural waters by boiling with meat offal, were continued. Both are of importance to the livestock industries; the first by reason of the taint imparted to flesh and milk, and the second through the toxicity of nitrites. Many plants were examined for oxalates in connection with the calculi programme of the Biochemical Section.

Nature of Specimens.

Of the specimens sent, 373 were viscera in connection with stock mortalities, 19 plants for nitrate determinations, 12 waters suspected of contamination with poisonous substances, 14 feeds suspected of having contributed to stock mortalities, and 37 miscellaneous samples for identification or for testing for compliance with purity standards. About one-third of the viscera samples contained arsenic, three samples strychnine, five lead, and five nitrates in amounts which, taken in conjunction with field evidence, would suggest their responsibility for the mortality. Carelessness in the use of arsenic is still evident, and one mortality involving a large number of sheep followed dipping in arsenic during wet weather.

A report of taint in meat from the cold room of a butcher's shop was investigated, and it was shown that milky pine sawdust was involved.

Careless storage of poisons continues to bring needless work to the section. In one case potatoes had been grossly contaminated with arsenic pentoxide.

BIOCHEMICAL SECTION.

This section has materially assisted with two investigations reported by the Division of Animal Industry.

The first, which arises from a study on fertility in rams, has involved the weekly estimation of blood vitamin A levels in experimental animals, together with liver vitamin A assays from specimens taken at the beginning and the end of the investigation. Considerable difficulty was experienced in obtaining reproducible results, but a satisfactory technique has now been developed and all aberrations accounted for.

In the second, weekly analyses were made of blood taken from a control group, a group receiving a copper supplement, and a group receiving a copper plus cobalt supplement. The supplemented groups showed a general improvement and, concurrently, a more satisfactory blood copper status, but following a balance-sheet experiment in which retention was checked against administration, it was felt that the weekly drenching with two grams of copper as copper sulphate was sub-optimal. This investigation will be continued.

The section has maintained an active interest in two of the three main lines of research previously reported (fluorosis and calculi) and has initiated programmes on copper administration and evaluation of fodder trees.

Fluorosis.

Two main courses of enquiry have been continued:—

(i.) *To obtain data on the effect of harsh feed on the teeth of sheep which had been exposed to water containing fluoride for the first two years of their lives.*—Twelve animals, left after two years of attempted mitigatory treatment, were allowed restricted grazing plus grassy lucerne fed in bales, and were given access to town water. They have been under observation for two years and the deterioration in the incisor teeth has been noted. It is proposed to examine the bones, flesh and organs of these animals in detail.

(ii.) *To examine the onset of symptoms of fluorosis under different periods of exposure to, and protection from, fluoride in the drinking water.*—Delayed eruption of permanent incisors, plus individual susceptibility of sheep in any one group, have made comparison of treatments somewhat inconclusive. It is proposed to continue these studies for another year.

Calculi.

Work on this serious disorder of sheep has been restricted to the regular analyses of pasture specimens from suspected or incriminated paddocks. A visit was made to an area immediately following the death of a sheep showing urinary blockage due to calculi. The urines from 25 sheep selected at random were examined to see if the alkalinity which favours precipitation in the bladder was present, but all showed normal values. It was concluded that this was an isolated case and that further losses were not likely to occur at that time. Specimens have also been examined from isolated cases in two other localities. Further work will be undertaken as opportunity occurs.

Edible Shrubs.

The task of estimating more closely the value of these "topfeeds" by actually measuring the apparent digestibility of their constituents has been commenced, and figures are complete for two varieties of mulga and for kurrajong. The digestibility is quite low for all food groups, and though this represents one series only and for one year only, it must be remembered that it was a particularly favourable year. It is quite clear from this work that the usual stockfood analysis alone is not suitable for gauging the fodder value of mulga and kurrajong, and the possibility that this may be true of other tree fodders is to be tested. The value of this work goes beyond that of a comparative study; it provides another clue to better practices in drought feeding.

Copper Administration.

"Steely," "satiny" or "doggy" wool is now recognized as an unfailing indication of insufficient copper in the diet of the sheep. Officers of the section have been preparing copper compounds and attempting, with them, to establish within the animal a reserve of copper insufficient to be toxic yet capable of yielding, progressively and over long periods, the small necessary daily release.

Fodder Deterioration.

The prolonged storage of fodder under conditions of high temperatures and free air circulation leads to a deterioration that can be attributed almost entirely to oxidation. This places some restrictions on fodder conservation, whether of locally produced roughage or of hay bought in the more favoured agricultural areas. The size of bales, their shape, and the baling pressure have a bearing on this loss. The protection of stacks from wind and insulation against heat are also important, but it is equally important not to condemn the practice of conservation or storage by initial over-capitalisation on the protective installations, and so, to gain more precise information, a beginning has been made on the annual plotting of loss in net food value in stored fodder.

GENERAL ANALYTICAL SECTION.

Pest Destroyers.

The plotting of efficiency against dose rate and the estimation of spray or dust residues have involved the section in over 300 analyses of DDT and BHC. These newer organic compounds are also used extensively in tick and buffalo fly control work. When they first became freely available, many cattle owners readily used them in place of arsenical dipping fluids. By 1950, two-thirds of the dips submitted for analysis were either DDT or BHC formulations. That position was maintained in the year under review.

Taints from Insecticides.

Marked protection against weevil attack is obtained when grain is treated with small quantities of BHC. There was a suspicion that, at the recommended levels, commercial preparations of BHC might affect the flesh and/or eggs of poultry fed treated grain. From the results of a conjoint experiment, it has been possible to set limits, and this information will shortly be ready for release.

Fodder Crops and Grain.

The regional experiment stations have provided fodder crop samples for studies of lime and phosphate uptake. Some of the newly-introduced winter cereals have shown up well, but the work should be continued for at least three years before conclusions are drawn.

At appropriate intervals during the year samples of Flinders and Mitchell grasses, cut from open plain country near the northern limit of their growth, were analysed. The protein content of the Flinders grass fell below 2 per cent. at its worst and reached only 6 per cent. at its best. The corresponding figures for Mitchell grass were 3 and 6 per cent. These are low, and taken with the phosphate figures, which ranged from .07 to .35 per cent. and only twice exceeded the .3 per cent. level which is regarded as critical, emphasise the difficulty that must be experienced not only in producing calves there, but also in rearing them.

Many of the phosphate figures are sufficiently low to indicate that phosphate is a major cause of infertility in stock. They point unmistakably to the need for continuous administration of phosphate supplements to breeding stock.

Perosis or "slipped tendon" is a disorder of poultry arising from insufficient biotin or manganese, or both, in the food. Milling by-products (bran and pollard) are richer in manganese than the whole grain, and as these have largely been replaced by grain in some areas it was decided to examine locally-produced grain for manganese status. It is interesting to record that perosis occurs on the Atherton Tableland and that maize produced there is low in manganese. The disability is not serious, for it can be remedied simply by the addition of small quantities of manganese salts to the poultry mash.

DIVISION OF ANIMAL INDUSTRY.

VETERINARY SERVICES BRANCH.

Mr. C. R. Mulhearn, Director of Veterinary Services.

Seasonal and pastoral conditions during the year are dealt with in some detail by the Director of Sheep Husbandry and the Officer in Charge, Cattle Husbandry Branch, so that the reader seeking information under these headings is referred to their reports.

The Government Statistician's figures show that at March 31, 1951, there were 6,733,548 cattle, 17,477,578 sheep and 374,991 pigs in the State.

STAFF.

The appointment of additional veterinary officers and the advent of further private practitioners greatly increased the veterinary services throughout the State. New Departmental officers were appointed to the Brisbane, Burnett and Rockhampton divisions for general duties, while one officer was stationed at Cloncurry to conduct contagious pleuro-pneumonia investigations in north-western Queensland. Two veterinary officers resigned during the year.

Five veterinary surgeons commenced practice in country districts and two in Brisbane. The establishment of additional practitioners in country districts is very gratifying and it demonstrates the value of the Departmental scheme for attracting these trained men to centres where their services are available to primary producers.

Some difficulty is being experienced in maintaining the stock inspection staff at full strength and new appointments during the year were outnumbered by resignations, retirements and transfer from the branch.

An examination of candidates for appointment as stock inspectors was held during the year and the staff will be increased in the near future from the successful candidates.

PEST AND DISEASE CONTROL.

As frequently happens in a bounteous season, the incidence of certain diseases was unusually high. Very serious losses due to blackleg in calves and contagious pleuro-pneumonia were recorded.

The excessive spring and early summer rainfall made conditions very favourable for the propagation of external parasites of cattle with the result that there was a marked increase in the degree of infestation of cattle tick and buffalo fly and both parasites extended beyond the limits of infestation of the previous year.

There was no obvious increase in the incidence of the common diseases of dairy cattle, tuberculosis and brucellosis. Conditions such as mastitis and sterility were not so regularly reported and did not appear to cause such economic loss as during some previous years. This may have been associated with the dry conditions during the autumn months, when these conditions are usually most prevalent.

As in past years, internal and external parasitism, tuberculosis, leptospirosis and footrot were most prevalent in coastal areas whereas tick fevers were more commonly encountered in marginal tick zones some distance from the coast.

Contagious Pleuro-Pneumonia.

Inspections of stock in the far north-western portion of the State are now easier to arrange than has been the case in the past, due to a large extent to additional staff, and this may have accounted for the relatively high number of 58 outbreaks of contagious pleuro-pneumonia reported, but even so it was quite evident that the disease was more prevalent than during an average year. It is apparent that the disease is continually smouldering on a number of properties in the Gulf and Peninsula areas where control measures are very difficult owing to the impracticability of regular inspections and musters. It is possible that the actual losses on one of these properties, apart from the potential outbreaks that may develop when recovered animals are travelled, are of a more serious nature than those experienced in recorded outbreaks in the more closely populated areas of the State which are readily diagnosed and controlled.

As indicated in Figure 1, there has been a progressive increase in the number of outbreaks during the past three years. This may have been associated with favourable seasonal conditions which have permitted large scale movements of store stock from areas in the Northern Territory and north-western Queensland where the disease is common.

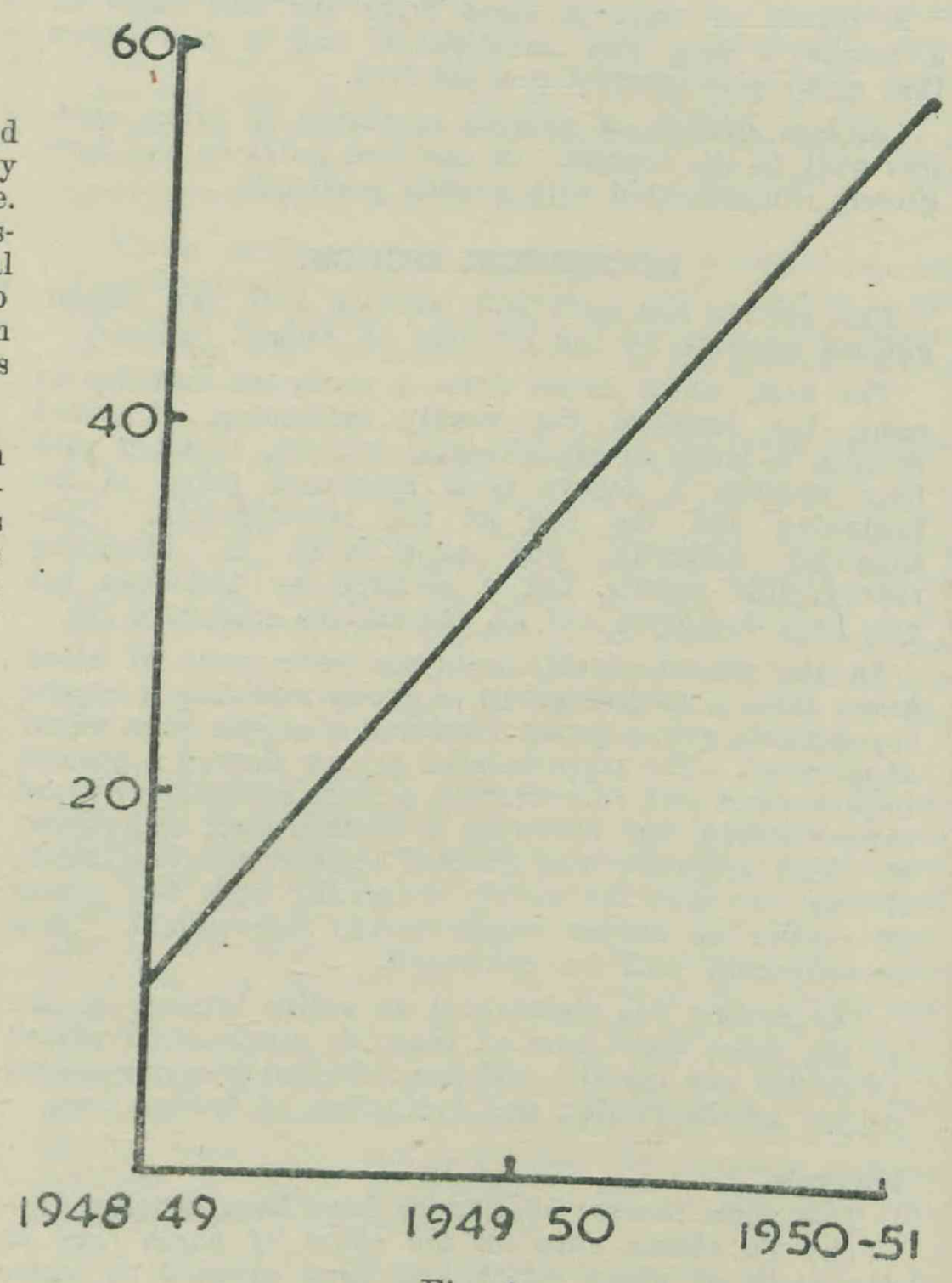


Fig. 1.

PLEURO-PNEUMONIA OUTBREAKS REPORTED IN THE PAST THREE YEARS.

Though a large proportion of the outbreaks were associated with Northern Territory cattle in the far western areas, the disease was still very widely distributed and outbreaks were recorded in all the principal stock areas of the State. The wide distribution necessitated modification of a control programme whereby it was proposed to impose restrictions on the movement of cattle from areas where the disease is relatively common to areas in the south-eastern corner of the State where the disease is ordinarily rare. However, preventive inoculation was still made a condition for the issue of permits for store cattle travelling from or through a suspected area.

The disease is controlled in the majority of outbreaks by the usual measures of quarantine and inoculation, with the destruction of the active acute cases and control of the movement of cattle from adjoining buffer areas. When outbreaks occur in dairying areas, carriers are detected by the complement fixation test and eliminated by slaughter. The control measures have of necessity to be modified to handle outbreaks in travelling and local cattle in the far north-western area where quarantine restrictions are impracticable.

Tuberculosis.

The tuberculin testing programme was continued throughout the year. As in the previous year, the services of practitioners were largely utilised in the tuberculosis control campaigns in the milk supply herds of Brisbane, the South Coast and the Darling Downs.

Details are given in Table 1.

TABLE 1.

CATTLE TESTED FOR TUBERCULOSIS IN 1950–51.

District.	Number of Herds.	Number of Tests.	Number of Reactors.	Percentage of Reactors.
Southport ..	89	7,553	64	·84
Coomera	49	4,696	55	1·17
Beenleigh ..	18	1,168	51	4·37
Soutn Brisbane and Brookfield ..	85	3,806	98	2·6
North Brisbane and Petrie	42	2,678	24	·89
Samford	85	6,602	75	1·13
Beaudesert ..	76	6,853	17	·24
Beaudesert/Border	38	4,661	15	·32
Dayboro	31	2,574	26	1·01
Dayboro/Mt. Mee	21	1,854	15	·81
Kilcoy	67	6,643	195	2·93
Caboolture ..	53	4,687	211	4·7
Maleny	21	1,451	122	8·4
Ipswich	162	8,770	47	·53
Total for Brisbane Area	837	63,996	1,025	1·6
Rockhampton ..	47	3,329	33	·99
Kingaroy ..	52	3,128	27	·86
Toowoomba ..	268	9,034	29	·32
Warwick	174	6,873	15	·21
Total	541	22,364	104	·46
Grand Total ..	1,378	86,360	1,129	1·31

Of the reactors slaughtered at the Goodna works, 7.9 per cent. showed no visible lesions.

In addition to the above 24,832 cattle were tested in other areas, of which 742 (2.9 per cent.) were positive reactors.

The campaign was extended in the Brisbane Valley and on the Darling Downs and new areas were created in the Rockhampton and Kingaroy districts. In the latter district, herds supplying cream have been included in the scheme. Extension of the scheme to new areas was made possible by using the services of veterinary surgeons who have commenced practice in the areas concerned.

The incidence of tuberculosis in milk supply herds that were earlier heavily infected is now low.

In areas where practitioners are not available, departmental veterinary officers are employed on tuberculosis control work. This work is organised in co-operation with slaughtering inspections, and is responsible for the elimination of a large number of diseased animals.

Arrangements for tuberculin testing of all herds supplying whole milk to hospitals in the larger cities and towns were made during the year. Testing is proceeding.

Progress has been made with the tuberculosis-free herd scheme, which now contains 34 accredited herds. These herds comprise both beef and dairy cattle.

Tuberculosis control work in stud beef cattle herds in North Queensland has been commenced and will be extended during the coming year.

Brucellosis of Cattle.

Control measures for brucellosis were confined mainly to the policy of building up herd immunity by the inoculation of calves with Strain 19 vaccine. The work was undertaken in all the principal dairying districts and approximately 26,000 calves were inoculated by Departmental officers during the year. This method of control has now been in operation in Queensland herds for more than four years and there is every indication that it is giving satisfactory results.

A limited amount of testing of adult animals, chiefly for diagnostic purposes in association with sterility investigations, has been undertaken.

Brucellosis was diagnosed and found to be causing serious sterility in a beef cattle herd in the South Burnett district and as a result 384 calves were inoculated on the property.

Swine Brucellosis.

Swine brucellosis was diagnosed in a small number of herds during the year. Though the general incidence of this disease is low, it has been responsible for serious interference with breeding programmes in individual herds.

The response to the Brucellosis Testing Scheme has been promising; 37 herds are now listed and hold certificates, while a further 15 are awaiting accreditation.

Sterility.

Sterility is one of the most serious problems of the dairying industry and, though not so prevalent as during the previous year, it was detected frequently in the Burnett and other dairying areas.

Two types of sterility were encountered. In one the disease is constantly in evidence and there is a regular wastage of a number of animals each year due to inability to breed. This type appears to be associated with brucellosis. In the second type, mass infertility of a large proportion of the herd occurs. The younger cows appear to be the most affected and outbreaks are encountered during the early months of the year. In some cases, vaginitis is evident, but frequently the cause of the trouble is obscure. This infertility is usually of a temporary nature and may disappear after a period of several months, in which case it may or may not reappear during the following year.

In a number of herds in which infertility was occurring, it was established that aphosphorosis was a major factor, and improvement has apparently followed the correction of this trouble.

Tick Fever.

Serious mortalities resulting from tick fever were reported from marginal country in the Rockhampton and Burnett districts. Losses amounting to 300 head were reported from one property. Most of the mortalities were associated with the extension of ticks into clean country. Preventive inoculation was widely practised in these areas and was generally successful, though occasionally disappointing results were experienced.

A series of outbreaks of tick fever were recorded from the Lake Nash, Urandangie and Dajarra areas, following the introduction of ticks into this part of the State from the Northern Territory. Mortalities occurred both in local and travelling cattle. Two outbreaks of anaplasmosis were reported from North Queensland.

Blackleg.

The incidence of blackleg in calves was again exceptionally high. The disease was prevalent throughout the Coastal, South Burnett, and Brisbane Valley areas in the late winter and early spring and inoculation within these areas was regularly carried out. Unfortunately, little protection resulted from the inoculation and in the autumn and early winter there was a general "flare up" of the disease throughout the country extending from Roma to Bowen. Many owners inoculated calves a second and even a third time, and though some protection may have resulted from the inoculations, mortalities continued and losses of up to 50 per cent. of calves on individual properties were reported.

Failure of vaccination may have been due to a more serious form of the disease operating during the year under review. On the other hand, it may have been the result simply of a much wider distribution of the disease. The outbreaks were regularly investigated and strains of the causal organism obtained for incorporation in a new vaccine being prepared by the Commonwealth Serum Laboratories.

Miscellaneous Diseases.

Leptospirosis.—This disease was again prevalent in the Gympie, Brisbane, Burnett and Darling Downs dairying districts. Calves principally are affected, and though no spectacular losses were reported the aggregate loss of calves throughout the area would be very considerable. Cases of abortions, mastitis, loss of production and occasionally death resulting from leptospirosis in mature cattle were reported.

The disease is regarded very seriously in the Gympie district, where in addition to a relatively high incidence amongst cattle, a number of people have become affected.

Footrot in Cattle.—Many cases of footrot in cattle were recorded during the second half of 1950 in the Brisbane, Burnett, Rockhampton and Atherton districts. Satisfactory results were obtained by treatment with soluble sulphamezathine, but this preparation was frequently difficult to obtain.

Ephemeral Fever.—Outbreaks of ephemeral fever were reported from eight properties on the Atherton Tableland. On one property, all the typical symptoms of the disease were detected and 23 out of 42 animals on the farm were obviously affected.

Trichomoniasis of Dairy Cattle.—Trichomoniasis of dairy cattle was recorded for the first time in Queensland. This disease chiefly affects dairy cattle and it causes abortions and serious sterility. It has been controlled by quarantine, improved husbandry and breeding by artificial insemination.

Other diseases of cattle which were responsible for losses during the year included hypocalcaemia, grass tetany, calf scours, calf pneumonia, calf diphtheria and wallum disease, the etiology of which is obscure.

Urinary Calculi in Sheep.—Losses amounting to 200 head on individual properties have been recorded, principally amongst wethers, in the Charleville, Longreach and Winton districts. This condition is considered to be due to the ingestion of plants with a high oxalic acid content, such as pigweed and roly poly. It is recommended as a control measure that ewes be grazed on areas where the plants abound and wethers be moved to country where they are non-existent or present only in small quantities.

Melioidosis has been diagnosed in sheep and goats in the Townsville district. This disease is comparatively new to Queensland and it is being watched with interest. At the present time, it does not appear to be of much economic importance.

Diseases of Swine.—The diseases most commonly encountered amongst pigs included salmonellosis of both the pneumonic and intestinal types, Glasser's disease and internal parasitism.

A limited number of outbreaks of swine erysipelas were recorded from the Brisbane and Darling Downs districts. Quarantine restrictions were imposed in one instance where the disease assumed unusual severity.

A mortality which occurred when a herd of pigs was turned into a paddock of green wheat was considered to be due to nitrite poisoning. Thirty pigs died.

Arsenical Poisoning.—Several instances of arsenical poisoning were recorded during the year. The most serious was in the Chinchilla district, when approximately 1,800 sheep out of a mob of 2,000 died within a period of a few days after dipping in an arsenical solution. Others included the loss of 50 out of 55 and 42 out of 45 dairy cattle following spraying with arsenical mixtures. In addition, losses of lesser magnitude were regularly reported from most of the country where arsenic is used for tick control or as a weedicide.

Deaths from ingestion of other chemical substances included several resulting from lead poisoning following licking of paint containers or old batteries, and the loss of 26 calves following treatment with sodium fluoride as an anthelmintic.

Mineral Deficiencies.—Clinical evidence of aphosphorosis was forthcoming from a large area of coastal country between Brisbane and Rockhampton and the usual symptoms of low production, stiff gait, and wasting were detected. In some cases an associated sterility was also considered to be due to aphosphorosis. The condition was corrected following the feeding of mineral supplements.

In some of the deficient areas in the Gympie district, where feeding of dairy cattle is continually carried out, the opportunity has been taken to include mineral supplements in the feed and on one farm an outstanding result in increased production and growth has been obtained.

Copper deficiency was diagnosed in cattle on a number of properties during the year. The diagnosis was based on the analyses of blood and liver for copper content and on the therepeutic effect of copper sulphate given to affected animals. This deficiency has been recorded in cattle in coastal districts from the New South Wales border to Rockhampton and it occurs generally on soils of reasonably high fertility.

Pronounced symptoms, including emaciation, weakness, fading of coat colour and scouring, were very evident on one property in the Brisbane district, where approximately 10 per cent. of a herd of 1,000 were lost in one year principally due to this condition. Treatment of the cattle with copper supplements resulted in clinical improvement.

It is considered that on some properties the copper deficiency may be associated with a cobalt deficiency and/or an excess of molybdenum.

Plant Poisoning.—Mortalities due to plant poisoning were very extensive and most trouble was recorded amongst cattle and horses. In cattle the most serious losses were due to Noogoora burr (*Xanthium pungens*) in the Bowen and Gympie districts, poison peach (*Trema aspera*) in many coastal and sub-coastal areas, yellow daisy (*Wedelia asperrima*) in the Julia Creek district, lantana (*Lantana camara*) in coastal areas and bracken fern (*Pteridium aquilinum*) in the Atherton area. It has been established that portion at least of the losses from Soley's disease are due to bracken. Other plants which were incriminated or suspected included yellow wood (*Terminalia oblongata*), wild tobacco (*Nicotiana* spp.), paspalum ergot (*Claviceps paspali*), caustic vine (*Sarcostemma australe*), green cestrum (*Cestrum parqui*), and wild cottons (*Asclepias* spp.)

Serious losses in horses due to Birdsville disease were recorded in the Windorah and Birdsville districts and cases were also reported from the Winton and Cloncurry areas. There is ample evidence that this condition is caused by ingestion of the native indigo plant (*Indigofera enneaphylla*). Areas in which this plant is unknown are being selected as horse paddocks.

Further cases of Tallebudgera disease, which is suspected to be due to ingestion of Crofton weed (*Eupatorium adenophorum*), were reported from the South Coast and Beaudesert areas.

Oesophageal disease of horses, which has been prevalent in North Queensland, is now definitely considered to be due to ingestion of the plant *Crotalaria aridicola*, and paddocks with a minimum of this plant are being selected for horses. The plant is also being eliminated with hormone weedkillers.

Cases of coastal staggers due to Gomphrena weed (*Gomphrena celosioides*) were reported from the Townsville and Bundaberg areas. Control of the plant by means of weedicides is being attempted in the latter area.

Internal Parasites.

Seasonal conditions during the year were very favourable for the development of heavy infestations of helminth parasites and gross parasitism was recorded in calves in coastal areas. The majority of cases of clinical parasitism were due to barber's pole worm infestation (*haemonchosis*) but some cases were due to infestation with either hookworm (*Bunostomum*) or nodule worm (*Bosicola*). Heavy lungworm infestations were also recorded.

Phenothiazine, which has been extensively used, has given good results against *Haemonchus* and *Bosicola* but it is relatively ineffective against *Bunostomum*. This material is in very short supply and there is no suitable substitute for the control of *Bosicola*. This is regarded very seriously in both sheep and cattle areas where the parasite is of economic importance.

In many cases the clinical effects of internal parasitism were complicated by malnutrition and gross tick infestation and attention to all factors was necessary to prevent losses and bring about control.

Liver fluke infestation was recorded from cattle in the Gympie, Woodford and Kilcoy areas and from sheep in the Stanthorpe district. Mortalities of sheep suspected of being due to black disease were reported from the last district.

Internal parasitism of sheep, chiefly due to *Trichostrongylus* spp., occurred in southern districts in the winter and spring of 1950. Heavy infestations, resulting in mortalities in young sheep, were recorded in the Roma district. Outbreaks of haemonchosis were reported later in the year and mortalities occurred as far inland as Longreach and Hughenden. Losses due to nodule worm infestation were reported from the Darling Downs.

External Parasites.

Ticks.—Conditions favourable for cattle tick propagation resulted in an increase in the degree of infestation during the summer months over a large portion of the usual infested area.

There was some extension of the infested area along practically the whole of the "tick line" from the Northern Territory to the New South Wales border. Most of the extension resulted from increased tick populations along the fringe of the infested area; it was

generally of a minor nature and satisfactory control is being effected. It has been necessary to arrange for the erection of new dips, which will be charged with DDT, for control in one area.

Tick outbreaks in clean country due to illegal or irregular movements were recorded on the Darling Downs and in the Kingaroy districts, but they are of minor importance and are being brought under control.

A very serious extension of the tick infested area occurred in north-western Queensland, due primarily to the mild winter followed by an excessively wet spring and early summer, but occasioned in part by the difficulty in exercising full control over the numerous large scale stock movements that take place in the area.

A very large area of country extending from Camooweal to Mt. Isa, Dajarra, Urandangie, Walgra and Lake Nash became infested (see Figure 2). Special restrictions on the movements of stock from or through these areas then became necessary for the protection of clean country. Owing to the absence of suitable facilities within the area, it was necessary to send stock back to Lake Nash for one or two treatments prior to moving through the Channel country and/or to arrange for detraining of cattle for treatment at one of the dipping centres on the Great Northern Railway prior to travelling into clean country.

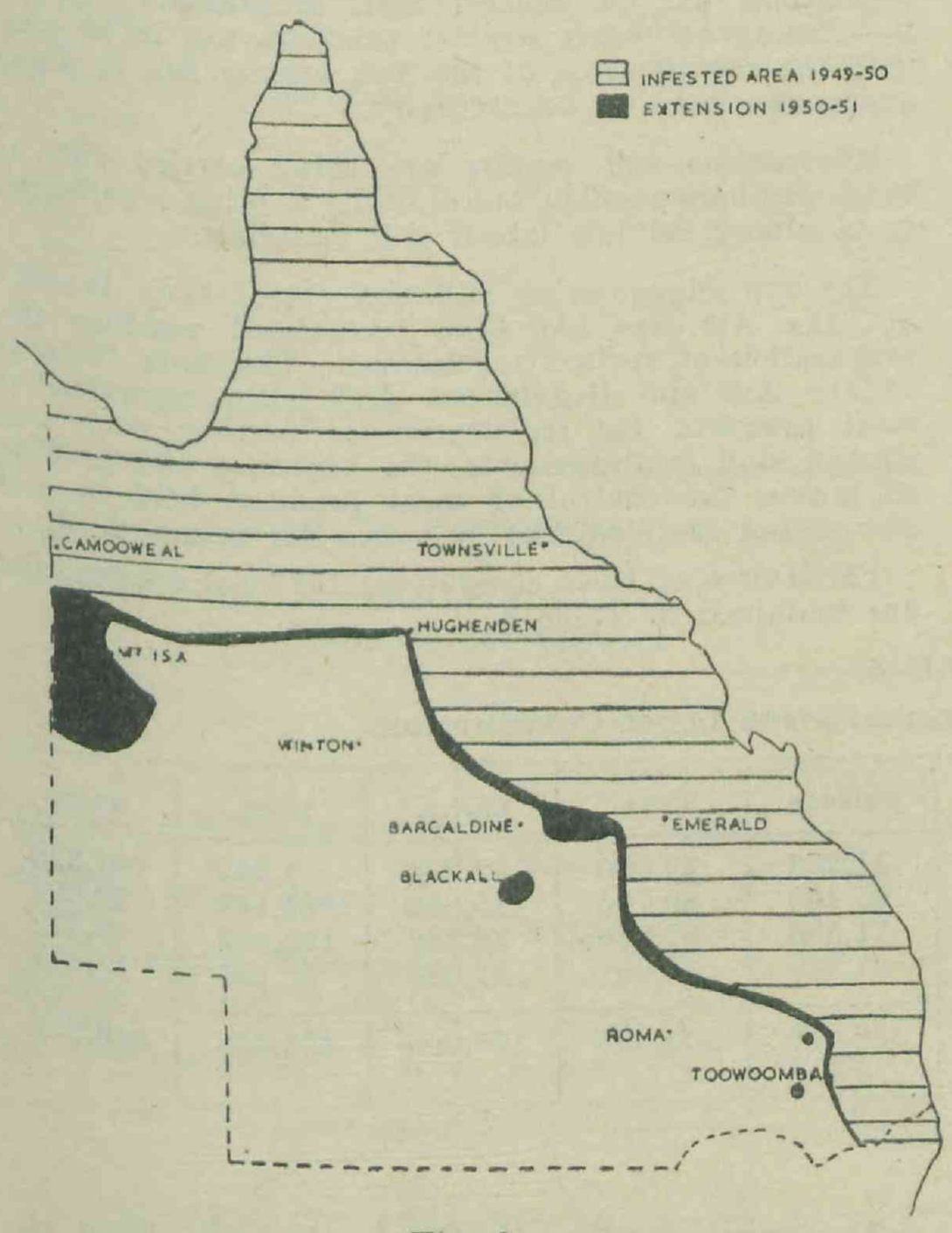


Fig. 2.
SKETCH MAP OF CATTLE TICK INFESTATION.

Control within the infested area again proved difficult where only standard arsenical solutions were used, and this together with the shortage of arsenic caused a swing to alternative insecticides for tick control. The newer insecticides, particularly DDT and BHC, when used at the recommended strengths, continue to give satisfactory results and no outbreaks of ticks in clean country have occurred in cattle which were cleared from ticky country by the use of these preparations. This is in marked contrast to the experiences of some years ago when arsenical preparations were used, for in addition to the extra treatments that were required at the clearing dips, tick outbreaks in clean country were regularly reported. There has been some criticism of the newer insecticides and in isolated cases owners have changed back to arsenic, but wherever complaints have been investigated they have indicated that the faults were not due to the insecticides.

A large number of cattle dips have been charged with DDT by the Department. These dips are strategically placed along the principal stock routes and they are used to minimise external parasitism, both cattle tick and buffalo fly infestation, in travelling stock. In addition to those situated well inside the tick infested country, a series of dips have been selected and charged at suitable points in the vicinity of the tick clearing stations so that cattle can have two dippings in DDT at intervals of seven to 10 days. This in most cases is sufficient to clean the animals so that there is no delay at the clearing stations. Details of dippings in DDT dips are given in Table 2.

TABLE 2.

STOCK TREATED IN DDT DIPS IN 1950-51.

Number of dips charged	38
Cattle dipped	466,970
Horses dipped	6,223

Arrangements are also in hand for the charging of a series of dips around clean country on the Darling Downs to reduce the risk of this area becoming infested and to minimise the infestation in the buffer areas between tick free and tick infested country.

Buffalo Fly.—Heavy infestations of buffalo fly were built up in the infested area early in the season. Control measures were intensified in coastal areas and were reasonably successful, but in inland areas in which it was not practicable to put special control measures into effect, the fly spread rapidly. It moved down the Channel country from the Northern Territory to the vicinity of Charleville and also from the Dawson Valley through to the Roma, Miles and Chinchilla districts (see Figure 3). This spread of the fly was undoubtedly assisted by the movement of infested travelling cattle and it was not anticipated, as the inland limits of the parasite are usually controlled by the drier climatic conditions of the west. However, immediately the fly was detected along the Western railway, control measures were brought into operation and all stock were treated with DDT prior to moving from the infested to clean areas. This necessitated the requisitioning of special equipment and employment of additional staff. It is not anticipated that the buffalo fly will persist in the inland area, but the control measures were necessary to prevent its spread to the more humid areas on the Darling Downs and the south coast.

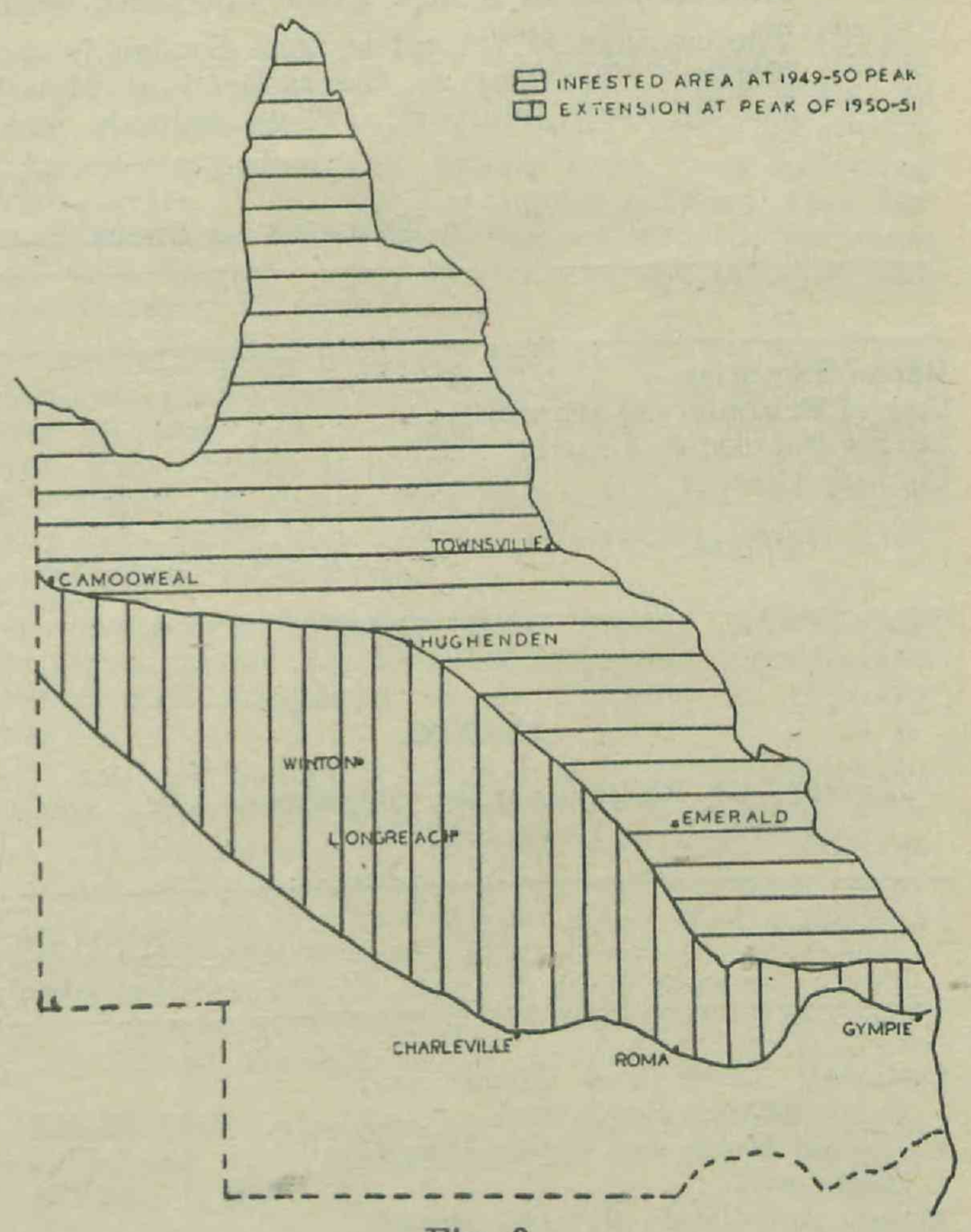


Fig. 3.
SKETCH MAP OF BUFFALO FLY INFESTATION.

Regular inspection and treatment of all infested travelling stock was continued in the coastal area. These duties were organised from Maryborough. Though there was a slight extension of the infested area, especially right on the coast, the control measures were generally successful and prevented the spread of the fly to the densely populated dairying centres in the Gympie, Mary Valley and Brisbane Valley districts for at least another year.

The control measures on the coastal strip were carried out under difficulty owing to the nature of the wallum country, in which it is almost impossible to control cattle movements owing to the lack of fences. When

the fly became established on the southern side of the Mary River, it was obvious that it would eventually extend through the wallum country to the Gympie dairying district, and control measures are being organised in anticipation of its appearance there after the dormant winter period.

With the advent of DDT the economic importance of the buffalo fly diminished tremendously, for almost complete control can be maintained with this insecticide. Nevertheless, the parasite must still be regarded as a serious pest to both the beef and dairying industries.

EXTENSION SERVICES.

Field days which were attended by officers of the Veterinary Services Branch were held in all districts but more particularly in the South Burnett and Rockhampton areas. These field days were reasonably well attended and discussion of the various aspects of animal disease proved very popular. Visits were also made to meetings of primary producers' organisations and addresses on subjects of local interest were delivered.

STOCK MOVEMENTS.

As a result of favourable seasonal conditions, stock remained strong throughout the winter and spring of 1950, and as there was a plentiful supply of feed and water on the stock routes, conditions for stock movements were satisfactory.

Owners took advantage of these conditions and large numbers of cattle were moved from the breeding areas in the Northern Territory to fattening country in Queensland. Fat cattle were also readily available throughout the year and large consignments were moved to New South Wales for slaughter.

Movements of special interest included:—

(1) The transfer of 300 special cows from a property in the Cloncurry district to the Kimberley region in Western Australia for the establishment of a high grade Shorthorn herd.

(2) The carriage of fat cattle from Soudan in the Northern Territory to the railhead at Mount Isa by road transport. These animals were conveyed in transporters consisting of a prime mover and two trailer units. Each transporter carried 30 head per trip and two trips were made each week.

Details of stock movements across the border are given in Table 3.

TABLE 3.

Trans-Border Stock Movements.

—	Cattle.	Sheep.	Pigs.
Entered from Northern Territory	89,436	..	..
Entered from New South Wales	10,166	123,708	113
Removed to Northern Territory	1,022	70	..
Removed to New South Wales	307,958	407,094	24,246

MEAT INSPECTION SERVICE.

The observance of The Slaughtering Act of 1898 and regulations has in general been satisfactory, though the issuing of orders against practices not in keeping with the requirements of the Act, usually due to negligence, continues to be necessary.

Renovations and repairs are being carried out by butchers where possible, but difficulty is being experienced in obtaining suitable labour and materials.

The new Slaughtering Bill was passed early in 1951 but the Act has not been proclaimed pending the preparation of revised regulations. The main features of the Act and Regulations deal with inspection of meat products, the registration of butcher shops and slaughtering establishments, the branding and grading of meats, the control of meat products held in cold stores, and the slaughter of horses for animal food.

Particulars of stock slaughtered for local consumption are contained in Table 4.

TABLE 4.

Total Numbers of Stock Slaughtered for Local Consumption.

—	Bullocks.	Cows.	Calves.	Sheep.	Swine.
Bacon Factories	11,203	22,010	12,954	1,952	261,328
City of Brisbane (Abattoirs)	65,469	80,705	115,813	289,148	32,997
Larger Population Centres	71,585	67,226	38,182	135,543	39,472
Country Centres	37,819	35,887	32,056	32,195	12,814
Totals	286,876	205,828	199,005	458,838	346,611

BRANDS.

Details of Registrations, Transfers, &c., for Year 1950--51.

—	Number.	Number since Inception of Legislation.
Ordinary Three-piece Horse and Cattle Brands Registered	..	92,242
Cancelled Horse and Cattle Brands Registered	1,091	13,236
Horse and Cattle Symbol Brands Registered	144	2,563
Horse and Cattle Brands Transferred	2,232	77,229
Cattle Earmarks Registered ..	846	34,687
Sheep Brands and Earmarks Registered	263	13,805
Sheep Brands and Earmarks Transferred	275	8,850
Distinctive Brands Registered ..	5	1,322
Alteration of Address of Brands ..	264	..
Brands Cancelled	18	..
Earmarks Cancelled	187	..

There was a marked increase in the number of registrations and transfers compared with the previous year.

The increases are as follows:—cancelled horse and cattle brands 154, symbol brands 48, horse and cattle transfers 132, cattle earmarks 211, sheep registrations 93, and sheep transfers 40.

This year's figures are well above the average for the last 10 years.

The printing of the Horse and Cattle Brands Directory complete to the end of 1948 and the Sheep Brands and Earmarks Directory, complete to the end of 1950, has been finalised. Very few cases of irregular branding and earmarking were reported and it is apparent that stock owners generally are observing the requirements of the Brands Acts.

BREACHES OF ACTS.

During the year, there were 15 prosecutions for breaches of the Diseases in Stock Acts and all were successful. The commonest breaches were again failure to obtain a permit to travel stock (Section 18) and failure to provide a waybill (Section 19).

There were nine prosecutions under the Slaughtering Act.

ANIMAL HEALTH STATIONS.

Dr. J. Legg, Director of Research.

This report covers the activities of the Animal Health Stations at Yeerongpilly and Oonoonba.

LABORATORY.

The number of specimens handled by the stations each year continues to increase, suggesting a greater interest on the part of stockowners generally in obtaining more information regarding mortalities, which are often a weekly occurrence in some districts. This interest may be related to the improved field services of the Department, as well as the enhanced value of most of the domestic animals. Table 1 sets out the details of material submitted.

TABLE 1.

SUMMARY OF SPECIMENS EXAMINED.

—	Yeerongpilly.	Oonoonba.
Number of batches of specimens	2,472	542
Complement fixation tests for contagious bovine pleuro-pneumonia	545	..
Brucellosis agglutination tests—		
Bovine	5,560	566
Porcine	1,716	27
Milk samples, bovine mastitis ..	383	22
Autopsies—		
Fowls	996	120
Ducks	21	13
Pigs	79	10
Sheep	75	4
Cattle	34	4
Horses	2	11
Dogs and cats	4	6
Other animals and birds ..	9	7

Vaccines supplied to stockowners are shown in Table 2.

TABLE 2.

VACCINES SUPPLIED.

—	Yeerongpilly.	Oonoonba.
Contagious pleuro-pneumonia (doses)	299,225	389,025
Infectious labial dermatitis (doses)	539,500	..
Brucella abortus Strain 19 (number of calves inoculated)	26,716	..
Tick fever blood (doses) ..	14,395	6,576

DISEASES AND PARASITES OF CATTLE.

Tick Fever.—Steers for bleeding for the purpose of immunising cattle against the common tick fevers have been in great demand by stockowners. During the year, 214 were distributed from Yeerongpilly and 18 from Oonoonba.

Table 3 shows the numbers of bleeders sold and stud cattle immunised at Yeerongpilly since 1944-45.

TABLE 3.

TICK FEVER IMMUNISATION (YEERONGPILLY).

Year.	Bleeders Sold.	Stud Cattle Immunised.
1944–45	53	216
1945–46	73	190
1946–47	76	170
1947–48	134	187
1948–49	110	312
1949–50	156	467
1950–51	214	569

Because of the large numbers of cattle coming in to the stations for immunisation, accommodation has at times been difficult to provide. The higher prices which buyers are obliged to pay for herd bulls induces them to have the cattle immunised under controlled conditions.

On the whole, the immunisation of these animals has been satisfactorily performed though there has been an odd death due to an unusually severe reaction or to complications. In a few cases there have been mild relapses following the second reaction (*B. argentina*) and for this reason careful attention has to be paid to animals for several days after apparent recovery.

Anaplasmosis was again noted in North Queensland, in the Charters Towers district. A feature of the disease was the mild course. With regard to anaplasmosis, it may be deduced that apparently all or nearly all strains of the organism in Queensland are very mild or attenuated, otherwise there would be more outbreaks noted in the field. In this respect Queensland is in a fortunate position because in all other countries in which the disease is found there are strains which produce severe reactions and often heavy mortalities. It is not known why these strains vary so much and why Queensland apparently has only mild ones, but the position of an anaplasm strain having altered and acquired increased virulence may some day have to be met.

Cattle Tick Control.—Comparative field spraying trials with chlordane, toxaphene and dieldrin (''Compound 497'') were continued in dairy herds in the Brisbane district during the summer. In all cases satisfactory control of the parasites was obtained. There does not appear to be very much difference in the results obtained with these three preparations provided they are used at suitable levels—e.g., chlordane 0.25 per cent., toxaphene 0.5 per cent. and dieldrin 0.05 per cent. No harmful effects of any kind were noted. It would appear that there would be a considerable demand for these products if they were available to the dairy farmer.

In one trial carried out on a dairy farm in the Toogoolawah district, spraying thoroughly every 28 days with dieldrin (0.05 per cent.) was apparently sufficient to prevent all female ticks from becoming fully mature. This herd was heavily infested when the trial commenced in the early summer and the parasites had very largely disappeared from the farm at the commencement of winter.

Periodic inspection showed that larval ticks were not picked up for several days after any one treatment and none of these had advanced further than the young adult stage by the time the next treatment was given. It is known, of course, that both toxaphene and chlordane have fairly high residual effects but details have not yet been worked out.

In respect of dipping trials, limited observations have been carried out with DDT, benzene hexachloride (BHC) and toxaphene, in continuation of previous work.

A form of biological assay has been introduced to determine the ''tickicidal'' value of a dipping fluid and this method appears to work very well. The test animal is a beast carrying a heavy population of ticks in all stages and the dipping fluid under trial is applied by means of a power spray after removal of all coarse organic matter likely to clog the small openings of the nozzle. An assessment is made of the effect of the fluid on the tick at different stages of its parasitic life.

In one test it was determined that after 16 months a vat charged with 0.5 per cent. toxaphene, and through which some 2,500 head of cattle had passed, was as efficient as when originally charged. With vats charged with benzene hexachloride there is a suggestion of a slight decrease in killing effect after 2-3 years and after several thousand cattle have been dipped, but in two trials under control the amount of concentrate was purposely kept at a low level—i.e., there was no safety margin. The problem of loss of efficiency with dipping fluids is one of considerable importance in good seasons because of the extensive stock movements from ticky to clean country and suitable weather conditions for tick propagation.

A very small trial was carried out with a fog consisting of a mixture of DDT and BHC at fairly high concentration, using three heavily infested steers. The fog was applied to the animals in an enclosed space

for four minutes. Subsequent observations showed that the kill of ticks was very high though a small percentage (perhaps up to 10 per cent.) in the nymphal stage escaped. The results suggest that the method is worth persevering with if for no other reason than that improved methods of applying insecticides to beef cattle are required.

Worm Parasites.—Observations on seasonal fluctuations in the worm burden of cattle were continued in association with C.S.I.R.O. Veterinary Parasitology Laboratory. These studies confirmed the observations already reported for dairy and beef calves in coastal Queensland. The main results are summarised as follows.

Clinical parasitism is most prevalent in dairy calves 4-12 months old and in beef calves a few months after weaning. Under normal conditions it is usual for each species of internal parasite to increase in numbers to a peak and then rapidly decline and remain at a low level. The time at which these peaks occur varies with the different species. Species of *Cooperia* are the first to appear, followed by *Haemonchus contortus, Bunostomum phlebotomum* and *Bosicola radiatus.*

There is evidence that cattle develop a strong resistance to infestation during the first 18 months of life, and it is unusual to find an adult animal heavily parasitised. This resistance is somewhat specific in nature, for the numbers of one species may be declining while a second continues to increase. Calves exposed to a moderate larval intake early in life develop resistance and when exposed later to heavily contaminated pastures they may fail to develop clinical parasitism. These animals may show a small rise in worm burden but generally do not become as heavily parasitised as animals freshly exposed to high larval intake. The resistance to *Haemonchus contortus* is not as strong as against the other species and outbreaks of parasitism in older calves are generally due to this species.

Clinical symptoms of parasitism often occur some time after the time of maximum worm burden. This delayed onset of symptoms has proved confusing in the interpretation of worm egg counts in the faeces as a means of diagnosing parasitism. However, from the information now available the worm egg count can be used to assess whether an animal has a harmless or harmful worm burden.

Anthelmintic treatment periods have been recommended so as to remove the worm burdens before the animals show clinical symptoms of parasitism.

Leptospirosis.—The accompanying map (Figure 1) shows the number and distribution of outbreaks that have been confirmed by laboratory tests since the cause of this disease was first found in January, 1949.

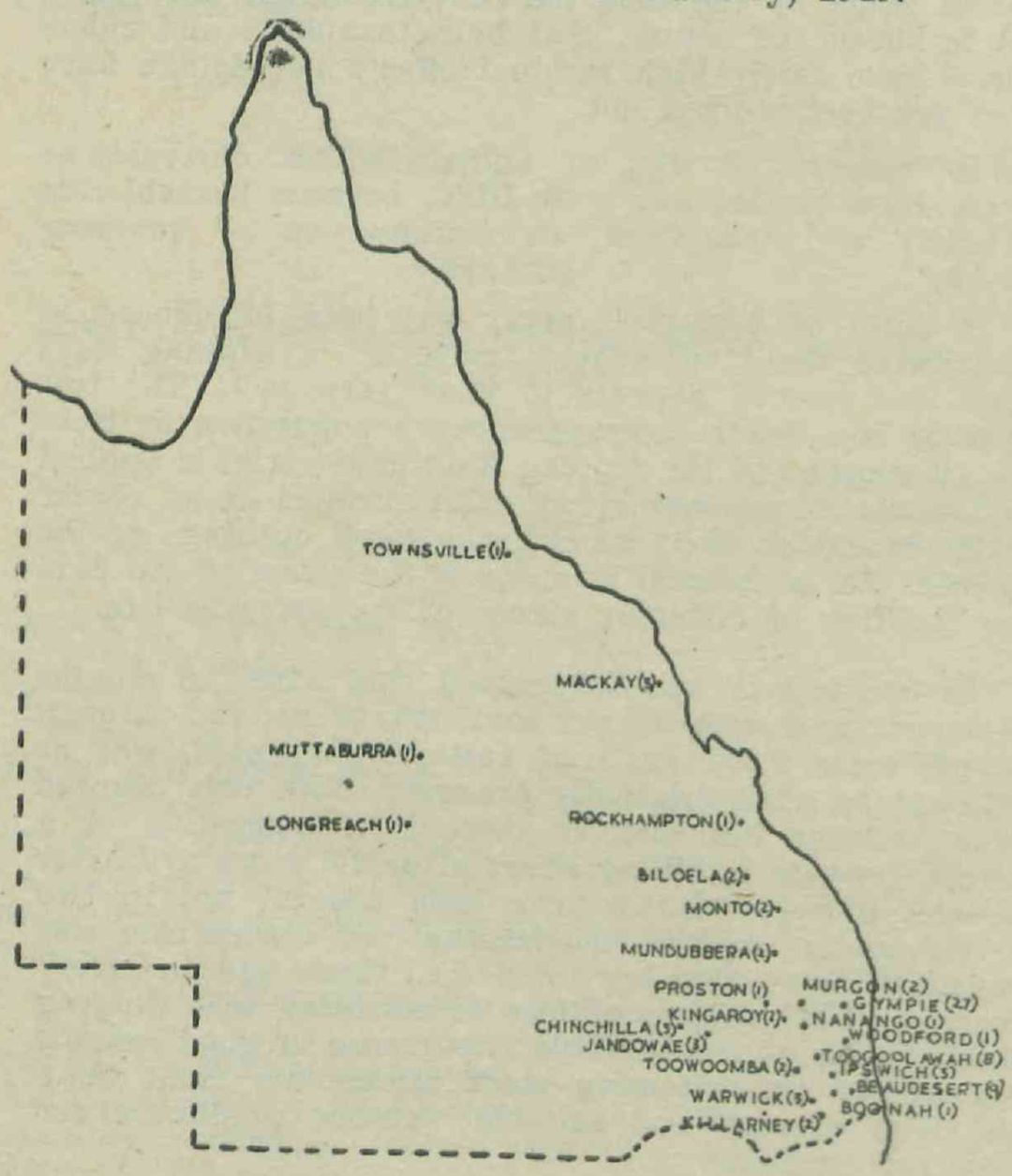


Fig. 1.

SKETCH MAP SHOWING LOCALITIES IN WHICH LEPTOSPIROSIS HAS BEEN LOCATED, AND NUMBER OF OCCURRENCES RECORDED.

For the investigation and control of most diseases it is necessary to have accurate diagnostic tests that can be used on large numbers of animals. Two tests for leptospirosis—namely, the agglutination test on blood serum and the microscopic examination of urine—were therefore studied. They have been improved to a point where they are now used as routine tests for diagnosis, detection of carriers and a study of the epidemiology of the disease.

It has been found that calves excrete leptospira in the urine for two to three months after they become sick. Though one cow was observed to excrete the organism for three months, most cows are only infrequent and irregular spreaders of infection.

The importance of swine as carriers of leptospira has been frequently observed. They excrete the organism in urine for up to a year but have not been found to suffer any ill-health. An important step in control is to confine pigs so that their urine cannot transfer infection to cattle. In several outbreaks it was suspected that the disease had been brought into dairy herds by purchased pigs.

Penicillin treatment of affected calves has been moderately successful, but it has the disadvantage that the treated animals continue to excrete leptospira in the urine. Streptomycin seems a better treatment, and in addition the treated animals do not appear to remain carriers. The number of calves observed so far, however, is small.

Two of the strains of leptospira from cattle were examined by the School of Public Health and Tropical Medicine in Sydney and found to give complete cross-agglutination with the type human strain of *Leptospira pomona,* thus confirming the identity of the bovine strain occurring in Queensland.

Copper Deficiency.—Deficiency of copper in the diet of cattle was identified for the first time in Queensland in 1950. It was since been found in 17 herds, 13 in the Moreton division, and one each at Killarney, Southbrook, Gympie and Thangool.

Cows as well as calves and growing stock are affected. In all cases observed the chief symptom was unthriftiness and poor growth or poor milk production; the occurrence of other symptoms—diarrhoea, anaemia and soft bones—was variable. Diagnosis was in all cases confirmed by analysis of the copper content of liver or blood in the Chemical Laboratory.

It seems clear now that copper deficiency is the cause of an unthriftiness of cattle recognised for many years in parts of south-eastern Queensland, but hitherto not satisfactorily explained.

Bovine Trichomoniasis.—This disease is in some countries a serious cause of infertility and abortion of cows. It was identified for the first time in Queensland in July, 1950, in a dairy herd near Brisbane. The disease is possibly present in many other herds, but the few specimens examined have not yielded any other positive results.

Exact diagnosis of trichomoniasis presents considerable difficulties. The causal organism is mostly confined to the uterus, but occasionally it enters the vagina and then is irregularly present in the discharges. It is therefore difficult to secure positive specimens from live animals except at or about the time of abortion or by making repeated examinations.

Blackleg.—During the first half of 1951 blackleg was far more prevalent in southern and central Queensland than it had been for many years. In July, 1950, investigations indicated that the blackleg vaccine used by the majority of Queensland cattle-raisers was not giving adequate protection. These reports became more frequent as the outbreak reached its peak in 1951. Specimens for bacteriological examination were therefore obtained from as many outbreaks as possible. In the early stages of the investigation it was suggested that the failure of vaccination may have been due to the blackleg-like disease cause by infection with *Clostridium septicum.* Bacteriological examinations showed that this was not so, the blackleg bacillus (*Cl. chauvoei*) being found regularly in all the specimens examined. A total of 40 strains of the blackleg bacillus was recovered from outbreaks—26 in vaccinated and 14 in unvaccinated

cattle. All these strains were sent to the Commonwealth Serum Laboratories for further study, and, in particular, to determine whether they differed in any way from the strains normally causing blackleg in cattle in Queensland.

Soley's Disease.—Certain plants have been under suspicion as being related to this disease and a series of feeding tests have been planned. As mortalities amongst yearling calves and certain of the cows were considered to be due to bracken poisoning, a trial with this plant was carried out initially. One animal died with a classical syndrome and the other was clinically affected but recovered.

Observations on the herd have continued and animals were introduced from Oonoonba for further studies.

All animals that died during the year were autopsied by field officers. Gross liver lesions were present in all cases. Culture and transmission tests failed to reveal an infectious etiology.

DISEASE OF HORSES.

Tallebudgera Horse Disease.—This disease is confined to the south-eastern corner of Queensland and is peculiar in more than one respect.

The most noticeable lesions on post-mortem are found in the lung tissue.

Feeding tests with Crofton weed (*Eupatorium adenophorum*) were recently commenced on a property in the Nerang Valley under control of the Prisons Department, which has provided accommodation and the necessary assistance. The test animals were started with a mixture of equal parts of lucerne chaff and plant (also chaffed) and then the former gradually reduced in quantity while the latter was increased proportionately. There has been no difficulty in getting animals to consume the plant, which they appear to relish. So far several hundreds of pounds of plant have been consumed with no untoward effects.

Oesophageal and Stomach Ulceration.—An unusual condition seen in horses in certain districts in North Queensland was referred to in last year's report. Two feeding tests with a native plant, *Crotalaria aridicola*, were carried out in the Mt. Surprise district. In the first test in the late winter of 1950 four local horses were used. One was confined and fed chaffed freshly collected plant; two were grazed in a small area where the plant was abundant, and the fourth was grazed in a similar plot where the plant had been removed. The control remained normal and showed no lesions on post-mortem, while the other three developed the disease. Dried material fed at the Oonoonba laboratory showed small lesions only in the experimental horses.

A second series of similar tests using five horses was carried out early in 1951 when fresh green plant was abundant, but using horses which were introduced from outside the enzootic area. All the experimental horses except the control when autopsied between the 49th and 70th days showed lesions.

Coastal Staggers (*Ataxia*).—At Oonoonba further feeding tests were carried out with the plant *Gomphrena celosioides* and earlier observations were confirmed. The information is now being prepared for publication.

Birdsville Horse Disease.—In last year's report it was stated that the investigations of this disease had reached the point where the plant *Indigofera enneaphylla* had come under suspicion and that, using this information, Northern Territory veterinarians had been able to produce the disease by feeding the plant.

During the past year limited feeding tests with the fresh plant at "Currawilla" Station (Windorah) and with the dried plant at Yeerongpilly Animal Health Station, using material collected in the enzootic area, were completed. These tests confirmed that the plant is the cause of Birdsville disease.

Ironwood Poisoning.—In an experiment at Oonoonba less than two ounces of air-dried ironwood (*Erythrophloem chlorostachys*) caused death in 60 hours of a horse weighing approximately 900 lb. The main symptoms noted were a marked reduction in reaction to external stimuli (the animal, a nervous one, could be approached and handled with ease), pounding heartbeat and embarrassed respirations. At autopsy extensive haemorrhages were noted in the heart muscle and small, shallow, patchy ulcers along parts of the intestinal tract.

Rubber Vine Poisoning.—This plant (*Cryptostegia grandiflora*) was found to very toxic to horses, an animal weighing approximately 800 lb. dying within half an hour after consuming eight ounces. The most prominent symptoms noted were marked muscular incoordination, twitching of muscles and profuse sweating. Later, the animal showed inability to hold the head erect. Finally it collapsed and died.

DISEASES OF SHEEP.

Infertility.—In connection with low fertility of sheep in north-western Queensland, it has been postulated that depressed activity of the thyroid gland (due to the hot environment) might impair the ability of rams to convert carotene, which is known to be low in the pastures in certain seasons, into vitamin A. To test this hypothesis an experiment with 24 rams was done at Yeerongpilly in collaboration with the Chemical Laboratory and the Sheep and Wool Branch. The thyroid-depressing drug methyl thiouracil was used to simulate the effects of high temperature. After 100 days of treatment the thiouracil-treated rams showed definite thyroid depression, but their ability to convert carotene into vitamin A, as judged by the amount of vitamin stored in their livers, was not impaired.

A chronic infectious disease of the reproductive organs —infectious epididymitis—is a serious cause of infertility and wastage of rams. Though the disease is well-known in several other countries the cause has not so far been established. The study of the disease has been continued at Yeerongpilly. An organism was recovered from tissues of naturally affected rams and is now being studied to determine whether it is, in fact, the cause of the common, naturally occurring form of the disease.

Abortion and stillbirths occur occasionally in sheep but have received little attention from sheep owners and veterinarians in this State (or elsewhere) in the past. Three foetuses from an outbreak of abortion in a flock at Texas were found to be infected with the bacillus *Listeria monocytogenes*. This organism has not previously been found in Queensland, though it has occasionally been found as a cause of encephalitis ("circling disease") and abortions in sheep in New South Wales and South Australia.

It is thought that Listeria infection is probably not the chief cause of infectious abortion among ewes in Queensland. Investigation of the matter is, however, not easy because it is difficult to get material from the sheep-raising areas into the laboratory in a state fit for bacteriological examination.

Infectious Labial Dermatitis.—A total of 539,500 doses of "Commonwealth" vaccine was issued during the year. The vaccine appears to be giving satisfactory control of the disease.

In collaboration with the Queensland Institute for Medical Research experiments were done on the transmission of the virus to human volunteers. Most of the volunteers resisted quite heavy inoculation of the skin with the virus (irrespective of their previous experience with sheep), but six definite infections were established among the 18 people inoculated.

Natural outbreaks of the disease occurred in goats in the Charters Towers and Winton districts.

Urinary Calculi in Sheep.—Mortality from calculi was investigated on five properties in collaboration with field officers and the Chemical Laboratory. In all outbreaks the animals concerned were wethers in good to prime condition. The pastures in all instances contained some plants of high oxalate and high calcium and magnesium content, which were freely eaten. Losses ranged from odd sheep up to 12 per cent. of the wether flock.

In an experiment at Yeerongpilly in collaboration with the Chemical Laboratory an attempt was made to produce calculi in wethers. Potassium oxalate was fed for six months at a high level (one gram per 6 lb. of body weight per day). No ill-effects were produced. Furthermore, it was found that this large amount of oxalate caused no change in the alkalinity or carbonate content of the urine. It is known that ingestion of soluble oxalate may produce in ruminants the first prerequisite for the formation of calcium carbonate calculi—namely, a urine of high alkalinity and high car-

bonate content. The experiment just concluded shows that this is not always so. It is thought that other components of the diet affect the fate of the oxalate, and the matter is being studied further.

Melioidosis.—Since this curious infectious disease was first identified in 1949 no further outbreak came to notice until it was found in the small flock kept for experimental purposes at Oonoonba Animal Health Station. During the year three sheep died or were destroyed from the flock of 20 head. The affected sheep showed lameness due to infection of the joints and coughing due to abscesses in the lungs, and in one animal the brain was affected.

The source of infection is obscure. The disease has never previously been recorded in any animal in Australia. Overseas work indicates that rodents, particularly rats, are the reservoir of infection from which the disease is transmitted to domestic animals and perhaps man. Experimental studies on the disease are being continued.

DISEASES OF SWINE.

Tuberculosis.—In North Queensland tuberculosis was discovered in a feral pig on a property where the incidence of tuberculosis was high in a stud of beef cattle.

Swine Erysipelas.—This disease was diagnosed on three occasions during the year. The acute septicaemic form occurred in a herd at Harrisville, while the more common arthritic form occurred at Allora and Beaudesert.

Streptococcal Arthritis.—The common causes of infectious arthritis of swine in Queensland are swine erysipelas and Glasser's disease. Both diseases occur mainly in pigs from a few weeks to a few months of age. During this year, however, six outbreaks of acute arthritis in newborn pigs were found to be due to infection with streptococci. The pigs were affected at or very soon after birth, and it is thought that infection was contracted from the reproductive tract of the sow during the process of birth. The mortality was heavy in affected litters, but prompt treatment with penicillin at appropriate dose rates gave good results.

The outbreaks occurred in the Gympie, Burnett and Darling Downs districts.

DISEASES OF POULTRY.

The poultry industry continued to make extensive use of the stations for the diagnosis of poultry diseases. A total of 1,116 fowls was examined post-mortem at the two stations.

A field day for poultry farmers was held at Yeerongpilly in collaboration with the Poultry Branch. In demonstrations and talks emphasis was placed upon the importance of disease control and correct feeding as major influences in the cost of producing eggs.

Each hatching season 50 to 70 batches of day-old chicks are submitted to Yeerongpilly for diagnosis. The post-mortem and bacteriological procedures used for such specimens in most veterinary laboratories do not appear to have been critically examined to determine their efficiency for detecting the common infectious diseases of baby chicks—pullorum disease and salmonellosis. Eighty batches of specimens comprising a total of 290 chicks were therefore examined by a detailed bacteriological procedure. Analysis of the results has led to the adoption of a highly efficient and simplified procedure for detecting these diseases.

Pullorum disease was found in six lots of baby chicks. The Department's blood testing scheme for the control of this disease has relegated it to a position of minor importance among the causes of loss among baby chicks.

The presence of pullorum disease in breeding turkeys was confirmed by tube agglutination tests done at the laboratory on blood samples from birds that gave positive reactions to the field test. The disease has not previously been recorded in turkeys in Australia. It is a serious problem in turkeys in America, especially where mechanical incubation of eggs is practised. The disease seems to be of minor importance in turkeys in Queensland at present, but if the industry develops and mechanical incubation is widely used then it may become a disease of more importance.

POISONING OF LIVESTOCK.

Arsenic poisoning was found in 36 separate herds of cattle, two flocks of sheep and three flocks of fowls. Lead poisoning was diagnosed twice in cattle and once in a dog. These losses, some of which were disastrous, were due to stock drinking at sheep or cattle dips or to carelessness with dipping fluids, weedicides and discarded arsenic or lead paint containers.

The following plants were suspected to have caused mortality:—

Trema aspera (poison peach)—bullocks at Gayndah.

Lantana—dairy cattle at Nambour.

Nicotiana spp. (native tobacco)—cattle at Clermont.

Bracken—calves and yearlings on the Atherton Tableland.

Sorghum verticilliflorum (wild sorghum)—caused prussic acid poisoning in dairy cattle at Gympie.

Euphorbia drummondii and *Euphorbia stevenii*—sheep at Longreach.

Eremophila maculata (fuchsia bush), *Myoporum deserti* (Ellangowan poison bush), *Myoporum acuminatum* and *Pimelea pauciflora*—two stud rams died in a paddock containing these four poisonous plants, but it was not possible to determine which plant caused the deaths.

Portulaca oleracea (pig weed)—sheep held in yards at Longreach after a rail journey gorged on this plant and died of acute oxalate poisoning.

Noogoora burr seedlings—pigs at Brisbane.

Duboisia myoporoides (corkwood)—a horse at Kingaroy.

Cestrum parqui (cestrum)—deaths occurred in fowls confined in a yard where they ate a large quantity of leaves.

The small black seeds of *Polygonum convolvulus* (black bindweed) are sometimes present in quantity in samples of wheat, and wheat so contaminated has been suspected on several occasions of causing sickness in pigs. A feeding test was therefore done with wheat heavily contaminated with this weed seed. Two pigs were fed the wheat at 3 lb., increasing to 4½ lb., per head per day, plus meatmeal ½ lb., salt 1 oz. and lucerne 1 oz. per head daily. For the first 11 days of the test the wheat was artificially contaminated so that it contained 9.8 per cent. of black bindweed seeds and then the residue containing 0.115 per cent. of seeds was fed for a further 36 days. The pigs remained normal throughout and increased their liveweights from 68 lb. and 76 lb. to 117 lb. and 119 lb.—gains of approximately 1 lb. per head per day.

SHEEP AND WOOL BRANCH.

Mr. G. R. Moule, Director of Sheep Husbandry.

The year just completed has been one of the most difficult which the sheep industry has faced for some time. The variability of the seasonal conditions experienced in semi-arid pastoral Queensland was demonstrated forcefully by the occurrence of heavy flood rains, lush feed, serious losses from bush fires and drought in the same districts within 12 months.

The exceptionally heavy summer rains of 1950 were followed by falls in the winter and by July parts of semi-arid Queensland, whose mean annual rainfall is under 20 inches, had received over 60 inches of rain in the preceding 18 months. Further heavy rains fell in July, and though these were fairly widespread, the highest totals were recorded at the headwaters of the Condamine and Macintyre River systems. As most of the watercourses were full, and since runoff is slow because of the gentle fall in their basins, severe flooding occurred over the wide plains transected by these rivers. Sheep became isolated on islets, or were driven up on to the few available high places such as the banks of earth tanks.

As the chances of replacing lost sheep were not bright, and wool prices were high, wool growers in the flooded areas, which extended from Goondiwindi to Dirranbandi, decided that strenuous efforts would have to be made to save their flocks. Many of the floodbound ewes were close to lambing and the majority of flocks carried more than four months' wool, so aeroplanes were used to transport fodder to floodbound stock. In all 440,000 lb. of fodder were dropped from low-flying aircraft and as a result the lives of a large number of breeding ewes, and of the lambs they carried, were saved.

Further heavy rains occurred over the whole of the sheep pastoral country in November. These followed useful falls in the south-east in October and preceded heavy rains in the central-west and north-west. However, the high falls in these districts in December and January did not extend to the Warrego and Maranoa. Light scattered falls occurred during the remainder of the summer, but the weather remained hot, and the rank feed soon became dry. With the advent of winter, which was heralded by cold westerly winds, many wool growers faced the prospect of drought conditions developing before spring. The gravity of the position was accentuated by the occurrence of extensive bush fires in the Maranoa, Warrego and Mitchell pastoral districts. Over half a million acres were burnt in one series of fires in the Warrego district. Aircraft were used in locating fires and directing ground workers during serious fires in the Charleville and Cunnamulla districts in January. Some useful falls of rain occurred during June in the southern part of the State, but by the middle of winter sheep were being hand fed in the central-west.

Despite the seasonal conditions which have prevailed during the last three years, sheep numbers remain disappointingly low. Heavy losses were experienced in the Darling Downs, Maranoa and Warrego and parts of the Mitchell stock districts as the result of severe worm infestation amongst sheep. Unfortunately, many wool growers did not realise the seriousness of the situation nor the nature of the problem with which they were confronted. In addition, supplies of phenothiazine were inadequate to meet requirements. The State's sheep population at the end of March was a decrease of 104,574 on the previous year's total. As good lambings were reported from most districts and as most wool growers joined all ewes which were available, the severity of the losses during the year can be gauged.

Wool production has remained steady, though a slight increase in the cut per head has been noticeable as the result of the seasonal conditions coupled with the comparatively low stocking rates. In all 554,705 bales of wool containing 165,485,184 lb. were sold during the year. These figures do not include A.W.R.C. disposals. The market has remained buoyant and the sale of the clip returned a total of £99,136,400. Once again wool returned more money to the State than any other export product. The average price per bale was £A178 14s. 5d., and the average per pound, 143.78d. It is doubtful if the prices reached during the February peak will be attained again for some considerable time.

Ruling prices for sheep have been high and lambs have commanded strong competition in the Cannon Hill saleyards. During the last decade Queensland has been unable to produce enough lamb to meet the requirements of the Brisbane trade alone and lamb is practically unknown in other coastal cities. However, there has been a noticeable trend during the year towards the inclusion of sheep raising amongst the animal industries in the sub-coastal districts. While this may have resulted partly from the buoyant market conditions, there is a growing appreciation amongst farmers of the extent to which sheep can be used as an adjunct to present farming practices. They can be useful in cleaning headlands, in weed control and as a source of manure, and a further expansion of sheep raising in those districts could make a useful contribution to the State's meat supply. Sheep have not been popular on the sub-coastal agricultural country in the past because of difficulties in the control of parasitic worms and predators, and because farmers were not conversant with the general nutritional requirements of these animals.

DEVELOPMENT OF THE BRANCH.

Five years have elapsed since facilities became available for the implementation of plans made when the Department was re-organised. As this presented an opportunity for the development of the Sheep and Wool Branch, this might be an appropriate time to review its activities. It was considered initially that the Branch would be developed in two phases, each of which would take about five years. The first stage envisaged the establishment of field officers in the main towns in the principal sheep raising districts. This has now been accomplished and Sheep and Wool Advisory Officers are located at Warwick, Dalby, Roma, St. George, Charleville, Emerald, Blackall, Barcaldine, Longreach, Winton, Hughenden, and Julia Creek. The field staff has been gradually enlarged, but the amount of work field officers have undertaken has increased rapidly. A good deal of their time is taken up in conducting practical demonstrations under field conditions as part of their advisory work. This permits close personal contact between extension workers and wool growers. The way in which service of this nature has increased during the last five years is shown in Figure 1. Because of the urgent necessity of demonstrating the use of new insecticides in the control of body strike of sheep during the severe fly wave of autumn 1950, the demonstrations conducted last year reached higher figures than might be regarded as normal.

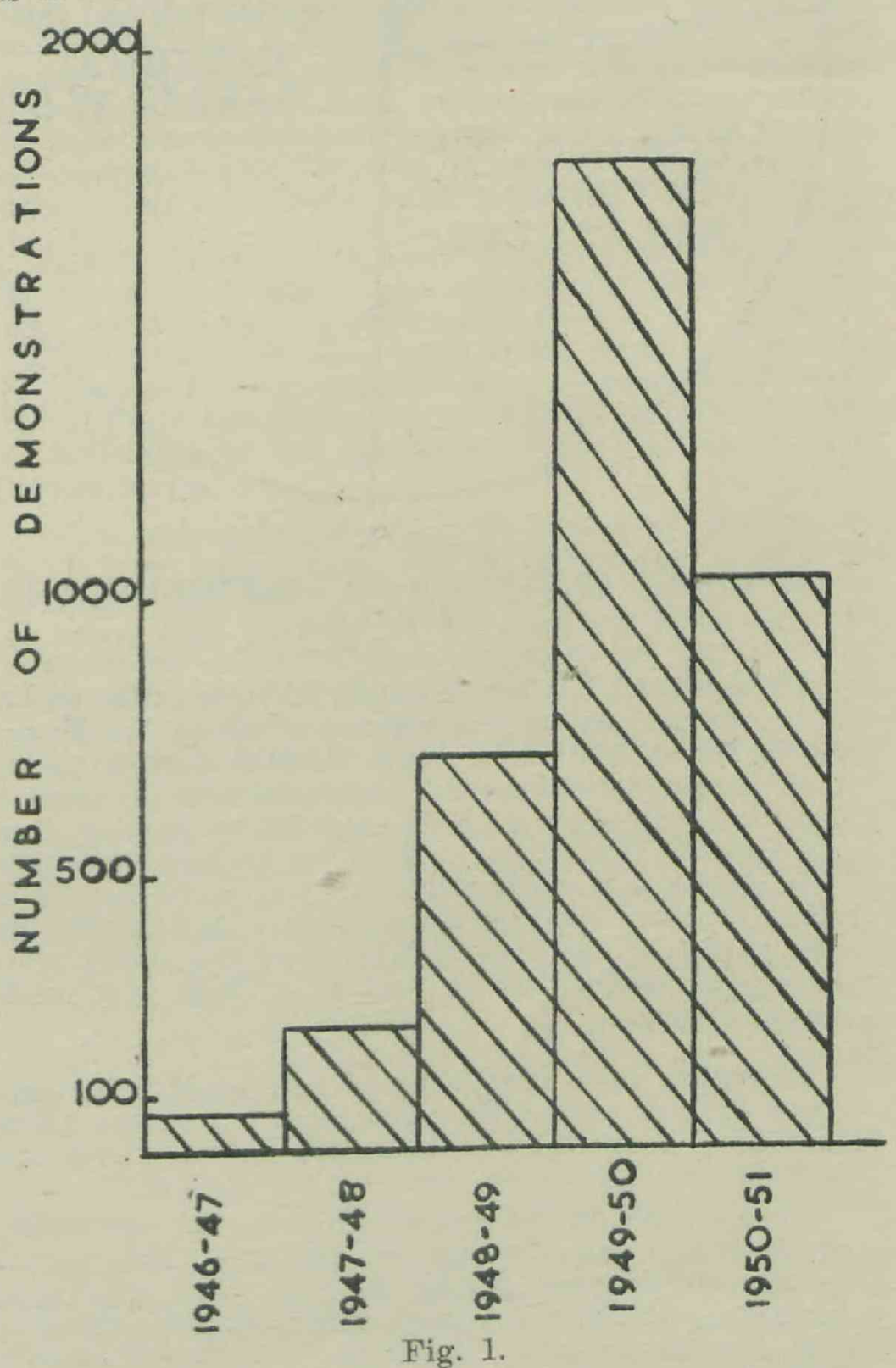


Fig. 1.

NUMBER OF DEMONSTRATIONS DURING THE PAST FIVE YEARS.

A dissection of the nature of the advice given to wool growers and of the demonstrations undertaken by field officers in the last 12 months is shown in Figures 2 and 3.

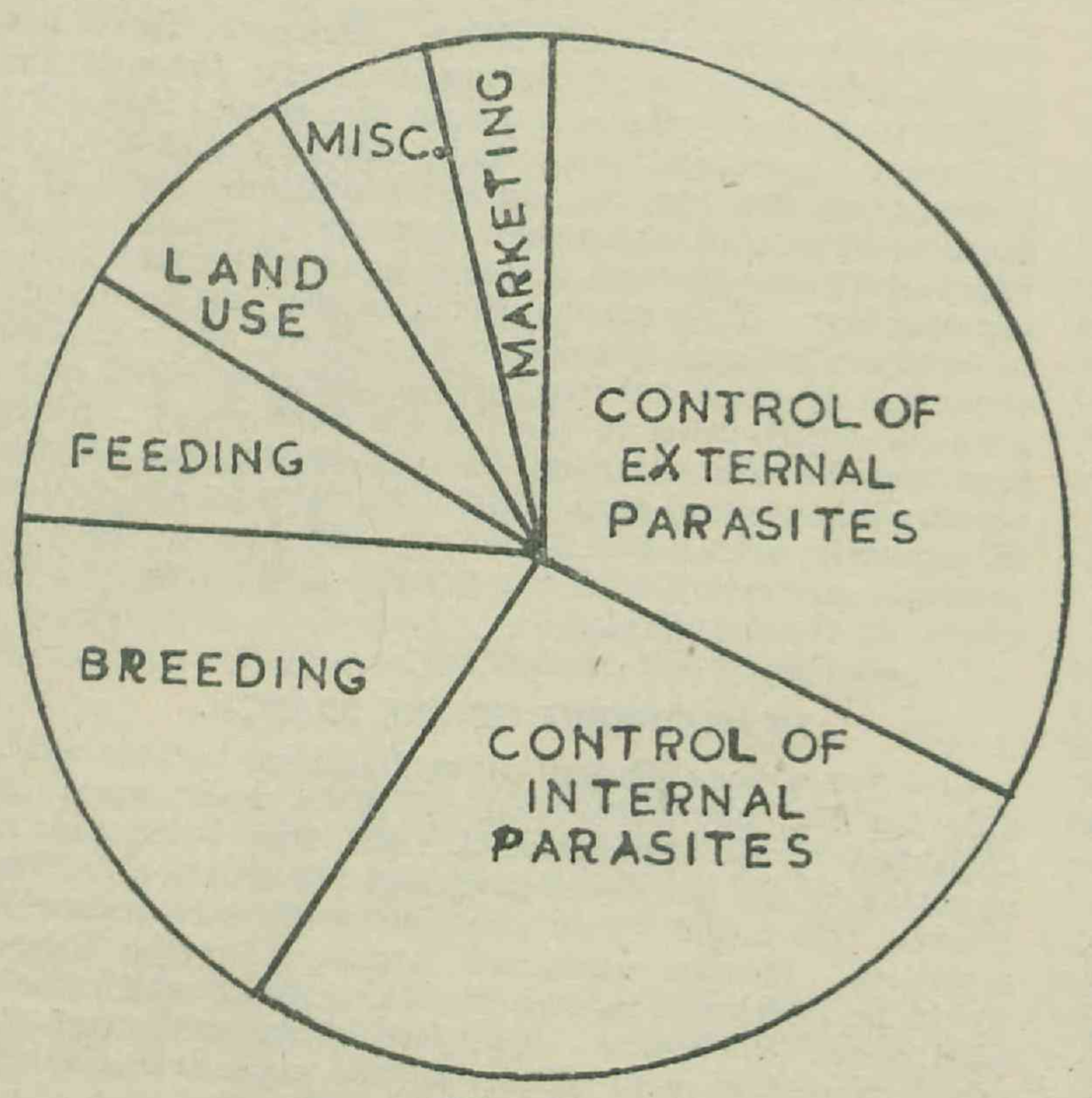


Fig. 2.
DISSECTION OF SUBJECTS ON WHICH ADVICE WAS GIVEN TO WOOL GROWERS IN 1950-51.

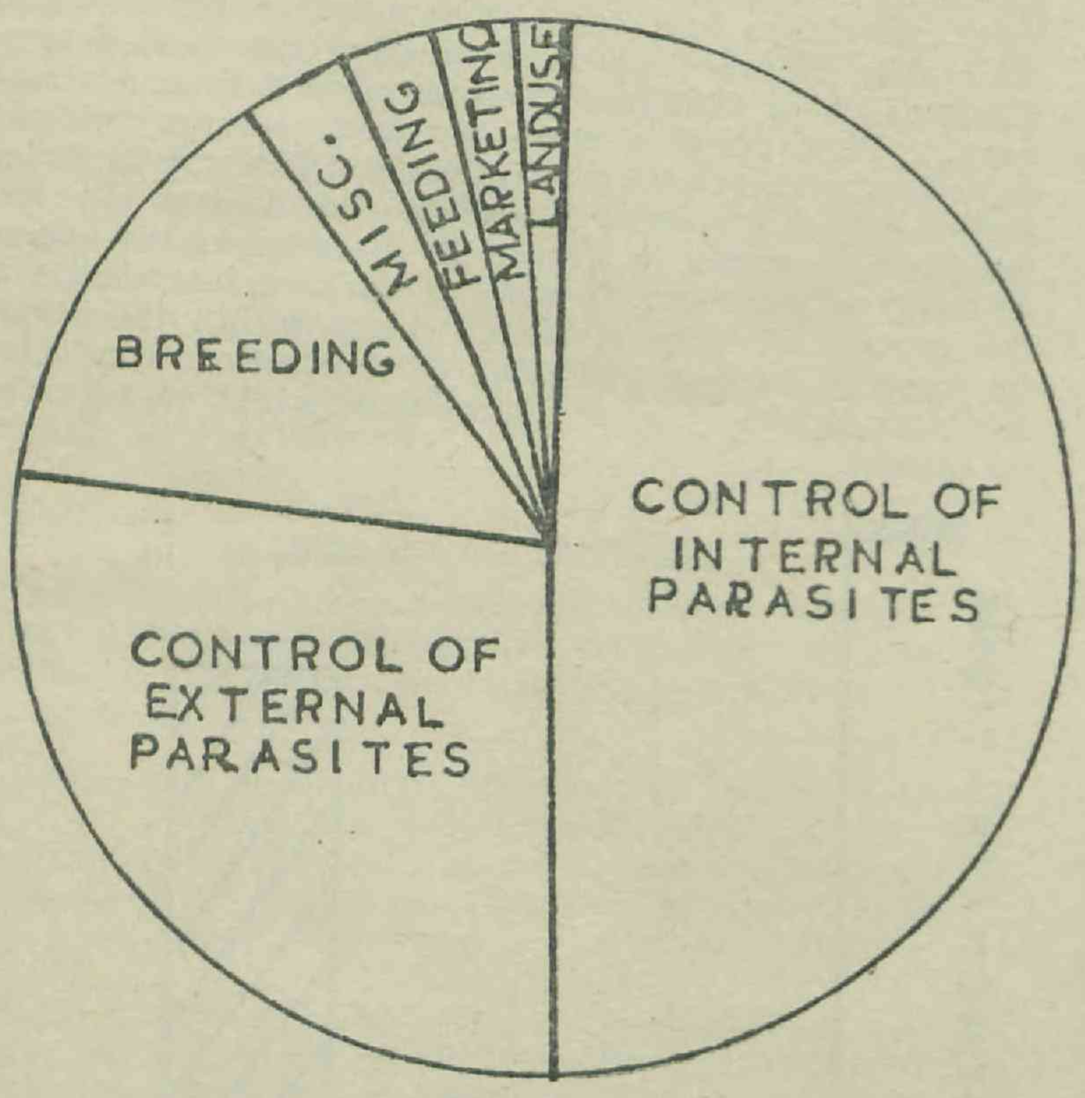


Fig. 3.
DISSECTION OF SUBJECTS OF DEMONSTRATIONS IN 1950-51.

Though there has been a steady increase in the amount of work done on various aspects of sheep breeding, it is clear that field officers have devoted a large part of their time to extension work associated with the improvement of husbandry methods essential to keeping sheep alive rather than to methods likely to increase production. While this has resulted partly from the cumulative effect of three consecutive good years, it has also been due partly to the poor standards of husbandry which have been applied for so long in a large part of the sheep country.

Extension work pertaining to new methods is sometimes difficult, especially when these cut across beliefs that have been widely held in the industry over long periods.

An approach to the second phase in the development of the Sheep and Wool Branch has been made possible by the establishment, during the year, of a wool biology laboratory within the branch. Facilities are now available for the accurate measurement of the diameter of fibres in wool samples, for the determination of the length of various wool fibres in a staple, and for the computation of clean scoured yield of greasy wool. In addition, facilities are available for establishing the degree of hairiness in wool and for determining the proportion of the follicles which produce wool fibres and those which produce kemp fibres.

The creation of these facilities has made the application of improved methods of husbandry possible. They should be of particular value to stud masters who wish to use progeny testing as an aid to selection as well as to flock masters who are interested in selecting sheep suited to any particular environment.

VALUE OF ADVISORY SERVICES.

It is always difficult to assess the value of advisory services to an industry which utilises such extensive areas of country under such contrasting environmental conditions. However, the opportunity occurred recently of making some assessment of the efficiency of the methods recommended for the control of the sheep blowfly under severe fly wave conditions. A questionnaire was sent to about 12.5 per cent of the wool growers selected at random and known to be using the Mules operation in their husbandry practices as the result of demonstration work undertaken by field officers of the branch.

One hundred and sixteen wool growers replied, giving their opinions on the protection afforded by the Mules operation under what was probably the severest fly wave experienced in this State for many years. The answers relate to almost one million ewes and the size of the flocks ranged between 1,000 and 100,000 breeding females. Some of the owners were so impressed with the results they obtained that they treated their wethers as well. About one-third of those who replied had treated all their ewes, and 90 per cent. of them preferred to treat their sheep as weaners. One hundred and six owners claimed good to excellent protection, and from actual figures submitted by 22 wool growers it was clear that the incidence of crutch strike had been reduced from 16 per cent. in untreated flocks to less than 3 per cent. in treated flocks. All wool growers contacted indicated that they intended to use the recommended methods.

EXTENSION WORK.

Field officers continued with their extension work and 1,041 demonstrations were given. In addition, advice on a variety of subjects was given to wool growers on 3,415 occasions. This work centred mainly around the following subjects.

Sheep Breeding.—The breeding of sheep in Queensland is controlled mainly by stud masters and their accredited representatives, commonly referred to as sheep classers. The work that has been done by these men in the establishment and improvement of the Australian Merino is well known, but there are indications that the rate of improvement in the heritable make-up of the average flock is very slow. This is due partly to the low reproductive rates in the majority of flocks, but it is also influenced by the methods of selection, based on the appearance of the animal, which are employed. Wool weights and the character of the clip are influenced largely by environment and are comparatively weakly inherited. This means that methods of selection based on hereditary considerations will have to be employed if real improvement is to be maintained.

There was an increased demand on field officers during the year for information about sheep breeding especially in relation to increasing reproductive rates and decreasing mortality in breeding ewes. In addition, a large number of flock masters and some stud men have consulted the branch about methods of selection and breeding plans which might be used to breed better sheep. As well as following breeding plans which will increase the frequency of hereditary factors controlling desirable characters in stock, growers are apparently becoming aware of the necessity for improving methods of selection. Besides disseminating information about breeding plans which might be adopted to detect the presence of concealed undesirable characters, it has been possible to recommend methods which might be employed in the use of sires of proved breeding worth.

Information about the suitability of various breeds of sheep and their crosses for particular purposes, such as fat lamb production, has also been made available to stud and flock masters.

Sheep Feeding.—Extension work on sheep feeding varied from the feeding of such small quantities as 1 milligram of cobalt per head per day to sheep suspected to be suffering from cobalt deficiency to planning drought feeding for more than 100,000 sheep controlled by a single owner. In addition, rations for stud sheep have been planned and advice given on the management of pastures and grazing crops.

Extension work was also undertaken on the aerial transport of feed to floodbound stock.

Marketing.—General extension work on the preparation of wool for market was undertaken. Special attention was focussed on the loss caused by branding fluids which will not scour out and the use of improved fluids of known scourability developed recently by C.S.I.R.O. has been recommended.

Control of Internal Parasites.—A large amount of extension work on methods that might be used in the control of internal parasites was necessary. The spread of these worms to districts which were previously regarded as being worm-free was due to weather conditions favouring rapid increases in worm populations. Features of particular interest are the rapidity with which heavy infestations of barber's pole worm developed and the serious increase in nodule worm populations. Both of these species require adequate summer rainfall, but the nodule worm requiring as it does a winter in which frosts are not frequent is likely to be a serious pest in a large part of Queensland when once established. Unfortunately, phenothiazine is the only drug which is reasonably efficient against nodule worm infestation and at the same time easy to use. Shortage of this drug is likely to jeopardise the success of sheep-raising in some districts.

The heavy body of grass and the policy of some wool growers of keeping sheep together so that they would be under close surveillance resulted in a good deal of overcrowding. This stimulated the rapidity with which worm infestations increased, so recommended control measures centred largely around flock and pasture management.

The finding of liver fluke of sheep in the Stanthorpe district during the year was interesting. Fortunately, the affected area is not extensive, but it is suspected that black disease, which results from a bacterial infection of the liver after it has been damaged by immature fluke, has already occurred.

External Parasites.—The westward spread of the body louse and the severity of the blowfly wave in the autumn of 1950 indicated the need for improvement in methods used for control of external parasites. Blowfly control has received continuous attention from field officers during the past five years. Up to the middle of 1950 they had undertaken some 826 demonstrations on properties and with an increased interest in modern methods of fly control 708 demonstrations were given during the past year. In addition, five field days were conducted and the Australian Wool Board's films were shown on four occasions in country centres. A surprising amount of opposition to the Mules operation still exists, however, and it is clear that a new approach to extension work embracing controversial matters or those which are particularly difficult to appreciate will have to be made. The benefits accruing from the use of the Mules operation are obvious and it can be expeditiously performed on large flocks.

Improvement Work.—Extension work on property improvement increased during the year. Advice was given on the repair of permanent improvements destroyed by fires and floods, as well as on the erection of new buildings and fences. Information was sought by wool growers on the conservation of water and on subdivision fencing in relation to land utilisation.

EVIDENCE PRESENTED TO ROYAL COMMISSION.

In preparing evidence for presentation to the Royal Commission on Pastoral Lands Settlement, a survey was made of vital statistics of the sheep industry and various aspects of sheep raising and wool production in Queensland were examined with special reference to the efficiency of land utilisation. The following criteria were used to judge the efficiency with which the sheep industry utilised the land available to it:

(i.) The productivity of the land used for sheep raising in relation to its productivity if it were used for any other form of production.

(ii.) The productivity of the industry in its present form in comparison with the maximum of which it is thought to be capable.

(iii.) The extent to which the natural resources of the country used for sheep raising and wool production are developed and husbanded.

(iv.) The stability of the industry with regard to its contribution to the national income, the security it provides for those engaged in sheep raising and wool production, and the permanent employment it creates.

It was concluded that:—

(i.) A large part of the country utilised for pastoral pursuits in the Darling Downs, Maranoa, Leichhardt and South Kennedy pastoral districts could be utilised more intensively. The introduction of agricultural practices in conjunction with pastoral pursuits was suggested and the contribution such developments could make to mitigating drought problems was stressed.

(ii.) In deciding upon a general policy for the settlement of the sheep country, consideration should be given, amongst other things, to the factors most likely to affect the maintenance of the State's sheep population. Amongst these, the preservation of the ewe flock is regarded as being of paramount importance. As it was demonstrated that the proportion of ewes to wethers was influenced by seasonal conditions and by reproductive rates, it was suggested that in fixing flock size, provision should be made for the inclusion of sufficient wethers to act as a "safety valve," and for sufficient ewes to re-build flocks reasonably quickly after they have been depleted by drought.

(iii.) The provision of adequate transport facilities for moving sheep from districts affected by drought conditions is a necessary corollary to the pastoral settlement of north-western Queensland.

(iv.) The capacity of animals to produce and reproduce in a particular environment is a reasonable indication of quality. Because of problems specific to the sheep industry in Queensland, the establishment of a strong stud industry in the environment in which sheep are bred is essential. Some studs holding special leases have fulfilled the terms demanded by their lease, while others have not done so. It was clear from an analysis of their figures that the conditions agreed upon have, in some cases, been too exacting. There was equally convincing evidence that some studs have not utilised their land as efficiently as they might have done. Others have maintained a high standard of production in both quality and quantity and there was reasonable evidence to suggest that some studs were in need of more country. In these circumstances it was considered that an immediate review should be made of the number of rams to be sold per 1,000 ewes maintained.

(v.) It should be the aim of the administration to encourage studs that would sell not less than 300 rams per annum and consideration should be given to the maintenance of some large flocks, capable of turning off reasonably large straight lines of ewes, which could be used for re-building flocks depleted by drought, and to contribute to the quality of flocks still in the formative stage.

(vi.) Raising the standard of husbandry is likely to be a long task, which will be influenced largely by economic conditions. It is already clear that the interest of some wool growers in the raising, well-being and productivity of their stock decreases as the price of wool rises. At the same time it is clear that the cut per head of sheep in Queensland also increases as the price of wool attains a level which removes the necessity of heavy stocking.

(vii.) The greatest scope for the application of more modern methods of husbandry rests with the stud sheep industry. As so much knowledge about methods of increasing lamb marking percentages is now available, and as such tremendous advances have been made in the development of aids to selection and in animal breeding plans, it is considered that an immediate improvement in the system of husbandry used in some studs is urgently required.

(viii.) Consideration should be given to safeguarding the fertility of the soil and preventing erosion in any districts where agricultural practices might be applied.

(ix.) The provision of adequate water and subdivision fencing as the quickest method of ensuring increased production should be encouraged. In the development of country, special consideration should be given to the quality of the water and the particular influence of soil and pasture on production.

(x.) Every effort should be made to maintain the stability of the industry by offsetting variations caused by adverse seasons.

RESEARCH WORK.

A programme of active research work was carried out during the year. It has included field trials associated with cobalt deficiency of sheep, studies of the aerial transport of fodder to floodbound sheep, and investigations into lowered reproductive rates of flocks in north-western Queensland.

Cobalt Deficiency of Sheep.—For many years a peculiar disease, known locally as coast disease, occurred amongst sheep depastured on the coastal sand dunes of South Australia. Work carried out by C.S.I.R.O. established that the cause of the complaint was a deficiency of two elements, cobalt and copper, which are essential to the well-being of sheep. The former is apparently not utilised by the animal body but by the bacteria in the rumen, to which it is essential for the formation of certain substances subsequently used by the sheep for making red blood cells. Sheep subjected to cobalt deficiency develop anaemia and symptoms characteristic of a fairly rapid wasting disease. Animals subjected to copper deficiency grow wool which lacks crimp and tensile strength. In addition, they are inclined to lose condition, but they do not suffer from the severe wasting disease which sheep affected by cobalt deficiency experience.

Copper deficiency was diagnosed amongst sheep in Queensland in 1946, but no evidence of cobalt deficiency was detected until 1950, when weaner sheep in the central-west exhibited symptoms typical of animals suffering from a lack of cobalt. The most suitable way of confirming the existence of a deficiency is to conduct a feeding trial, and one was concluded in August, 1950. Mortality continued amongst a group of weaners which were not given cobalt or copper, while animals of the same age and from the same flock, and running in the same paddock, thrived when given as little as 1 milligram of cobalt and 5 milligrams of copper per day.

Workers in South Australia have already found that the incidence of cobalt deficiency is very variable and further evidence of the existence of this condition in Queensland will be watched for with interest.

Aerial Transport of Fodder to Floodbound Stock.—During the July-August floods, over 444,000 lb. of fodder were carried in 85 flights, which occupied 320 hours of flying time, in feeding floodbound stock in the Goondiwindi and Dirranbandi districts. The total purchase cost of the feed was about £4,000 and the charges for air freight were approximately £15,000. Lucerne hay was fed almost exclusively, but the total cost of the operation could have been reduced by about half if a grain such as maize had been fed.

Throughout these operations C47 freight planes were used. These have an "all up" weight of about 26,950 lb. and weigh about 16,500 lb. empty. They are capable of lifting a load of 10,450 lb., which includes fuel and members of the crew. The actual weight of fodder carried on each trip varied between 6,930 lb. and 4,410 lb., depending upon the length of the flight. As no landing grounds near the flooded area were serviceable, all the fodder was flown from Brisbane and dropped on marked "target areas" while the aircraft were flying at about 110 m.p.h. at about 150 feet above the ground.

Difficulties were experienced initially in unloading bagged maize and on investigation it was found that the bags were too heavy and the momentum of the packages just before they struck the ground was so great that the bags burst. It was impossible to recover the maize which scattered over the sodden ground.

After a flight over the flood areas, during which the method of dropping was examined, a trial in which packs containing varying amounts of maize were dropped was conducted in conjunction with Australian National Airways. The results indicated that 60 lb. was the optimum weight to place in bags which were to be dropped under the conditions which prevailed at the time.

Several considerations led to this conclusion. In the trials 1,990 lb. of grain were dropped in 37 packages containing 60 lb. or less, and only 11 lb. of grain were lost from bags which broke when striking the ground. Nine hundred and ten lb. of maize were dropped in 15 packages weighing 70 lb. and of this 409 lb. were lost because the bags burst so badly on striking the ground that their contents were scattered beyond recovery. While it is probable that better results would have been obtained if triple bagging had been used for the 70 lb. packs, a favourable ratio between the weight of the containers and the weight of their contents would not have been maintained.

Human food and medical supplies were also dropped and the need for a committee to co-ordinate the activities of those participating in work of this nature, should such an emergency recur, is worthy of consideration.

Low Reproductive Rates of Flocks.—Queensland is among the few countries in the world with a major aggregation of wool-growing sheep in the tropics, and a review of the vital statistics of the sheep industry reveals that the reproductive rates of flocks in the tropics are below those of flocks in more temperate environments. Under a grant from the Wool Research Trust Fund, investigations have now been carried on for three years into lowered reproductive rates of flocks in the tropics and some interesting aspects of this problem have been encountered. It was shown several years ago that a number of factors influence the fertility of rams depastured in tropical Queensland. In the earlier work undertaken by the branch an effort was made to develop measures which might be adopted to prevent seminal degeneration in rams depastured in the semi-arid tropical environment.

When this was accomplished, attention was directed to the matter of the serious losses which occur among newborn lambs, and 10 observations have now been completed under field conditions to determine the extent of losses amongst lambs during the first three or four days of life. Data on over 2,000 ewes which have been lambed under intensive conditions have been compiled, and records pertaining to the birth weight, sex, strength, and survival to lamb marking time of more than 2,000 lambs are held.

These have revealed a close association between the birth weight of the lamb and its survival. Over three-quarters of the lambs which succumbed during the first three days of life weighed about 4 lb. at birth, whereas the lambs which survived in most cases weighed between 7 lb. and 8 lb. at the time of their birth. It was found that a large proportion of the ewes which lambed had some abnormality of the udder and there was an apparent association between this and low birth weight of the lambs. It was also found that losses were much higher in twin lambs than in singles.

The reasons underlying these results are not apparent, but trials are in progress to determine if some of them may not be due to dysfunction or depressed activity of the ductless gland system, which controls reproduction.

In order to permit a more detailed study of these aspects of the problems of lowered reproductive rates in tropical Queensland, a property known as the Toorak Homestead Block, which was part of the Toorak expired holding, was acquired early in 1951. This selection, which comprises about 36,850 acres, is located at about 21°S. At the present time developmental work is in progress and it is hoped to commence some field trials during the forthcoming breeding season.

CATTLE HUSBANDRY BRANCH.

Mr. R. D. Chester, Officer in Charge.

Unusual seasonal conditions were experienced during the year under review. Following the favourable seasonal conditions of 1949-50, the spring and early summer of 1950 were abnormally wet. Exceptionally heavy rains were experienced over most of the beef and milk producing areas of the State during December and January and in many areas severe flooding and consequent loss of production were regarded as inevitable in the late summer or autumn. However, the normal wet season was much curtailed and rainfall during the second six months of the year was in most areas below average and in some districts less than that experienced in the disastrous drought year of 1946. There is, however, an important difference between 1946 and 1951. The poor wet season of 1946 was preceded by a relatively dry spring with the result that pastures and water supplies were poor even at the beginning of the winter. In 1951, on the other hand, pastures and water supplies were still relatively satisfactory at the commencement of winter because of the very good conditions experienced earlier.

PRODUCTION.

Though the abnormally wet conditions of the first half of the year were offset by subsequent dry months, there was little adverse effect on the year's production in the beef industry.

The excellent summer conditions experienced in the previous year had ensured a high percentage of matings and conceptions in breeding herds, and as calves born in the spring months had excellent seasonal conditions, survival and growth rates were much above average. Brandings were greater than at any time since 1946 and on many properties the best ever experienced. Autumn calves were not so fortunate but losses of these calves should not be abnormal unless the spring of 1951 proves dry. Until the middle of winter breeding cattle remained in very good condition and growth rates of young cattle were maintained at satisfactory levels.

Because of the long wet season of 1949-50, coupled with the subsequent good winter-spring rains, the killing season for 1950 was later than normal. The killing season for 1951 commenced early because of a short wet season in 1950-51 and a subsequent dry autumn and winter. Stock routes were open early and most properties were able to work cattle probably six to eight weeks sooner than normal. Increased numbers in breeding herds and good brandings tended to build up stock numbers. The rapid drying back of water and the early cessation of grass growth produced a certain amount of anxiety in the minds of many cattlemen, with the result that there has been a tendency in all parts of the State for cattle to be marketed earlier than usual. This tendency to lighten stocking rates was apparent in the store cattle market as well as at the treatment works; during the period March to May there was a considerable drop in the monetary value of store cattle offered at auction, and these lower values were general throughout the State.

Movement of cattle into Queensland from the Northern Territory, as might be expected, commenced early in the season. Numbers of cattle entering the State from this source may be abnormally large during 1951 but they could be affected materially by early deterioration of stock routes and the serious difficulties that arise by reason of the presence of cattle tick and contagious pleuro-pneumonia in travelling mobs.

Dairy production in the spring was well maintained by the abnormal rains but midsummer production was seriously curtailed in many areas because of the excessively wet conditions. Much of the lower alluvial dairy country was unavailable for grazing for weeks at a time, and in the farming areas crops could not always be fed off at the most favourable stage because of the boggy nature of the farmland. Many farmers were unable to plant midsummer crops. On top of this the sudden end of the rainy period caught some farmers unprepared, with the result that early winter cereals were not planted until much of the soil moisture had been lost. In the Burnett and on the Darling Downs few farmers had green crops available for their cows during April and May. This resulted in an unusual and rather alarmingly rapid drop in production from March to June. Production on many farms on the Darling Downs in April was down to almost half the production for April, 1950. The same drop has been apparent in pasture dairying areas, where grasses matured early and subsequent autumn growth was disappointing. Rapidly increasing prices for grain (grain sorghum meal at Brisbane £12 per ton April, 1950, to £20 per ton April, 1951) caused a very steep decline in the amount of concentrates dairy farmers were prepared to purchase for their milking herds. This factor was undoubtedly important in reducing production, particularly in districts supplying milk to the metropolitan area. Purchased fodders increased in price by approximately 50 per cent. during the 12 months.

EXTENSION WORK.

Though staff numbers did not increase during the year, the service which the existing staff was able to give expanded considerably as a result of further experience and knowledge gained. The quality of the advisory service which could be given by the branch in the initial stages of its development was seriously affected by inability to recruit experienced graduate and technical staff. It was therefore necessary at first to appoint men lacking extensive experience in the specialised work in which they were required to engage, but the branch can now claim to have a number of well trained, experienced officers who can give valuable assistance to cattle raisers and dairy farmers.

Development of the branch has necessarily been slow and some areas are as yet inadequately served by field personnel. Most effort has so far been directed at developing a service to the important dairying areas and to beef raising districts in which it is considered that new and more intensive methods of production may become increasingly important in the near future.

The major obstacle to increased beef production in Queensland is the regular recurrence of droughts, and the future of much of the State's beef producing country may well depend on developing methods of countering their effects. There is, however, a large area of country in central and southern Queensland in which it is believed the cattle population could be increased considerably if more intensive methods of production can be practised economically. It is this area that offers the best prospects for relatively rapid development in the industry. With this in mind field officers have been placed in selected centres in order that they make make personal contact with progressive men in the industry and study at first hand the problems that are involved. It is only by so doing that sound technical information can be acquired for transmission to others seeking to develop more intensive methods of production.

Members of the field staff have visited an average of 35 properties each month. Apart from personal visits to farms every opportunity has been taken for members of the staff to attend field days and meetings. More than 50 such gatherings have been addressed. By these means it has been possible to give satisfactory cover to certain districts. From time to time senior officers stationed in Brisbane have made visits to various parts of the State and each important dairying district was visited on at least one occasion during the year.

The policy of combining extension work with field trials and demonstrations has been continued. This was made much easier by money available from the Commonwealth Dairy Industry Efficiency Grant. An extension officer is likely to be of most service to the district and most alive to the practical production problems of the industry if some of his time is given over to the collection of data through field trials and demonstrations. While the branch is in no way equipped at the moment to carry on an extensive programme of research, it is thought that short time research projects are essential to the development of a balanced outlook on extension work.

The work of the branch has been closely associated with that of the Veterinary Services Branch, the Herd Recording Section of the Division of Dairying and the Agriculture Branch of the Division of Plant Industry. As the work expands it becomes increasingly evident that progress towards increased production in both the beef and dairying industries can be made much more effective by close co-operation between all concerned in disease control, herd recording and pasture management. It is very gratifying, therefore, to be able to report that such co-operation has been a feature of the year's activities.

UREA FEEDING.

A preliminary urea feeding trial in the Beaudesert district was completed during the year. Though it was considered that there was little likelihood of urea proving an economic substitute for protein-rich concentrates, the fact that a serious protein shortage was becoming increasingly important in the metropolitan milk supply industry indicated that every avenue for increasing protein supplies should be investigated.

The trial was planned primarily to observe the effect of feeding urea as part of the concentrate ration over a long period. Observations were made on the effect of urea on appetite, the digestive processes, and milk production. It was clearly shown that, provided suitable precautions were taken, cows retained their full appetite over a period of at least six months when fed a concentrate mixture containing 3 per cent. urea and that no digestive upsets of any kind occurred.

Milk production from the cows fed urea compared favourably with that from cows receiving their protein as meatmeal, but because of the impossibility of obtaining sufficient evenly matched cows in each group a comparison cannot be made on a sound statistical basis. The findings have no immediate application, as price and availability of urea in Australia are both very uncertain quantities.

DEMONSTRATION WORK.

Feeding demonstrations with various concentrate mixtures were continued throughout the year with money made available through the Commonwealth Dairy Industry Efficiency Grant. The great increases in grain prices which occurred during the year have decreased the immediate value of these demonstrations. However, they are producing fundamental information on limited grain feeding under Queensland conditions, information that will be of permanent use to the industry.

Demonstrations are being conducted in six different districts of the State. It was intended to extend them to additional districts during the year but increasing costs of feeding made this inadvisable.

The demonstrations were designed to show the effect on milk production of feeding limited quantities of concentrates. In some herds two rates of feeding the one concentrate mixture were compared, while in other herds an attempt was made to demonstrate the effect of two concentrate mixtures of different protein values when fed at the same rate. In most herds the cows were grouped according to production and fed in two ways, but more than two methods of feeding have also been compared.

An analysis of results for the period January, 1950, to January, 1951, has been completed, and indicates that in all cases where concentrates were fed even in small quantities there was a lift in production. In the majority of cases where high and low rates of feeding were compared the low rate showed greater profit. Higher rates of feeding (1 lb. concentrates per 3 lb. milk) in all cases showed a greater increase in production than the low rates (1½ lb. concentrates per 10 lb. milk) but the extra milk production was insufficient to pay for the additional feed. Obviously, the economy of concentrate feeding depends on the milk/grain price ratio, which varies from year to year and also according to the ability of the farmer to produce concentrate feeds on the farm. These demonstrations have been particularly useful in illustrating the importance of producing home-grown fodders for the dairy herd. The value of both roughage feeds and grains was demonstrated in all six districts. When roughage feeds were scarce, increased production from limited concentrate feeding was relatively small, but when cows had adequate good roughage the value of the concentrate fed, as measured by increased milk supply, was considerably improved. This illustrates the prime importance of farmers having an abundant supply of good quality roughage for use in the off season.

Because of the marked seasonal growth of pastures in the summer rainfall zone and the low protein values of mature pastures in most of the State's dairying districts, it was anticipated that marked improvement would be shown by cows fed high protein concentrates, but though some increased production was obtained it was in nearly all cases very small. When considering this result it is necessary to remember that the year under review was a particularly wet one and protein values of pasture may have been higher over a longer period than in normal years.

CALF FEEDING DEMONSTRATIONS.

One of the least satisfactory aspects of dairy herd management is that of calf husbandry. Field staff have frequent occasion to note faults in dairy calf husbandry which result either in a large percentage of deaths or in stunting and poor development of the heifer calves that are being raised for herd replacements. Because of this situation, it was considered desirable to carry out calf raising demonstrations as soon as possible. A second reason for these demonstrations springs from the fact that many farmers in marginal dairying country who milk cows of the heavier breeds have wondered whether it is profitable to rear bull calves for sale as vealers or steers.

A number of calf rearing trials were commenced during the year on privately owned farms in order to demonstrate various rearing methods and study the weight gains in relation to costs of production. Some of the animals are shown in Plates 11-13, facing page 20.

In the metropolitan milk supply area the chief concern was to develop methods of rearing calves on minimum quantities of milk, using a concentrate mixture to replace milk at an early age. Calves were reared initially on 40 gallons of milk plus concentrates and subsequently other batches of calves were raised on smaller amounts until towards the end of the year one batch of calves was raised on as little as 20 gallons of milk. In the absence of figures for Australian calves the rate of weight gains compared with that for American calves of the same breed and found to correspond very closely. Food costs for the calves until put to pasture varied from £6 17s. 3d. to £8 10s. 3d. In these calculations milk was assessed at 2s. per gallon and grain at 3d. per lb.

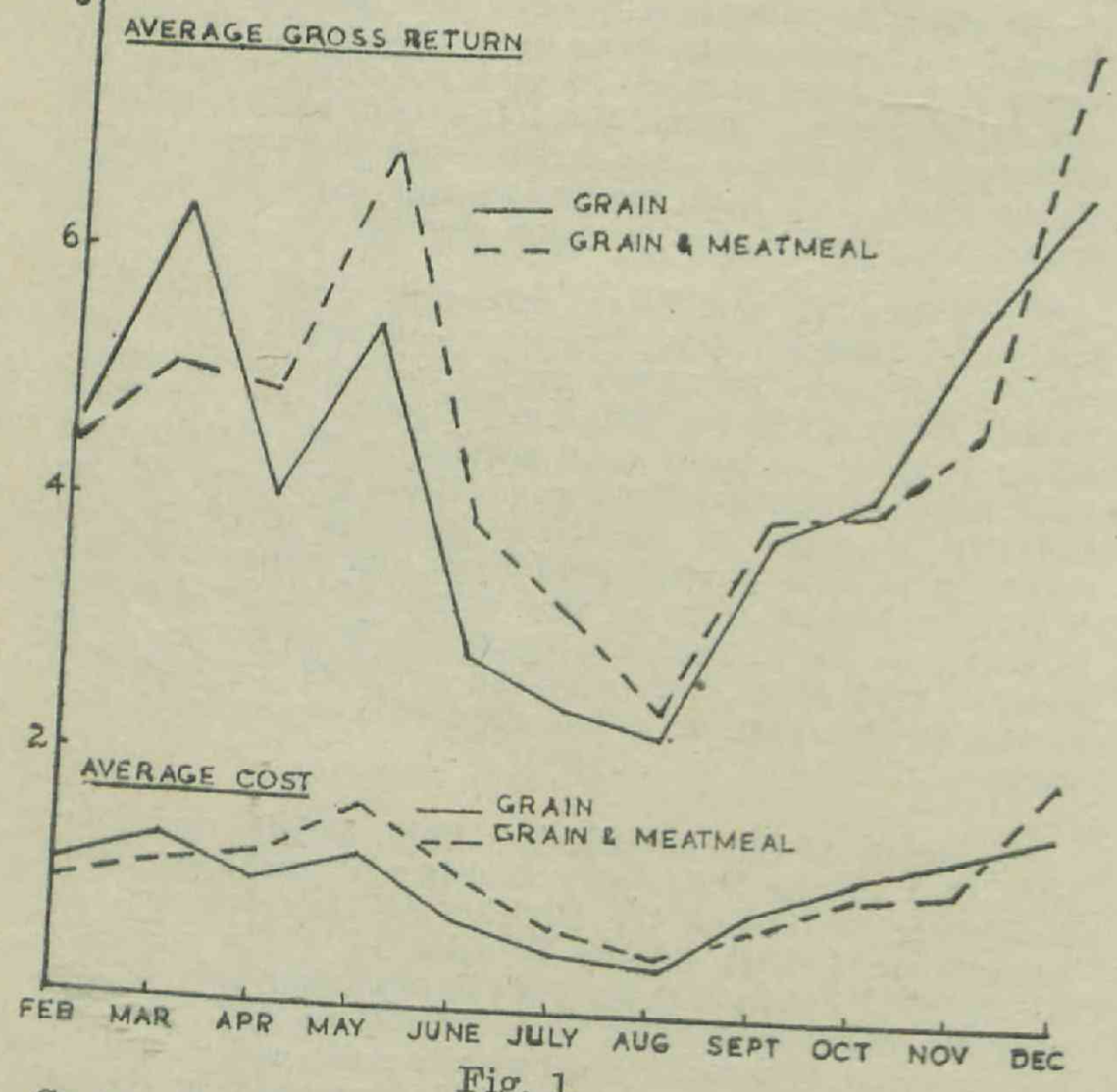


Fig. 1.

GRAPH SHOWING COSTS AND RETURNS FROM HIGH AND LOW PROTEIN CONCENTRATES IN A REPRESENTATIVE MILKING HERD.

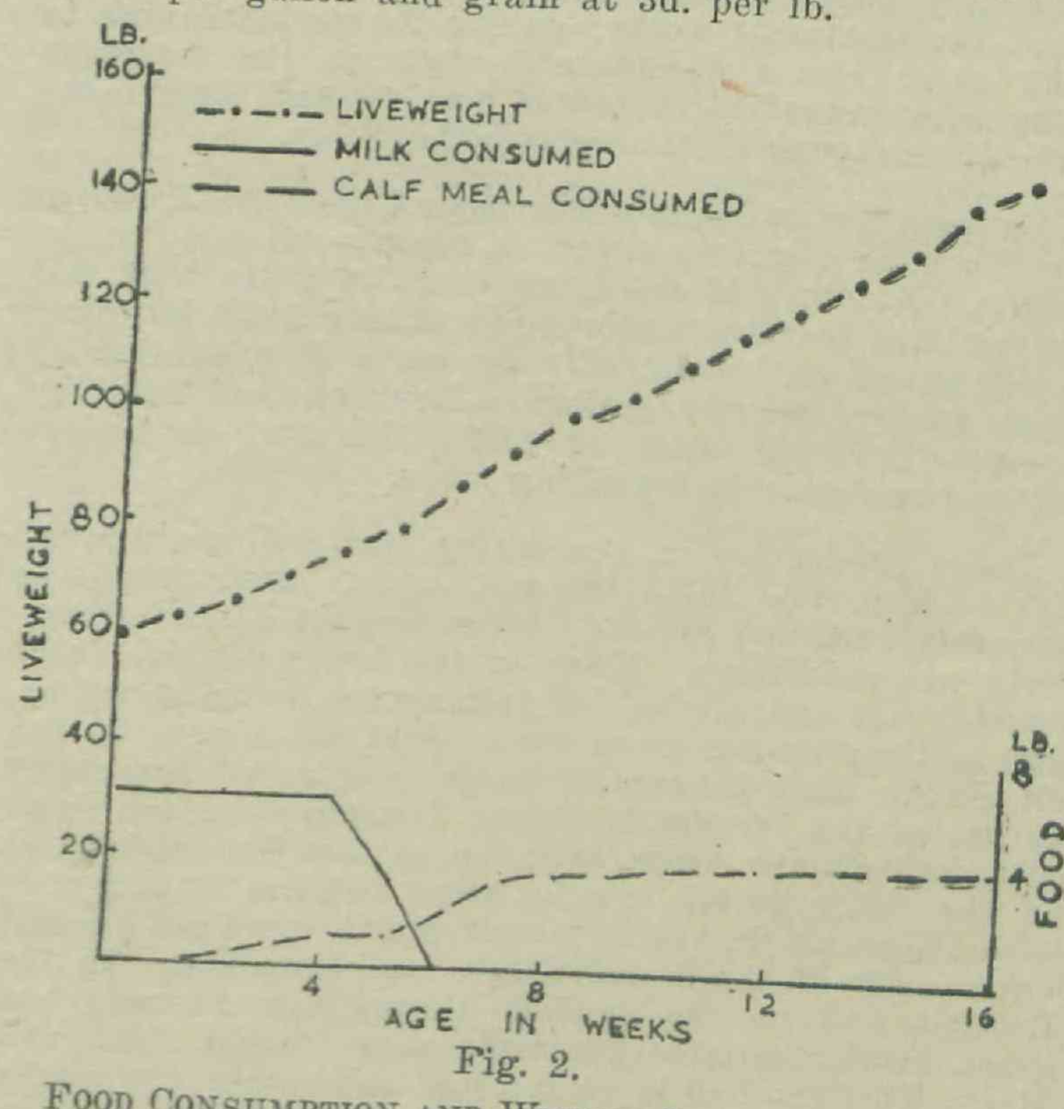


Fig. 2.

FOOD CONSUMPTION AND WEIGHT GAINS OF CALVES RAISED ON LIMITED MILK.

In other trials well-grown A.I.S. calves were raised on 60 gallons of milk plus concentrate to 212 lb. liveweight at five to six months of age. A.I.S. calves on smaller quantities of milk were only 140 lb. liveweight at this age whereas those on unlimited supplies of milk with access to a little grain and good grazing reached a liveweight of approximately 300 lb. at six to seven months of age.

The general conclusions to be drawn from these demonstrations at the moment are that it is possible to raise healthy calves on as little as 20 gallons of milk but if all concentrate foods have to be bought the cost of raising calves by limited milk feeding methods would appear to be at least twice as much as when calves have access to normal amounts of skim milk. In the demonstrations, costs were from £6 to £8 for calves on limited milk compared with £3 to £4 for calves on skim milk. These figures indicate that rearing calves on limited amounts of milk is likely to be worth while only if the calves are destined to serve as heifer replacements for the herd.

One interesting observation was made in regard to the control of internal parasites in the metropolitan trial. Regular drenching failed to control infestation adequately in the early part of the demonstration but subsequently efficient control was obtained by a combination of rotational grazing and strategic drenching.

MINERAL DEFICIENCY.

Clinical evidence of phosphate deficiency is apparent in cattle in many parts of the State, particularly in North Queensland beef cattle country, where bone chewing, stunted growth and lameness occur in many localities. A considerable area of central and southern coastal Queensland may be considered as marginal country in respect of phosphorus. In these areas adult dry cattle appear to thrive normally but frequently young growing stock fail to maintain growth and milking cows produce poorly. Blood phosphate analysis does not always substantiate the tentative field diagnosis of phosphate deficiency and there may possibly be other factors which are not at present apparent.

Observations are being made on a dairy herd in the Brisbane area where the blood phosphate level of the milking cows was lower than usual. Phosphorus in the form of bone-meal is fed at the rate of 4 oz. per cow per day and blood samples are examined at regular intervals for phosphorus content. Results so far do not indicate any marked response to this treatment.

Towards the middle of 1950, officers of the Veterinary Services Branch diagnosed copper deficiency in a beef cattle herd on the near north coast. Subsequently, copper deficiency has been diagnosed on a number of occasions in south-eastern Queensland, mostly in dairy cattle. It is too early at this stage to say how important copper may prove to dairy production in Queensland and what will be the most practical method of overcoming the deficiency. A copper-rich lick is being tried on one property, and in the case of milking cows copper is being fed in a concentrate mixture in the bails. A small trial on the near north coast has been arranged with the Agriculture Branch; cattle will be depastured on a variety of topdressed pastures and weighed at regular intervals in an attempt to assess the efficiency of pasture renovation methods in overcoming the deficiency.

STERILITY.

Losses in the dairy industry resulting from temporary or permanent sterility in the breeding herd are considerable. This applies particularly to areas where it is most profitable for farmers to calve their cows in the spring. Delayed conception can mean a considerable loss of production and is especially important to the farmer who markets whole milk, as it is essential that cows calve at predetermined intervals in order to maintain an even flow of production. A considerable amount of time is therefore given over to advisory work on sterility. As far as possible all cases reported by farmers are checked and an endeavour made to ascertain the cause of the condition. Though a great deal of information has been obtained it cannot be claimed that sufficient is yet available to deal satisfactorily with every case of herd sterility which is reported. It seems likely that a considerable proportion of reported cases of sterility are secondary to Brucella infection and this should always be dealt with before other control measures are applied. However, there is much evidence to show that nutrition, particularly mineral nutrition, is often a primary factor.

One interesting side result of routine examinations of cows in the normal investigations of herd sterility has been the diagnoses of trichomoniasis in dairy cattle for the first time in this State.

ARTIFICIAL INSEMINATION.

Dairymen, and to a lesser extent beef producers, continue to show interest in artificial insemination despite the fact that owing to rising costs the possibilities of commercial application are decreasing very rapidly. The process is considered to have possibilities in the breeding of very high class stud cattle, so efforts have been continued to develop a technique applicable to field conditions in Queensland. As a result of insemination with semen imported from the United States, a Guernsey heifer was born in a Maleny herd last spring. This was the first calf born in Queensland from imported semen. It has important implications for the stud industry as it may easily prove wiser and cheaper to import semen from proven sires overseas than to import young bulls of unknown breeding merit. Semen from a proven Jersey bull in the Illawarra district of New South Wales was flown to the Kingaroy district and used in one of the State's leading Jersey herds; five cows are in calf as a result.

Another important application of artificial insemination has been made in conjunction with the Veterinary Services Branch in eradicating trichomoniasis from a dairy herd in the metropolitan area. Conception rates in this herd have, on the whole, been excellent, though one or two cows have proved refractory.

CROP FATTENING OF BEEF CATTLE.

Several factors have operated to reduce the amount of crop fattening carried out on the Darling Downs in recent years. At the same time there has been an expansion of this method of production westward and northward from the Downs. In the southern part of the State, winter cereals have proved the most popular crops for cattle feeding, but in central Queensland, summer grazing crops, particularly grain sorghum, are preferred. It is thought there may be a considerable expansion in this method of fattening in the near future. In order to obtain data on fattening rates and costs, a co-operative scheme has been arranged between the Department and the Queensland-British Food Corporation whereby a series of grazing trials will be conducted on Cullin-la-ringo in the Emerald district. A weighbridge has been installed on this property and cattle are being weighed at weekly intervals. Unfortunately, owing to seasonal conditions, the extensive trials planned have had to be curtailed but some preliminary work will be possible.

EXPERIMENTAL HERD.

Some changes have been made in the dairy herd at Kairi Regional Experiment Station. The original herd of 23 cows was increased during the early part of the year by the purchase of five mature cows, but some culling became necessary owing to an outbreak of brucellosis, five positive reactors being sold for slaughter during the year. Three sets of identical twin heifers were purchased during the year and placed in the herd. These will be used for experimental work when they are in milk. The first heifer born in the herd came into production recently.

No experimental work was undertaken with the milking herd, which was maintained under a rotational grazing system, with moderate amounts of concentrates being fed in addition according to production. Milk from each cow is weighed at each milking and butterfat tests carried out once each week. It is considered that the management routine is now satisfactorily settled and with two lactations almost completed it will be possible to group the herd for experimental work during the next lactation.

It has not been possible to undertake extensive calf rearing experiments, but all calves born on the property have been reared and a trial carried out to assess the value of nipple-feeding methods. Preliminary trials have indicated that nipple-fed calves do not thrive as well as calves fed in the normal manner, but it is considered that minor adjustments to the nipple feeding apparatus might have made a considerable difference to the results obtained. It is intended to repeat the work with certain modifications in the coming season.

DAIRY FARM COMPETITIONS.

Field officers co-operated with officers of the Division of Dairying in judging these competitions and in conducting subsequent field days on prize-winning farms.

PIG BRANCH.

Mr. F. Bostock, Officer in Charge.

The following gives an indication of the work carried out by officers of the Branch during the year:—

Farm visits	2,552
Pig sales attended	76
Meetings attended	26
Field Days	16
Bacon factory visits	102
Shows attended	32
Demonstrations given	36
Lectures given	26
Regional Experiment Station visits ..	113

During the year, the Assistant Husbandry Officer was engaged in preparing and carrying out various experimental projects of the branch. His work also includes assistance to the various field officers on specific technical matters related to problems in feeding and husbandry that they have encountered during the course of their duties.

PRODUCTION.

Production figures for the year reveal a decrease of approximately 10 per cent. in the number of pigs slaughtered, which is attributed mainly to somewhat adverse seasonal conditions and the high price and shortage of cereal grains. However, the continued short supply of animal protein foods, fencing wire, piping and building materials was a contributing factor in preventing any substantial increase.

The quality of the pigs forwarded to market was generally satisfactory, though in all districts, except the Northern Tablelands, the overfat pig is still causing a good deal of concern. This year has, however, seen some diminution in the number of overfat pigs coming forward to bacon factories, mainly, it is thought, because of high price and shortage of food grains forcing considerable numbers of unfinished and lightweight pigs on to the market.

The seriousness of this problem of the overfat pig should not be overlooked. At all factories except the one in the area controlled by the Northern Pig Marketing Board, farmers receive the same return (weight for weight) for an overfat pig as for one with the most desirable proportion of fat to lean. A system of differential payments according to grade, such as is in existence in part of North Queensland, appears to provide the incentive to market pigs before they become overfat.

An announcement on the contract price for pig meats for export to the United Kingdom was considerably delayed, but a new price of 1s. 6d. per lb. to the producer, for first quality baconer pigs, eventually took effect in January. As a result of a shortage of pigs, however, the local price has averaged 1s. 7d. per lb. and the export of pig meats to the United Kingdom was consequently considerably reduced for the year.

STUD PIG RAISING.

Reports from the field staff indicated that there was a very keen demand for stud pigs in all parts of the State.

Selection of breeding stock on appearance alone, though of great value when made by the expert, has well known limitations; progeny testing is designed to overcome these. During the year, testing of animals in the piggery at Kairi Regional Experiment Station was commenced and the experience gained will be valuable in relation to the operation of a pig testing station in the future. Tests of this kind give information on such features as litter size, weight for age at slaughter, economy of liveweight gain and carcase quality.

CARCASE COMPETITIONS.

Cured baconer carcase competitions continue to gain in popularity and have been included in an increased number of country show schedules. These competitions have a distinct advantage over lectures and illustrated addresses, inasmuch as the producer is himself part of the show. They demonstrate to the producer in a very graphic way the type of carcase required by the trade and there is no doubt that they are achieving their objective, as is evidenced by the improvement in quality of the carcases exhibited in the 1950-51 competitions. Competing farmers have no doubt benefited from past experience of these competitions and utilised the information and knowledge gained in previous years.

For the fourth successive year, the Australian Meat Board, in association with the Department of Agriculture and Stock, and with the co-operation of all sections of the industry, conducted baconer carcase competitions on a district basis. Judging was carried out at field days arranged at Mareeba, Rockhampton, Toowoomba and Brisbane by officers of the branch. The championship for the State was awarded to a pig of the Berkshire breed, bred in the Toowoomba area. The score of 87½ points was the highest yet secured in any of these competitions in Queensland. The carcase, of 133 lb. dressed weight, was of good type, having a well developed eye muscle, an even covering of fat, good body length, very fair streak development and good type shoulders and hams; leg length was a little excessive.

The field days held in conjunction with these competitions proved very popular with the farmers, especially in the Central Queensland zone, where approximately 225 persons attended.

There were 141 pigs judged, of which 128 were eligible for competition. This represents an increase over the previous year of 25 carcases.

The entries which complied with the competition conditions of entry had an average score of 71.566 per cent., a considerable improvement on previous results and a praiseworthy effort on the part of producers. This improvement applied in all districts. It is, however, necessary to point out that there was a loss of points in one very important section—body length. Producers should pay strict attention to the selection of breeding stock in respect of good body length as this is a character which can be lost only too easily.

The number and standard of entries in these competitions for four years are shown in Figures 1 and 2.

The average of each section at judging is given below.

CARCASE COMPETITION SCORES.

—	Possible Points.	Average Points Scored.	Percentage of Possible Points 1951.	Percentage of Possible Points 1950.
Hams ..	8	6·441	80·517	76·213
Shoulders ..	7	5·921	84·598	83·664
Streak ..	12	7·414	61·784	64·724
Eye muscle ..	28	20·148	71·958	50·936
Backfat ..	20	15·445	77·226	72·864
Body length ..	20	12·984	64·922	66·941
Leg length ..	5	3·210	64·218	65·631
Total ..	100	..	71·566	65·218

As a result of a study of the Queensland carcase competition results for recent years, there are indications that allocation of points in accordance with the Hammond appraisal system has favoured carcases in the light and heavy weight ranges as compared with those in the medium weight range. Three main characters have been concerned—eye muscle, back fat and body length. Consideration is being given to modifying the Hammond appraisal system.

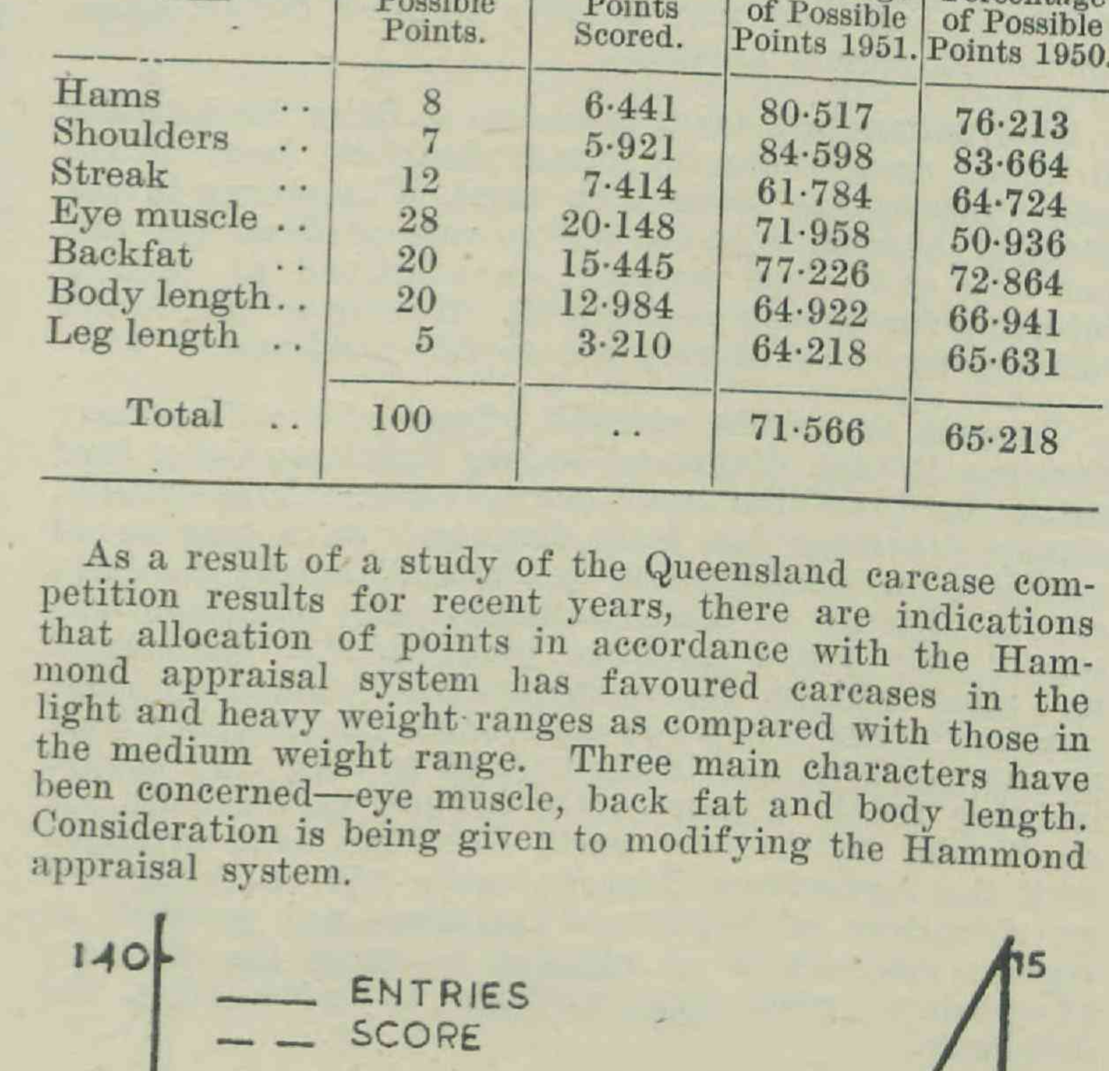


Fig. 1.

NUMBER OF ENTRIES AND POINT SCORES, BACONER CARCASE COMPETITION.

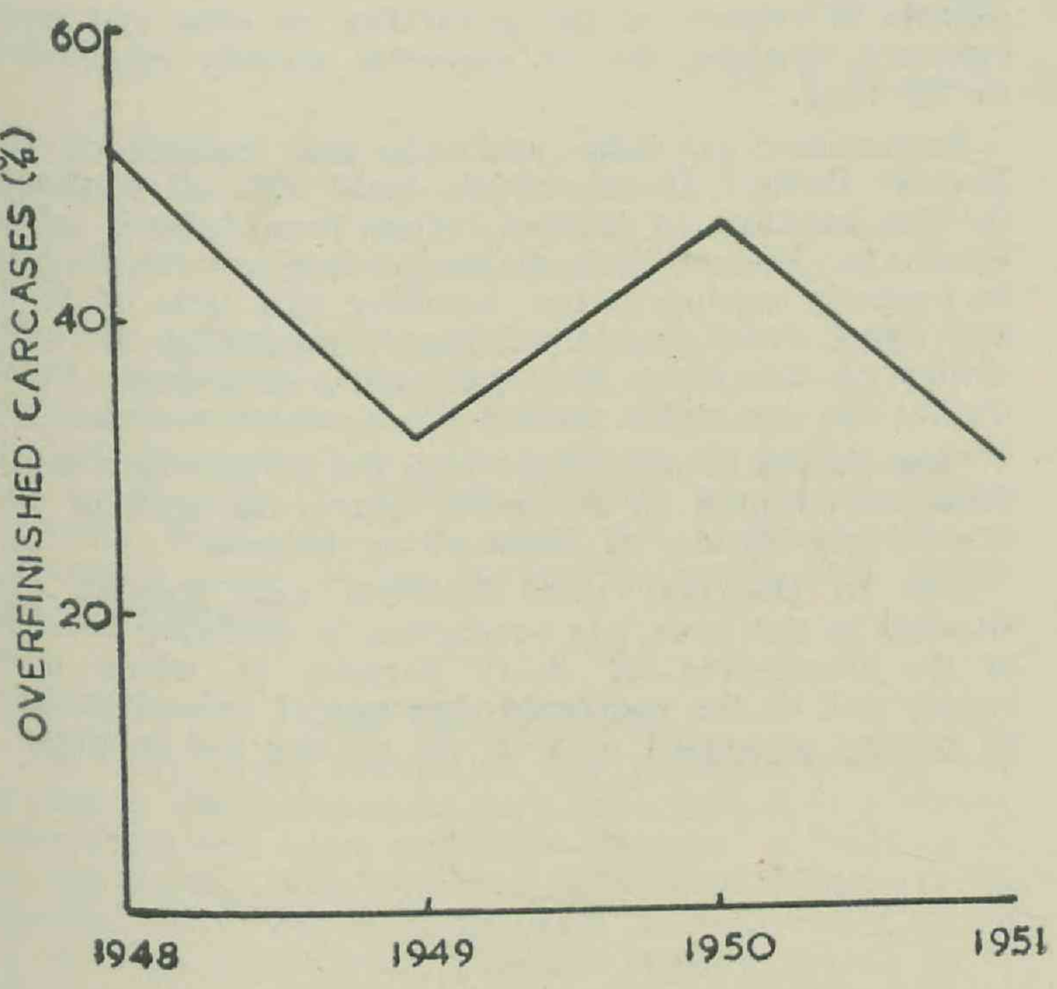


Fig. 2.

PERCENTAGE OF OVERFAT CARCASES IN BACONER CARCASE COMPETITIONS.

GENERAL.

At Kairi Regional Experiment Station the stud herd of Tamworth pigs established two years ago was strengthened by the addition of a second stud boar.

Overseas research into the effect of the plane of nutrition upon carcase development has suggested that by slowing down the growth rate of baconer pigs in the "finishing off" stages an appreciable improvement in carcase quality can be made. With this in mind, a suggested practical approach to the adjustment of feed intake is to feed increasing amounts of lucerne chaff in the rations of baconer pigs from the time they reach 100 lb. till they attain 200 lb. liveweight, at the same time decreasing the amount of grain fed. This practice effects a reduction in nett feed intake by increasing the amount of fibre in the ration. Its effect on growth rate and carcase quality has been under investigation. A trial at Kairi suggested that the inclusion of lucerne chaff at levels of from 5 per cent. to 15 per cent. in baconer pig rations can appreciably improve carcase grade. Confirmation is being sought by a further trial at H.M. State Farm at Palen Creek.

The brucellosis testing scheme introduced in 1950 in conjunction with the Veterinary Services Branch provides for the testing of stud herds until such time as they have passed two consecutive tests without any positive reactors being found. It is now well established, 37 herds having been issued with appropriate certificates and placed on the list published in the *Queensland Agricultural Journal* each month. Sixteen further herds have entered the scheme but have still to complete their tests.

The health of stock has been generally satisfactory but salmonella infection continues to be responsible for moderate losses on many properties. On the Downs a number of sows in widespread herds either aborted their litters or the suckers, if delivered at full term, were dead at birth. The cause of the trouble was not determined despite extensive investigations.

In Central Queensland trouble was experienced on several properties by breeding sows falling off in condition and losing their litters. Eating of the pods of a plant known locally as phasemy bean (*Phaseolus lathyroides*) is thought to have been responsible.

DISTRICT REPORTS.

North Queensland Area.—The year under review was one of seasonal vagaries which will adversely effect production in the ensuing year. Heavy rains in November and December, with below average rains in the remaining summer months, seriously reduced plantings of maize and other food crops. Pastures deteriorated much earlier than usual in 1951. These factors, together with the ever increasing demand for whole milk from the Tableland, suggest that a decrease in pig production will take place during 1951-52.

Overfat pigs again decreased in numbers in this area, probably as a consequence of a reduction in the permissible top weight for first grade baconers from 180 lb. to 160 lb. dressed, coupled with an increase to 1½d. per lb. in the margin between 1st and 2nd grade prices. An important feature of the Adviser's activities in this area is follow-up work on the farms in connection with pigs graded down on account of overfatness. This, in conjunction with the weight and price considerations just mentioned, is effecting substantial improvement.

Disease was not as prevalent as in former years. Major losses were from scrub ticks and Glasser's disease. As is usual in this area, kidney worms proved the most harmful of the internal parasites, and it is believed that they were the cause of considerable numbers of skin sores. This matter is still under investigation.

Central Queensland.—Accommodation for pigs in the area is, generally speaking, poor, though it is pleasing to be able to report that some improvement has taken place lately. Growers in many cases have heeded advice to alter their system from that of confining pigs in sties to the open range system. The use of the projector and suitable slides has been of valuable assistance in achieving that end.

Several new studs were established and others are planned. After farmers had been advised to improve the quality of their breeding stock, several consignments of pure-bred stock were procured from the south to raise the somewhat low standard which prevailed previously.

The problem of the overfat pig is lessening somewhat and, generally speaking, the quality of pigs consigned to bacon factories is of a better grade. The question of grading is often referred to by those growers who are endeavouring to produce a better quality carcase, the view expressed being that their efforts are worthy of an incentive payment.

Burnett Area.—Though the rainfall was approximately two inches above average, the distribution was most irregular. Excessively wet conditions in July resulted in many cereal crops in the area becoming affected by rust and this, together with very dry weather in August and September, reduced yields considerably. Abnormally wet weather during the following two months, when crops were ready for harvesting, caused lodging and in some cases total loss. Summer grain crops were also affected by unfavourable weather conditions.

Five field days, at which appropriate addresses were given, were held throughout the area; the attendance and interest shown were good. The farmers' baconer competitions held at an increased number of shows throughout the area were very successful, especially at Kingaroy, where 43 carcases were exhibited. The quality of carcases in general was far superior to the previous year, but body length was not good, only 10 out of 63 scoring more than half marks. This deficiency was emphasised to breeders by the Adviser and they were urged to pay more attention to selection of breeding stock.

Darling Downs Area.—Seasonal conditions generally were unfavourable, the rainfall being untimely. Grazing was plentiful, but the grass was too rank to be of much value to pigs.

Most stud breeders have received numerous enquiries for stud stock, but are complaining that farmers are not disposed to pay the prices asked for good quality pigs. This is thought to be the result of buyers of porkers and baconers not discriminating with regard to quality. Some breeders in the area feel that this state of affairs will continue unless a system of differential payments according to grade is introduced.

Diseases of pigs attracted a good deal of attention in this area, especially under conditions of poor housing and sanitation.

Warwick Area.—This area was staffed for the first time in August and during the subsequent months most major centres were visited by the Adviser and contacts made with the principal pig raisers and agents. A great number of farmers have visited the Adviser in his office. It can be said with confidence that the new appointment has been well received by pig producers in the area.

A large proportion of piggeries in the area carry less than five brood sows and feed on skim milk almost exclusively. In these circumstances farmers are not very anxious to improve buildings or stock, as the pigs are regarded only as a means to an end—disposal of skim milk. This opens up a very big problem which is not easy of solution and improvement will necessarily be slow but it is hoped none the less sure.

Moreton Area.—Useful falls of rain were experienced, resulting in reasonably good conditions prevailing throughout the area, and green feed was in fair supply, except for the last three months of the period.

The area includes the metropolitan district, in which the feeding of kitchen scraps, hotel refuse, &c. is extensively carried on by suburban pig farmers. This type of farming is largely controlled by the Brisbane City Council, which issues permits to operate. The Council maintains close liaison with the Branch and requests reports in respect of the suitability of sites and management, hygiene, &c. of piggeries already established in the area.

Inspections are also made at the request of the District Control Board, which deals with all contracts for the handling of kitchen refuse from defence establishments. Farmers submitting tenders are required to be properly equipped for handling this type of food, and apart from the initial report regarding the suitability of the farm and equipment, subsequent check inspections are made during the contract period.

Close liaison is maintained with the three major bacon factories situated in the area, where the bulk of the State's production of baconers is treated.

Due to the fact that Brisbane and Ipswich are situated in this area, pig production is declining because of the changeover by dairy farmers to whole milk supply and to the continued shortage of animal protein to replace separated milk in the rations fed to pigs.

POULTRY BRANCH.

Mr. P. Rumball, Officer in Charge.

The fact that Australia was called upon to play an important role as food supplier to the Allied Forces during World War 2 was responsible for rapid expansion of egg and to a lesser degree of poultry meat production.

On the cessation of hostilities more poultry meat supplies were available than the local market could absorb at prices profitable to producers. Fortunately, about this period contracts for the purchase of poultry meats were made with the British Ministry of Food. These contracts terminated last year, but there remains a substantial export trade in poultry meats that seems likely to continue.

EGG PRODUCTION.

The very rapid decline in egg production that was evident in 1950 appears to have been checked in southern Queensland and there is some evidence of a build-up in poultry flocks. The increased production which can be expected from this build-up could be very easily offset by the high prices being paid for poultry meats. It is all a question of which is the more profitable and/or simple form of production, eggs or poultry meat.

In Central Queensland a further steep decline in egg production has taken place. The year's intake of eggs by the Central Queensland Egg Marketing Board was lower by approximately 25 per cent. In Northern Queensland, it is estimated by the Branch Adviser, there has been a decline of 20 per cent.

POULTRY MEAT PRODUCTION.

There was a big increase in prices paid per pound liveweight for poultry during the period under review. Cockerels advanced from 1s. 10d. to 2s. 6d., hens from 1s. to 1s. 9d., and ducks from 1s. to 2s. These price increases have not been ruling for a sufficiently long period to have had any marked effect upon the production of poultry meats, but were probably responsible for the unprecendented demand for cockerel day-old chickens which has occurred since they came into operation. Day-old cockerels were formerly destroyed in thousands.

As pointed out in last year's report, the fall in duck prices during 1949-50 gave duck production a severe setback. Though prices once again offer an inducement to duck producers it will be some years before complete recovery can be expected, as hatching in this State is almost exclusively by natural means.

Table 1 gives the total poultry slaughtered in 12 Brisbane slaughtering establishments over the past three years and Table 2 the export of dressed poultry.

TABLE 1.

TOTAL BIRDS SLAUGHTERED.

1948–49.	1949–50.	1950–51.
1,231,029	1,299,445	1,158,920

TABLE 2.

EXPORT OF DRESSED POULTRY.

—	1948–49.	1949–50.	1950–51.
	Lb.	Lb.	Lb.
Boiler hen	1,792,000	1,684,480	1,400,000
Chicken (cockerel) ..	1,169,280	1,238,720	1,113,280
Duck	389,760	1,025,920	425,600
Turkey	49,280	67,200	69,440
Total	3,400,320	4,016,320	3,008,320

POULTRY STOCK SUPPLIERS.

It is pleasing to be able to report a slight reduction in the incidence of pullorum disease in flocks of stock suppliers. There are now over 100 flocks in which the incidence is 2 per cent. or less. Of these, 40 had less than 1 per cent. and 19 were free at the last test. Outbreaks of pullorum disease in chickens occurred only on rare occasions in chickens hatched by registered stock suppliers.

There has been a slight falling-off in the number of persons registered as stock suppliers. Some have cancelled their registration, and others have sold their properties to persons who have used the land for other purposes.

Table 3 sets out for the past three years the number of persons registered in each of the three categories provided under the Poultry Industry Acts.

TABLE 3.

REGISTERED STOCK SUPPLIERS.

—	1949.	1950.	1951.
Hatching chickens for sale..	186	188	176
Supplying fowl eggs for hatching	76	46	47
Poultry dealer	4	4	4

SEXING OF CHICKENS.

Though 28 persons were licensed for this purpose, only 24 actually engaged in the practice. Nine examinations were conducted but only two persons qualified.

The number of chickens handled by sexers during the past four seasons is set out in Table 4.

TABLE 4.

1947.	1948.	1949.	1950.
2,339,657	2,366,779	2,178,503	2,381,100

THE POULTRY INDUSTRY ACT.

This Act, which provides the basis for most of the activities of officers of the branch, was the subject of an amending Bill during the year. The Act now provides for the appointment of an advisory board to the Minister, which includes amongst its seven members three representatives of egg marketing boards and one representative of an organisation connected with the poultry industry. There is provision also for the payment of a levy by egg marketing boards with a view to the industry contributing financially towards the cost of the service given to it by the Poultry Branch. Additional powers have been provided to control the slaughtering of poultry but these have not been made use of as yet on account of insufficient staff.

EXPERIMENTAL WORK.

High Level Maize Feeding.

During the year under review nutrition experiments were conducted at Kairi Regional Experiment Station to investigate the effect of high levels of maize in rations fed to chickens, growing stock and layers.

Chickens.—The results from the chicken-raising experiment confirmed the findings of tests carried out in 1948 and 1949. As the maize content increased beyond 40 per cent. of the ration there was a progressive decline in weight to eight weeks of age. Figure 1 sets out the growth-curves of chickens on 30 per cent. maize (check), 50 per cent. maize and 70 per cent. maize. The curves for 40 per cent. and 60 per cent. maize have been omitted for the sake of clarity.

Growing Stock.—To determine whether the continued feeding of high levels of maize would have a further growth-retarding effect, the five groups of chickens were maintained from eight weeks to maturity on five growing rations with the same increasing levels of maize as used in the experimental starter rations.

At six months of age all birds in each group were weighed and the average group weight calculated. It was found that the differences which were very evident at eight weeks of age had disappeared. It would appear that, as the birds developed, their ability to handle the higher maize levels improved.

Laying Stock.—The laying experiment, commenced in March 1950 with 540 Australorp pullets divided into six groups of 90 each, concluded in March, 1951.

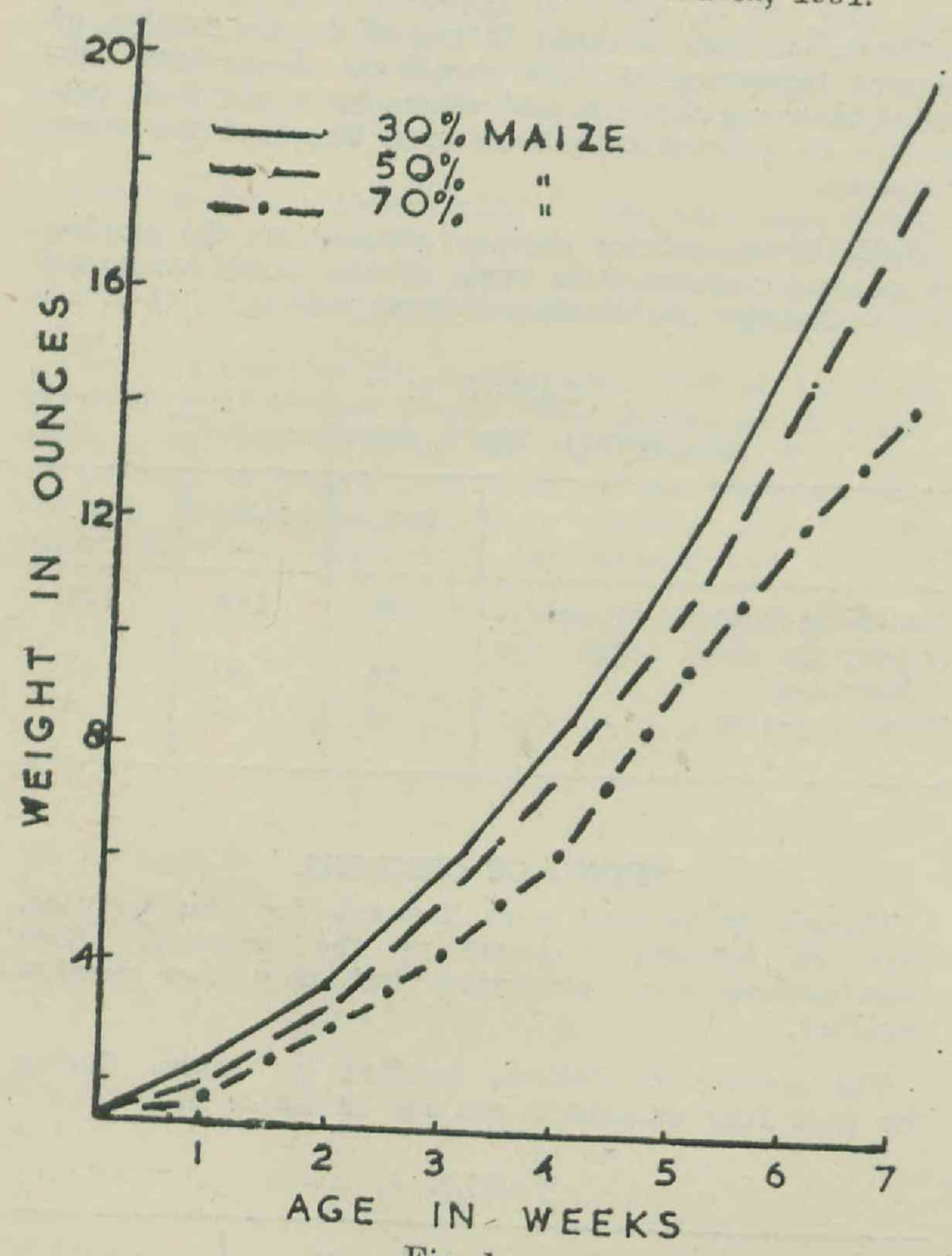


Fig. 1.
CHICKEN FEEDING EXPERIMENT.

The all-mash laying rations as set out in Table 5 were fed.

TABLE 5.

—	Ration No. 1. (Control).	Ration No. 2.	Ration No. 3.
Maize meal	55	62·5	70
Bran	12	14·5	8
Pollard	15	3	..
Meat meal and bone meal	10	11	12
Linseed meal ..	2	2	2
Lucerne meal ..	6	7	8

Fish oils containing vitamins A and D3, synthetic riboflavin and manganese sulphate were added to the mashes. Manganese sulphate was added to offset the low manganese content of maize. Both synthetic riboflavin (vitamin B2) and manganese sulphate were intimately mixed with the common salt portion of the ration in the following proportions:—20 lb. common salt, 2 grams riboflavin, 4 oz. manganese sulphate. This mixture was used at the rate of 1 lb. to every 100 lb. of mash.

Production and food consumption for the three groups were as set out in Table 6.

TABLE 6.

—	Ration No. 1 (55% Maize).	Ration No. 2 (62·5% Maize).	Ration No. 3 (70% Maize).
	Pen 1. Pen 2.	Pen 3. Pen 4.	Pen 5. Pen 6.
Average production per bird per pen per year ..	202·8 190·8	199·2 210·3	185·0 215·7
Mean production per bird on same ration ..	196·8	204·7	200·4
Lb. of feed to produce 1 dozen eggs	6·16	6·16	6·21

The results do not disclose any significant difference in production between rations.

Feeding BHC Treated Grains.

Some insecticides used to protect grains against weevil infestation impart a distinct flavour to these grains. One of these is benzene hexachloride (BHC), which, because of the shortage of carbon bisulphide, is being used on stored seeds intended for planting. The use of BHC on feed grains has received consideration in some quarters, and the branch accordingly initiated experimental work to ascertain whether grains so treated give off-flavours to flesh and/or eggs when fed to poultry.

Four out of five groups of cockerels, each containing 10 White Leghorns and 10 Australorps, were placed on "treated" mashes at 12 weeks of age.

One group was fed a commercial mash to which commercial BHC (13 per cent. gamma isomer) was added at the rate of 5 p.p.m. A second group received mash containing 25 p.p.m. A third group was fed mash to which deodorised BHC (99 per cent. gamma isomer) was added at the rate of 5 p.p.m. and a fourth group received deodorised BHC at the rate of 25 p.p.m. The fifth (check) group was fed the same mash without any addition of BHC. Commercial BHC has a characteristic musty odour, while deodorised BHC has little or no smell.

Two birds from each group were slaughtered five weeks after feeding began and thereafter at intervals of approximately 14 days.

Four out of five groups of pullets were also placed on laying mashes containing the same levels of commercial and deodorised BHC as for cockerels.

This work is being conducted at Yeerongpilly Animal Health Station, and though not completed it can be reported that an objectionable flavour was detected in both the flesh and eggs of those birds that were fed on mashes containing 25 p.p.m. of commercial BHC. This flavour was first noted in the case of flesh five weeks after the commencement of feeding, and in the case of eggs at seven weeks.

Grains treated with commercial BHC at this level can be said with certainty to be unsuited to poultry feeding.

At the lower level of commercial BHC a definite off-flavour in flesh was not noted until 11 weeks after feeding commenced. No taint was noted in eggs from pullets on this level until nine weeks after the commencement of feeding. In view of the fact that the smaller amount of commercial BHC has given a definite taint in flesh and to a lesser degree in eggs, grains treated even with 5 p.p.m. commercial BHC should be used with caution.

In neither of the cockerel groups fed on deodorised BHC was any tainting of flesh noted. In respect of the pullet groups on deodorised BHC, some observers have claimed to have detected slight taint in eggs but trained butter graders have so far failed to do so.

DISEASE AND PEST CONTROL.

Officers of the branch investigated 526 outbreaks of disease. This does not include the numerous calls or enquiries from householders. The percentage of outbreaks was as follows:—

Leucosis	27 per cent.
Coccidiosis	33 per cent.
Vitamin A deficiency ..	10 per cent.
Coryza	9 per cent.
Fowl pox	8 per cent.
Others	13 per cent.

Coccidiosis.—From the foregoing it will be noted that coccidiosis is the most prevalent disease and there appears to be no system of husbandry which under farm conditions will prevent outbreaks. The intestinal form of the disease was more commonly reported than the caecal form. Sulpha drugs have proved very effective in the control of caecal coccidiosis in Queensland but have been disappointing where the intestinal type is concerned.

Leucosis.—The percentage of outbreaks of disease due to leucosis was high and approached that recorded for coccidiosis. This disease is of great economic importance, for outbreaks occur as birds are approaching maturity.

Vitamin A Deficiency.—Despite the emphasis placed by the branch on the importance of Vitamin A in poultry nutrition, an increase in the number of cases reported has to be recorded. Lack of this vitamin can have a marked influence on the incidence of coryza and fowl pox.

Pullorum Disease.—One of the major functions of the branch is the testing of breeding flocks for pullorum disease. The extent to which this work has grown from 1938 onwards is set out in Figure 2.

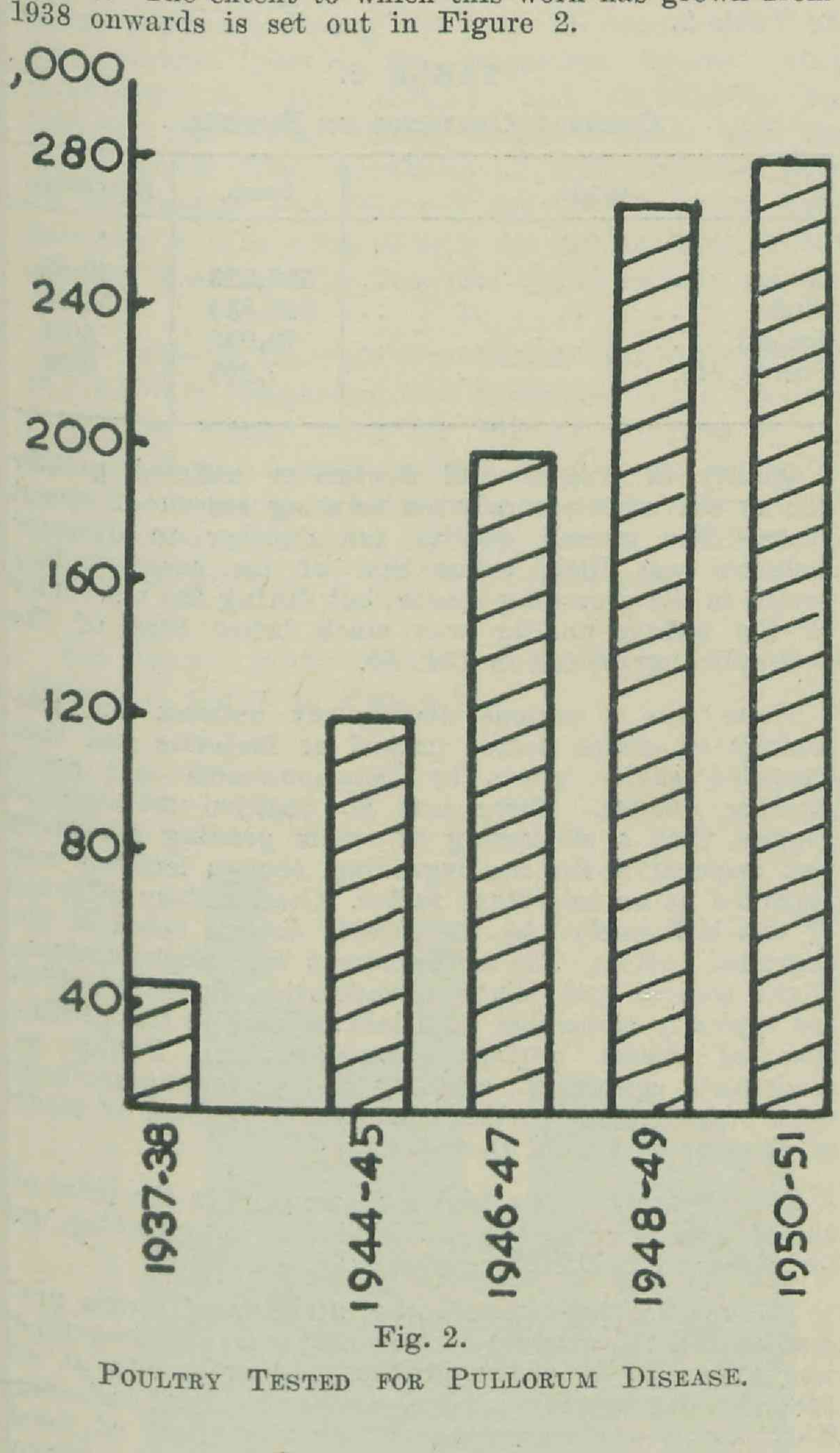


Fig. 2.
POULTRY TESTED FOR PULLORUM DISEASE.

Table 7 gives the districts, the number of birds and the percentage of reactors in each area. Each year some flocks that had not previously been tested are brought into the scheme. This masks to some extent the marked reduction in the incidence of this disease in those flocks that are kept under regular annual test.

TABLE 7.
PULLORUM TESTING.

District.	Number Tested.	Reactors.	Percentage.
Toowoomba ..	41,590	1,128	2·7
Ipswich	8,873	237	2·6
Brisbane	184,801	5,788	3·1
Bundaberg	18,373	221	1·2
Rockhampton ..	8,246	361	4·3
Townsville	6,360	129	2·0
Atherton	13,716	30	·2

Avian Tuberculosis Survey.—Owing to the reported occurrence of avian tuberculosis in the Northern Rivers district of New South Wales a close check was kept on birds killed at Brisbane poultry slaughtering establishments. In no case was the disease found. This is in accordance with the generally accepted view that avian tuberculosis does not exist in Queenlsand.

Stickfast Flea Control.—In the Boonah and Normanby areas, control is proceeding very satisfactorily with the use of DDT. Poultry are now being allowed to leave clean farms in those areas for immediate slaughter. The rise in prices of poultry meats is an added incentive for farmers to eradicate the flea from their properties.

EXTENSION WORK.

During the year officers of the branch made 3,500 visits to farmers, delivered 33 public lectures and conducted nine field days. All three methods of contract have their place, but as many farmers appear to be hesitant about asking questions at public lectures and field days, but will do so freely in the privacy of their own farms, visits to individual farms are regarded as of great importance.

DIVISION OF DAIRYING.

FIELD SERVICES BRANCH.

Mr. R. A. Paul, Director of Field Services.

Contrary to statements which have been publicised from time to time, there is no evidence available from the statistics of recent years, shown in Table 1, to suggest that there has been any serious decline in the production of dairy produce. With the exception of the drought year 1946-47, production in Queensland has been well maintained, and dairy cattle numbers have shown successive yearly increases since 1947.

TABLE 1.

SUMMARY OF PRODUCTION STATISTICS.

Year.	Dairy Cattle (At 31st Mar.) ,000.	Butter Production (Tons).	Cheese Production (Tons).	Total Milk Gallonage. ,000,000.
1945–46	1,443	45,198	12,023	269
1946–47	1,332	33,078	7,720	207
1947–48	1,382	46,454	9,641	273
1948–49	1,423	47,187	9,410	276
1949–50	1,433	48,197	9,170	281
1950–51	1,440	47,402	8,674	276

Though there has not been any general regression in the dairying industry, there is evidence that in a few shires in the Western Downs there has been some reduction in dairy cattle numbers.

BUTTER PRODUCTION.

Production.

The production of butter was 106,179,781 lb., valued at £15,500,000. For the period July to February production was in excess of that of the same period in the previous season, but the continued dry weather between February and June caused a serious decline during the remainder of the year. The output for the year was 1,778,746 lb. (1.65 per cent.) below that of the previous year.

Under the Commonwealth Government's guaranteed prices plan, the return to dairy farmers per lb. commercial butter was increased from 2s. 4½d. to 2s. 6¼d. from July 1st, 1950, and to 2s. 8½d. from December 1st, 1950, the average pay-out by Queensland butter factories to suppliers during the year being 2s. 8d. per pound.

The trend of butter production for the 10 years 1941-42 to 1950-51 is shown in Figure 1.

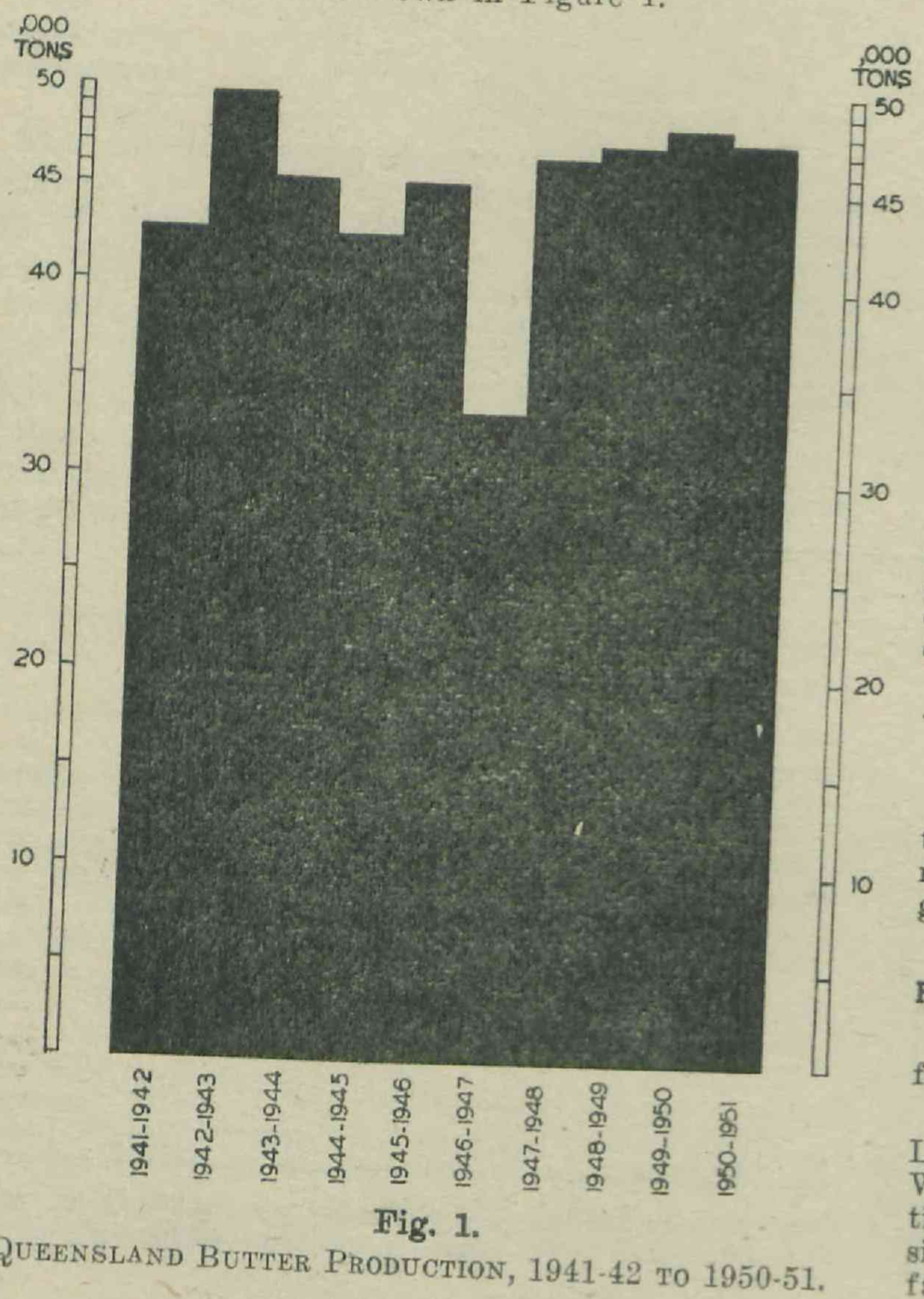


Fig. 1.

QUEENSLAND BUTTER PRODUCTION, 1941-42 TO 1950-51.

Quality.

The results of the official gradings are summarised in Table 2.

TABLE 2.

OFFICIAL GRADINGS OF BUTTER.

Grade.	Boxes.	Percentage.
Choice	595,973	39·49
First	826,835	54·79
Second	79,065	5·24
Pastry, etc.	7,296	0·48

Quality in August and September suffered greatly due to the most severe weed tainting season of recent years. The overall quality for October to January inclusive was little below that of the corresponding period in the preceding season, but during the remainder of the season quality was much below that of the corresponding period in 1949-50.

There was a serious discrepancy between the percentage of choice butter packed at factories and that classified choice grade by Commonwealth and State grading officers. There was no positive evidence to suggest that a slackening of cream grading standards was responsible for the degrading, though leniency was regarded as an important factor. Confirmatory evidence of this is furnished by the specific defects noted in the degraded butters. The most common were slight unclean, slight sourish and slight fermentation flavours, which are typically associated with lack of care in the production of cream during warm weather. Faulty or inadequate equipment, cleaning and processing methods were considered important contributory causes at many of the worst affected factories.

The desirability of a higher differential in the price of choice grade cream as an incentive to effecting an improvement in quality seems indicated.

The relationship between the intensity of cream processing and the extent to which butter was down-graded was shown by a survey of the grading results at 42 factories during the period November to April inclusive. This period was chosen to obviate any effect of weed taint, which is often very difficult to detect in cream supplies but shows up later in the resultant butter.

The percentages of butter packed as choice which was down-graded when officially examined, according to the intensity of vacuum treatment during pasteurisation, are shown in Table 3.

TABLE 3.

EFFECT OF VACREATION ON BUTTER QUALITY.

Vacuum Treatment.	Total Factories.	Factories with Over 20% Down-graded.	Total Down-graded all Factories.. (Per cent.)
Nil ..	2	1	27
Single	18	16	52
Tandem	18	9	24
Triple..	4	2	22

A general relationship between the intensity of cream treatment and the extent of down-grading of the resultant butter is shown, though no doubt some down-grading was also due to other factors.

Factory Buildings and Equipment.

A considerable amount of new plant was installed in factories and alterations made to buildings.

The Stanley River Co-operative Dairy Association Limited, commenced the re-building of its factory at Woodford. At Proston and Esk factories the pasteurisation plants were converted to triple vacreation, and similar equipment is being installed at three other factories.

Essential manufacturing requisites, such as boxes, salt, parchment, sodium bicarbonate and detergents, were all in short supply at one time or another during the year.

CHEESE PRODUCTION.

Production.

There was a reduction in the quantity of cheddar cheese produced during the year in comparison with the previous year's, the respective figures being 19,430,199 lb. for 1950-51 and 20,272,558 for 1949-50. The major factors in the decrease were the comparatively large quantities of milk obtained from the Toowoomba and Warwick factories to supplement decreased local supplies of milk for the Brisbane market and the closure of the Theodore cheese factory.

The value of the year's production was estimated at £1,750,000, in comparison with £1,450,000 in the previous year. The higher value for 1950-51 was due to the increase in the returns received by farmers under the guaranteed prices scheme, the average pay-out of factories for milk being 3s. 6½d. per lb. butterfat, as against 3s. 3d. per lb. in the previous year.

The annual production of cheese from 1941-42 to 1950-51 is shown in Figure 2.

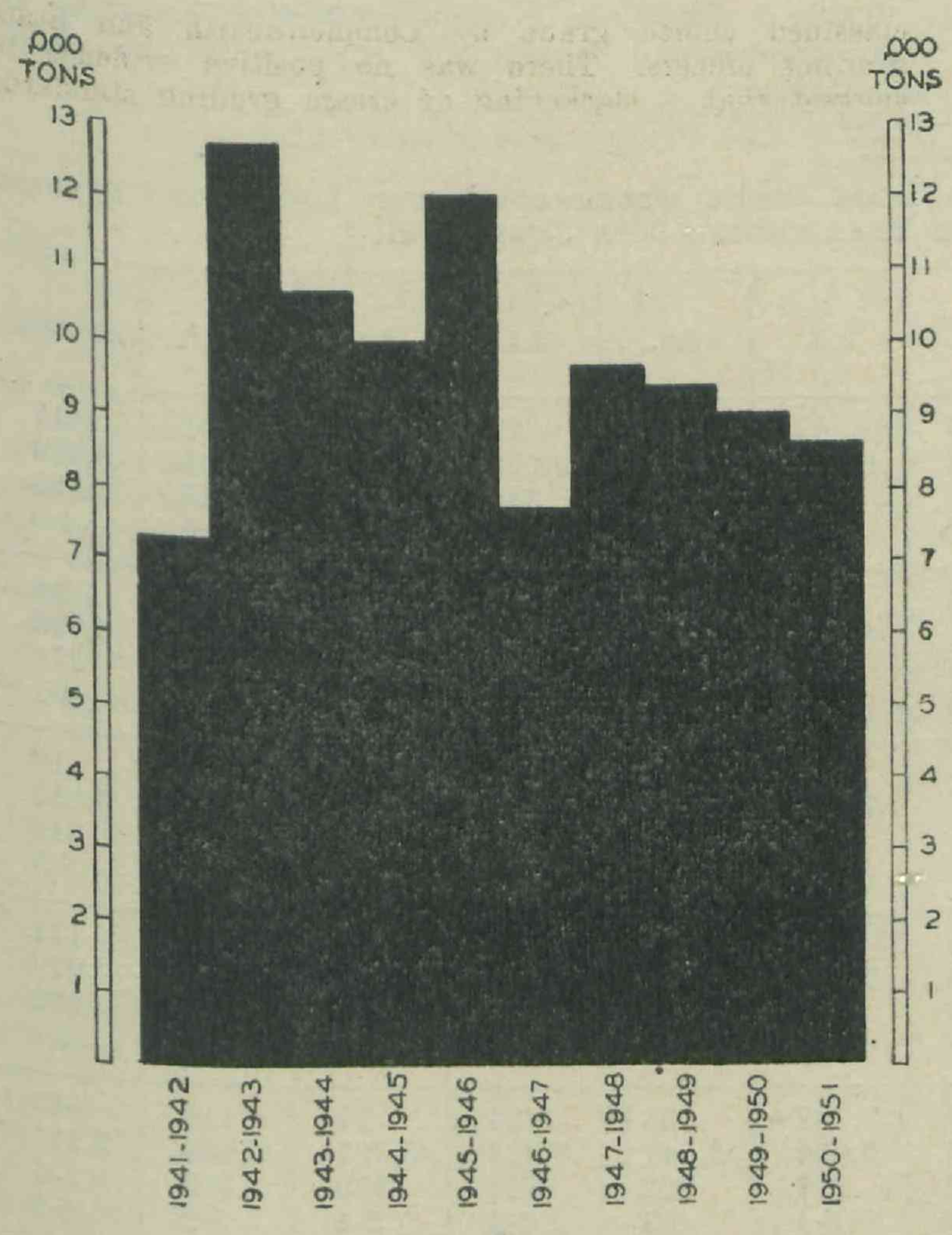


Fig. 2.

QUEENSLAND CHEESE PRODUCTION, 1941-42 TO 1950-51.

Quality.

Cheese quality, as reflected by the grading results of all cheddar cheese examined by Commonwealth and State graders for the past three years, is shown in Table 4.

TABLE 4.

OFFICIAL GRADINGS OF CHEESE.

Grade.	Year.		
	1950–51.	1949–50.	1948–49.
	%	%	%
Choice and 1st	70·34	79·8	71·47
2nd	28·43	19·54	27·61
3rd	1·23	·66	·92

In the first seven months of the year, cheese quality compared favourably with that of the previous season. A decline then set in and quality dropped sharply below that of the corresponding period in 1949-50.

Apart from flavour defects, faults in manufacture were prevalent during the year. Of these, open texture was the most prevalent, but crumbly body, weak body and dull colour were of common occurrence.

The decision of the British Ministry of Food to withhold the increased payment of 7½ per cent. in the contract price on dairy products below first grade will necessitate an early improvement in the quality of cheese at any factory which does not produce mainly a first grade product.

Factories and Equipment.

Whey separators were installed at the Felton and Southbrook factories, and further progress made in mechanisation of manufacture and better facilities provided for the propagation of starter cultures at some factories. There is need for a good deal more to be done to bring some factory buildings up to the required standard. Some trouble was experienced at factories due to weak rennet.

MARKET MILK.

During the year bottled pasteurised milk became available at Maryborough and Warwick. Officers of the Division have been energetic in efforts directed towards improving the structural and hygienic standards on milk supply farms and in factories.

Refrigerators for the cooling and holding of milk are being installed in increasing numbers on milk supply farms.

HERD PRODUCTION RECORDING.

Each year more and more farmers are recognising the fact that production recording is necessary to enable them to increase the average productivity of their dairy herds.

Pure Bred Production Recording.

Breeders and commercial dairymen are increasingly demanding production results when buying young stock. This trend is very heartening and shows that many are looking for production records when selecting animals. The numbers of herds of the various breeds recorded during the year, compared with the previous year, are shown in Table 5.

TABLE 5.

HERDS IN PURE BRED PRODUCTION RECORDING SCHEME.

Breed.	1949–50.				1950–51.
	Herds under Old Rules.	Herds under New and Old Rules.	Herds under New Rules only.	Total.	Total.
A.I.S. ..	32	36	7	75	52
Ayrshire	2	5	1	8	9
Friesian	..	1	1	2	3
Guernsey	4	7	2	13	13
Jersey ..	24	36	10	70	57
Dairy Shorthorn	..	..	..	..	1
Total	62	85	21	168	135

It will be noted that there were 135 herds being recorded under the new rules as against 106 herds in 1949-50.

Table 6 shows the numbers of cows of each breed which completed their lactations, the numbers and percentages which passed or failed to reach the required age standard, and the numbers of cows withdrawn.

TABLE 6.

NUMBERS AND PERCENTAGES OF COWS COMPLETING LACTATIONS, 1949–50 AND 1950–51.

Breed.		Total.		Passed.		Failed.		Withdrawn.	
		1949–50.	1950–51.	1949–50.	1950–51.	1949–50.	1950–51.	1949–50.	1950–51.
A.I.S.	No.	611	471	278	196	165	221	168	54
	%	..	..	45·5	41·6	27·0	46·9	27·5	11·5
Ayrshire	No.	79	69	40	29	31	29	8	11
	%	..	..	50·6	42·0	39·2	42·0	10·1	15·9
Friesian	No.	8	26	2	9	4	9	2	8
	%	..	..	25·0	34·5	50·0	34·6	25·0	30·8
Guernsey	No.	101	129	66	64	23	47	12	18
	%	..	..	65·3	49·6	22·8	36·4	11·9	14·0
Jersey	No.	519	621	294	317	158	228	67	76
	%	..	..	56·6	51·0	30·4	36·7	12·9	12·2
Dairy Shorthorn..	No.	3	4	0	0	3	4	0	0
	%	..	..	..	..	100	100	..	..
Total ..	No.	1,321	1,320	680	615	384	538	257	167
	%	..	..	51·5	46·6	29·1	40·8	19·4	12·6

A total of 615 cows (46·6 per cent.) reached the required standard, compared with 680 (51·5 per cent.) in the previous year. A disquieting feature is the number of animals (7·7 per cent. of all cows with completed lactations) with a lactation period of less than 273 days. A survey of data has shown that production is closely related to the length of lactation. Breeders then will need to concentrate on families or strains which have the capacity to milk for at least nine months.

Table 7 shows the average production, according to age groups and breeds, of cows which completed lactations.

TABLE 7.

BREED PRODUCTION AVERAGES FOR REGISTERED HERD BOOK STOCK WHICH COMPLETED LACTATION PERIODS OF 273 DAYS OR LESS DURING THE YEAR ENDING 30TH JUNE, 1951.

Breed.		J.2.	S.2.	J.3.	S.3.	J.4.	S.4.	Mature.	All Ages.
A.I.S.	Number of Cows ..	172	67	47	31	29	10	61	417
	Milk (lb.)	5,660	6,173	6,493	7,326	8,026	7,109	8,803	6,619
	Butterfat (lb.) ..	228	248	260	291	334	281	347	265
	Test (%)	4·0	4·0	4·0	4·0	4·2	4·0	3·9	4·0
Ayrshire	Number of Cows ..	21	6	6	4	3	5	13	58
	Milk (lb.)	5,927	6,261	6,934	6,605	7,023	7,442	7,870	6,735
	Butterfat (lb.) ..	246	275	293	283	284	303	309	278
	Test (%)	4·2	4·4	4·2	4·3	4·0	4·1	3·9	4·1
Friesian	Number of Cows ..	13	..	1	1	2	..	1	18
	Milk (lb.)	6,789	..	7,623	8,062	6,604	..	6,717	6,882
	Butterfat (lb.) ..	234	..	299	297	238	..	215	240
	Test (%)	3·4	..	3·9	3·7	3·6	..	3·2	3·5
Guernsey	Number of Cows ..	47	16	8	7	3	3	27	111
	Milk (lb.)	5,174	5,699	7,197	6,993	6,802	6,511	7,184	6,079
	Butterfat (lb.) ..	243	276	335	330	334	326	330	286
	Test (%)	4·7	4·8	4·7	4·7	4·9	5·0	4·6	4·7
Jersey	Number of Cows ..	239	59	37	33	34	27	116	545
	Milk (lb.)	4,704	5,173	5,092	6,047	6,024	5,701	5,864	5,241
	Butterfat (lb.) ..	244	272	277	322	317	309	306	275
	Test (%)	5·2	5·3	5·4	5·3	5·3	5·4	5·2	5·2
Dairy Shorthorn ..	Number of Cows ..	..	..	..	2	1	..	1	4
	Milk (lb.)	..	..	..	4,419	4,791	..	4,113	4,435
	Butterfat (lb.) ..	..	..	..	170	192	..	139	165
	Test (%)	..	..	..	3·8	4·0	..	3·4	3·7

All Ages and All Breeds—No. of Cows, 1,153; Milk, 5,917 lb.,; Butterfat, 271 lb.; Test, 4·6%.

Age correction factors to convert the production of young cows to a mature-equivalent basis, and expectancy tables which give the average age-corrected production to be expected from the daughters of cows in various production ranges when mated with an average bull, were prepared. The data for both purposes can only be regarded as tentative and will be reviewed from time to time as more information becomes available.

Grade Herd Recording.

Farmer's Own Sample Scheme.—During the year 13 herds were being recorded under this scheme. The number of cows recorded was 844, and 308 completed lactation for an average production of 3,273 lb. milk and 148 lb. butterfat. Entry to this scheme is restricted to farmers in districts not served by a group scheme. As group herd recording expands, the number of farmers using the farmer's own sample scheme declines.

Group Herd Recording Scheme.—During the year 42 groups were in operation. This was disappointing, as it had been hoped to build up to a strength of 50 groups, but shortages of equipment prevented this goal being reached.

The recording of individual cow records is now being done on automatic machines installed in the Government Statistician's office. These machines facilitate the work and ensure greater accuracy.

During the recording year ended September 30, 1950, 34 units had been operating long enough to have cows with completed lactations. In all, 22,392 cows from 715 herds completed lactation, for an average production of 152 lb. butterfat, compared with 144 lb. for the previous year.

Table 8 gives the number of cows and their average production according to age groups. There are still too many cows of unknown age, showing that in the past farmers have failed to keep sufficient records of their herds.

TABLE 8.

AVERAGE PRODUCTION OF COWS IN AGE GROUPS.

Age Groups.	No. of Cows.	Average Milk Yield.	Average Butterfat Test.	Average Butterfat.	Average Butterfat. 1949-50.
		Lb.	%	Lb.	Lb.
2 years..	1,197	2,929	4·5	131	136
3 years..	1,364	3,403	4·4	151	140
4 years..	1,503	3,696	4·4	162	148
Mature..	4,947	3,959	4·3	169	160
Unknown	13,381	3,408	4·3	146	139
Total	22,392	3,523	4·3	152	144

The average production of cows in herd recording groups in various districts is as shown in Table 9.

TABLE 9.

DISTRICT AVERAGE PRODUCTION.

District.	No. of Herds.	No. of Cows.	Average Milk Yield.	Average Test.	Average Butterfat.	Average Butterfat. 1949-50.
			Lb.	%	Lb.	Lb.
Eastern Downs	186	5,490	3,867	4·2	162	173
Western Downs ..	60	2,508	3,348	4·0	134	..
South-east Queensland	255	8,537	3,250	4·6	149	127
South Burnett	87	2,625	3,460	4·0	140	131
Upper Burnett	20	956	3,832	4·1	156	160
Atherton Tableland	97	2,194	3,893	4·4	172	160
Mackay ..	10	82	2,881	4·5	131	..

Table 10 gives the number and percentage of cows in the various production ranges.

TABLE 10.

RANGE OF BUTTERFAT PRODUCTION.

Butterfat.	Number of Cows.	Percentage of Cows.
Lb.		
Under 50	1,196	5·34
50–99	3,401	15·19
100–149	6,559	29·29
150–199	6,388	28·53
200–249	3,326	14·85
250–299	1,146	5·12
300–349	287	1·28
350–399	71	·32
Over 400	18	·08

Several articles on herd recording and surveys of data published during the year created wide interest and many farmers are applying the information therein in planning their future programmes.

DAIRY INDUSTRY EFFICIENCY GRANT.

In addition to group herd production recording and the analysis of production data, both of which have been dealt with earlier, activities under the Commonwealth Dairy Industry Efficiency Grant supervised by the branch include:—

(1) Development of demonstration farms and the conduct of field days on them.
(2) Dairy farm and other competitions.
(3) Operation of a Mobile Film Unit.
(4) Cheese milk cooling demonstrations.
(5) Subsidised interstate transport of sires.

Demonstration Farms.—The object of operating such farms is to illustrate how dairy farm production and efficiency can be increased by the provision of improved pastures and crops, conserved fodder, rotational grazing facilities, and home grown grains for supplementary feeding; the application of herd recording and modern milking methods; the correct use of improved cleansers and sterilizers; water treatments; and cooling of milk and cream.

Fifty-three farms were originally selected in the Ipswich, Toowoomba, Dalby, Caboolture, Gympie, Kingaroy, Biloela and Atherton Tableland districts, and more recently nine farms commenced operations at Allora, Killarney, Pittsworth, Millmerran, Warwick, Gladstone, Gayndah, Rockhampton and Mackay. Four farms were sold during the year and the demonstrations discontinued.

As yet it is too early to assess the value of the work being carried out on each farm, but an accurate record is being maintained of expenditure, and this will be available for comparison with increased revenue.

Already much interest has been shown by dairy farmers in some aspects of the work on these farms. Many enquiries are being made for the composition of some of the cleansers being used. Water samples are being received from farmers who have had demonstrated to them the advantages of a "soft" water supply for the cleaning of dairy equipment. Enquiries are also being received for the details of construction of charcoal coolers and water cooling towers and on the availability of dual udder wash containers, strip cups, swivel milking stools and metal bail-door stick handles.

In the agricultural field it has been demonstrated that the use of rust resistant oat varieties, hybrid maize and improved sorghum varieties gives increased returns; that application of lime and suitable artificial fertiliser following on soil analysis may be sound farming practice: that the growing of rye grass-clover pasture under irrigation is practicable; that the provision of annual winter and summer growing legumes not only ensures more and better balanced grazing but also enhances soil fertility; and that the use of efficient drainage, cultivation and re-seeding methods can rehabilitate a worn-out pasture on lowlying ground.

Officers of the Division of Animal Industry are assisting the development of the work on these farms in the directions of disease control, adequate feeding and general animal health.

These and other methods of economically increasing production, or of making the work of dairy farming more attractive, are being demonstrated where practicable, and results are being made available to dairy farmers through the holding of Field Days and advisory visits by Departmental officers.

In recent months an elevated milking bail shed was erected on one of the demonstration farms in the Biloela area and it is claimed by the operator that the work of milking is considerably less tiresome than in the ordinary type of shed. The cow steps up two steps, each 10 inches high, to reach the milking platform, the operator standing in a well below the cows. All stooping is eliminated and the milking process is carried through remarkably smoothly.

Two other demonstration farmers have "doubled-up" their machines—that is, four units in a two-unit shed and six units in a three-unit shed. Further study of these two modifications will be carried out in the coming year, particularly in relation to the economic aspects.

Field Days were held on seven of the demonstration farms during the year and attendances on each occasion were excellent, indicating that much interest is being shown in the work. The farm survey data collected each month on these farms enable the subject matter for field days to be related to the farm on which the day is being held, and factual information as to progress being achieved is imparted. It is expected that a much larger number of field days will be held in the coming year, since the majority of farms are approaching the stage at which the various demonstrations can be interpreted.

Competitions.—In the 1951 dairy farm competition, 104 entries were received and the first judging has been completed. The interest in these competitions is widespread, and attendances at the field days conducted on

the prize-winning farms in the 1950 competition were excellent. At these days the judges compare the competitors' points with the judging schedule, and indicate where weaknesses occur and how best these may be improved. Reports indicate that much good has resulted, as numbers of farmers have made alterations to their methods with a view to improving efficiency.

Two new competitions were initiated. In the Dairy Building and Equipment Competition, 80 entries were received and judging has just been completed. This competition definitely shows the high standard of milking shed and equipment provided by the more progressive dairyman, and many labour-saving devices which have been brought to notice will be made available to the dairy farmer.

The Dairy Shed Design Competition did not attract a large number of entries, but those received were of a uniformly high standard and several suggestions in the entries should prove of use to many a farmer contemplating building or altering his dairy shed.

Film Unit.—The Mobile Film Unit during the year toured all the dairying areas except the Atherton Tableland and the Darling Downs. One hundred and twenty screenings were made and the total attendance approximated 11,500. Reports indicate that the programmes were well received and have had a definite influence in increasing efficiency, particularly in the milking shed.

Cheese Milk Cooling Demonstrations.—Ten farms have been selected to carry out this work, but as yet the material is not to hand to set up the necessary equipment. The results of this work should prove of great value in cheese milk producing areas, and undoubtedly will result in improved cheese quality.

Sire Subsidy Interstate Transport.—Twelve farmers availed themselves of the service, eight bulls being of the A.I.S. breed, three Jersey and one Ayrshire.

GENERAL.

Other activities which occupy an appreciable part of the Branch work are the routine administration of the Dairy Produce Acts, the conduct of examinations, inspection of factory accounts, registration of farms and factories, statistics of manufacture, pay-outs and grading of butter and cheese factories, the control of the transport of milk and cream, and general advisory correspondence.

Table 11 indicates the volume of routine inspection and advisory work performed.

Field Days, regarded as most valuable means of conveying the work of the Branch to the farming community, were held on 34 farms and a number of articles contributed to journals.

TABLE 11.

SUMMARY OF FIELD STATISTICS, 1950–51.

District.	Mileage.		Total Farm Visits.	Routine	Quality.	Orders.	Herd Book. Tests.		Factory Visits.			Suppliers' Tests.	Factory Tests.
	Dairy.	Other.					Herds.	Cows.	Butter.	Cheese.	Milk.		
Brisbane	28,957	..	2,880	873	1,858	536	112	724	403	..	180	2,462	..
Brisbane (Milk Quality Control)	29,221	..	2,689	715	1,913	296	94	843	73	4	222	5,352	478
Downs (Toowoomba)	32,802	54	2,454	520	1,530	720	52	763	294	134	42	6,148	1,192
Downs (Warwick)	21,545	4,553	2,206	704	1,488	248	70	642	258	178	46	7,549	2,528
Rockhampton	34,631	1,317	2,467	890	1,577	53	30	388	212	23	102	4,345	861
Maryborough	31,691	1,137	2,804	567	2,237	108	134	1,116	250	16	43	1,570	305
Gympie	27,718	721	2,986	1,119	1,767	65	97	905	416	33	68	3,974	60
Northern	5,522	..	549	283	254	..	28	397	130	..	..	766	60
	212,087	7,782	19,035	5,671	12,624	2,026	617	5,778	2,036	388	703	32,166	5,484

The following is a list of farm and factory visits carried out by the Brisbane Milk Board officers and field officers of this Department on registered Milk Board producers and factories for the year ending June 30, 1951 :—

	Farm Visits.	Factory Visits.	Mileage.
Milk Board Officers	1,704	445	26,913
Departmental Officers	1,589	1,371	17,260
Total of both Sections	3,293	1,817	44,173

DAIRY RESEARCH BRANCH.

Mr. L. E. Nichols, Director of Research.

Bacteriological, chemical and technological problems of the dairying industry have been handled at the Brisbane, Toowoomba and Hamilton laboratories. In addition to laboratory control services for market milk, cheese and butter, a programme of investigations has been actively pursued.

A feature of the year's work was the expansion in research, particularly on problems of butter quality and market milk.

The Brisbane laboratory has specialised in market milk and milk products, dairy chemistry and chemical engineering, the Toowoomba laboratory on cheese and cheese starter problems, and the Hamilton sub-laboratory on butter.

INVESTIGATIONS.

Research has been confined to problems directly affecting the production or quality of dairy produce, either on the farm or at the factory. Special attention has been focussed on factors affecting the keeping quality of butter.

Butter.

Keeping Quality Trials.—Further work was performed on the keeping quality of butter, and a total of 89 churnings has now been examined. Detailed bacteriological and chemical analyses, before and after three months' storage at 10°F., have been carried out.

The decline in butter production, which is necessitating longer storage to meet market demands, and an apparent decline in the keeping quality of butter as shown in Table 1, emphasise the importance of the work.

TABLE 1.

BUTTER CHURNINGS DEGRADED.

Year.	Total Churnings.	Before Storage		After Storage	
		Number.	Per cent.	Number.	Per cent.
1949 ..	31	6	19	17	55
1950 ..	29	4	14	21	72
1951 ..	29	14	48	25	86
	89	24	27	63	71

These results cover churnings from 29-31 factories throughout the State each year. The investigation is throwing light on some of the causes of deterioration, both chemical and bacteriological. Information has been obtained on the occurrence of oxidation defects; fatty acid values appear to be showing some relationship to keeping quality, either directly or because of their relationship to the pH of the butter serum.

The results of pH are of special interest.

pH RANGE.

—	6·8–7·2.	7·3–7·6.	7·7–8·2.
Number of Samples..	22	27	21
Average Loss of Points	1·07	0·63	0·38

These figures exclude samples in which obvious bacteriological or oxidation defects occurred. The results seem to show that better keeping quality can be expected in the more alkaline ranges. Investigations are proceeding.

Unwashed Butter Trials.—Investigations into the manufacture and keeping quality of unwashed butter were extended and have now included 51 churnings of choice grade unwashed butter and their normally washed controls, together with four pairs of first grade churnings.

The grading results obtained so far show little difference in keeping quality in cold storage between washed and unwashed butters, provided the butter was well made (see Table 2).

Some factories experienced considerable difficulty in producing a good-textured butter, and the greater flavour loss on storage for these factories is considered to be due to the poor texture.

TABLE 2.

DIFFERENCE IN GRADE SCORE BETWEEN WASHED AND UNWASHED BUTTER.

Factory.	No. of Samples	Flavour Score.			Texture and Condition Score.		
		Fresh.	Two Months.	Four Months.	Fresh.	Two Months.	Four Months.
A. ..	24	0·08	0·02	0·07	0·06	0·06	0·10
B. ..	20	0·10	0·23	0·45	0·67	0·88	0·94
C. ..	6	0·08	0·83	0·4	0·92	1·08	1·0
D. ..	1	0	0·5	1·0	0	0	0

Results obtained on pats cut by hand and held for four weeks at about 45°F. gave similar trends. Divergent results, however, were obtained on pats prepared in a vacuum patting machine. In eight of the 25 churnings, the unwashed pats developed a defect, described as "condensed-oxidised," which lowered their flavour score by 2-5 points.

The results showed a mean increase of 0.44 per cent. in curd content. This factor, and the saving of refrigeration, are two definite economic advantages. However, the difficulty in producing unwashed butter of good texture and the occurrence of defects following vacuum patting are two factors against the acceptance of the process as a normal factory procedure. It could, however, prove of considerable value when refrigeration breakdowns occur or when chemical taints arise from the butter wash water.

The Microscopic Appearance of Butter.—A method for the microscopic examination of butter, which can be used in practice to give information as to the degree of working during manufacture, has been developed (Plates 19 and 20, facing page 24). The work during the year has been to determine the accuracy of the method and to confirm the relationship of the moisture distribution in butter to bacterial growth and the development of defects.

Composition of Milk.

Investigations on the variation in the composition of milk of different breeds of dairy cattle were completed during the year and a report submitted for publication in the *Queensland Journal of Agricultural Science*. It was observed that the fat content declined appreciably during the months of July to September inclusive. This is of considerable concern to the market milk trade.

During the year, work was carried out on experimental herds to determine if the seasonal decrease in the fat percentage could be offset by augmenting normal feed with special rations. Using suitably paired animals within two herds, experimental groups of cows were fed long lucerne hay at the rate of 10 lb. per day per cow and compared with the controls. Responses ranging from 0.2 to 0.4 per cent. fat were obtained in the case of one of the experimental groups but no changes in the fat percentage occurred in the other. Overall production was, however, increased by feeding long lucerne hay in one trial and 2 lb. of linseed meal per cow per day in a second trial. The results obtained suggest the advisability of further investigations, and these have been planned. The herd at Kairi Regional Experiment Station has also been included to ascertain the effect of different feeds on the composition of milk.

Research with Penicillin.

Because of the widespread use of penicillin in dairy herds, there is likelihood of residual penicillin affecting both cheese manufacture and the grading of market milk. Penicillin assays have been carried out by the paper-disc method (Plate 18, facing page 24) on the milk of individual cows and the influence of various penicillin concentrations on the methylene blue test, non-acid test and starter vitality test determined. Another investigation deals with the effect of certain strains of coliform bacteria, which produce the enzyme penicillinase, in activating residual penicillin in milk.

Detergents and Chemical Sterilants.

Laboratory methods for evaluating the performance of new chemical sterilants before application to field conditions have been investigated. Three hypochlorite powders and four of the recently developed quaternary ammonium compounds have been under test, using a laboratory strain of *Escherichia coli*. To date, the hypochlorite compounds show a superiority in the sharpness of the kill at the 30-second level.

In an effort to determine a cheap yet effective detergent and sterilant for dairy farm use, trials were commenced in the Caboolture district using various detergents and combined detergent-sterilants. Detergents were changed monthly and the bacteriological state of the equipment evaluated weekly. In addition, an attempt is made to pinpoint the sources of infection of milk during production on the farms to assist advisory services.

To date the results have been obtained with:—

(*a*) Combined detergent-sterilant.

(*b*) Soda ash plus a wetting agent.

(*c*) Caustic soda.

(*d*) Trisodium phosphate.

Already the benefit of adding wetting agents to soda ash has been observed, especially where the water supply is hard. Tests carried out in connection with the sterilizing of the teat-cups of milking machines by leaving them between milkings in a cold 0.5 per cent. lye solution gave satisfactory results.

Serratia marcesens.

A strain of *Serratia marcesens* isolated from a sample of defective cream developed an intensely red exo-pigment and caused discolouration of milk and cream. Other strains are being tested for the production of marcesin and anti-biotic property.

Cheese.

Cheese-Milk Refrigeration Trials.—Further batches of cheese were manufactured from refrigerated milk during the summer months. Starter percentages were reduced from 2 to 1½, resulting in a much improved texture, whilst lower acidities in manufacture permitted the cheese to be made in a normal time without effect on quality. The quality of the refrigerated milk was superior to the control milk, as indicated by the following averaged results obtained over the summer months.

—	Modified Methylene Blue Test.	Acidity.	Temperature.
Refrigerated Milk ..	Over 5½ hrs.	0·15%	50°F.
Control Milk.. ..	1½ hrs.	0·20%	80°F.

During manufacture the quality of the curd from the refrigerated milk was superior in flavour. With ageing, however, the differences in quality became less marked. It is now intended to extend the trials to include milk cooled by atmospheric water cooling devices.

Freeze-Drying of Cultures.—A number of aspects of the freeze-drying of starter cultures were investigated. The equipment used is shown in Plate 21, facing page 24. Experiments are still continuing into—

(1) The method of freezing.

(2) The speed of freezing.

(3) Survival rates.

(4) Differential survival rates of *Streptococcus lactis* and *Str. cremoris*.

(5) The use of anti-oxidants.

It is felt that the method of drying the culture on the inner surface of a small cotton wool stoppered tube, contained in an outer tube which ultimately becomes the sealed vial, has much to commend it from a practical distribution point of view.

Metabolite Studies.—With the aid of the disc, cylinder and cup methods (Plate 18, facing page 24) a technique is being used which will permit of a study of the reactions of different species of starter bacteria and phage types to various substances. Already the effect of calcium, phosphorus, yeast and certain proteins has been examined and some differences in growth and susceptibility have been observed. It is hoped that the methods will enable a study of the factors likely to influence bacteriophage multiplication during cheese manufacture and the activity of cheese starters.

Bacteriophage.—The use of improved media and methods has greatly facilitated the study of bacteriophages, enabling satisfactory plaque production to be obtained. Cross-relationship studies on starter strains and bacteriophages have been continued, not only on new phage isolations but on old filtrates held under refrigeration. The work has proved of benefit to the cheese industry in determining suitable rotations of starters for factory use.

The behaviour of phage in the cheese-vat has also been examined, particularly in regard to development and concentration where acidity fails during manufacture. Titre values, however, for the critical concentration of phage varied with the particular strain of starter in use. It also appears that phage infection from the atmosphere is of less significance than contamination from the equipment.

For some years it was thought that the return of insufficiently heated whey to farms constituted a serious source of phage at a factory. Recent work has disproved this conception. However, before suggesting any modifications for the heat treatment of whey (which involves a considerable fuel cost), observations are being made on the possible effect on cheese quality. The investigations so far indicate that the thorough daily cleaning of the whey tank is of great importance.

LABORATORY CONTROL SERVICE.

The Branch has continued to provide a control laboratory service to assist in improving the quality of dairy produce and efficiency of the dairying industry in Queensland. In this work it has collaborated closely with the Field Services Branch of the Division.

Cheese Quality Improvement.

Starter Cultures.—The use of enriched purification medias, continued vitality testing, phage-typing and the selection of new starter strains from imported cultures have helped to further popularise single strain cultures in this State.

Queensland factories are increasingly adopting improved methods of starter culture propagation for the control of bacteriophage. These include isolated starter rooms, water seal lids, flame rings, pipetted inoculations, and the wider use of mother culture steamers. As a result of such methods the incidence of "failures" at factories due to phage is showing a steady decline. Over 1,000 cultures were distributed to factories during the year. Uniformity of working and good vitality under factory conditions have been reflected by the greater care and attention to cultures.

Special cultures for fancy cheese manufacture have also been distributed.

Cheese-ripening Salt.—In an effort to hasten the ripening of cheese, the use of a ripening salt has been tried. Solutions have been added to milk, curd, and as a spray over the surfaces of finished cheese. The advantages of the various methods of application for cheddar cheese manufacture are now being examined. So far the spray method has been effective in reducing mould growth, and in experimental batches some flavour improvement has been recorded.

Cheese Composition.—A survey of cheese composition has shown variable moisture percentages, which in a number of cases are fairly high. Seasonal variation occurs, with moistures highest in winter. For best keeping quality and flavour development, a 36 to 37 per cent. moisture content has been tentatively recommended, and factories have been advised to modify manufacturing methods.

Processed Cheese.—Two processed cheese companies sought advice on how to combat an outbreak of mould and "blown" packaged cheese. The causal organisms were isolated. Contaminated wrappers proved the source of mould infection and appropriate fungicidal treatments were applied. Coliform bacteria and yeasts were isolated from the "blown" cheese.

Butter Improvement.

The work performed during the year included routine bacteriological and chemical examinations of butter samples taken at the time of grading, advisory services and factory surveys. Nearly 2,000 churnings of butter from 43 factories were examined bacteriologically. A modification introduced during the year was the plate count for coliform bacteria with a view to determining whether it is a more reliable indicator of factory hygiene than the presumptive test normally used.

The intensification of efforts to improve factory hygiene is giving good results, many factories having considerably improved their equipment and general cleanliness. Table 3, showing the bacteriological quality index averages for the last five years, illustrates this improvement:—

TABLE 3.

AVERAGE BACTERIOLOGICAL QUALITY INDEX.

Quarter.	1946-47.	1947-48.	1948-49.	1949-50.	1950-51.
July-September ..	212	247	279	281	295
October-December ..	212	209	200	202	279
January-March ..	171	163	187	223	257
April-June	204	227	263	247	276
Average ..	200	212	232	238	277

The 1950-51 average is easily the best since the inception of the service. It represents 69.3 per cent. of bacteriological examinations within the standards set, compared with only 50 per cent. in 1946-47.

Guidance to factories in standardising the chemical composition of butter involved 1,930 moisture and salt determinations. For those factories under the Butter Improvement Service, the average composition of butter produced is estimated as:—moisture 15.58 per cent.; salt 1.36 per cent.; curd 0.86 per cent.; fat 82.20 per cent. For all factories (after making an allowance for the Port Curtis group) the estimated composition was:—moisture 15.60 per cent.; salt 1.38 per cent.; curd 0.86 per cent.; fat 82.16 per cent.

The estimation of the pH of butter serum was continued, 1,110 estimations being performed. The results show an improvement, as their variability was less than in previous years.

Eighteen factories were visited and bacteriological surveys conducted for the purpose of advising on factory hygiene, overcoming unusual degrading or correcting specific defects. Following these visits, reports with detailed recommendations for improvements were forwarded to the factories and field officers.

Substitute Neutraliser.—In view of a shortage of sodium bicarbonate for neutralising cream, a possible substitute was tested. Soda ash was chosen because of its availability. Care was necessary, particularly in regard to the preparation of solution, its dilution prior to use and addition to the cream, to prevent any off flavour development. No detrimental effect on the flavour of butter was observed in trials on both choice and first grade cream.

"Rabbito" Butter.—With the approach of cold weather, "rabbito" taint occurred in butter from several factories. On examination the affected butter showed faulty texture, free moisture and abundance of proteolytic bacteria. Adjustment of churning temperatures, thorough working of the butter, and efficient chlorination of the butter wash waters will control this defect.

Butter Box Timbers.—In conjunction with C.S.I.R.O., investigations of the suitability of certain Queensland timbers, other than North Queensland kauri and Queensland hoop pine, for butter-box manufacture were concluded and reported upon during the year.

Market Milk Quality.

The laboratory quality control of market milk was continued for the Brisbane Milk Board at the Brisbane and Toowoomba laboratories. Service was also given pasteurised milk plants at Toowoomba, Warwick, Murgon, Bundaberg, Maryborough, Ipswich, Nambour and Southport, and depots at Dayboro, Caboolture and Woodford.

The services of the laboratory have been directed towards maintaining and improving the quality of milk during a period of rapid expansion in the market milk industry.

Summary of Work.—Table 4 summarises the work done in Brisbane in comparison with the previous year.

TABLE 4.

SUMMARY OF MILK EXAMINATIONS.

	1949-50.	1950-51.
Platings—bottled pasteurised milk	1,497	1,360
Presumptive coliform tests ..	1,242	1,309
Phosphatase tests—		
Number	807	1,486
Percentage negative ..	99	99·4
Methylene blue tests at Depots—		
Number	77,970	80,164
Percentage below 4 hours ..	8·7	6·6
Microscopic examinations ..	5,004	5,185
Fat Tests at Depots—		
Number	27,998	28,780
Percentage below 3·3% ..	12·0	10·8
Pasteurised milk fat tests ..	1,859	1,706
Average fat percentage ..	3·83	3·77
Bulk Milks received from Country Depots—		
Methylene blue tests ..	3,231	2,933
Fat tests	3,071	2,820
Factory surveys	60	67

In addition, 2,575 milk samples were examined at the Toowoomba laboratory. The marked increase in the number of presumptive coliform tests performed is due to the value of this test as an indicator of post-pasteurisation contamination.

The number of phosphatase tests was increased considerably in comparison with the previous year and the results indicate the high degree of efficiency of pasteurisation now practised in all milk pasteurising plants.

The reduction in the percentage of methylene blue tests below four hours reveals a further improvement in the quality of raw milk over the previous year.

The results show a reduction in the percentage of raw milk below the legal fat standard of 3.3 per cent., which is attributed principally to an effort by producers to reduce the interval between the night and morning milking. The average fat content of pasteurised milk was 3.77 per cent.

As for milk, tests have been conducted on pasteurised cream to ensure that tentative bacteriological and chemical standards are complied with.

Laboratory officers made 67 visits to milk plants for the purpose of conducting bacteriological surveys or correcting some fault in processing. In addition a number of farms were visited in the course of experimental work.

Improved Milk Plant Equipment and Technical Control.—The standard of equipment and processing at city and country plants is high, the majority possessing the latest high-temperature short-time systems of pasteurisation and automatic filling and bottle-washing machines. Several plants have also installed straight-through can-washers.

Regular checks of the efficiency of processing, particularly in regard to pasteurisation, bottle washing and can-washing, are made at plants. Rinse techniques have been used to estimate the overall performance of such equipment in relation to provisional standards and results have been satisfactory in most instances.

Regular line run surveys of milk plants have proved effective in tracing faults in the processing and handling of milk. Thermoduric bacteria counts have also been performed regularly with a view to assisting the elimination of these organisms from raw milk supplies and to increase the efficiency of the pasteurising process.

Because of the influence of coliform bacteria on milk quality, experiments are being conducted to determine the factors influencing their rate of multiplication in pasteurised milk.

The use of selective media and incubation temperatures ranging from 30 to 37°C. for milk work has been examined and incubation temperatures reduced to 32°C. for standard plate count determinations. The higher counts obtained suggest that a revision of the plate count standard may be necessary and specific media prescribed.

Keeping Quality of Pasteurised Milk.—Dye reduction tests have been applied to stored pasteurised milk as an index of its keeping quality. Various combinations of time and temperature of storage ranging from 18 to 24 hours and from 60 to 70°F. are being tried in an endeavour to find the combination most suitable for local conditions. So far the results indicate a high standard of keeping quality for pasteurised milk supplied in Brisbane.

Milk By-Products.

An association which recently commenced buttermilk drying has been regularly sending samples for chemical and bacteriological examination and as a result the quality of the powder has steadily improved. The checks have also served as a guide to the butterfat losses normally occurring in butter manufacture.

FARM SURVEY INVESTIGATIONS.

The branch has advised on aspects of some projects on the Commonwealth Dairy Industry Efficiency Grant demonstration farms, as follows:—

(1) Analyses of farm water supplies for recommendations as to suitable softening treatment.

(2) Testing the efficiency of selected dairy detergents and chemical sterilizers.

(3) Extending the use of modern milking devices such as specially designed strip cups and dual udderwash containers.

(4) Advising on the construction of charcoal cream coolers and water towers for cooling of milk.

Bacteriological surveys carried out on some of the demonstration farms have shown that considerable improvement has resulted from the application of recommended procedures for the cleaning and sterilizing of dairy equipment, the cooling of dairy produce and the softening of water.

GENERAL.

A total of 534 samples for general analyses included milk, butter, cheese, cream, buttermilk powder, separated milk, stock food, detergents, brines and boiler scale. These analyses were mainly for routine and advisory purposes, but some were associated with current investigations.

Of 10,512 pieces of dairy glassware tested, 1,445 pieces were rejected for failing to comply with the prescribed standards.

Eleven visits made to factories were connected with chemical engineering problems such as water treatments, air-conditioning, boiler efficiency and corrosion.

A total of 183 samples of water was received for advice concerning specific uses on farms and in factories, especially in relation to softening, clarification and avoidance of corrosion.

Investigations have included the use of:—

(1) Chlorinated rubber enamels for hot and cold water tanks in factories.

(2) Plastic coatings as a possible substitute for stainless steel in vat and tanker construction.

(3) Special anti-mould paint formulations for the protection of shelving in cheese cool stores.

Five papers have been contributed by the laboratory staff for publication in the *Queensland Journal of Agricultural Science* and two for publication in the *Queensland Agricultural Journal.* Officers have also participated in the preparation of show exhibits, radio talks, and field days.

DIVISION OF MARKETING.

MARKETING BRANCH.

Mr. H. S. Hunter, Director of Marketing.

MARKETING.

Branch officers have been actively engaged in the varied duties associated with the administrative, legal, and economic problems involved in the activities of the boards on which the branch is represented and which operate under the following Acts:—

The Primary Producers' Organisation and Marketing Acts, 1926 *to* 1946.

The Wheat Pool Acts, 1920 *to* 1930.

The Fruit Marketing Organisation Acts, 1923 *to* 1945.

The Primary Producers' Co-operative Associations Acts, 1923 *to* 1934.

The Dairy Products Stabilisation Acts, 1933 *to* 1936.

The Second-hand Fruit Cases Act of 1940.

The Peanut Industry Protection and Preservation Acts, 1939 *to* 1941.

A detailed statistical and descriptive account of the activities and progress of the various marketing boards (of which the Director of Marketing is *ex officio* a member) will be given in the annual report by the Director of Marketing to the Honourable the Minister as required under "*The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1946."

During the period under review the attention of the Branch has been focussed on the problems created by the dominantly inflationary tone of economic conditions. In one way or another, either directly or indirectly through influences associated with it, this has affected the activities of all the commodity marketing boards constituted under the above marketing legislation.

Moreover, there have been shortages of some commodities, of which potatoes, onions, milk, and butter are notable examples. These have developed as an immediate result of adverse seasonal conditions, but their occurrence has served to highlight the growing pressure of the demands of increasing population upon rural production.

Thus the major marketing problem that has been encountered by organised marketing bodies has been that of meeting the situations which arise from circumstances of this kind. In some cases this has been manifested by the increasing difficulty of carrying out normal marketing functions because of shortages in labour, materials, or transport. In others there has been the problem that has been created because farmers themselves in their efforts to meet the situation so far as it affects their own individual enterprises are increasingly turning to mechanisation. This in turn enormously speeds up the capacity of the farmer to deliver his commodity to the marketing authority and a great burden is thereby placed on facilities which were established to cope with the normal rate of intake of a few years ago but which do not meet present-day demands. Boards dealing with grains, and indeed most agricultural crops, are finding this difficulty facing their operations with ever-increasing intensity.

Where boards are attempting to modify or enlarge facilities to meet these changes or developments in the selling end of their business—as with The Butter Marketing Board in its plans for the enlargement of handling facilities at Hamilton, and the Committee of Direction of Fruit Marketing with the development of canning, processing, and other facilities—they are being confronted by the intense competition that exists for scarce raw materials and labour.

Some of the more recently-constituted boards, and particularly The Potato and Onion Marketing Boards, have been under considerable stress and strain because of the prevalence of black marketing, which is the result of Australia-wide shortages of the commodities which they handle.

A brief review of major marketing developments in some of the industries dealt with is given below.

The Dairying Industry.

Of recent years there has been a gradual increase in butter consumption within the State, both absolutely and on a *per capita* basis. *Per capita* consumption of butter at approximately 32 lb. per annum as at the end of the year was virtually on a level with that which existed prior to the introduction of rationing in 1943. Increasing utilisation of milk, both for the manufacture of milk products and for consumption as whole milk, has of course had an effect on supplies of cream for butter manufacture. The supply and consumption rate of butter and cheese in Queensland was such towards the end of the year that in June quotas of butter and cheese promulgated for intrastate trade under the Dairy Products Stabilisation Acts were 100 per cent. of production.

Production of butter and cheese in Queensland during 1950-51 totalled 1,897,773 boxes and 19,429,065 lb., respectively, in comparison with 1,927,825 boxes of butter and 20,273,644 lb. of cheese in the previous year. Dissections of sales of butter and cheese in 1950-51 taken into account for equalisation purposes are given in Tables 1 and 2. For information, a comparison has been made with the preceding two years.

TABLE 1.

BUTTER—DISSECTION OF DISPOSALS, 1948–49 TO 1950–51.

Year.	Quantity Manufactured.	Commonwealth Sales.		Export.			Grand Total Sales.
		Queensland.	Interstate.	Ships' Stores and Countries other than Great Britain.	Great Britain.	Total.	
	Boxes.	Boxes.	Boxes.	Boxes.	Boxes.	Boxes.	Boxes.
1950–51*	1,897,773	631,728	336,182	132,144	797,725	929,869	1,897,779
1949–50	1,927,825	468,330	194,764	125,332	1,139,411	1,264,743	1,927,837
1948–49	1,887,886	432,377	133,339	66,130	1,256,084	1,322,214	1,887,930

* These figures are subject to revision.

TABLE 2.

CHEESE—DISSECTION OF DISPOSALS, 1948–49 TO 1950–51.

Year.	Local Sales.	Sales for Processing.	Overseas Sales.	Total Sales.
	lb.	lb.	lb.	lb.
1950–51	8,980,046	4,440,934	5,377,137	18,798,117
1949–50	9,215,313	4,195,911	5,983,857	19,395,081
1948–49	7,500,540	3,516,442	10,029,541	21,046,523

The Egg and Poultry Industry.

As a consequence of the dissatisfaction of growers with the United Kingdom export price during recent years, every endeavour has been made by egg marketing boards in the various States to exploit other market outlets permissible within the terms of the United Kingdom Contract agreement. The quantity of eggs exported to destinations other than the United Kingdom increased from 309,660 dozen in 1947-48 to 853,035 dozen in 1950-51, an increase of 275 per cent. Collaterally, export of eggs in shell and egg pulp to the United Kingdom, after having increased from 2,082,914 equivalent dozens in 1947-48 to 4,838,762 equivalent dozens in 1948-49, declined to 2,871,999 equivalent dozens by the 1950-51 season. Movements in these sales categories since 1947-48 are illustrated graphically in Figure 1.

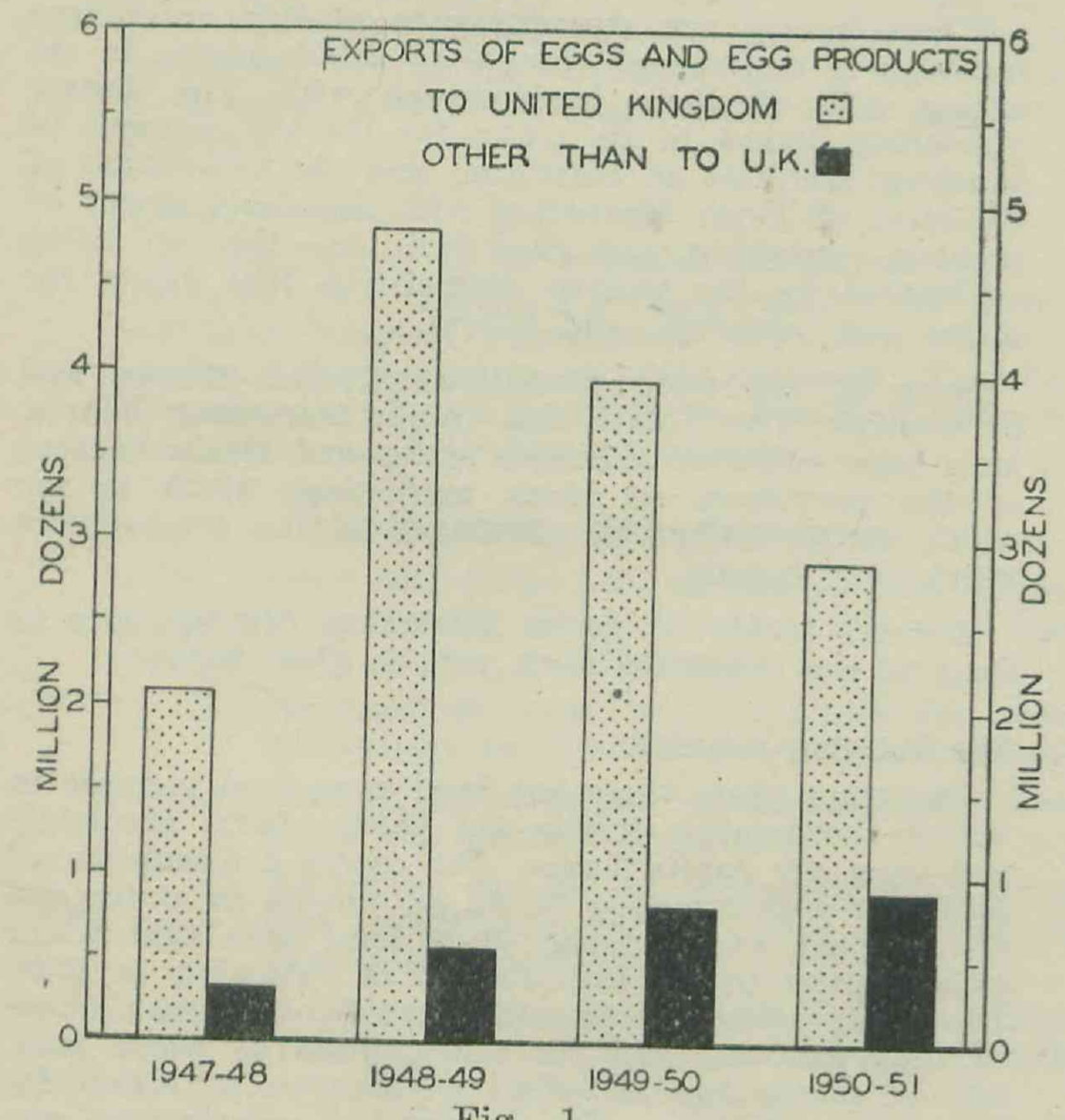


Fig. 1.

Eggs and Egg Products.—Dissection of disposals by Queensland Egg Marketing Boards other than on the local market, 1947-48 to 1950-51.

Of course, the overriding importance of the local market must not be lost sight of. Local sales by Marketing Boards in 1950-51 of both eggs and egg pulp totalled 6,601,063 equivalent dozen eggs, roughly two-thirds of total commercial production.

Production during the year ended 30th June, 1951, as reflected in receivals by The South Queensland Egg Marketing Board, amounted to 10,105,534 dozen eggs. This represents a slight overall decrease of 3.22 per cent. in comparison with the previous year. Towards the end of the year production had recovered from the setback experienced as a result of the abnormal seasonal conditions of early 1950. However, receivals by the South Queensland Egg Marketing Board were still lower than in May-June, 1949, and May-June, 1950.

The Fruit and Vegetable Industry.

Perhaps the greatest development in the industry during the year has been the ever-increasing importance of the factory outlet in the pineapple, banana, strawberry, and citrus industries. In surpassing the 1950 summer crop of 902,000 cases of pineapples, a new record was established by the 1951 summer crop, when a total of approximately 966,000 cases was harvested. From this harvest 695,000 cases were sent to canneries up to April 30, 1951, compared with 625,000 cases for the same period during 1950. The quality of the fruit, moreover, showed improvement, to which favourable growing conditions contributed, though it is generally considered that the "continuous loading" scheme organised by The Committee of Direction of Fruit Marketing and other improvements in transport and handling also played an important role.

After much experimentation the Committee of Direction cannery at Northgate was finally successful in perfecting the canning of bananas, though only token quantities have been available to date. A small trial shipment was sent to England and the immediate reaction was a firm order for 10,000 cases, valued at approximately £20,000. Whether or not an export market for canned bananas can be developed which will maintain a similar market stability for banana growers as that now enjoyed by pineapple growers remains to be seen. One difficulty which stands in the way of such an attempt to stabilise the banana fresh fruit market by diversions to the cannery is the ease with which the heavy producing areas in northern New South Wales can flood the Brisbane markets when prices are higher here than on southern markets.

Factory purchases have also had a stabilising effect on the marketing of other fruits. In the case of strawberries the early announcement of a guaranteed price of 1s. 6d. per lb. induced increased plantings, while payments of £30 per ton for first grade and £24 per ton for second grade papaws have minimised the heavy mid-season rush of supplies upon the fresh fruit market. The factory intake of citrus from the 1950 crop showed an increase to 1,336 tons from 541 tons in the previous year. The three months' experiment in door-to-door delivery of fresh orange juice by United Milk Vendors Pty. Ltd. in co-operation with the Northgate cannery will be watched with interest.

The Peanut Industry.

For the fourth year in succession the acreage planted to peanuts in Queensland showed a decline. The total planting for the 1951 season was in the vicinity of 17,500 acres, compared with approximately 24,000 acres for the 1950 season.

The decline in this industry has particular significance for the South Burnett district, which is by far the most important peanut-producing centre in Australia. In that area during the 1950 season, 85 per cent. of the crop was produced. However, the area harvested in 1950 amounted to only 40 per cent. of that put under crop in the record season of 1947. By contrast, the acreage of maize, the other leading crop in the district, has shown a steady upward trend, giving an overall increase of approximately 10 per cent. over the same period.

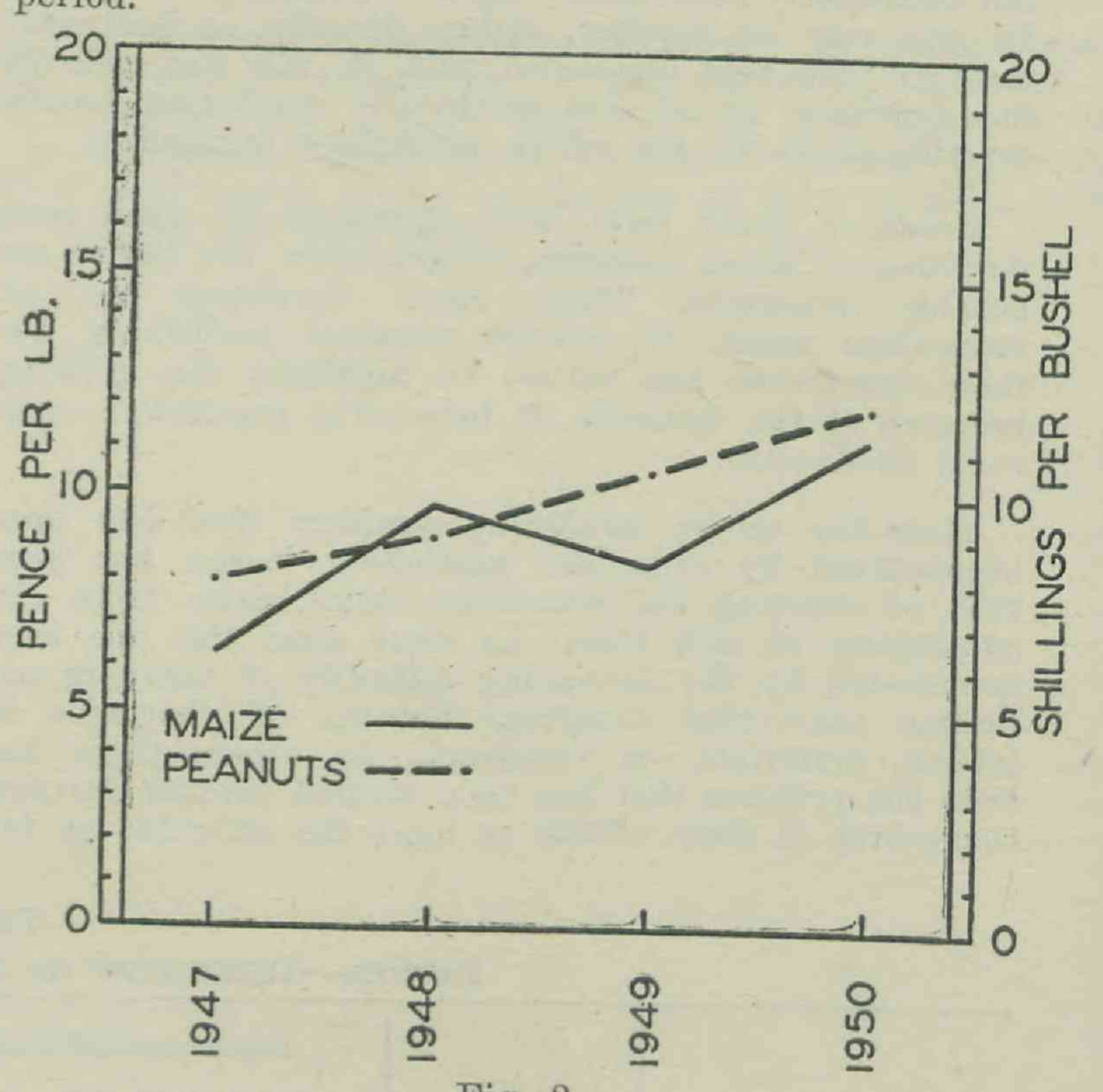


Fig. 2.

Peanuts.—Prices realised by The Peanut Marketing Board for edible kernels, compared with average maize prices on the Brisbane market, 1947-50 seasons.

As indicated in Figure 2, the prices of these two commodities over this period have shown a rather similar upward tendency. Maize prices have been kept buoyant by high overseas prices, while a strong home demand has maintained rising prices for peanuts. On the whole, however, the price differences have not been great enough to explain the decline in peanut acreages.

The sharp decline in local production has led to increasing pressure for the duty-free importation of peanuts for the edible trade. For the 12 months ended 30th June, 1951, applications for duty-free imports of peanuts amounting to 2,770 tons were approved by the Department of Trade and Customs. This has had the further result that Board prices have increased by 50 per cent. to bring them up to import parity.

The Wheat Industry.

The total area planted to wheat in Queensland was expanding rapidly up to the outbreak of war and had reached 498,984 acres by 1938-39. This fell during war years to 367,725 acres in 1943-44. Recovery was rapid and by 1948-49 the total acreage was 660,875 acres.

During the three subsequent seasons the rate of expansion has slowed considerably and the preliminary estimate for the 1951-52 season is 680,000 acres (Fig. 3).

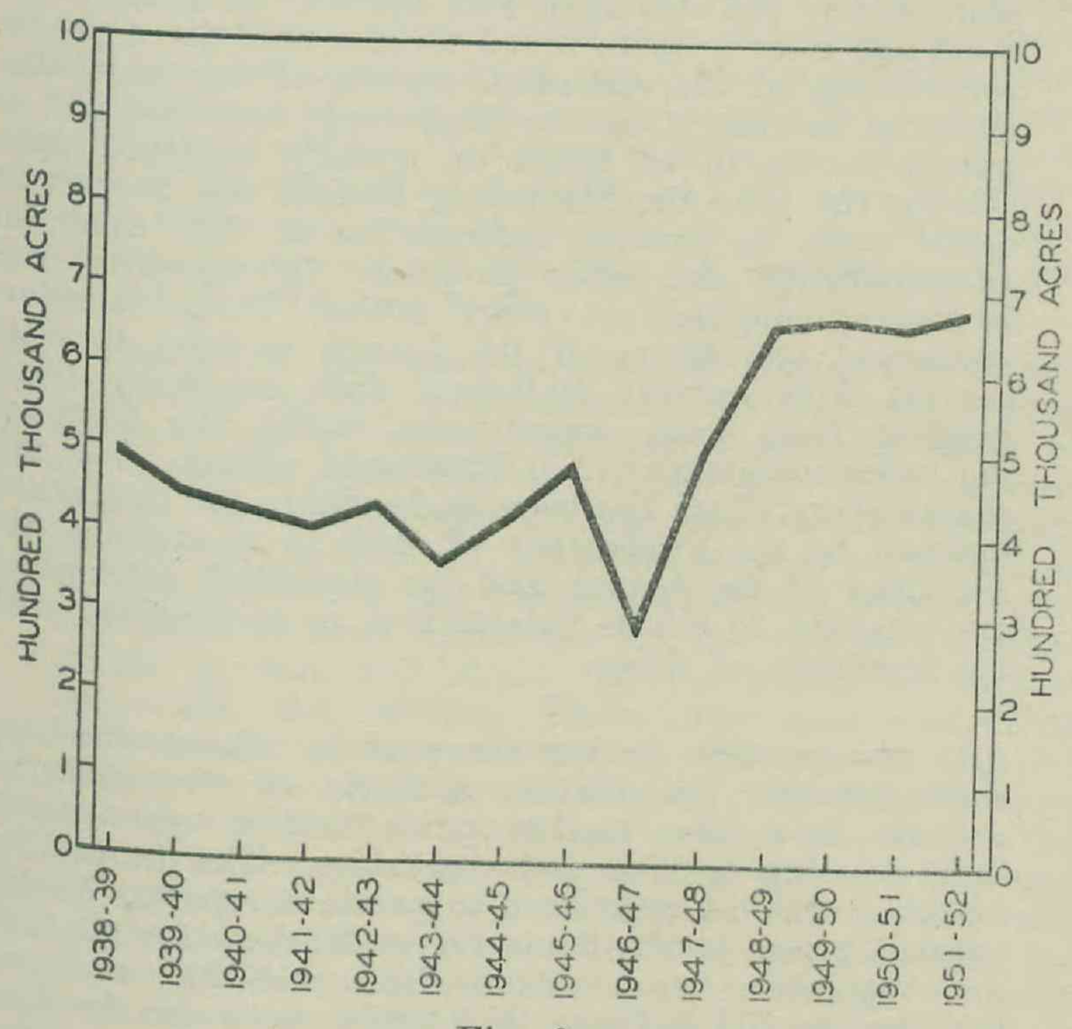


Fig. 3.

WHEAT.—Area planted to wheat in Queensland, 1938-39 to 1951-52 seasons.

Wheat production in Queensland during the 1950-51 season was 8,500,000 bushels from a planted area of approximately 660,000 acres, compared with 11,778,495 bushels from a planted area of 668,859 acres during the previous season. The harvest was of itself insufficient to meet the State's normal annual wheat requirement, but stocks carried over from the previous harvest served to cover the deficit. This raises the question as to whether the present acreage under wheat in Queensland is sufficient under average seasonal conditions to supply the State's consumption requirements.

Average annual consumption of wheat for all purposes in Queensland during the two cereal years 1948-49 and 1949-50 was 9,684,000 bushels, which comprised 4,875,000 bushels for flour milling, 3,951,000 bushels for stock feed, 664,000 bushels for seed, and 194,000 bushels for sundry purposes such as the manufacture of breakfast foods, &c. This is considerably greater than prewar consumption, which in 1939-40 totalled only 5,416,000 bushels. This tremendous increase in consumption has been due mainly to the increasing use of wheat for stock feed, which in 1939-40 accounted for only 1,143,000 bushels. Flour milling requirements have increased by about 1,000,000 bushels during the last 10 years. Figure 4 shows the present distribution of Queensland wheat consumption for various purposes.

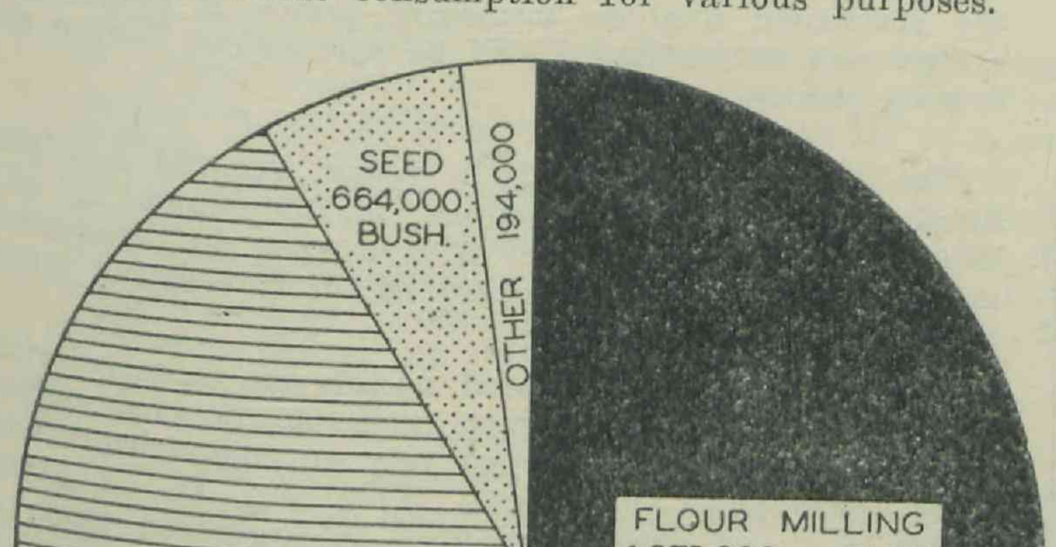


Fig. 4.

WHEAT.—Dissection of Queensland annual consumption of 9,684,000 bushels among various purposes. (Annual average for cereal years 1948-49 to 1949-50.)

The 1950-51 average yield per acre based on area planted was approximately 13 bushels and the figure based on area harvested would be somewhat higher. This yield seems very low when compared with yields of the previous three years, which ranged from 19.6 to 23.6 bushels per acre. However, as the average yield in Queensland over the last 30 years was only 15.1 bushels per acre, the 1950-51 yield was not far below average. In fact, in 11 out of the last 30 years yields were lower than in 1950-51.

This must inevitably lead to the conclusion that, even if consumption were not to increase, the State's present wheat acreage will recurrently prove insufficient to provide consumption requirements directly from local production unless alternative feed grains are available or stocks of wheat are carried over at the end of each season—at least until sufficient supplies are assured from the incoming harvest. There will, of course, in many years be a surplus above immediate requirements.

Queensland's population is increasing and if the increased consumption required is to be met a substantial increase in the acreage under wheat will be necessary each year. On the basis of the rate of increase in population during 1950, an additional 10,000 acres will have to be planted each year in the immediate future to provide for increased flour consumption. The figure of 10,000 acres for the annual increment may be expected to increase progressively as long as the present rate of population growth is maintained. If to this is added the present tendency toward increased use of wheat for stock feed, which during the past year has been to some extent curbed by transport difficulties, the annual acreage increase required would be much larger.

The Potato Industry.

Shortages of potatoes in the eastern mainland States, due to the irregularity and uncertainty of shipping from Tasmania and to the effect of seasonal conditions on the Victorian crop, seriously disturbed effective distribution in Queensland. To meet normal requirements for 1950-51, at least 35,000 tons of imported potatoes were needed to supplement local production, which amounted to only 20,000 tons instead of a normal crop of 30,000 tons. However, imports during this period amounted to only 20,000 tons.

During the year The Potato Marketing Board conducted preliminary trials with the cold storage of the summer crop and successfully handled 11,000 bags in this way. Developments in this direction, whilst they will not be a complete solution to the problem of potato distribution in Queensland, do at least hold out out a definite promise of materially assisting the orderly marketing of the summer crop, temporary surpluses of which, up to the present, have had to find an outlet in New South Wales owing to difficulties of storage under ordinary conditions.

The Tobacco Industry.

During the past year prices for tobacco leaf showed further marked increases and there is every indication that the present high level of prices will be maintained throughout the remainder of the 1951 sales. The average price realised for leaf from the 1949-50 harvest was 72.4d. per lb., while the average for leaf from the 1950-51 harvest sold to 30th June, 1951, is 108d. per lb. Among the many factors responsible for the exceptionally strong demand for leaf during 1951, the influence of shortage of leaf due to the comparative failure of the 1950-51 Queensland harvest was not inconsiderable. Though the area planted for the 1950-51 crop (approximately 3,870 acres) was over 30 per cent. higher than the previous season's acreage, the production of about 1,180 tons was almost 25 per cent. lower. This has forced manufacturers into strong competitive bidding in order to obtain sufficient leaf to keep factories operating in the case of smaller manufacturers and to make up the necessary percentage of Australian leaf to qualify for the lower tariff on imported leaf in the case of the larger companies.

The output of manufacturers using wholly or mainly Australian leaf is increasing, and this, combined with the rapid development of co-operative manufacture in Queensland, is making itself felt through increased demand for Australian grown leaf.

The Barley Industry.

Large quantities of barley malt are imported into Queensland each year to supply the requirements of breweries, while at the same time substantial quantities of barley are being exported as grain to interstate and

overseas markets. Production in this State falls far short of local consumption requirements. Average production during the past three years has been approximately 550,000 bushels, of which about two-thirds was of malting quality, while consumption of barley during the same period was approximately 900,000 bushels per annum, comprising some 470,000 bushels as malt and over 400,000 bushels as feed. Average annual exports of barley during this period were approximately 60,000 bushels to overseas countries and some 8,000 bushels to other States.

There are three main reasons for this apparently anomalous position. Firstly, Queensland's active malting capacity is very limited and some 430,000 bushels of malt have to be imported each year from other States to fulfill the requirements of brewers. Secondly, a large proportion of locally-grown barley, including much of malting quality, is used for stock feed in the areas in which it is grown.

Finally, overseas sales of malting barley from the 1950-51 crop were made at 14s. 0d. per bushel f.o.b. Brisbane by The Barley Marketing Board, thus enabling the Board to pay a relatively high return to growers for malting barley. The returns to growers by the Board for Chevalier malting barley in 1949-50 and 1950-51 were 9s. 0d. and 9s. 6d. per bushel, respectively, whereas the average for the years 1946-47 to 1948-49 was only 6s. 5d. per bushel.

The present consumption pattern of barley in Queensland is illustrated in Figure 5, showing the average annual proportions used as feed and malt during the years 1948-49 to 1950-51. The relationship between imports, local production and exports is also shown in the same figure.

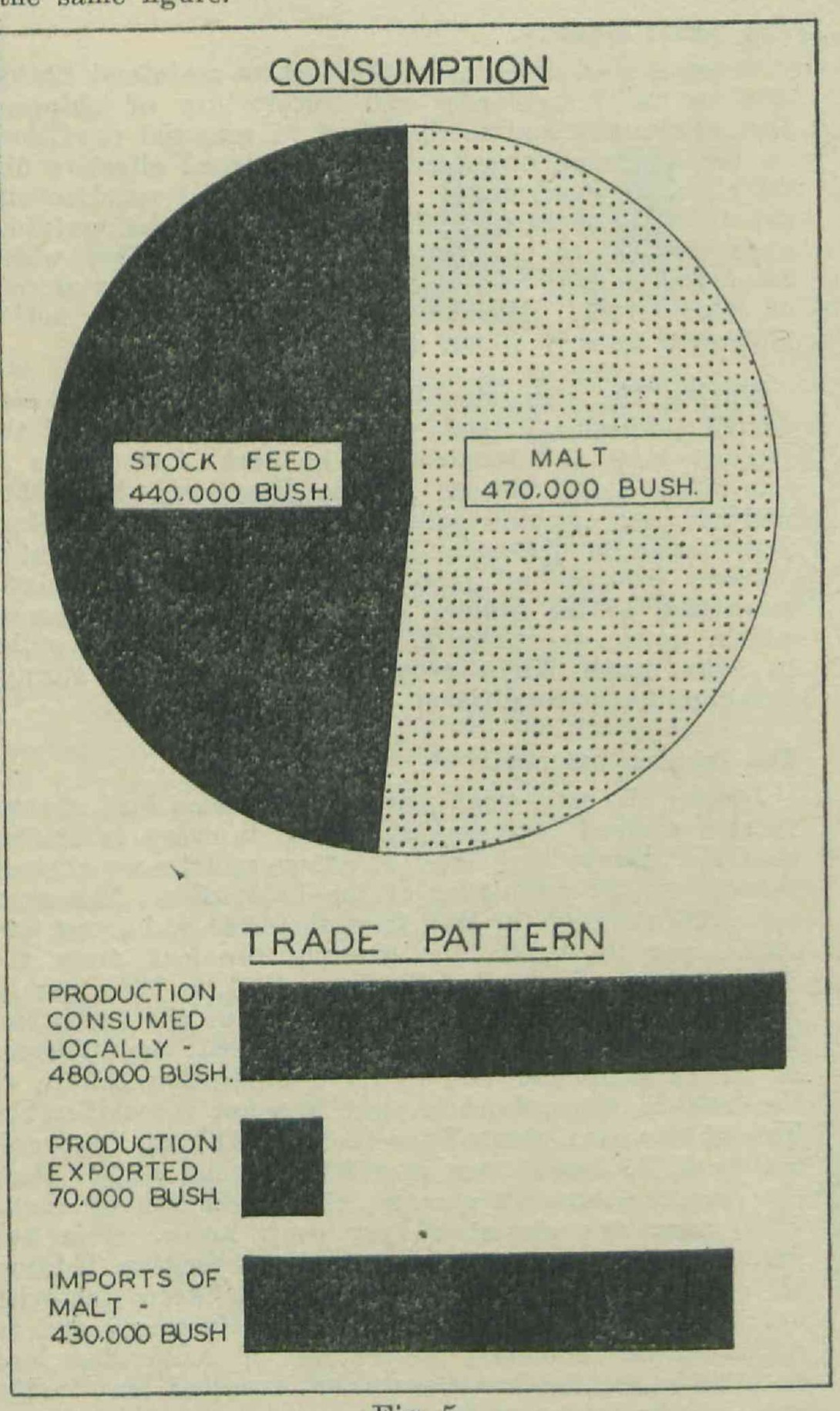


Fig. 5.

BARLEY.—Queensland consumption as malt and stock feed, and Queensland trade in barley, showing produc- consumed locally, production exported and imports of malt. (Average of years 1948-49 to 1950-51.)

STATISTICS.

The significance of statistics in rural industry has increased considerably of late years. This is due not only to a growing appreciation of the importance of rural production but also to the ever-increasing complexity of the industry itself, which makes it more sensitive to external influences. Economic events now spread their influence more rapidly and they become more widely diffused than ever before. It follows that more and more is there found to be a need for a precise formulation of the statistical aspects of any particular situation so that it can be adequately described and so permit action to be based on soundly analysed data. During the year the Marketing Branch was frequently called upon to provide information of this kind for administrative and other purposes. Of necessity, this is usually required at short notice. It is therefore incumbent on officers of the branch to keep in close contact with current statistical data on many levels ranging from local comparisons within the State to the more comprehensive international sphere. For this reason every effort has been made within the limitations imposed by the availability of staff to so organise the functions of the branch and the statistical data which are recorded to enable information to be provided with the minimum of delay.

It was possible during the year to take preliminary steps towards the further analysis of the statistics derived from the market price service, particularly those relating to fruit and vegetables. The desirability of this work was mentioned in previous reports. Weekly average prices at the Roma Street Markets for all fruit and vegetables are available from mid-1947 and preliminary results indicate that useful work can be done in illustrating trends and movements as well as making illuminating comparisons with other prices. These analyses will assist to elucidate and illustrate important economic factors which influence fruit and vegetable industries and could form the source of advisory material of value to growers as well as to those who are engaged in or concerned with the various industries.

Crop Reporting and Forecasting.

Further advances were made in the Crop Reporting and Forecasting Service by the inclusion during the year of peanuts and tobacco leaf in the crops for which reports are regularly issued. Preliminary examinations of the practicability of extending the service to other commodities were made during the year.

A comprehensive analysis of the procedure required to institute a forecasting service for the egg industry was carried out, but owing to staff difficulties it has not been found practicable to put any scheme for this industry into operation.

The co-operation of the Marketing Branch was sought by the Commonwealth Bureau of Agricultural Economics in the institution of an Australia-wide reporting scheme to cover the pig industry. Only preliminary consideration has as yet been given to this matter, but the detailed investigation of the industrial structure and the statistical analysis necessary before a forecasting system can be instituted will be carried out during the coming year.

The accumulation of four years' records has produced a wealth of statistical matter which is now capable of being analysed with a view to discovering more refined statistical techniques for forecasting crops.

A forecasting system based, as this one is, on selective sampling of farmers, known as honorary crop correspondents, in key areas, must rely on comparisons with some established condition. This may be an actual figure, such as acreage planted in a certain year, or an hypothetical figure, such as "normal" plantings or "normal" production. Although the concept of "normal" is used in crop forecasting work in some countries, the comparison adopted by this branch is with the previous year's performance, as it is felt that variations relative to the last season can be more accurately gauged and introduce less of the subjective element into a crop correspondent's reports than if he were asked to visualise a "normal" situation.

Though acreages calculated in this way have been found to be substantially accurate, estimating yields per acre is a much more difficult process. Crop correspondents are asked to estimate the average yield per acre for their immediate locality and also to indicate how this estimate compares with the previous season's figure. The comparison with the previous season's average yield merely provides a rough check and gives

no opportunity of further statistical analysis. The greatest attention must be directed to the actual physical estimate of the correspondent for his locality. These estimates tend to exhibit an upward bias insofar as the localities selected tend to be the more important and more efficient localities, and the crop correspondents themselves tend to be among the most efficient farmers in these localities. Due account must be taken of this bias in the estimation of yields, and the most important task which can now be undertaken is the calculation of formulae to correct this bias. A commencement has been made with this work.

The policy has been adopted of giving the officers responsible for the preparation of the forecasts greater opportunities of visiting the major growing areas of the crops in which they are concerned. This personal contact with Departmental field officers and honorary crop correspondents, on whom the success or failure of the crop reporting and forecasting service largely rests, and the first-hand knowledge of the various localities gained in this way should be the means of further improving the service. There are many problems encountered which can only be resolved by careful enquiry on the spot in consultation with those persons who have a detailed knowledge of local conditions. The list of honorary crop correspondents who are assisting in this work is kept constantly under review, new appointments being made from time to time with the object of obtaining the best possible sample for each crop. In this sampling, geographical distribution is one of the most important, though not the only, consideration.

Publication of the monthly "Report on Production Trends" was continued throughout the year. No basic change in its form of presentation was made, though minor improvements were effected.

As some indication of the value which rural, commercial and governmental circles attach to these publications, the number of addresses for each type of report are as under—

Monthly Report on Production Trends ..	567
Grain Sorghum Crop Reports	443
Wheat Crop Reports	441
Maize Crop Reports	405
Barley Crop Reports	340
Peanut Crop Reports	338
Potato Crop Reports	295
Tobacco Crop Reports	288

Market Price Reporting.

This service, which was inaugurated in 1947, has as its primary object the collection, and distribution to interested persons and bodies, of the wholesale prices of a wide range of primary produce.

The "Daily Official Market Quotations" cover details of prices realised on Brisbane markets for fruit, vegetables, and farm produce. Also included is a commentary on quality of receivals and conditions of supply, intended to guide producers in the profitable marketing of their crops. Most growers obtain this information through the Australian Broadcasting Commission's daily broadcast of the report during the "Country Hour" or through the daily press.

In addition, a special report is furnished to the Australian Broadcasting Commission covering prices realised for and supply of fruit and vegetables from other States sold on the Brisbane markets. This information, together with similar information from other capital cities, is broadcast daily from Sydney, and its utilization is of increasing importance and assistance to orderly marketing, particularly in view of the development in modern fast interstate transportation by air of perishable commodities.

A development in the Fruit and Vegetable Markets has been the increasing reliance placed upon the "Daily Official Market Quotations" by all sections of the industry. Several Governmental and semi-Governmental Departments and numerous outside bodies have established a system of letting contracts to private persons for the daily purchase of fruit and vegetables, the price to be based upon the prices recorded in "Daily Official Market Quotations." The volume of this business is expanding rapidly due to the increase in Army establishments, migrant holding depots, &c.

A "Weekly Market Report" summarises the week's trading in the Fruit and Vegetable and Farm Produce Markets. This report also includes ruling wholesale prices for wheat, flour, bran and pollard, butter, cheese, bacon, ham, honey, and eggs.

From the records of daily prices of fruit and vegetables and farm produce, weekly, monthly, and yearly average prices are calculated.

GENERAL.

In the course of their administrative duties officers have dealt with a varied range of marketing and economic problems associated with the developments taking place in rural industry. Reference to the more important matters coming within this ambit is made hereunder.

Development of Co-operative Processing.

The branch has been represented on inter-Departmental committees set up to examine proposals for the provision of Government guaranteed finance to assist growers' co-operative organisations to erect facilities for processing or manufacture. Of the two committees which operated during the year, one dealt with an application by The South Queensland Tobacco Growers' Co-operative Association Limited for financial assistance to buy a tobacco factory at Inglewood and to purchase tobacco leaf. The other was concerned with an application by The Buderim Ginger Growers' Co-operative Association Limited for extension to the plant at Buderim to enable the association to process ginger to a more advanced stage than existing facilities permitted.

The rapid strides that have been made by co-operative organisations in the field of manufacture or processing the raw material from the farm have been a significant feature of marketing development during the year. This has been evidenced by the extensions made, and others that are planned, to the Northgate Cannery, the developments noted above, and also the commencement during the year of the operation of The Great Northern Cannery Co-operative Association Limited, which was set up to process tropical fruits on growers' behalf. Another association was also registered in the north to process peanuts. The North Queensland co-operative tobacco manufacturing factory has also made rapid strides and now over 6,000 lb. of tobacco are being manufactured weekly. The erection of two first-class storage buildings for the holding of 400 tons of leaf has also been commenced.

Cotton.

In association with the Division of Plant Industry, consideration was given to the revival of the cotton-growing industry and the branch was represented during the year at discussions with Commonwealth Government officers in regard to the guarantee of a price of 9½d. per lb. of seed cotton for a period of five years as a means of restoring the confidence of cotton growers in the long term stability of the industry. This was finally agreed to. The renewal of interest in the crop due to the guarantee, to the importation of mechanical harvesters, and to the prospect of prices in the immediate future substantially above the guarantee is demonstrated by the 1951 harvest, which is expected to exceed 7,000 acres in comparison with 1,600 acres last year.

Grain Export.

The principles laid down by the Commonwealth Government for the export of grain sorghum from the 1950 harvest differed in one important point from the principles which had applied previously. For previous seasons, the export was required to be on growers' behalf so that the growers obtained the full benefit from the export price. From the 1950 harvest, export permits were granted to any persons, firms or pools applying for an export licence provided 40 per cent. of receivals was supplied to the domestic market. In all, 28,206 tons of grain sorghum from the 1950 harvest were exported, 14,856 tons (52.7 per cent.) by produce merchants and other firms, and 13,350 tons (47.3 per cent.) by growers' co-operative pools.

Maize growers also participated in the export market. After consideration of local requirements, the Commonwealth Government gave approval for 6,000 tons to be exported from the southern Queensland crop. Of this total, 4,500 tons were exported by growers' co-operative associations. The Atherton Tableland Maize Marketing Board exported 10,393 tons of maize from the 1950 harvest.

Because of the Australian demand for maize for industrial purposes no export was permitted for the 1951 season. The crop was estimated to yield 2¾ million bushels. Permits were issued by the Commonwealth Government for the export of more than 1½ million bushels of grain sorghum up till the end of May, 1951, from an estimated crop of 2½ million bushels.

Bulk Handling of Wheat.

Considerable attention has been directed to the problems associated with the establishment of bulk-handling facilities in the wheatgrowing industry. Further visits were made to other States in order to elaborate on the information which was compiled the previous year. These visits were of particular value, as other States where bulk-handling facilities are established are all engaged in giving consideration to the extension of their systems in order to cope with the current shortage and high price of jute bags. Moreover, it has been found that systems devised a decade ago to cope with the then normal rate of harvest and delivery by growers are no longer capable of handling the harvest, which has been speeded up by mechanisation. This is a problem similar to that which is being encountered by many marketing boards and which was mentioned earlier in this report.

Standing Advisory Committee on Tobacco.

The Director and the Chairman of The Tobacco Leaf Marketing Board (Mr. E. H. Short) were appointed to a Commonwealth Standing Advisory Committee, comprising representatives of the Departments of Trade and Customs, Commerce and Agriculture, the C.S.I.R.O., tobacco manufacturers, and growers. The Committee was established mainly for the purpose of advising the Commonwealth Government as to the percentage of Australian grown leaf to be contained in manufactures of tobacco and cigarettes in order to qualify for reduced import duties on imported tobacco leaf.

PRIMARY PRODUCERS' CO-OPERATIVE ASSOCIATIONS.

Two new associations were registered under the Primary Producers' Co-operative Associations Acts during the year.

The Brisbane Valley Co-operative Association Limited was formed by farmers in the Toogoolawah district with the main object of marketing the primary produce of its members and establishing a machinery pool for the use of members.

The Southern Granite Belt Fruitgrowers' Co-operative Association Limited was formed by fruitgrowers in the southern end of the Stanthorpe district for the purpose of establishing and operating a fruit packing house and merchandising agency at Glen Aplin. The Committee of Direction of Fruit Marketing has made available to the association a sum of £3,000 as an interest free loan, as well as a further cash advance of £2,400, repayable in five annual instalments to be met from share calls paid by members.

At this time, when many associations are facing the problem of raising the fresh capital required to provide additional machinery, plant, and buildings to cater for their expanding activities or for the replacement of assets, it is of interest to record that one association during the year took advantage of a provision in the Primary Producers' Co-operative Associations Acts which empowers an association to provide by its rules that it shall be obligatory upon members to subscribe capital proportionate to the use made of the Association. The rules of this particular Association, whose manufacturing activities have expanded rapidly in the past three years, were amended to require members to subscribe capital to the extent of 5 per cent. of the gross proceeds of their produce for a period of five years. Deductions are made by the association from proceeds of sales and shares are issued to the nominal value of the amounts deducted.

STANDARDS BRANCH.

Mr. F. B. Coleman, Standards Officer.

Though for the entire year the Inspection Section suffered a deficiency of one Inspector, the provision of additional motor transport to the branch permitted more frequent return visits and also enabled less accessible places to be visited, some for the first time.

During the year under review 433 sellers of agricultural requirements were visited, against 369 during last year. Inspections covering the Brisbane, Darling Downs, Moreton, Burnett, and Wide Bay districts were carried out.

SEED ANALYSIS.

Table 1 sets out details of seed samples examined at the Brisbane Seed Testing Station.

TABLE 1.

SUMMARY OF SEED SAMPLES EXAMINED.

—	1949–50.	1950–51.
Samples received from—		
Inspectors of Branch ..	3,769	4,423
Seed Certification Officers ..	..	190
Sellers	2,532	2,226
Buyers	64	148
Government Departments ..	961	1,658
Experimental test samples ..	1,188	238
Total samples examined ..	8,514	8,883
Germination tests carried out..	11,016	9,740
Inspectors' samples failed to comply—		
(i.) Farm seeds—		
(*a*) Low germination ..	46	99
(*b*) Purity	160	164
(ii.) Vegetable seeds ..	328	310
(iii.) Packeted seeds	624	..

It will be seen that the number of samples received from seed sellers was maintained and that 148 samples were received from buyers, compared with 64 in the previous year. The increase in buyers' samples is partly due to complaints relative to poor germinating onion seed, a considerable amount of which represented sales on which evidence could not be collected and consequently action could not be taken.

The high humidity resulting from the abnormal rains can be held partly responsible for the loss of germination in many seeds.

Table 2 sets out details and comparisons with the previous year's work relative to action taken with seeds found not to comply with the Act's requirements.

TABLE 2.

ACTION TAKEN ON UNSATISFACTORY SEEDS.

—	1949–50.	1950–51.
Cleaned under supervision of an inspector—		
Farm seeds ..	1,931 bags	244 bags
Destroyed or otherwise rendered unsuitable as seeds—		
(i.) Farm seeds ..	957 bags	2,468 bags
(ii.) Vegetable seeds	11,450 lb.	12,203 lb.
(iii.) Packeted seeds	624 packets	..

Frequent requests are made for permission to return to the supplier, invariably in another State, seed which fails to comply with the Act and which has been seized. Past experience has shown that this is a most unsatisfactory practice and such requests are refused.

The examination of each bag of French bean and lucerne seed in consignments being offered for sale is still necessary, though there has been some improvement. This method, while being time consuming, is well worth while in affording some protection to buyers. Samples drawn from 362 bags of French beans were examined; 40½ bags were found not to comply with the minimum germination standard of 75 per cent. Good French bean seed should germinate 90 per cent. or over. The high proportion of sub-standard seed is evidence of a most unsatisfactory state of affairs, which continues notwithstanding that all lots which fail to comply with the prescribed standards are destroyed.

At the time of writing, bean seed is worth £30 per bag. Some sellers appear to be more concerned with the financial side of the transaction than with supplying their clients with an article that will give a reasonable return. The loss of a few bags of bean seed to the seed seller represents little, but to the grower of green beans it represents a substantial portion of his livelihood. Unless sellers of bean seed acquire a fuller appreciation of their responsibility, more drastic action will have to be taken.

Owing to the abnormally wet conditions that prevailed during the past season, the quality of Rhodes grass seed declined. As it was anticipated that this would be seasonal only, for the period ending June 30th, 1951, the sale of Rhodes grass seed germinating not less than 20 per cent. was permitted, provided that the seed complied with the standards prescribed for purity. This matter has been reviewed in the light of the new season's harvest, and it is regretted that restoration of the 30 per cent. minimum germination standard cannot be recommended.

A total of 319 samples of lucerne seed was examined, each representing one bag; 7.5 per cent. contained excessive amounts of inert matter and weed seeds, a percentage nearly double that of the previous year's.

The principal prohibited seeds found in samples taken by inspectors and the number of times they occurred were as follows:—

Carthamus lanatus (saffron thistle)	11
Datura spp. (thornapple)	28
Ipomoea sp. (morning glory, bell vine) ..	51
Melilotus indica (Hexham scent)	51
Raphanus raphanistrum (wild radish) ..	6
Rapistrum rugosum (turnip weed)	120
Salvia reflexa (mint weed)	208
Sorghum halepense (Johnson grass)	16

Restricted weeds (i.e., those whose presence is permitted only in specified numbers per ounce or pound) found in Inspectors' samples were as follows:—

Argemone mexicana (Mexican poppy) ..	9
Polygonum spp. (wireweed)	190

Greater care is needed by all concerned if these objectionable seeds are to be eliminated from seeds being sold for sowing.

INVESTIGATIONS.

Considerable progress has been made in overcoming the difficulty experienced in ascertaining the germinability of Townsville lucerne seed due to the percentage of hard seeds.

Repeated germination tests extending over three years have been carried out on samples of green panic grass seed. The results indicate that an improvement can be expected for the first 18 months of storage under dry conditions, after which a slight decline can be expected.

CLEANING MACHINERY.

Progress has been made by seed merchants in the installation of modern cleaning plant. Latest additions are two specific gravity separators from U.S.A. and one of Swedish origin. Further machines are under way. While this is a step in the right direction, there is

room for much additional plant. It is reasonable to believe that but for the dollar position further installations would have been made.

Buyers of seeds for sowing could help to improve the position by refraining from buying cheap seeds, a considerable quantity of which are "over the fence" sales. Such goods are usually uncleaned and no efforts have been made to ascertain their purity and germination.

SEED CERTIFICATION.

During the year additions to the seed certification scheme were Q526 and Q719 hybrid maize and Alpha, Martin, and Caprock grain sorghums.

Table 3 sets out the amount of certified seed which has been produced since the scheme came into operation in 1946-47.

TABLE 3.

PRODUCTION OF CERTIFIED SEEDS.

Year.	Hybrid Maize.	Sorghum.			French Beans.	Tomato.	Papaw.
		Grain.	Sweet.	Roma Sudan Grass.			
	Bush.	Bush.	Bush.	Bush.	Bush.	Lb.	Lb.
1947–48	..	600	..	..	..	..	..
1948–49	306¼	523	..	..	2	218¾	..
1949–50	1,314	5,416	..	516	201	128¼	..
1950–51*	2,843½	987	171	78	98	41¾	..

*These figures are incomplete.

Five growers satisfactorily completed a probationary period to grow hybrid maize, two did not plant, one failed to complete the period and two had their plots destroyed by prolonged dry weather or cutworms.

Nine acres planted to hybrid maize for seed certification purposes were not harvested due to adverse weather conditions.

Because of the germination being below the prescribed minimum, 21 bushels of hybrid maize, 489 bushels of Early Kalo grain sorghum, and 68½ bushels of Wheatland grain sorghum seed were rejected for certification purposes.

Ten acres of Sugardrip sweet sorghum were destroyed by frost. Seven acres of Early Kalo grain sorghum and 15 acres of Roma Sudan grass were not harvested due to adverse weather conditions. In addition, a sample of seed taken at random from 44 acres of Wheatland grain sorghum germinated 59 per cent., which is below the prescribed minimum, and the crop was consequently abandoned for certification purposes.

Due to a crop of Sudan grass growing within the isolation limits, 25 acres of Alpha grain sorghum were rejected. A further 25 acres of this variety were cancelled because the grower was unable to supply labour for rogueing the crop.

Seventy-five acres planted for the production of certified Brown Beauty bean seed were found to be infected by bacterial blight and were rejected. A small area (½ acre) suffered severely from excessive rain. Unfortunately, as a result of these causes, no Brown Beauty bean seed will be certified this season.

The germination of 18 bushels of Brown Beauty bean seed was below the prescribed minimum due to "baldhead" and other abnormalities. Experimental work is being carried out to determine whether any particular harvesting machine causes these abnormalities.

The practice of confining each grower of certified tomato seed to the production of one variety and requiring the sowing of two separate areas by each grower was continued. However, no Q3 seed was harvested, as the grower was unable to plant one area and the other was rejected due to the crop being below varietal standard through physiological causes.

REGISTRATION.

During the year, 924 preparations were registered under the Fertilisers, Stock Foods, Veterinary Medicines, and Pest Destroyers Acts. Licences were issued to 639 dealers in fertilizers and veterinary medicines.

The Pest Destroyers and Veterinary Medicines Boards considered claims regarding the efficacy of 456 preparations for which registration was desired; 35 preparations were refused registration.

The Veterinary Medicines Board, when making the triennial review of preparations for which registration is sought, has endeavoured to bring claims made as to efficacy and the naming of preparations into line with present knowledge. Preparations sold under the name of "condition" powders and like names are in the main laxatives or tonics and must therefore be designated as such and the use of the meaningless term "condition" eliminated.

Formulae that served their purpose in the past but are now superseded by more efficient chemicals are being eliminated.

Some sellers still seek approval for preparations claiming to prevent or cure "symptoms" and often fail to appreciate the Board's action in insisting on the declaration of actual maladies for which the preparation is useful.

Inspectors submitted 137 samples, which were analysed by the Agricultural Chemist. Where deficiencies occurred, suitable corrective action was taken with the firms concerned.

The number of samples submitted by buyers was comparable with the number submitted in previous years, indicating that buyers generally are satisfied with the quality of the article they obtain.

TABLE 4.

SUMMARY OF ACTION IN REGISTRATION SECTION.

Samples received from—	
Inspectors	137
Buyers	10
Samples analysed by Agricultural Chemist	209
Samples examined by Standards Branch ..	136
Licences issued	639
Registrations effected	924
Registrations refused	35

FERTILIZER SUPPLIES.

For the first time since 1939 good supplies of sulphate of ammonia were available, but owing to abnormal rains which interfered with the cultivation of the sugarcane crop, the supplies were not fully availed of.

There is a world-wide shortage of sulphur, which is necessary in the manufacture of superphosphate. Queensland's supplies of this fertilizer are made at Pinkenba, where pyrites of Queensland origin is burnt in place of raw sulphur. Therefore, provided the supply of phosphatic rock is maintained, no shortage of superphosphate need be feared. The rest of the Australian States, particularly the major wheat producers, are not so fortunate, as they are still, in some cases, dependent upon supplies of sulphur from overseas and in addition have an increased demand for superphosphate to fill.

The supply of blood and bone fertilizer shows no sign whatsoever of improvement, nor can the position be improved until greatly increased numbers of cattle are processed. Even then, owing to the disparity in prices between feeding meals and fertilizer, it is doubtful whether any major relief would be obtained.

Adequate supplies of potash are available from Europe provided shipping can be maintained.

Table 5 sets out the prices of fertilizers for the years 1949 to 1951 f.o.r. Brisbane.

TABLE 5.

FERTILIZER PRICES.

Name.	1949. November.	1950. 1st July.	1951. March.
	£ s. d.	£ s. d.	£ s. d.
Ammonium Sulphate 20·5% Nitrogen	22 17 6 (*a*)	26 17 6 (*a*)	26 17 6 (*a*)
Superphosphate 22% P_2O_5	7 10 0 (*b*)	9 15 0 (*b*)	9 15 0 (*b*)
Blood and Bone 5 : 15 : 0	8 10 0	8 10 0	12 10 0
Muriate of Potash 60% K_2O	30 18 0	30 18 0	34 8 0

(*a*)—Less 7s. 6d. for cash.

(*b*)—Less 5s. for cash.

A Commonwealth subsidy of £500,000 was granted during the year to assist purchasers of nitrogenous fertilizers, which include sulphate of ammonia. Owing to the withdrawal of the superphosphate subsidy, the price was raised by £2 5s. per ton. Increased costs of production and distribution caused the price of potash to rise from £30 18s. to £34 8s. per ton.

The price of blood and bone (meatworks) fertilizer rose by £4 to £12 10s. per ton as from March, 1951.

There does not appear to be any prospect of a reduction in fertilizer prices. On the contrary, freights and other costs are rising and unless the nitrogen subsidy is continued the price of sulphate of ammonia will inevitably show a rapid rise.

The demand for nitrogen for munitions production is an unknown factor, so it is not possible to give any indication as to the supply position for sulphate of ammonia for the current year.

FEED WHEAT.

Due to the adverse seasonal conditions of 1950, a considerable proportion of the feed wheat available is pinched. Its analysis of 13.8 per cent. crude protein, 3.8 per cent. crude fibre, 2.0 per cent. crude fat and 12.2 per cent. moisture compares favourably with that of feed wheat of other harvests. The weight of 40.6 lb. per Imperial bushel is, however, considerably below that of heavy grain. In many instances, owing to lack of experience of pinched grain, buyers were rather loath to accept delivery due to the poor appearance and light weight per bag. However, because of its chemical composition and the fact that it is bought by weight and not by volume, there is no reason for buyers to be dubious.

Amendments to the Regulations under the Stock Foods Acts prohibit the sale of any stock food that has deteriorated in quality due to fermentation or water and also fix three grades for the sale of feed wheat.

It has been necessary to issue a warning against the purchase of hay, chaff, or seeds containing seeds or parts of skeleton weed. This weed has a bad reputation in the South, as in addition to depressing yields it chokes harvesters and blocks riddles when stripping. It is not eaten by stock and has been described as being almost as tough as a bundle of wire. So far as is known, it is not at present in Queensland. It could be expected to thrive under the conditions prevailing on the Darling Downs and it is difficult to eradicate; hence its introduction into Queensland is prohibited under The Diseases in Plants Acts and its sale is prohibited under the Stock Foods Acts.

IMPORTS AND EXPORTS.

Details of the goods examined at the port of Brisbane for the purpose of the Quarantine Act and/or Commerce (Trade Description) Act are set out in Table 6.

TABLE 6.

IMPORTS AND EXPORTS EXAMINED.

Kind of Seed.	1949–50.	1950–51.
Imports—		
Miscellaneous Vegetables—	2,200 lb.	3,356 lb.
Beans ..	4 bags	69 cwt.
Garden peas ..	73 bags	60 bags
Farm seeds ..	463 bags	252 bags
Parcel Post ..	92 parcels	261 parcels
Exports—		
Grass seeds ..	..	450 bags
Miscellaneous packets of seeds ..	..	379 packets

Reports were issued on samples of grain, submitted by shippers or agents and representing the quantities set out in Table 7, in connection with which the buyers' terms of contract stipulated that a certificate be issued. These figures do not represent the total exports.

TABLE 7.

Kind of Grain.	Quantity.
Barley	25,340 bags
Canary seed	41,253 bags
Maize	34,147 bags
Millets	120,471 bags
Sorghum	323,293 bags
Sunflower	95 bags

CLERICAL AND GENERAL DIVISION.

Mr. W. T. Gettons, Assistant Under Secretary.

Coincident with expanding activities in the production and marketing divisions of the Department the work of the Clerical and General Division has increased. As examples, the figures for inward correspondence and expenditure are quoted. In 1948-49, 79,796 letters were received. During the last year 83,069 came to hand. Expenditure on all accounts totalled £1,084,880, compared with a total of £711,472 in 1947-48. There has been no corresponding increase in the number of clerical staff employed at the Chief Office.

It is the practice to station clerical assistants when possible at country centres to enable the field staff to spend more time in the field and to provide attention for the public during the absence of such officers. This has not progressed as desired but 22 centres have the benefit of one or more clerical assistants.

The installation of an up-to-date accounting machine in the Accounts Branch during the year has proved worth while and has aided in the expeditious payment of accounts. Owing to the limited availability of staff to meet increasing duties, it is necessary to work a great deal of overtime. This is not in the best interests of the staff but it is unavoidable.

The volume of work in the Commercial and Despatch Branch has greatly increased and much time is necessarily spent in locating sources of supply of requirements for the technical divisions. Working methods are constantly being reviewed to eliminate delay in the ordering and delivery of goods.

ACTS.

"The Farm Produce Agents Acts, 1917 *to* 1932."

During the year supervision was exercised over farm produce agents in their dealings with principals.

Inspections of the books and records of many Brisbane and country agents were made to verify that consignments were being correctly accounted for. Minor irregularities in the keeping of the books by some agents were noticed and rectified, and advice for the more effective keeping of records was tendered. Requests by growers for investigation of transactions received attention.

There are 156 licensed farm produce agents in Queensland and of these, 91 are in the Brisbane area.

"The Milk Supply Act of 1938," *"The Regulation of Sugar Cane Prices Acts," "The Abattoirs Acts,* 1930 *to* 1949."

Under these Acts, Boards have been constituted to carry out the provisions of the Acts. Matters referred to the Department by such Boards or functions prescribed by the Acts to be carried out by the Department are usually handled by the Division.

Under the Abattoir Acts, Local Abattoir Areas have been declared and Local Abattoir Boards have been constituted at Ipswich, Toowoomba, Bundaberg, Rockhampton, and Townsville, and the Boards are proceeding with arrangements for the provision of centralized killing facilities for their areas. During the year a Committee appointed by the Government investigated the desirability and feasibility of establishing in Central and North Queensland Public Abattoirs to handle both the export and local trade. After consideration of the report which was submitted by the Committee, following exhaustive enquiries, the Government decided that under existing circumstances no material advantage would accrue to graziers or the public generally through the establishment of Public Abattoirs in these areas.

"Re-establishment and Employment Act, 1945."

The Department has continued the administration of that portion of the *Commonwealth Re-establishment and Employment Act*, 1945 relating to the payment of allowances to discharged members of the Forces engaged in agricultural occupations within the State of Queensland. From 1946 until the 30th June, 1951, 2,482 ex-servicemen received assistance. The recipients were engaged in the following branches of industry:—

	Number of Applicants engaged.
Wheat growing	64
Cattle grazing	73
Sheep grazing	57
Dairying	395
Pig raising	20
Mixed farming	505
Market gardening	403
Orcharding	59
Banana growing	153
Viticulture	5
Poultry raising	151
Apiculture	7
Nurseries	9
Pineapple growing	154
Sugar cane farming	294
Tobacco growing	29
Cotton growing	6
Peanut growing	16
Miscellaneous	82

The allowance is a Commonwealth grant made to eligible ex-servicemen to ensure that they receive an adequate living allowance during the first 12 months of their recommencing in an agricultural occupation after discharge from the Forces.

It is necessary that applications be made within five years of any of the following dates, whichever is the latest:—

1.—

(*a*) The cessation of hostilities.

As September 2, 1945, is regarded as the date of cessation of hostilities those persons who were discharged on or before that date ceased to be eligible to apply for the allowance as from September 2, 1950, unless they received or are receiving rural training under Part III. of the Act.

(*b*) The date on which the applicant ceased to be engaged on war service, provided such date was not later than June 30, 1949;

(*c*) The termination or completion of any training which the applicant received under Part III. of the Re-establishment and Employment Act, 1945; or

2. Where the applicant is a widow, within five years of the latest of any of the undermentioned dates—

(*a*) The cessation of hostilities;

(*b*) The date on which the applicant's husband ceased to be engaged on war service, provided such date was not later than June 30, 1949;

(*c*) The termination or completion of any training which the applicant's husband received under Part III. of the *Re-establishment and Employment Act* 1945.

Ex-servicemen who were discharged after September 2, 1945, are eligible to apply at any time up to five years from their date of discharge from the Forces, provided such date of discharge was not later than June 30, 1949. If they received rural training under Part III. of the Act, the maximum period of five years for lodgment of applications will commence to run from completion of such training.

Those persons who enlisted before June, 30, 1947, and who were still in the Forces at June 30, 1949, other than on a career basis, are deemed to be discharged at June 30, 1949, for the purpose of calculating the five-year period from the date of discharge, within which application must be made.

TRANSPORT.

During the year the Department operated a fleet of 208 Government-owned motor cars and utilities. The total mileage travelled by these vehicles amounted to 1,271,628 miles at an overall cost, exclusive of depreciation, of £31,900.

The transport position was improved materially by the purchase of 23 new vehicles to replace old machines discarded from the fleet on the recommendation of the Chief Inspector of Machinery, but there are still some old models which it will be economical to replace as soon as new machines can be secured. Spare parts, including tyres and tubes, are very difficult to obtain for old motor cars, and often for new vehicles, and this adds to the task of keeping field officers mobile.

Some 140 field officers use their privately-owned vehicles in the performance of their official duties and are paid on a mileage basis. An increase in the mileage rate, recently granted, has encouraged a number to negotiate the purchase of new vehicles and to a degree this has relieved the demand for Government-owned transport. Other officers are willing to purchase their own cars for official use on a mileage basis but because of the big outlay required in the first instance are unable to do so. The introduction of a scheme along the lines adopted by some other States, whereby officers are assisted financially by the Government to provide the first cost, would undoubtedly result in a greater number of officers providing their own transport and would further relieve the Government of the necessity of providing so many vehicles.

INFORMATION BRANCH.

A feature of the operations of the branch during the year was the large number of requests from prospective settlers resident in other States and countries for information on farming conditions in Queensland and how to go about acquiring suitable properties. These requests came from nationals of many countries, including Great Britain, Holland, Canada, United States of America, India, and New Zealand. In addition to providing information to individual enquirers, detailed information on various primary industries was supplied to migration officers attached to migrant ships.

The "*Queensland Agricultural Journal,*" the Department's monthly advisory Journal, maintained a monthly distribution of over 14,000 copies, which means that it is received by over a quarter of the State's primary producers. The number of recipients may be regarded as fairly satisfactory, though the nature of the publication is such that all farmers and graziers would benefit by using it.

Among the crops treated in a comprehensive manner in the journal during the year were potatoes, wheat, hybrid maize, cabbages, cauliflowers, cucumbers, peanuts, bananas, and root crops. On the animal side, dehorning, sterility, feeding of dairy cattle, brucellosis of cattle, coccidiosis and salmonellosis of poultry, and infectious pneumonia of swine were among the most important items fully covered by special articles.

The soil conservation series begun in the previous year was continued with articles on gully erosion, pondage and diversion structures, and contour banks, and a report on contour furrowing of claypans was also published. Cream and butter defects, and methods for cooling milk and cream on the farm, were the subjects of special articles. A wide range of other subjects was also dealt with during the year. Included among these were items on child welfare for the benefit of farm families. An average of 40 illustrations per month was used to enhance the value of advisory articles.

It is a condition of various schemes operated by the Department that details of participating herds be published in the journal. Accordingly, each month lists of brucellosis-tested swine herds and tuberculosis-free cattle herds are published, and annually a list of the performances of all cattle participating in the stud herd recording scheme is published.

Advertising matter submitted for publication in the journal was closely scrutinised by the editorial staff and technical officers to ensure that no objectionable or misleading material was included and that no veterinary medicines, fertilizers, &c., were advertised for sale in contravention of regulations under various Acts.

Branches contributing articles to the Journal have continued to have reprints made for the purpose of providing a supply of advisory leaflets and pamphlets for distribution to individual enquirers. Approximately 100,000 reprints of 70 articles were made for various branches of the Department.

Despite a reduction in the size of some newspapers because of the shortage and cost of newsprint, the matter sent to newspapers weekly by the Department in the form of a News Bulletin continues to be widely used. Trade journals and rural broadcasters have also received and used this matter. The items included in the bulletin are mostly of a topical advisory nature and serve to keep the farming community informed on approved practices. Information on the general activities of the Department is supplied from day to day to newspapers and radio news services, and special articles were written for many purposes.

Many country newspapers and several broadcasting stations gave willing assistance to the branch in inducing farmers to plant cotton in 1950 and in promoting fodder conservation. Scripts on cotton growing were prepared by the branch and delivered by field officers or station announcers at broadcasting stations serving the areas most suitable for cotton growing, and additional matter was supplied to the press. Printing blocks illustrating the mechanical harvesting of silage and the construction of concrete silos, together with descriptive articles on fodder conservation, were supplied to numerous country newspapers, all of which prominently displayed the various items.

Several scientific papers written by officers of the Department were published in the Department's quarterly the "Queensland Journal of Agricultural Science." This journal was commenced in 1944 not only to facilitate publication of the results of Departmental scientific work, but also to provide an exchange for scientific literature made available freely to the Department by scientific institutions throughout the world. Articles sent to press during the year included contributions on the cotton jassid problem, nitrite poisoning of pigs, rat populations in canefields, the Gayndah laterite soil, leptospirosis in calves, variations in milk composition, wilt disease of passion fruit, new species of fruit fly, and a laboratory whirler for bacterial counts in milk.

At the request of the Australian and New Zealand Association for the Advancement of Science, the officer in charge of the Branch acted as a member of the committee which prepared the "Handbook for Queensland," to which several officers of the Department contributed chapters and which was largely illustrated by photographs supplied by the Department.

Second editions of three volumes of the Department's "Queensland Agricultural and Pastoral Handbook" are in course of preparation. Material is being assembled for Volumes I. (Farm Crops and Pastures) and II. (Horticulture), while Volume III. (Pests and Diseases of Crops) is in the final stages of printing. The handbook series proved very popular when it was first issued some years ago, and there has been a wide demand for all three volumes since they have been out of print. The printing of second editions will be welcomed not only by primary producers but also by students and teaching staffs.

The Queensland edition of "Dairy Farming in Australia," which is being published in separate State editions with funds from the Commonwealth Dairy Industry Efficiency Grant, is expected to be ready late in 1951. Most of the advisory matter in this book was prepared by officers of the Department of Agriculture and Stock.

Requests by broadcasting stations for special sessions by Departmental officers have become somewhat embarrassing, inasmuch as most technical officers are fully employed in field or laboratory work and find it difficult to devote sufficient time to the preparation of scripts for regular broadcasts. Nevertheless, weekly sessions are being provided for the A.B.C. Country Hour and for a few provincial stations, while occasional material is supplied for other sessions. During the year, officers of the branch delivered 34 broadcasts additional to those given by technical officers.

Coloured film slides showing weeds, pastures, poisonous plants and pests and diseases of plants were shown at the Pittsworth Show. As a contribution to the Commonwealth Jubilee Celebrations, numerous exhibits were made by individual branches at country shows, thus easing the demand on the Information Branch for visual education exhibits.

At the Brisbane Royal National Show the branch conducted a theatrette, showing films of various Australian primary industries in order to acquaint city and town dwellers with these industries as well as to give primary producers a broad view of primary production on a national scale. Films dealing with the wool, wheat, beef cattle, grain sorghum, dairying, pineapple, tomato growing, and other industries were well received.

The Photography Section handled approximately the same volume of work as in the previous year. Field visits were made to various localities in company with advisory and scientific officers for the purpose of recording phases of primary production and research activities. Printing, developing, and enlarging work was carried out for many branches and work was done for other Departments. Lantern slides and film strips were prepared for lecture purposes.

The Central Library's holdings increased considerably during the year. A number of new periodicals of considerable value to research and extension officers made their first appearance, and a large volume of pamphlet and bulletin material was also received. Concurrently with an increase in the volume of accessions, there has been a heavier demand by officers of all branches on library services.

With so many workers now engaged in research in agricultural and cognate industries throughout the world, a tremendous amount of research having some bearing on problems of farming and grazing in Queensland is being prosecuted. Ready reference to scientific publications is therefore essential to faster progress in research in this State. Similarly, the extension officer may serve his purpose more adequately if he has the published experience of others to assist him. The Department, which receives approximately 700 different periodicals as well as bulletins from hundreds of sources, may well claim to have one of the most useful libraries of its type.

INDEX TO SUBJECTS.

(Main references only. See also Table of Contents.)

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