1956.

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QUEENSLAND.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE AND STOCK

FOR

THE YEAR 1955-56.

PRESENTED TO PARLIAMENT BY COMMAND.

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ORGANISATION OF THE DEPARTMENT AS AT 30th JUNE, 1956.

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. (seconded to Queensland Meat Industry Board).
Special Administration Officer	H. Barnes.
Extension Co-ordinator	G. R. Moule, B.V.Sc.
Officer in Charge, Information Services	C. W. Winders, B.Sc.Agr.
Accountant	E. C. R. Sadler, A.A.U.Q.

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Agriculture Branch—

Director of Agriculture .. .. W. J. S. Sloan, M.Sc.Agr.

Regional Experiment Stations Branch—

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

Horticulture Branch—

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

Science Branch—

Sections of Botany (S. L. Everist, B.Sc., Government Botanist); Entomology (W. A. McDougall, D.Sc., Chief Entomologist); and Plant Pathology (J. H. Simmonds, M.B.E., M.Sc., Chief Pathologist).

Chemical Laboratory—

Agricultural Chemist .. .. C. R. von Stieglitz, F.R.A.C.I.

DIVISION OF ANIMAL INDUSTRY—

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Assistant Director	A. L. Clay, B.V.Sc.

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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—

Director of Cattle Husbandry .. .. .. D. N. Sutherland, B.V.Sc.

Biochemical Branch—

Biochemist .. .. J. M. Harvey, D.Sc.

Pig Branch—

Officer in Charge .. .. F. Bostock.

Poultry Branch—

Senior Poultry Husbandry Officer .. .. .. F. N. J. Milne, B.Sc.

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Field Services Branch—

Director of Field Services .. .. F. C. Coleman.

Research Branch—

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

DIVISION OF MARKETING—

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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 1955-56.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

Dear Sir,—I have the honour to submit the following report covering the activities of the Department of Agriculture and Stock for the year ending June 30, 1956. Immediately following this section will be found reports from the Divisional Directors, followed by more detailed records in the constituent Branch reports.

Whilst a perusal of the administrative and Divisional reports will give an overall picture of Departmental activities, only a reading of the Branch reports will engender a full appreciation of the scope and ramifications of current work.

Production statistics are set out in Tables 1 (animal industries) and 2 (plant industries). Generally seasonal conditions have favoured the animal rather than the plant industries. The conditions for the first part of the year were mostly favourable but the second half saw excessively wet weather over most of the State. An intense cyclone caused marked damage in North Queensland, and excessive rains caused widespread flooding and soil erosion over vast areas of the State. The variable effects of these conditions on the different primary industries are set out in the Divisional reports.

GENERAL ECONOMIC OUTLOOK.

The year 1955-56 saw a continuation in the upward trend of the volume of rural production in Australia. This now stands at a level one-third above the pre-war level; the increase over 1954-55 production was some 6 per cent.

It is, of course, necessary for Australia to maintain a steady expansion in the volume of rural production, at least proportional to the population increase. Not only must our people be fed and clothed but exports must earn overseas credits to pay for the many necessities of modern life which must be imported. At present, and at least for years to come, the bulk of such exports must necessarily be primary produce.

Australia's population is expected to exceed 10 millions in 1960. If present domestic consumption levels are maintained, and if imports *per caput* remain at the level of the past three years, then export earnings must be stepped up by some 20 per cent. between now and 1960, if further balance of payment difficulties are to be avoided.

Sales of export commodities have almost completely returned to normal trade channels and primary produce is facing increasing competition and price resistance. It is obvious that marketing, rather than production, has now become our major problem. Nevertheless, with the exception of a carry-over in wheat (now decreasing), all exportable surpluses have been sold.

Development of a buyer's market has been favoured by the decision of the Government of the United States to dispose of its vast accumulated stocks of farm commodities. Stocks have been accumulated as a result of too-long sustained systems of wartime price support, and it is somewhat reassuring to learn that these systems are now being considerably modified.

An additional factor has been the goal of self-sufficiency pursued by many nations under pressure of currency or strategic considerations. The United Kingdom provides an example: In 1955 it produced 63 per cent. of the beef and veal consumed, compared with 47 per cent. (for a much smaller population) in 1938. Comparable figures for fresh pork are 91 and 74 per cent., and for hams and bacon 46 and 36 per cent.

While the short-term export outlook may not be reassuring for certain commodities, it must always be borne in mind that world population is now increasing by 40 millions yearly and that, consequently, overall demand for primary produce is ever increasing. In our national development we should be guided by this long-term view rather than by the aggregate of fluctuating short-term conditions.

In Commonwealth councils this Department has pressed for long-term stable marketing systems for crops such as tobacco, oilseeds, and cotton, which, if produced in adequate quantities, can greatly relieve the pressure on import financing.

Within Queensland the seasonal conditions of the year were mixed. A very good start was later marred by a cyclone and floods of unprecedented magnitude in January and February. A study of Tables 1 and 2 shows that summer-harvested crops and animal production reached high levels. On the other hand, autumn crops such as tobacco, maize and potatoes were depressed and owing to excessive rains land preparation for the coming season's crops was retarded and impeded.

Generally, prices received for wool, meat and grains were lower than in the previous year; prices for dairy produce and eggs have been somewhat better. The Commonwealth Sugar Agreement was extended for a further year (to 1963), the price for the "negotiated price quota" (314,000 tons) remaining at £Stg. 40 15s. per ton; free market export prices remained

around the minimum of 3·25 cents set by the International Sugar Agreement but the domestic price of refined sugar was increased from 9d. to 10d. per lb. retail. A new International Wheat Agreement of three years' currency was negotiated in April, 1956, but, as the agreement covers only one-third of the international trade in wheat, it provides no great security although the ceiling and floor prices of C $2·00 and C $1·50 are satisfactory.

PRODUCTION TRENDS.

In Fig. 1 are set out calculated trend lines covering production per unit for eight major industries over a period of 35 years from 1921-22.

Pigmeats and egg production have not been included owing to the lack of comparative data. In the case of pigmeats, market requirements as to weight per pig have varied, whilst the proportional diversion to bacon and pork varies from season to season and so affects carcase weight. Grain sorghum is now of more economic importance than maize but has not been cultivated commercially long enough to provide the necessary long-term yield data for its inclusion.

The five agricultural industries all show sustained upward trends in yield per acre. In the animal industries there is a marked upward trend in the production of beef per head of cattle, and a steady increase in the wool per sheep, but unsatisfactory trends are evident in the production of milk per cow and in the percentage of choice grade butter manufactured.

The yields of wheat and barley show marked seasonal fluctuation but there is an obvious upward trend, from about 11·5 bushels of wheat per acre in 1921 to 20 bushels in 1955, the comparable figures for barley being 12 and 22 bushels. These yields are the best in the Commonwealth.

The yield of maize per acre declined in the depression years of the 'thirties, doubless owing in part to the use of inferior "home" seed. Over the past 17 or 18 years, however, there has been a steady increase, due mainly to the displacement in less favourable areas by grain sorghum, and the increasing use of hybrid maize. Nevertheless, maize yields are still far below countries such as the United States.

The rate of increase in sugar cane yields has slowed down after the considerable advances recorded in the nineteen-thirties. Sugar cane is harvested here as an approximate annual crop compared with up to two years' cropping in some other countries. Production of sugar per acre per month in Queensland is second only to Hawaii.

The post-war period saw a rapid lift in the efficiency of the tobacco industry and at present yields are stabilising around 900 lb. per acre. The completion of the Tinaroo Dam in North Queensland will result in a much greater proportion of the crop being grown under full irrigation and a further upward trend might then be expected.

There has been a tendency to regard the beef industry as a Cinderella, and even a backward industry. Nevertheless there has, in the course of 35 years, been an approximate increase of 60 per cent. in the quantity of beef marketed annually for each head of cattle depastured. The marked rise in the percentage of cattle and calves slaughtered each year indicates that this increase is due in considerable part to slaughtering at an earlier age, and the reduction of losses through death. At the same time, there is no doubt that property improvement and a better standard of husbandry have helped. The trend shows no signs of falling off, which is encouraging for the future.

Wool per sheep has shown a steady increase but this has amounted to only about one more pound of wool in the 35-year period. It is true that marked advances in breeding had already taken place before 1921; nevertheless, progress should be more rapid and the new fleece testing service established in the Sheep and Wool Branch can assist woolgrowers in speeding the rate.

It is hard to ascribe to any particular causes the decline in milk production per head of dairy cattle which has taken place in the past 20 years. This is disturbing, particularly as in the peak year production was less than 250 gallons per cow. The main contributing factor is undoubtedly the low plane of nutrition during the dry season, and this can only be met by supplementary feeding and improved pastures. To date there has been little response to advocacy of fodder conservation but there are encouraging signs of a rapidly awakening interest in pasture improvement. The Department has for some years conducted an extensive series of pasture demonstrations and in this work it has received very material assistance from the dairy industry.

Of perhaps even greater significance is the downward trend in the percentage of choice butter manufactured. This has taken place in spite of the continuing improvement in the range and quality of butter factory equipment. Another unsatisfactory feature is that although 60 per cent. of the butter is graded as choice by factory graders, only 37 per cent. is so graded by the Commonwealth graders.

In a competitive world this downward trend in quality can be serious. It is evident that two things are required—stricter grading at factory, and more realistic quality price margins for cream. It could not seriously be claimed that low quality is due to inadequate extension services. Over the past few years the Division of Dairying has made a particular effort to stimulate interest in quality improvement. During the past year, in addition to thousands of farm visits, Divisional officers have addressed or shown technical films to 444 gatherings in dairying centres, attended by over 16,000 people.

THE NEED FOR PERMANENT LAND USE SYSTEMS.

In the post-war period the Department has established four "regional" experiment stations for the investigation of the problems and potentialities of mixed farming and the profitable integration of crop and animal production.

Nowhere in the world has agriculture survived unless a balanced agricultural system has been evolved—and many deserts and near-deserts bear silent but stark witness to this truism.

TABLE 1.

Pastoral and Dairying Statistics.

(Source—Queensland Government Statistician and Commonwealth Statistician).

——	Average 1934–35 to 1938–39.	Average 1944–45 to 1948–49.	1951–52.	1952–53.	1953–54.	1954–55.	1955–56. (a)
Beef Cattle (number) ..	4,631,482	4,797,681	5,137,715	5,378,397	5,702,999	5,860,848	5,939,000
Cattle and Calves slaughtered (number) (b)	1,046,111	1,019,621	1,028,722	1,272,585	1,366,273	1,430,096	1,464,014
Beef and Veal produced (tons)	180,717	186,354	177,608	252,495	257,783	271,550	291,378
Dairy Cattle (number) ..	1,387,011	1,417,892	1,296,659	1,372,998	1,383,208	1,377,214	1,382,000
Total Milk produced for all purposes (,000 gallons)	278,227	255,810	181,148	285,533	249,712	275,605	285,000
Butter produced (tons) ..	54,722	43,453	28,211	49,425	42,154	(a) 46,215	48,000
Cheese produced (tons) ..	5,077	9,778	4,700	9,439	6,746	(a) 7,924	7,500
Sheep (number)	21,060,513	17,912,361	16,163,518	17,029,623	18,193,988	20,221,826	21,972,000
Wool production (,000 lb.)	164,971	161,401	138,767	163,149	174,414	176,548	186,500
Sheep slaughtered (number) (b)	1,029,054	1,201,301	731,635	953,838	964,006	913,485	1,010,759
Mutton produced (tons) ..	19,192	20,712	13,082	18,572	18,075	17,254	20,479
Lambs slaughtered (number) (b)	72,178	111,111	97,348	121,781	116,898	95,662	120,569
Lamb produced (tons) ..	974	1,568	1,338	1,799	1,617	1,296	1,714
Pigs (number)	294,776	395,814	316,529	335,809	384,453	406,879	374,000
Pigs slaughtered for pork (number) (b)	260,928	155,897	165,149	115,091	129,447	159,744	149,606
Pigs slaughtered for bacon and ham (number) (b)..	264,306	308,930	204,493	285,326	329,727	326,316	301,936
Pork produced (tons) ..	9,867	9,202	8,604	6,548	7,132	8,370	7,708
Bacon and ham produced (tons)	9,269	10,707	7,669	9,510	10,616	10,805	10,217

(a) Preliminary figures. (b) Slaughtered for human consumption.

TABLE 2.

Agricultural and Horticultural Statistics.

(Source—Queensland Government Statistician.)

——	Average 1934–35 to 1938–39.	Average 1944–45 to 1948–49.	1952–53.	1953–54.	1954–55.	1955–56. (a)
Sugar Cane (b)—						
Cut for crushing (acres) ..	247,092	244,554	274,757	332,703	367,640	365,252
Cane production (tons) ..	5,181,124	5,073,804	6,841,536	8,751,063	9,864,304	8,616,163
Yield per acre (tons) ..	20·9	20·7	24·9	26·3	26·8	23·6
Sugar manufactured (tons)	757,560	707,144	934,614	1,220,383	1,301,245	1,135,675
Wheat—						
Area (acres)	340,055	408,570	724,495	579,969	687,402	581,732
Production (bushels) ..	4,766,927	8,175,054	18,662,391	10,180,368	16,477,770	14,921,913
Yield per acre (bushels) ..	14·0	20·0	25·8	17·6	24·0	25·6
Maize—						
Area (acres)	174,628	132,280	108,230	114,735	114,673	108,146
Production (bushels) ..	3,271,919	3,119,961	2,650,365	3,041,607	3,079,692	2,710,107
Yield per acre (bushels) ..	18·7	23·6	24·5	26·5	26·9	25·0
Barley—						
Area (acres)	9,777	18,043	71,879	56,076	87,297	145,526
Production (bushels) ..	153,028	392,609	2,108,979	1,138,839	2,572,902	4,216,044
Yield per acre (bushels) ..	15·7	21·8	29·3	20·3	29·5	28·9
Oats—						
Area (acres)	8,542	23,690	56,403	13,480	36,432	35,638
Production (bushels) ..	102,819	419,350	1,302,528	199,026	597,087	742,950
Yield per acre (bushels) ..	12·0	17·7	23·1	14·8	16·4	20·8
Canary Seed—						
Area (acres)	19,233	11,604	21,124	4,104	23,294	73,469
Production (bushels) ..	91,616	101,708	339,135	29,427	377,706	894,633
Yield per acre (bushels) ..	4·8	8·7	16·1	7·2	16·2	12·2
Millet, Panicum and Setaria—						
Area (acres)	(c)	21,661	16,461	39,382	45,842	49,508
Production (bushels) ..	(c)	279,521	211,089	556,401	802,806	746,679
Yield per acre (bushels) ..	(c)	12·9	12·8	14·1	17·5	15·1
Sorghum—						
Area (acres)	(c)	67,405	190,619	181,819	202,532	155,527
Production (bushels) ..	(c)	1,511,831	3,329,133	4,039,779	5,082,762	3,960,195
Yield per acre (bushels) ..	(c)	22·4	17·0	22·2	25·1	25·5

(a) Preliminary figures.
(b) Sugar figures supplied by Bureau of Sugar Experiment Stations.
(c) Very small amounts. Exact figures not available.
(d) In 1947–48, 112 acres produced 1,176 bushels, and in 1948–49, 4,139 acres produced 35,019 bushels.
(e) Figures not available.

TABLE 2—*continued.*

—	Average 1934–35 to 1938–39.	Average 1944–45 to 1948–49.	1952–53.	1953–54.	1954–55.	1955–56. (*a*)
Lucerne Hay—						
Area (acres)	50,600	43,942	45,806	51,626	58,133	49,946
Production (tons)	84,808	93,005	106,618	113,640	145,732	116,629
Yield per acre (tons)	1·7	2·1	2·3	2·2	2·5	2·3
Wheaten Hay—						
Area (acres)	5,388	9,723	8,284	6,279	5,538	5,197
Production (tons)	5,379	10,006	11,476	8,785	8,022	8,442
Yield per acre (tons)	1·0	1·0	1·4	1·4	1·4	1·6
Arrowroot—						
Area (acres)	888	614	356	348	372	338
Production (tons)	9,456	6,956	4,054	2,852	4,114	3,698
Yield per acre (tons)	10·65	11·33	11·39	8·19	11·06	10·94
Cotton—						
Area (acres)	55,504	9,541	5,866	8,965	8,377	13,290
Production (lb.)	16,598,485	3,447,003	2,184,268	5,132,145	3,597,207	5,359,217
Yield per acre (lb.)	299	361	372	572	429	403
Linseed—						
Area (acres)	..	(*d*)	25,875	3,647	15,569	45,202
Production (bushels)	..	(*d*)	269,244	15,492	202,664	526,075
Yield per acre (bushels)	..	(*d*)	10·40	4·25	13·02	11·63
Peanuts—						
Area (acres)	14,542	28,375	18,920	36,617	37,971	32,421
Production (lb.)	13,641,059	32,258,355	18,901,157	40,020,438	31,262,224	(*e*)
Yield per acre (lb.)	938	1,137	999	1,093	826	(*e*)
Potatoes—						
Area (acres)	12,144	13,155	11,641	9,382	9,621	10,202
Production (tons)	20,929	29,332	35,051	32,628	30,651	37,561
Yield per acre (tons)	1·7	2·2	3·0	3·5	3·2	3·7
Pumpkins—						
Area (acres)	21,829	35,778	28,016	25,231	22,097	22,747
Production (tons)	52,248	81,063	69,464	65,858	56,019	50,819
Yield per acre (tons)	2·4	2·3	2·5	2·6	2·5	2·2
Tobacco—						
Area (acres)	3,659	1,921	4,339	4,065	5,135	6,301
Production (lb.)	2,033,736	1,580,365	3,431,300	4,015,000	4,331,595	3,831,346
Yield per acre (lb.)	556	823	791	988	844	608
Apples—						
Area (acres) (bearing)	3,320	4,583	4,965	5,090	6,590	5,661
Production (bushels)	252,756	369,892	204,754	499,699	592,300	733,543
Yield per acre (bushels)	76	81	41	98	106	129
Bananas—						
Area (acres) (bearing)	6,016	6,022	3,662	4,531	5,452	5,353
Production (bushels)	651,558	628,515	384,836	532,810	538,650	626,196
Yield per acre (bushels)	108	104	105	118	99	117
Citrus—						
Area (acres) (bearing)	3,303	4,290	4,512	4,572	4,622	4,640
Production (bushels)	349,180	530,316	431,753	542,057	567,428	653,302
Yield per acre (bushels)	106	124	96	119	123	141
Pineapples—						
Area (acres) (bearing)	4,766	5,479	6,258	7,105	8,355	8,471
Production (dozens)	1,624,362	1,788,261	2,209,185	2,988,420	3,580,641	4,038,815
Yield per acre (dozens)	341	327	353	421	429	477
Beans, French—						
Area (acres)	2,733	5,161	5,205	4,604	4,810	4,831
Production (bushels)	267,842	444,394	555,168	506,930	517,688	539,569
Yield per acre (bushels)	98	86	107	110	108	112
Onions—						
Area (acres)	1,155	2,273	2,813	2,497	2,807	2,480
Production (tons)	3,468	10,016	11,542	11,957	12,243	9,157
Yield per acre (tons)	3·0	4·4	4·1	4·8	4·4	3·7
Tomatoes—						
Area (acres)	5,137	7,739	5,833	5,058	5,327	5,530
Production (bushels)	502,171	779,676	732,613	671,300	749,131	682,777
Yield per acre (bushels)	98	100	126	133	141	123

QUEENSLAND

PRODUCTIVITY TRENDS IN SELECTED RURAL INDUSTRIES.

1921-22 TO 1956-57

INDEX BASE - 1921-22 TREND VALUE = 100

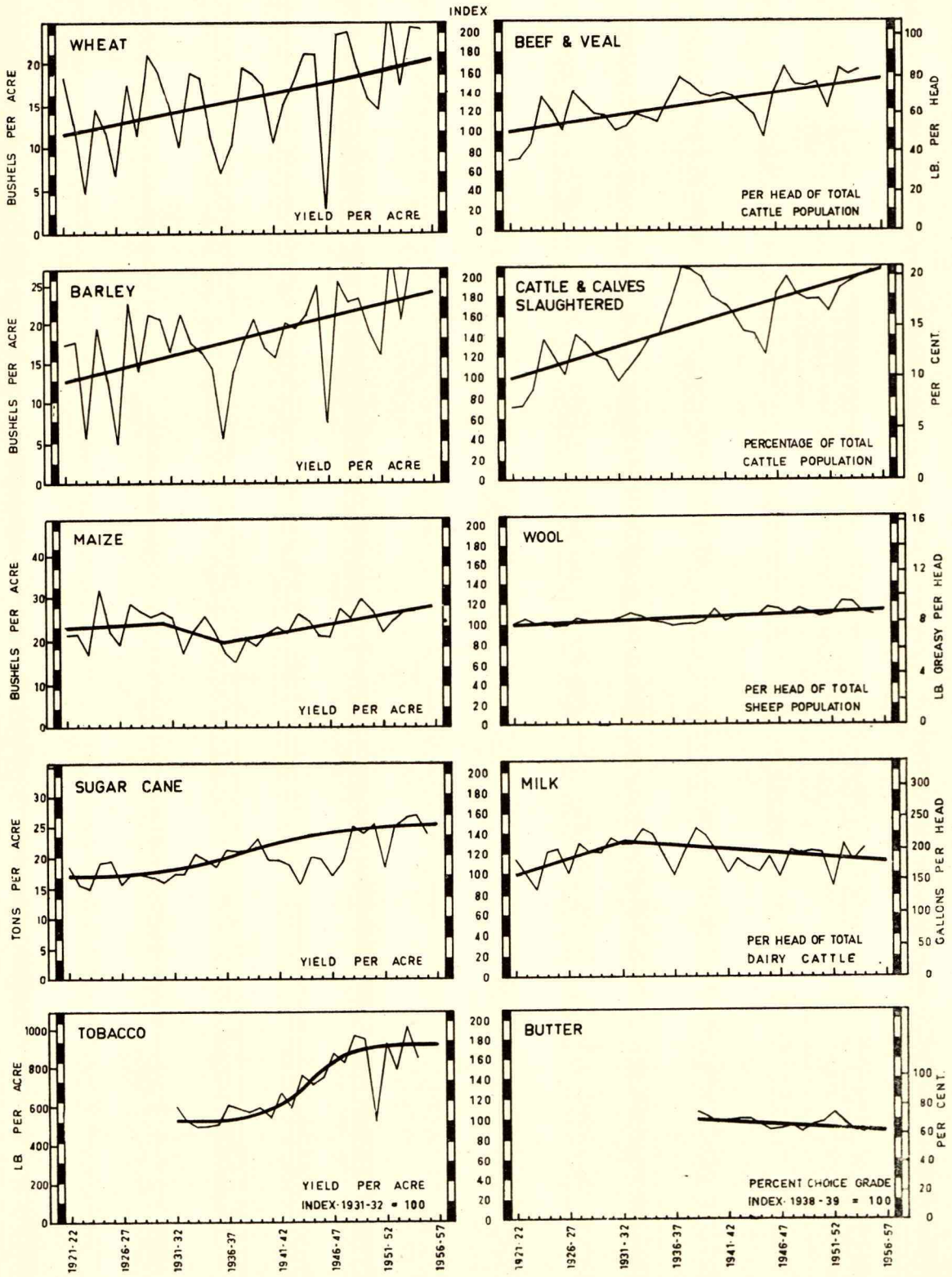


Fig. 1.

Well-planned crop rotation, with the inclusion of pastures and grazing within the rotation, is the only alternative to loss of soil and fertility in most places.

To supplement the work of the regional stations a broad attack on pasture development was made a major post-war activity. If farming land is to be profitably rotated to pasture then there must be available both pasture plants and management methods which can ensure high production on valuable land.

Valuable scientific and practical results have been obtained and work on the regional stations has demonstrated the mutually beneficial effects of crops and animals.

Farmer and grazier interest in pastures has been greatly stimulated by the State-wide competitions now being conducted by the Royal National Association; entries in the third competition total 101.

The rapid spread of buffel grass into the medium and low-rainfall cattle grazing areas, and the increasing use of lucerne and phasey bean as legume components with Rhodes, green panic and buffel grasses, bid fair to lift carrying capacity greatly. The use of fertilizers for pastures, the inoculation of legumes and, in short, the appreciation of the need to "farm" pastures is growing apace.

The stage, then, is much better set for the adoption of balanced farm programmes than it was a decade ago. That there is a very great need for the widespread adoption of such programmes was made rather painfully obvious at at the beginning of this year. Following record or near-record downpours soil erosion and siltation of water channels occurred on an unprecedented scale and serious damage resulted in the Darling Downs, South Burnett, Isis and Atherton districts.

On the Darling Downs an estimated 750,000 acres of first-class cultivated land was damaged by erosion and half a million acres was flood-damaged. On the Atherton Tableland the maize-cum-peanut farms were extensively eroded, with consequent damage to watercourses and roads.

Although the 1956 rains and floods were far above normal, it must be remembered that this land is now more susceptible to erosion and flood damage than it was before. A much reduced downpour can do equal damage in the future.

Whilst mechanical measures will greatly assist in erosion control, the spearhead of the attack must lie in balanced land use. In order to assist extension officers in advising on changeover to mixed farming, an economic survey of farming on the Atherton Tableland was carried out during the year. This survey highlighted both the advantages and the immediate difficulties associated with such a change in methods.

PRACTISING WHAT IS PREACHED.

Two types of experiment station have been established—the specialised, and sometimes one-crop, stations (e.g. horticulture, pasture, tobacco) and the general purpose or regional stations.

A consideration of the yields being obtained on these stations is very instructive as indicating how far the general State and district averages fall below those reasonably attainable under practical farming conditions.

Four regional stations have been established —on the Darling Downs (Hermitage), the Callide Valley (Biloela), the Lower Burdekin (Ayr), and Atherton Tableland (Kairi). Grazing animals are maintained on all four of these stations in order to carry out practical experiments into crop-cum-animal systems of farming.

Nowhere in the world has agriculture as yet persisted indefinitely unless a system of mixed farming has been developed. It is therefore highly important that we demonstrate the role of this type of farming in the conservation of soil and the maintenance of soil fertility.

These stations are necessarily a combination of a laboratory and a show window where research results are displayed for inspection. Here we show what we do and the means by which the results are obtained with practically all field crops and pastures having potential value here. This is not without its problems, since we are alternatively criticised for having too much or too little equipment according to the viewpoint of the farmer.

These two attitudes are particularly evident in respect of machinery. However, we have accepted as policy that we should have on hand machines of a wide range of types to cope with a wide range of both crops and cultural treatments; at the same time the value of different implement designs can be appraised, and demonstrated to interested farmers. To this extent it is true that some stations are over-capitalised in machinery in comparison with a commercial farm, but, on the other hand, all machinery demonstrated is of the type which can be financed by the general run of good farms.

We use no special or "hot house" methods of farming on these stations. Indeed, on the other hand, we carry out many treatments which actually depress yields. For example, a plant spacing trial will necessarily contain plots in which the plants are far too close together; and others where they are much too far apart. However, consideration of a few important individual crops will indicate the long lead given by these stations.

At Hermitage, on land which was run-down when repossessed in 1945, wheat trials conducted during the year yielded as much as 53 bushels per acre, while the average of all fields was in excess of 40 bushels. At Biloela, in a less favourable wheat area, yields averaged around 30 bushels. The State average was 21·5 bushels per acre.

Grain sorghum at Hermitage averaged 69 bushels; at Biloela the best yield was 58 bushels and the average about 40; the State average was 25 bushels.

Maize was grown at the Ayr and Kairi stations. On the former the highest yield was 78 bushels and the average over 60; on the latter (in a cyclone year) the highest yield was 72 bushels and the average yield on maize-grass rotational fields was around 50 bushels, compared with a State average of 25.

Cotton at Biloela has, over 30 years, averaged 1,400 lb. for irrigated fields and for dry fields 800 lb. in the first year after pasture, and 600 lb. for all fields. The State average, on mainly dry-land cultivation, is only about 300 lb.

Unquestionably these high average crop yields are due in a large measure to the systems of crop and pasture rotations followed and the cultural methods employed. Moreover, the fertility of the soils is being built up, not depleted.

CUTTING OF WASTE.

All crops are subject to hazards of many kinds during growth. The difficulties do not end there and, after harvest, further serious losses may be caused by spoilage and blemish. In some countries these post-maturity crop losses average as high as one-third.

By reason of their succulent nature, fruits and vegetables are particularly susceptible to deterioration and blemish while in storage and transit. Since costs of production, harvest, storage and transport have then already been incurred, monetary losses at this stage are on a maximum scale.

A reading of the report of the Director of Horticulture will show that the study of this problem has been given particular attention—and with marked success.

The marketing of bunched bananas in plastic sleeves reduces weight loss and skin blemish. Covering bananas with a thin coating of wax not only provides protection in transport but also delays maturity, thus extending their "life" and so giving more time for market disposal.

Research into the storage of apples and the various factors which determine storage life are enabling apples to be stored for longer periods with less waste. Fruit from old trees may store better than fruit from young trees, while the state of maturity at which fruit is picked is important. Increasing the carbon dioxide content with reduction of the oxygen content of the cold-store atmosphere increased the storage life of Granny Smith apples by two months—thus enabling this valuable apple to be sold in November-December when the market is usually short of apples. Superficial blemish in cold store may be reduced by the use of oil wraps or coating with diphenylamine.

Peaches and plums do not normally store well, so that these delicious fruits are available over only a short period, and high percentages are lost through over-ripeness in over-supplied markets. Treatment with ethylene and pre-cooling can extend their availability by one to three weeks; more research may further extend the availability.

The use of plastic wrappers for the cold storage of pre-packed vegetables has proved very effective in maintaining weight and freshness. Experiments are being carried out with anti-biotics in an effort to further reduce mould and bacterial attack of soft vegetables such as beans and lettuce. Highly successful trial shipments of pre-packaged vegetables were made to New Guinea and Darwin.

Following experiments, in co-operation with the Railway Department, refrigerated vans of fruit and vegetables have been consigned to the far north and far west for some few years past. American-type fans now installed in an experimental van indicate that their use will eliminate the irksome and costly pre-cooling. Produce will be loaded direct from the market floor and, in addition, it will be practicable to open the van to unload at intermediate stations. If current test are successful another impediment to the supply of garden-fresh fruit and vegetables to western towns will have been removed.

INDUSTRY CO-OPERATION.

In recent years a number of primary industries have expressed a desire to participate financially in co-operative plans to provide increased research and extension activities, and the Australian Agricultural Council has considered several proposals submitted by various industries with the object of arriving at a workable basis.

The tobacco industry has made good progress in this field and during the year agreement was concluded on a Commonwealth-wide scheme for tobacco research and extension.

Commonwealth legislation enacted during October, 1955, provides for the creation of a Tobacco Industry Trust Account to finance tobacco industry research and extension carried on by the C.S.I.R.O., State Departments of Agriculture, and other research institutions. The Commonwealth Government and the manufacturers will each contribute half of the estimated capital expenditure of £168,000, while the estimated annual maintenance costs will be met by contributions of £14,000 from growers, £28,000 from manufacturers and £21,000 from the Commonwealth Government.

Of this money, Queensland, as the major tobacco producing State, will receive £30,650 for capital expenditure, £22,600 for annual maintenance costs, and £3,000 for three undergraduate scholarships and an overseas visit by a Departmental specialist officer.

Departmental proposals provide that a large portion of this allocation be used to equip and maintain Parada Tobacco Experiment Station and for the future development of the Inglewood Tobacco Experiment Station.

To facilitate industry participation, State Tobacco Advisory Committees and a Central Commonwealth Tobacco Advisory Committee are in process of formation.

The Australian Wheat Growers' Federation agreed that producers be levied to provide additional money for research and extension, and the Commonwealth Government has undertaken to subsidise these moneys. Appropriate legislation for the collection of a levy has been enacted and negotiations for the administration of the fund are in an advanced stage.

Departmental advisory services must be very closely identified with the industries they serve if they are to be fully effective. Following personal observation of the operation of the County Agricultural Committees in England, the Minister suggested that local advisory committees might be set up in Queensland. With the co operation of the Queensland Dairymen's

Organisation three such committees have been set up at Atherton, Gympie and Oakey. They are known as Dairy Extension Advisory Committees and comprise three industry and three Departmental nominees. Should the experiment prove successful committees will be set up in other areas.

Industry-Departmental advisory committees have also been set up for the pastoral, poultry, cereals, pasture, banana, pineapple and vegetable industries.

SYSTEMATIC BOTANY.

To the general public there is perhaps no branch of science which appears as uninteresting and "academic" as systematic botany. It is true that the very detailed work of description and classification requires patience and assiduity of a high order, but there are few botanists who are not enthralled by their work.

That their studies are far from being an academic backwater is forcibly emphasised by the Government Botanist's recording that ten thousand plant specimens were submitted to him for identification during the past year. Moreover, a high proportion of these specimens was submitted by landholders; it is also pleasing to note increasing submission of specimens by School Project Clubs and Junior Farmers Clubs.

The correct and rapid identification of plants is an important service for many reasons but two examples might be cited here:

The importation of new weeds from overseas or from other parts of the Australian continent is an ever-present hazard and one which can best be met by very early identification and eradication while eradication is still feasible. During the year some notable new introductions of weeds were found as a result of observant farmers submitting specimens of strange plants. These included a wild mustard from northern Europe; giant sensitive plant introduced in green manure seed; and opium poppy which turned up in a lucerne field. Their early identification undoubtedly saved a great deal of time, energy and money.

Submission of plants suspected of poisoning stock is of particular importance in this country of broad acres. If a plant is independently submitted as a suspect from several centres, warnings can be issued to stock-owners pending confirmatory tests.

The Department's herbarium has one of the world's leading reference collections of tropical and subtropical plants. The collection comprises altogether some 200,000 species. Unfortunately, it is perforce housed in an old wooden building in which the danger of fire is ever-present.

PINEAPPLES.

Without doubt the pineapple is the backbone of the Queensland fruit industry, contributing as it does 40 per cent. of the value of all fruits and more than 50 per cent. of the earnings of plantation crops. Production is still expanding, particularly in the central districts; the record production of 3,153,000 cases (1½ bushels) was established in the favourable season of 1954-55, but the current crop is below normal.

A total of about 8,000 acres is currently under fruit on commercial farms. The great bulk of these plantings is centred in the coastal areas immediately north of Brisbane; however, increasing plantings are being made on the central and far northern coastal plains.

The average farm is a "one-man" farm with about four acres in fruit; average yield per acre is somewhat over 400 bushels per acre.

Work on a pineapple farm is heavy and exacting, particularly in southern Queensland, where uneven terrain often militates against mechanisation.

Technically, production methods have made considerable advances in recent years. The pineapple growers have on two occasions financed the visit of a Departmental technologist overseas. On its part, the Department has established a balanced Pineapple Section in the Horticulture Branch, with headquarters at Nambour. Spray weeding techniques suitable to uneven terrain and the growth habit of the plant have been developed; good control over time of fruiting is being effected with the aid of suitable sprays; the heavy fertilizer requirements have been worked out with precision; and considerable advances have been made in disease control, although wilt remains a problem.

About 25 per cent. of the fruit is currently consumed as fresh fruit and of this about two-thirds is sold in the southern States of the Commonwealth. The remaining 75 per cent. is processed in four proprietary canneries, and in two growers' canneries situated in Brisbane (Northgate) and Rockhampton (Koongal).

The Northgate cannery, operated by the Pineapple Sectional Group of the Committee of Direction of Fruit Marketing, was established in 1947. With an annual intake of about 50,000 tons it has by far the greatest fruit intake of any cannery in Australia. It cans a range of fruits and has established overseas an enviable reputation for quality with its "Golden Circle" brand. Canned juice is produced as a by-product and a recent development has been an extensive domestic sale of bottled pineapple juice.

The export of canned pineapples, juice and tropical fruit salad has provided a valuable outlet for the increasing production, but has also made a significant contribution to Australia's export earnings. The value of exports over the past five years has totalled more than £12 millions.

During the past five years an average of 70 per cent. of the canned pineapples produced, and 75 per cent. of the juice, have been exported. Since cannery intake is about 75 per cent. of fruit production, it will be seen that the industry is particularly dependent upon the export trade.

Competition in the overseas markets is rapidly increasing from countries having the advantage of lower wage scales, and which are also striving to achieve the quality standards set by Queensland. In view of this growing competition the Pineapple Sectional Group Committee has asked this Department to initiate an economic survey of the industry for the purpose of strengthening any weaknesses.

SUGAR.

It was stated in last year's Annual Report that, for the 1955 season, production would be limited to the aggregate mill peak of 1,170,900 tons of 94 n.t. sugar. However, the seasonal conditions were such that the sugar outturn did not reach the collective peak, being 1,135,675 tons. Crop development was adversely affected by the heavy arrowing in most varieties, and cane quality was lower than normal because of the extended wet season and the lack of sunlight. The same limitation as to tonnage will apply for the 1956 season, but it is very unlikely that the aggregate peak figure will be attained.

The overall sugar price for the season's output was £42 6s. 5d. per ton, being an advance of £1 1s. 10d. on the previous year. This placed the aggregate value of the crop at £48,048,154 so that sugar virtually tied with wool as the leading wealth producer among the primary industries of Queensland.

There was considerable activity in the preparation for bulk handling of sugar. The Mackay harbour installation is well advanced and is expected to function for the 1957 season; Mackay mills are installing their individual bulk hoppers and facilities; and successful tests have been held with road transport units. At Lucinda Point the port facilities are being developed, and at Bundaberg tenders are being called for the new port and bulk terminal.

The agricultural side of the industry appears to have settled down following the post-war expansion and it would appear that, in an average year, near-peak production will be attained. The factories, despite their parallel development, appear to be operating at higher pressure than previously and do not possess the comfortable margin they used to enjoy. This is perhaps due to an out-of-balance condition consequent upon rapid growth of plant, and will doubtless be corrected in the next year or so.

Discussions on a new International Sugar Agreement which were held in New York this year failed to reach finality and the conference was adjourned to Geneva in October. This conference will be followed by the annual conference in London to negotiate a price for sugar marketed under the Commonwealth Sugar Agreement.

THE DAIRY INDUSTRY.

Dairy Cattle.

The number of dairy cattle recorded as at March 31, 1956, was 1,382,000, an increase of 5,000 over the previous year. Associated with the generally favourable year, overall milk production increased from 276,000,000 gallons to 285,000,000 gallons.

Herd recording has been further developed but has by no means yet reached a satisfactory level of numbers. In contrast to most overseas dairying countries this scheme is Government-financed to the extent of nearly two-thirds; it is desirable that industry play a larger and more positive part in this scheme.

Herd recording is undoubtedly the basis for building herd improvement and, especially with the widespread use of milking machines, the performance of individual cows can be determined only by systematic test. The value of herd recording has been amply demonstrated on the Kairi Regional Experiment Station, where in the course of six years an average purchase of heifers has, by testing and culling, been built up to the best herd in the Atherton Tableland herd recording groups.

Of interest is a project to test several young bulls each year by artificial insemination of large numbers of cows in herd recording groups. The relative production of the daughters will then be measured and the value of the sires assessed with a view to using the best in artificial insemination services. In this connection it is of interest to note that in 10 years the British Milk Marketing Board has developed artificial insemination to the extent of inseminating annually over 1¼ million cows, or more than half the cows in the country.

Irrigated Pastures.

Whilst irrigation of pastures from surface storage schemes cannot be applied to more than a small percentage of Queensland farms, there is as yet an unexploited field in the irrigation of small individual areas from underground supplies, streams and "water harvesting" farm storages. There is probably a minority of farms which cannot develop one or other of these sources of water to some extent. Departmental officers have been stressing the fact that where possible an area of irrigated pasture should be as much a part of the dairy farm programme as a field of winter oats or a patch of cattle pumpkins. With such pasture, milk production can be both increased and stabilised.

The establishment of an Irrigation Experiment Station at Gatton in 1945, for investigational work and the training of officers in irrigated pasture management, has been followed by an extension drive in the field which has been greatly aided by the Commonwealth Dairy Industry Extension Grant. Farmer interest has developed rapidly.

An interesting and instructive example of the influence of an area of irrigated pasture on milk production will be found in the report of the Director of Agriculture. A Toogoolawah farmer with a herd of 30 cows averaged 120 lb. butterfat per cow per lactation in 1953 and was placed 14th in his herd recording group. He brought an area of 15 acres of irrigated pasture into grazing early in 1954, whereupon the recorded butterfat production rose to 216 lb. per cow and the herd moved to third place. Since then the herd has run first or second in each month's recording and butterfat production is now over 1 lb. per cow per day.

Wholemilk Supplies.

Under the provisions of "*The Milk Supply Act of* 1952" a franchise for the supply of pasteurised milk has been granted in 11 areas, while pasteurisation plants operate without franchise in the Brisbane, Malanda, Murgon, and South Coast areas. It is estimated that at least two-thirds of the people of Queensland have access to supplies of pasteurised milk. A development of interest has been the delivery in bulk of previously pasteurised milk to several far western towns.

During the year approximately half a million laboratory tests were carried out in Departmental laboratories on milk intended for human consumption. A large proportion of these were carried out in conjunction with, and on behalf of, the Brisbane Milk Board. In addition, the Director-General of Health and Medical Services keeps a close check on retail milk. It will therefore be seen that a very comprehensive control is exercised over this important item of the human diet. Close veterinary supervision is also exercised over dairy cattle (see page 70).

Generally, the bacteriological quality of the milk was good. Rapid laboratory methods enable sources of bacterial contamination to be readily identified and producers are quickly advised of any falling off in the quality. The average fat content of milk supplied to the Brisbane market was 3·9 per cent., which is 0·6 per cent. above the legal minimum standard of 3.3 per cent.

It should perhaps be emphasised that the percentage of samples in which legal and other standards are not fulfilled cannot be taken as in any way indicating the general quality of the milk supply. Obviously, samples are taken much more frequently where there is any reason to suspect that milk might fall short of requirements. It should also be remembered that only a proportion of sub-standard milk is the result of malpractice; certain cows under certain conditions temporarily produce sub-standard milk.

Still another point to be borne in mind is that normal milk, drawn from the cow under the best conditions, contains some bacteria; only sterilized milk is bacteria-free. Consequently, the object of bacteriological examination of milk is to make sure that there are not excessive numbers of bacteria, or bacteria of harmful types.

Cheese.

Cheese production declined slightly for the year ended March 31.

Consumption *per caput* is relatively low in Australia and there is little doubt that the home market could be rapidly expanded by the production of cheese of higher average quality and more uniform quality, a wider range of types, and more attractive merchandising.

Cheese receives a great deal of attention at the hands of the Division of Dairying because of this potential market and because it is realised that under Queensland's climate conditions the cheese manufacturers face special difficulties. Some years ago an officer was sent to New Zealand for special training and since his return has concentrated on problems of cheese manufacture.

A drive for the improvement of cheese factories and equipment initiated some 20 years ago has resulted in a cheese industry which is generally well-equipped. Laboratories for the investigation of cheese processing and storage have been set up in Brisbane and Toowoomba.

A reading of the report of the Director of Dairy Research reveals several interesting and promising lines of investigation now in progress:—

A considerable loss of cheddar cheese results from the inedible rind associated with the traditional cloth cheese bandages. Attractive rindless cheese has been produced by using a plastic covering; waste is negligible in these circumstances.

An experimental cheese vat has been set up to investigate the production of fancy cheese, particularly of the Roquefort type. At present Australia imports the great bulk of the fancy cheese consumed.

Investigations under way are designed to shorten the period of cheese manufacture, to increase the yield of cheese from milk, and to study the relation of cheese yield and quality to nutritional standards of dairy herds. Some interesting leads have been uncovered, indicating the differential effect arising from feeding pastures and forage of different types. At this stage they are only leads and further work under varying seasonal conditions is needed.

Extension Drive.

Material is being assembled for a special extension drive in the dairy industry. Queensland is in the process of changing from the extensive to the intensive farming system. Reliance on natural pastures, without fodder conservation or supplementary feeding, results in low and very variable yields under Queensland's climatic conditions.

The drive will be designed to lift and equalise production by pasture improvement, fodder conservation, herd recording, and better husbandry generally. Attention will also be given to quality improvement; far too much inferior cream is being produced, factory grading is not strict enough, and there is often too much extraneous matter present.

HEALTHIER CATTLE.

Outstanding success has attended the scheme to control tuberculosis in dairy cattle; this disease not only causes ill health and loss of production in the cattle but is also communicable to humans in the form of glandular tuberculosis.

There are now 800,000 dairy cattle under test in Queensland. In spite of the fact that a considerable proportion of the herds has come under test only during the past three years, the rate of infection recorded last year was only one cow in two hundred. Indeed, in Queensland herds which have been under continuous test for five years or more the infection rate is nearer one per thousand cows.

It should perhaps be emphasised that for the most part these infected cases are detected in the early stages, before the stage at which their milk is likely to be infected. It is estimated that more than 90 per cent. of the people now get T.B. tested milk. (It is also estimated that more than two-thirds of the people have access to pasteurised milk.)

Bovine pleuropneumonia has assumed considerable economic importance not only in its direct influence on infected cattle but also due to quarantines imposed, or projected, upon the entry of Queensland beef cattle into New South Wales and Victoria. This disease is found mainly in the sparsely populated areas of the north and north-west, and the adjoining Northern Territory, where cattle are not frequently handled, or even seen, by their owners.

With the co-operation of the Department of Primary Industry, regular reports on pleuro-pneumonia infection are now received from Commonwealth Inspectors at export meatworks. A small but experienced Departmental team has been assigned to follow up these reports and make contact with all properties from which infected cattle have been slaughtered. Following a 2-year drive, the percentage of infection reported from the northern meatworks indicates that the campaign is being successful.

Due to the abnormally wet season, following a mild winter, both the cattle tick and buffalo fly invaded further territory. In the case of the buffalo fly this invasion will probably be shortlived, but the tick advances are more stubborn. The important eastern Darling Downs, usually tick-free, has had to be declared an infested area.

Apart from seasonal malnutrition the greatest single production problem confronting the beef cattle industry is undoubtedly that of tick control. On their part the ticks have not been passive in the war which is being waged against them. A strain resistant to arsenical tickicides became evident about 20 years ago but it proved susceptible to post-war preparations containing chlorinated hydrocarbons. Again new resistant strains have arisen, but research work indicates that the threat may be met by the use of organic phosphates. From this work also emerges the hope that the intervening period in "double dipping" for cattle in transit may be reduced from several days to one or two.

BEEF.

The beef industry has received a considerable setback following the termination of bulk purchase by the United Kingdom Government, accompanied by increased competition in the United Kingdom market from both home-grown and Argentine beef.

Australia's export beef trade is essentially a Queensland trade, some 80 per cent. of all beef exported coming from this State. Since about 60 per cent. of Queensland's production is now normally exported, it is obvious that the industry in this State is very dependent on export prices, and this applies particularly to the northern and central districts.

In 1955 export prices dropped sharply below the 1954 level and this year fell still further. As a result of these falls the minimum price guarantee provisions of the 15-year Meat Agreement have been met by the United Kingdom Government.

This market decline is unfortunate not only in the consequent reduced financial returns but also in the sapping of confidence. Beef producers faced discouraging market conditions between the two World Wars but the favourable prices ruling after World War II. had encouraged and permitted property development designed to produce a better product. It is widely appreciated that younger and quicker grown beef is required by the market, but this can only follow investment of money in property improvement and higher standards of husbandry. Consequently any diminution of faith in the future must seriously retard such development.

Whilst the beef industry has a considerable measure of protection in the current agreement with the United Kingdom, it is apparent that this agreement is not working as effectively as was hoped.

Moreover, the marketing system seems to call for review. Export grading, too, appears to have been continued on an outmoded basis, the Australian first-grade carcase often being too fat to be highly regarded by the consumers in the United Kingdom. In this connection it is interesting to recall that two years ago this Department was roundly criticised in some quarters for altering grade standards for local consumption. It was alleged that we were attempting to pass off an inferior article on the consumer; time has proved that our assessment of first grade was the correct one.

Although the beef industry has made very good progress over the past 30–40 years (see page 2 and Fig. 1) there are many technical problems, peculiar to tropical and subtropical Queensland, which require study. For this reason a Cattle Husbandry Branch (the only one in Australia) was set up in 1947. An indication of the investigational work in progress in this Branch is given in the report of the Director of Cattle Husbandry (pages 86 to 90).

Of particular interest is the provision of continuous cattle weighing stations at 14 points, and the testing of the relative growth rates of straight British breeds and British-Indian hybrids at four stations. Results to date show that the hybrids have a greater earlier growth rate, particularly under less favourable conditions.

SHEEP HUSBANDRY.

This industry has experienced a long run of six to eight (depending on locality) favourable seasons in succession. Sheep numbers have continued to rise, the population having increased by $1\frac{3}{4}$ millions to almost 23 millions as at March 31. This represents an increase of six millions in four years and the present level is about one million above the 1934–39 average. Wool prices declined during the year and industrial trouble has impeded export; sales for the period under review totalled about £48·5 million.

A Departmental fleece measurement programme was initiated several years ago and has developed considerably during the period under review. The object of the programme is to use laboratory fleece test and measurement as an adjunct to visual selection of stud sheep. Investigation has indicated that the rate of flock improvement can be multiplied by three if measurement is added to the eyes of stud masters in choosing rams and ewes for breeding. In this connection the Director of Sheep Husbandry (see page 83) describes an interesting method for more accurate assessment of fleece weight prior to shearing. During the year 5,607 wool samples were tested in the laboratory.

Because of staff difficulties, coupled with the long distances of the west, this Branch has had to rely on schools, press and radio for more of its extension work than usual. The value of these adjuncts to extension has been well demonstrated and, in particular, a press and

radio campaign on the prevention of blowfly strike was very successful in a year favourable to this parasite. Considerable success also attended an effort to promote fodder conservation in sheep areas. Interest in silage conservation has been stimulated and it is estimated that some 40,000 tons were conserved during the year.

An important research breeding project is being carried out on the Toorak sheep husbandry station in the north-west. In an environment far from ideal an attempt is being made to devise methods for selecting types of sheep more suited to the demands of the dry tropics.

POULTRY.

Provision of poultry houses at the Rocklea Animal Husbandry Station and the Regional Experiment Station at Kairi, have enabled a marked increase in controlled experimental work. The report thereon of the Senior Husbandry Officer contains a number of items of interest. An increased grant from the Commonwealth Extension Services Grant has also enabled steps to be taken to institute a State Poultry Improvement Plan.

One of the great difficulties associated with the egg industry is the seasonal variation in production; a period of glut followed by a period of scarcity has been the normal pattern each year. Research has shown that this seasonal variation in production is associated with length of daylight, and that a lift in production can be effected in late autumn and winter by the use of artificial light to prolong the length of "day." The Poultry Branch is now making a feature of the demonstration of this method.

During the year Queensland's first Random Sample Production Trial was concluded. Essentially this service is a form of performance measurement made available to breeders. It will also provide purchasers with a reliable guide to the best sources of hatching eggs or day-old chickens and will thus provide a powerful stimulant to breed improvement. It is the considered opinion of all poultry authorities that the service, if availed of by the industry, can greatly improve efficiency in egg production.

ADMINISTRATION.

Biochemical Laboratory.

The untimely death of Dr. Montgomery White in September, 1955, deprived the Department of a brilliant scientist and a stimulating personality. His fundamental training and broad outlook enabled him to take an informed and comprehensive view of the interrelationships of plants and animals, and he did much to foster perspective in this important field.

Following Dr. White's death it was decided to divide the activities of his laboratory, placing the positions of Agricultural Chemist within the Division of Plant Industry, and Biochemist within the Division of Animal Industry. The Biochemical Laboratory is established at Yeerongpilly and is under the control of Dr. J. M. Harvey. It is presently largely concerned with "deficiency" and "excess" conditions in animals and is performing an important diagnostic service as well as carrying out research.

Market Inspection.

An administrative change of importance made during the year was the transfer of market inspection of fruit and vegetables from the Horticulture Branch to the Standards Branch. This change, which had been contemplated for some time, consolidates all supervision of market and label standards within one Branch. At the same time it relieves senior administrative officers in the Horticulture Branch of considerable calls on their time and permits their greater attention to the research and extension programmes of an expanding Branch.

Farm Economics.

As the business side of farming and marketing grows more complex it is obvious that farmers need more assistance and guidance in the field of economics. A start has therefore been made in establishing a small farm economics section in the Division of Marketing. A survey of the economics and implications of mixed farming versus crop farming on the Atherton Tableland has been completed and a pilot survey of the pineapple industry is now in process. Queensland crop and animal industries are in process of change from extensive to intensive methods, whilst market difficulties underline the desirability of a much great measure of diversification of production than presently exists on the average farm. The rapid tempo of modern life does not permit the solution of these problems by a leisurely trial and error method and the farm economist can assist here as in other directions.

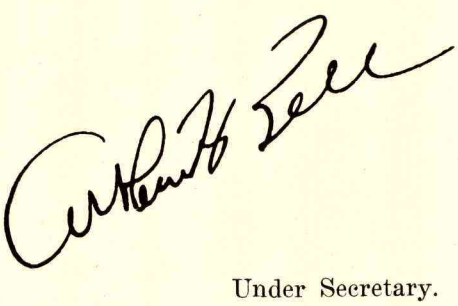
Overseas Visits.

The Under Secretary and the Director of the Division of Plant Industry returned from overseas visits and the Director of Dairying proceeded overseas; these visits were financed from Commonwealth and industry funds. A Senior Cattle Husbandry Officer has proceeded to the Oregon State College to take up advanced studies under a United States grant.

Acknowledgments.

It is desired to acknowledge the generous assistance received from Commonwealth and State Departments, organisations of primary producers and individual producers, press and radio. My personal thanks are due particularly to Mr. Robert Veitch, Assistant Under Secretary (Technical), who capably acted as Under Secretary during my absence overseas.

Yours faithfully,



Under Secretary.

20th September, 1956.

DIVISIONAL DIRECTORS' REPORTS.

DIVISION OF PLANT INDUSTRY.

Director: Dr. W. A. T. Summerville.

The past year has been a very difficult period for crop farmers. The winter of 1955 was a severe one in its effects on many perennial crops, whilst the long-continued rains of the summer seriously interfered with, and in some instances completely prevented, land preparation for annual crops such as cereals and vegetables.

To these adverse effects on the overall management of farms must be added troubles arising out of leaching of soil nutrients, with problems of fertilizer usage, and difficulties in harvesting, transport and storage of summer-maturing crops.

Those primary producers who depend essentially on grass were much more fortunate in this period when many districts received 40-50 per cent. more rain than normally. Grass alone does not make any property, so that even though the feed supply was abnormally good in quantity, both quailty of the forage and adverse effects on animals reduced the value considerably.

In so far as the agricultural community was concerned, the most adverse conditions undoubtedly fell to the lot of settlers in the Inglewood district. Here the flood effects were disastrous and it will take a long time for the district to recover fully. Both the immediate destruction of crops, especially tobacco, and the long enduring loss of soil are deplorable, and those affected will need a considerable measure of courage and knowledge to rehabilitate themselves.

STAFF.

The Division and the Department suffered heavy loss by the untimely death of Dr. Montgomery White. Dr. White was a particularly well-informed scientist in an unusually wide field embracing both plants and animals, and particularly in the biochemical work he gave outstanding service to the Department and the community. He cannot readily be replaced.

The death, by accident, of Mr. R. W. J. Clark must also be recorded with deep regret. This officer, too, was giving fine service, especially in the field of soil surveys. We can ill afford such losses.

Other staff losses during the year included two by retirement under age limit provisions. Eight graduates terminated their services with the Department, and of these two have joined the staff of the Queensland Agricultural High School and College. In addition, six other technically trained men resigned, and 16 other members, mainly of the clerical staff, have left.

Following on the death of Dr. White a major readjustment of organisation of chemical services, with consequent staff changes, resulted in seven chemists being transferred to the Division of Animal Industry.

A further rearrangement of duties necessitated the secondment or transfer of 11 members of the horticultural staff, mainly engaged on inspectional work, to the Division of Marketing.

The following table shows the movement of staff during the period under review.

Category.	Gains.	Losses.	Transfers to Other Divisions.
Male graduates (Permanent)	2	9	7
Male graduates (Temporary)	3	1	..
Female graduates (Permanent)	4	2	..
Female graduates (Temporary)	1	..	..
Technical and Inspectional (Permanent)	5	6	10
Technical and Inspectional (Temporary)	8	..	..
Non-technical	16	16	2

In addition, two trainee graduates took up full-time duty and 12 undergraduate trainees were recruited.

The most serious position is that with respect to male graduates, since only one of those recruited has had worthwhile experience, whilst those lost included eight well experienced men. The loss of the other seven to other Divisions is to be discounted, since the work also was transferred. On the technical side the net gain for Divisional work is seven, but again we have had to replace experienced men with inexperienced ones for the most part.

It is pleasing to report that two members of the staff have been awarded scholarships. Mr. B. R. Champ, Assistant Entomologist, was awarded a Gowrie Scholarship and has proceeded to England, where he is studying for a higher degree at the University of London. Mr. O. R. Byrne, Assistant Plant Breeder, has recently received a Services Canteen Trust Fund Scholarship which he proposes to use in furthering his studies at an Australian University.

Such awards are pleasing in that they not only constitute a recognition of the calibre of the recipients but also give an indication of the merit of the work that the men have been doing and help towards increasing that merit in the future.

DEVELOPMENTS IN SERVICES.

The completion, in all essentials, of a closely knit organisation to conduct research and extension in tobacco production was an outstanding event in the period under review. The agreement whereby State and Federal Governments, manufacturers and growers have combined to provide financial and other resources in an effort to improve this industry is something which might well be emulated by other industries. It can scarcely fail to have wholly desirable effects.

Immediately, this agreement has enabled the acceleration of development of the two tobacco experiment stations, one at Inglewood to serve the south-western areas and one at Parada to serve the north.

The Inglewood Station was officially opened by the Hon. the Minister for Agriculture and Stock in October last. In common with the surrounding farms, the property suffered flood devastation, with consequent loss of current work and delay in development. Every effort is being made to restore normality as quickly as possible, and it is hoped that even in the rehabilitation methods the Station will provide guidance to the tobacco growers of the district.

Parada Station is not so far developed as is Inglewood, but the provision of extra funds by the combined tobacco interests will help materially to accelerate development, and this Station will undoubtedly be a boon to settlers in the Mareeba-Dimbulah Irrigation Settlement in particular. As the C.S.I.R.O. plans to set up a comparable Station in the area for complementary work, tobacco growers are assured of a marked increase in the research work on their crop.

Towards the end of 1955 it was possible to decentralise the pathology service by one further step, in the stationing of an officer of that section at Kingaroy to service the South Burnett district and in particular to intensify the work on peanut diseases.

In entomology, too, another field station was opened—this time at South Johnstone, from which centre the coastal areas of North Queensland will be serviced.

During the year "Brian Pastures" Research Station was officially opened. Here, with financial assistance from the Australian Meat Board, fundamental work on beef cattle pastures will be conducted. The formative stages have proceeded well under the local guidance of Mr. T. G. Graham, and this well equipped property of some 5,000 acres should be a most useful unit in the attack on pasture problems affecting the Burnett and contiguous areas in particular, and a very large part of the State in general.

Satisfactory progress can also be recorded at Millaroo, where, with the help of the Burdekin River Authority and the Irrigation Commission, a regional experiment station is being developed. This Station is being planned to elucidate problems which arise out of the development of irrigation in the Burdekin Valley and will eventually supplant the temporary Station now located in the delta region near Ayr.

No material progress has been made towards the provision of the cold storage experiment laboratory to be erected at Hamilton. However, some time has been devoted to the perfecting of plans for the more important units which it is hoped will be incorporated when building operations have commenced.

SPECIAL PROJECTS.

During October and November, the Director of Agriculture attended a conference held in Manila, under the auspices of the Food and Agriculture Organisation and the World Health Organisation, on the subject of Nutrition and Health Education. The importance of this subject needs no emphasis and it is apparent from Mr. Sloan's report that valuable interchange of information and ideas took place and that the project was a worthwhile one.

From April to October the Director of the Division was overseas on a number of projects. In the course of the visit four international conferences were attended. These were the International Conference on Arid Lands at Albuquerque, New Mexico, the Commonwealth Agricultural Bureaux Review Conference at London, the F.A.O. Extension School at Wageningen, Holland, and the International Horticultural Congress at The Hague, Holland.

The C.A.B. Review Conference was essentially an administrative one, with the Australian delegation other than one officer being provided by C.S.I.R.O.; the Commonwealth Government has a very considerable financial interest in the affairs of the 12 bureaux, which are of first-rate importance in the dissemination of scientific information throughout the British Commonwealth.

The other three conferences were of a purely technical nature and enabled the gathering of latest information on a wide variety of subjects. Special reports have been furnished on a number of subjects arising out of these conferences.

In addition to attending these meetings, visits were made to seven universities in the United States of America and six in the United Kingdom, and also to six other research institutions in the United States and to 11 such institutions in the United Kingdom.

Apart from gathering information on recent advances in scientific work, a study of the problem of acceleration of the flow of information from research workers to extension services and the primary producer was undertaken. This is of major importance in Queensland and the study showed that there are ways in which our organisation can be improved. Steps to improve our service have been taken and it is planned that others will follow as personnel and finance become available.

This study tour was made possible by the interest and financial help given by the Queensland Dairymen's Organisation, the C.O.D. Pineapple Sectional Group, the C.O.D. Vegetable Sectional Group, and the Department of Commerce and Agriculture (now the Department of Primary Industry). The assistance of these bodies is greatly appreciated. Though some information, particularly that on extension work, is of direct and potentially

immediate value, it will be realised that on the more scientific side value is bound up with the proving of information and methods under local conditions, so there must be some time lag in application from the primary producers' point of view.

At the F.A.O. Conference on Livestock Production under Tropical Conditions, held in Brisbane in August, the Chief Agrostologist (Mr. S. Marriott) played an important role in conveying information on recent advances in pasture studies.

A number of other conferences of a technical nature were attended during the year, covering such subjects as plant nutrition, plant diseases, plant quarantine, tobacco, cotton and phytochemistry. Both marketing and production become more complex as time goes on and the need for interchange of information on methods, status of industry and trends assumes more and more importance. With the paucity of numbers of scientific workers no State can afford to consume time covering ground that has already been covered elsewhere in the Commonwealth, so that frequent meetings of these officers seem inevitable. Every effort is, however, made to limit such conferences to the smallest number compatible with efficiency.

SOIL EROSION AND CONSERVATION.

The abnormally heavy and prolonged rains once more focused attention on the devastation of erosion. This year the worst effects were felt on the Darling Downs and the Atherton Tableland—our two most vulnerable areas at present. In the case of the former, the greatest ill effects were felt on the plains country, where extensive flooding caused considerable monetary loss to many farmers. The trouble arose this year from the siltation of watercourses and natural drainage lines, but basically the problem is created by the movement of soil from the higher land, resulting in its deposition on the flatter parts and reduction in water absorption potential of the washed-out slopes.

—(*Photo. by courtesy of the "Downs Star," Toowoomba.*)

Plate 1.—Soil Erosion Has Been Aggravated by the Wet Conditions of the First Half of 1956. Advanced gully and rill erosion are evident in this aerial photograph of a Darling Downs farm.

In all our more vulnerable areas farmers are much more alive to the causes of the trouble, and to the far-reaching effects of failure to correct defects, than was the case say 10 or even five years ago. There is still, however, a tendency to expect the Government in the form of some Department to do far more than its fair share in combating the menace. It is true that the Soil Conservation Service of the Department can help very materially, but the farmer has an even more important part to play. Still we are in need of more trained men to assist and every opportunity is being taken to recruit them.

Further legislative measures may be called for but at present the remedy lies essentially in the hands of the landholders.

PASTURES.

There can be little, if anything, more important to the agricultural welfare of this State than the improvement of our pastures, which are basic to our whole economy. It is

Plate 2.—Chisel Ploughing Native Pasture at "Brian Pastures" Pasture Research Station Preparatory to Sowing Introduced Species.

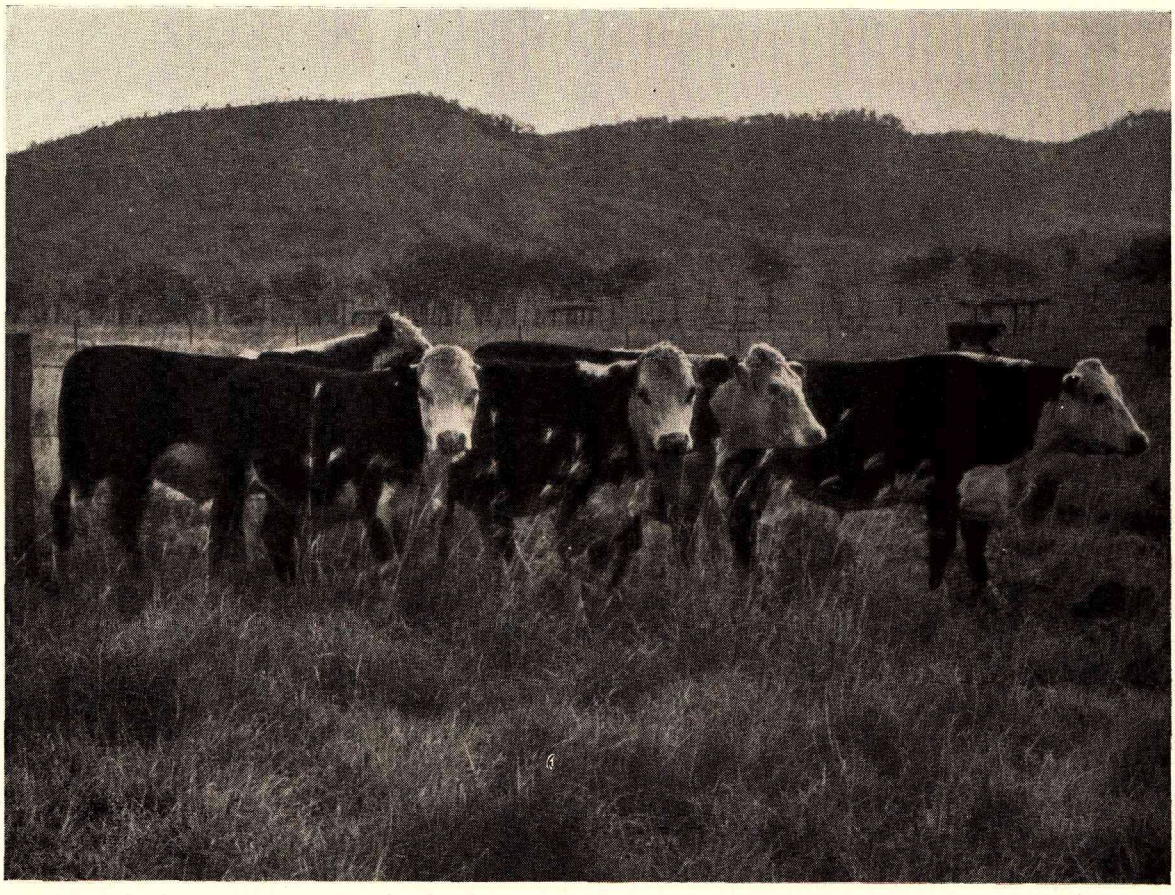


Plate 3.—Three-year-old Steers on a Rhodes Grass-Lucerne-Phasey Bean Pasture in the Main Grazing Trial at "Brian Pastures" Pasture Research Station.

therefore most pleasing to be able to record that every year now sees appreciable improvement in the overall pasture position. This may be attributed to two particular factors. These are, firstly, the result of investigations by agrostologists, and secondly, the growing appreciation by farmers and pastoralists that improvement is needed, is a business proposition, and is practicable. Divisional officers have had a major part in developing both of these factors.

The demand for services of Departmental officers is now so great that whilst gratifying it is also embarrassing, and considerably more man-hours are now given by Agriculture Branch officers to pastures than to any other crop.

Probably the greatest weakness in pasture development lies in the seed supply. So great is the demand, and so poor the supply, that we are constantly faced with disappointed farmers or, what is perhaps worse, unscrupulous exploitation in the form of exorbitant prices. Further, our work has shown very clearly that differences in strains can be at least as important as differences in species, and strain differences are difficult or impossible to detect in seed. Buffel grass, for example, has many strains, some of which are markedly inferior, and use of inferior strains can be followed by disappointment or even financial loss.

It is clear that three things are necessary. Firstly, every effort must be made to ensure that the farmer knows precisely what strain he needs. Secondly, there must be protection by legislation to safeguard the farmer who purchases seed. Thirdly, the cost of production of seed must be kept within reasonable bounds. Steps are being taken in each of these directions. The last-mentioned is the most difficult in that mechanical harvesting is an inescapable necessity if costs are to be reduced. Good progress is being made here with grasses, but the tropical legumes offer some peculiar difficulties. The work will be continued.

FIELD CROPS.

As will be seen from the report of the Agriculture Branch, there has been a very satisfactory increase in the area under cultivation and all the evidence we have is that this increase will continue for a considerable period.

However, crop producers are faced with difficulties arising largely out of unpredictable or decreasing markets. In particular, wheat growers are experiencing worry concerning the profitable disposal of their grain. In consequence, they are searching for alternative crops for portion of their land. This has led to marked increase in the amount of barley, canary seed and linseed sown, and arising largely from this cause also safflower is finding favour. There is no doubt that safflower production deserves serious consideration, but two points need to be borne in mind. The first point is that safflower demands appreciably more soil moisture than do the grain crops, and consequently careful choice of land and thorough preparation are required. The second consideration is the market. This is a new crop and it will take time to establish and stabilise the market. Until that is done the large-scale planting of safflower is scarcely warranted.

Plate 4.—Tobacco Growers on the New Settlement on the Lower Burdekin are Erecting Substantial Buildings for Curing and Handling Their Leaf.

Apart from increase in area under cultivation, one of the best features of Queensland's general agriculture to-day is the widespread insistence on high quality seed. It is felt that the technical and regulatory work of the Department has had a very beneficial effect in this direction. At the present time, in each major seed-producing district officers are devoting from 30 to 60 per cent. of their time to seed certification and allied work. To this must be added the efforts of the Standards Branch of the Division of Marketing and the searching deliberations of the Seed Certification Committee. This is very worthwhile work, but if the volume continues to increase it seems inevitable that commercial interests will need to be approached to share the activities. This has not been justified nor even practicable

during the formative period, but that stage is now nearing completion and some change seems inevitable as an alternative to a scarcely justifiable or practicable increase in staff.

The inadequacy of an agricultural system based on one crop or one type of crop is forcing itself more and more into the consciousness of many farmers, and monoculture, particularly with grains, is progressively declining. The rate of decline could be accelerated to the national advantage. However much it might be of national interest it can scarcely be expected to gain much impetus until it can be shown that it is economic to the individual also. Proof of an economic situation for the future is a very difficult thing to establish, but there are too many signs that monoculture is becoming uneconomic to be ignored.

In this connection the evidence being collected by the Cereals Advisory Committee shows clearly that many cereal growers have reached cross-roads. It must be frankly admitted that which road should now be taken is not as clear as could be desired. All the scientific evidence insists that animals must come more and more into the management system of many arable farms, but no further generalisation can be made. The farm size, general farm features, and the geographical location will have to be the deciding factors for each individual—whether dairying, beef cattle fattening, wool or fat lambs are best suited cannot at this stage be the subject of unequivocal recommendation.

FRUIT AND VEGETABLE CROPS.

The vagaries of the weather have been more keenly felt in the horticultural industries than by any other branch of primary production. Prolonged rain has had adverse effects on practically every phase of production—land preparation, fertilizing, pest and disease control, harvesting and marketing. In consequence, the main markets have often not been well supplied and though prices have accordingly sometimes been high, the number of individual producers getting any benefit has been very small, and both producers and consumers have suffered.

The banana industry is faced with serious problems. Whilst individual properties have fared badly from high winds and other adverse weather conditions, the basic problem arises out of instability of the market. High prices in quickly produced crops quite commonly are followed by gluts and unremunerative returns, and so in the absence of control the pendulum swings to and fro. The basic troubles of the industry are not of a technical nature and what remedy there may be appears to lie almost wholly in the hands of the industry to devise and implement.

The pineapple is still in the forefront of the horticultural industries of the State. The winter of 1955 was a very bad one in so far as pineapples were concerned, and the adverse effects, especially in the plant crop, will carry over for at least 12 months. In so far as the Division of Plant Industry is concerned, the Pineapple Advisory Committee, which maintains close relations with the Sectional Group Committee, has continued its valuable work in ensuring that the points of view of producers and the scientific services of the Division are made known and reconciled.

Whilst the pineapple has been the subject of fairly extensive research for the better part of 20 years, it is quite obvious that there are still important problems to be solved, and any changes that take place must be towards intensification of investigation. Costs of production are too high for the future well-being of the industry. Some of these costs are definitely outside the field of plant research but there are aspects of soil fertility and disease control which it is felt could be investigated with considerable advantage.

Plate 5.—Brown Beauty Bean Selections and Strains. Bean varietal improvement is a major project at the Redlands Experiment Station.

Plate 6.—Rows of Elephant Grass Inter-planted With Drilled Lucerne at Biloela Regional Experiment Station. Yield under irrigation in first 12 months—grass 49-85 tons and lucerne 20.71 tons per acre.

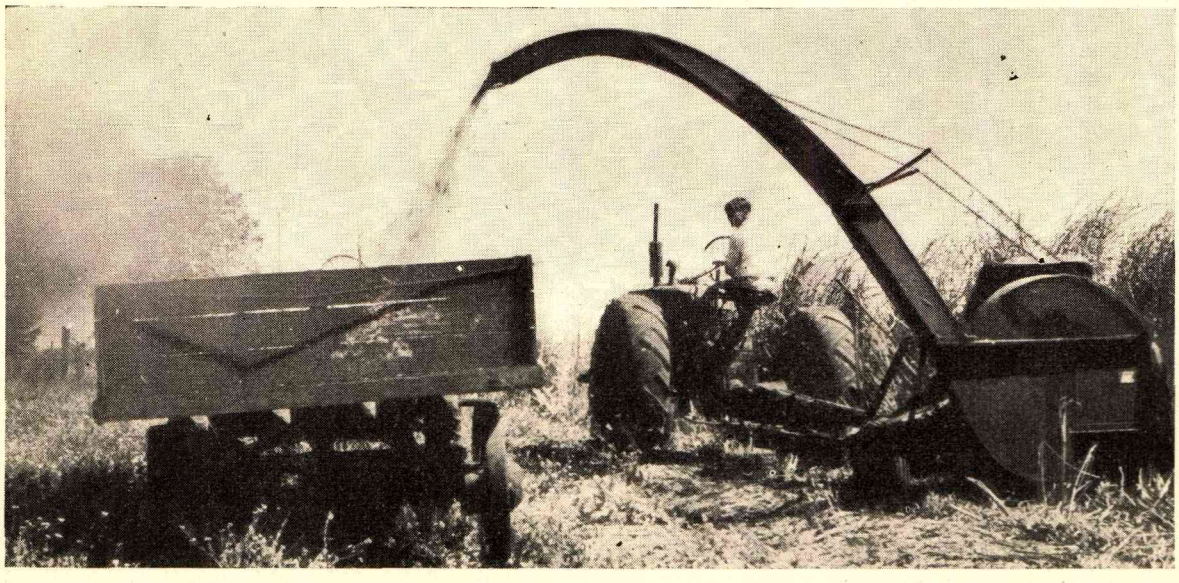


Plate 7.—Harvesting China Fodder Cane for Silage at Kairi Regional Experiment Station.

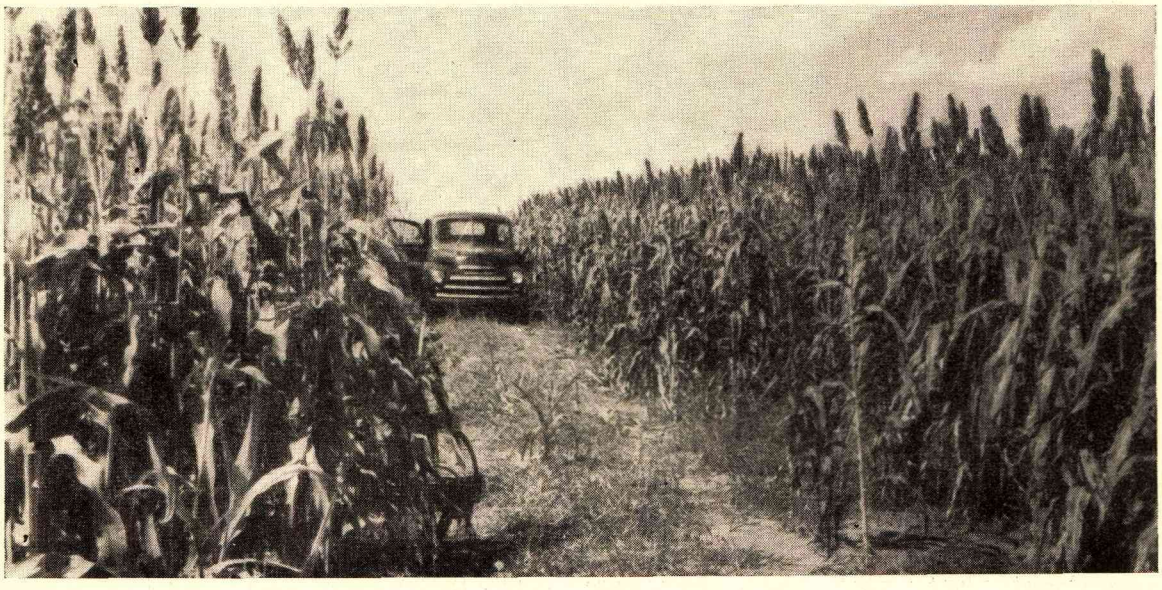


Plate 8.—Sugardrip Sweet Sorghum at Biloela Regional Experiment Station. This variety yields up to 15 tons of silage per acre at the Station.

Of the temperate climate fruits, apples have enjoyed the most successful year, and both in quantity and quality of these fruits, especially the Granny Smith variety, there are grounds for satisfaction with the present and optimism for the future. Complacency, however, is not to be condoned, for in this industry competition can be fierce. Our general production conditions must be recognised as little, if any, better than marginal, and good results can only come as the result of continuing to take advantage of the most recent advances in all phases, particularly perhaps marketing techniques.

Whilst the pest and disease aspects of citrus production are felt to be reasonably satisfactory and based on adequate investigatory work, there are cultural questions demanding further attention. The evidence strongly supports the conclusion that genetic and plant breeding aspects are those on which more emphasis must be placed. This work is of necessity long-range in nature, and though progress can be reported it will require many years of work before much that is definite and lasting can be achieved.

In so far as vegetables are concerned, overseas study by the Director of the Division showed that in the matter of research techniques this Department is keeping well up-to-date. This study revealed too that probably our best avenue of research lies in the direction of plant breeding. We must do all possible to develop our own varieties in many classes of vegetables. New techniques are becoming available which will widen the possibilities of variants, and the outlook is promising. Seed production will then become a matter of considerable importance.

CHEMICAL SERVICES.

Chemistry has long been recognised as a most important tool in agricultural research. There are few branches of activity within the Division of Plant Industry which do not have to call on chemical knowledge quite largely, and none that do not need some of this basic science.

Whilst chemistry must therefore always be an integral part of the training of all agricultural scientists, often it is not practicable for each man to do more than a fraction of the chemistry pertaining to his own particular sphere. It is thus necessary to have a strong section of the Division specialising in chemistry and capable not only of performing the intricate and exacting pure chemical work but also of advising adequately the specialist in other fields on chemical aspects.

The Chemical Laboratory has perforce then been developed on lines of an ancillary service advisory to other sections of the Division rather than as a direct service to the primary producer. Such a role is apt to be misunderstood and its importance minimised by those outside the organisation. The fact of the matter is, however, that whilst the research chemist himself rarely comes into contact with the public, the results of the agronomist, agrostologist, entomologist, plant pathologist and others are frequently attributable in no small measure to the worker in the Chemical Laboratory.

Apart from research, there is too that chemical service which by virtue of thousands of analyses protects the primary producer against both wilful and accidental sale of substandard agricultural materials. In common with their research colleagues, the workers in this section of the Chemical Laboratory rarely get the recognition which is justly theirs.

SCIENCE SERVICES.

The sections of entomology, plant pathology, and botany have a long record of achievement and have added to this during the period under review.

Details are set out in the sectional reports and only some of the special features will be mentioned here.

The brigalow control work is one study of particular importance. This problem has many facets, which together with the abnormal seasons preclude finalising the research results for a considerable period. However, it now seems quite clear that by the use of the hormone 2, 4, 5-T in diesel oil emulsion highly satisfactory kills of the trees can be obtained. It is equally clear that the timing of spraying is of the greatest importance. The ultimate effects of any herbicide depend largely on the efficiency of absorption and translocation through the plant. Both of these features are inevitably bound up with the physiological state of the plant. This in turn is profoundly influenced by the climatic conditions.

Whilst then we are confident we have the right tool, we still have work to do to determine the best way to use it. Progress, though impeded by abnormal weather, has been good, and it is proposed to intensify the efforts.

In so far as plant pathology is concerned, a steady programme of investigations has been maintained. The plant pathologists in general have not had as effective a service from the chemical industries as have their fellow workers in entomology. Partly arising out of this there is an increasing tendency for the pathologist to look more and more for genetical resistance. Provided other aspects such as yield and quality are given due attention, the production of plant varieties resistant to disease generally offers the most economical method of combating that disease. Thus the plant pathologist is constantly looking for resistance and at present is particularly concerned with troubles in wheat, maize, oats and vegetables.

Probably the most noteworthy points in the current entomological programme are the intensification of nematode and fruit fly investigations.

Nematodes are amongst the most difficult pests to control and for a long time the prospects of success have been considered so remote that other pests offering better promise of tangible results have been given first priority. The addition to the staff of a specially trained entomologist and the more hopeful outlook on control has led to the concentration of effort on these pests, the full significance of which we can only now begin to assess. There seems little doubt that the loss to tobacco and pineapple growers alone justifies all the work we can undertake.

Fruit fly is not now a pest of first magnitude, but it certainly has that potential if control measures are relaxed. Both for this reason and because of the spread of the pest to southern States, where overseas markets have been affected, it is incumbent on us to obtain all the information we can on the insect. Apart from direct work on control the study has therefore embraced ecological aspects designed to shed light on the local and general breeding and dispersion of the fly.

BIOMETRICS.

The biometricians have much in common with the chemists in the lack of recognition. These officers perform a most valuable service in all worthwhile research work. When they are provided with a clear statement of the problem they are able to ensure that sound experimental work is planned.

Experimental work is the most costly part of the Departmental programme and sound planning is imperative if we are to avoid waste of money. In ensuring soundness, the biometrician is thus to be regarded as an excellent safety device.

In the ultimate interpretation of results, too, these mathematicians are most helpful, so that their role is a dual one—sound planning in the beginning, and true evaluation at the finish.

In the Division of Plant Industry no major investigation work is contemplated without the advice and guidance of the biometrical staff.

EXTENSION.

Research work is often surrounded by some aura of wisdom or knowledge which to an extent tends to glamourise it, at least at the expense of other phases of activity of the Department. There is so much that we don't know that it is difficult to visualise too much emphasis being placed on the importance of continuing investigations.

But such research work, unless translated into achievement by the primary producer, is useless, or at best of only potential value.

Its full value then depends very largely on the success of the extension workers. Knowledge for knowledge sake may have its place elsewhere, but in the Department of Agriculture knowledge must be for the primary producers' sake. This is fully realised and for some years now, by schooling, by organisation and by stimulus, every avenue has been explored to improve our extension services.

The more or less obvious first step is to train men, already versed in agriculture, in methods whereby the man on the land can be most effectively assisted. This is being done as quickly as appropriate officers, facilities and other commitments permit.

The next step would seem to be to do everything possible to provide men skilled in methods with the best and latest information. This calls for organisation requiring the closest liaison between research and extension, and the research must include that done not only by Departmental officers but by other organisations, both governmental and private. This may prove to be a more difficult task; certainly it will call for a high standard in both knowledge and personality of the men entrusted with the commission. This aspect is receiving attention.

Over all this it must be realised that there are two parties to the job—the officer and the producer. The final measure of success lies with the producer. The officer can succeed only in so far as the man on the land is co-operative and receptive.

By and large, farming is not a means of amassing a fortune. But it is a way of life, and the standard of living is governed by the standard of efficiency of the farm work. Moreover, that same efficiency will dictate in a large measure the standard of the son's living as well as that of the father. Thus immediate profit taking is not the yardstick to use in assessing true efficiency. It counts, but so too do the long-term effects, and breadth of thinking in terms of long-term land use is also an essential measure of efficiency.

The aim of the extension work, therefore, must be to place the standard of living on the highest possible plane consistent with permanence of agriculture. The day-to-day problems, large though they may loom at the time, must be integrated to care for the sound long-term management.

The essential is broad as well as detailed agricultural education and this is the aim of the efficient extension worker.

DIVISION OF ANIMAL INDUSTRY.

Director: Mr. W. Webster.

Seasonal conditions during 1955-56 markedly affected Queensland's animal production. Following a wet winter in 1955, good rains continued in the spring and through the summer and autumn. Flooding was widespread and in some districts repeated. Many areas of the State received as much as their usual annual rainfall in the first half of 1956. Prolific growth of pastures resulted, but for an appreciable part of the year the growth was rank and the leaching effect of the rain affected the quality of the grazing. Except on those properties where effective pasture management is practised the full benefit of the rain has not been obtained. A serious effect was interference with soil tillage and planting operations. Planting of fodder crops was hindered and grain for animal fodder may be in short supply; likewise conserved fodder and crops for grazing.

Serious flooding destroyed both pastures and crops, caused death of stock from drowning and starvation and destroyed fencing. High winds and rain ruined standing crops and in some districts destroyed farm buildings, particularly those used for housing pigs and poultry. Owing to the sodden nature of the ground, fodder crops planted especially for grazing were not available at the correct time. This applied particularly to crops intended to be fed by strip grazing. From the animal industry point of view, there were nevertheless some bright aspects associated with crop damage: lodged crops or waterlogged grain crops that could not be harvested were eventually turned over to stock.

Rain seriously interfered with bush hay conservation work on the central tablelands, by making the soil too wet to support haymaking equipment and in some cases making the grass too wet for curing. During the recent series of very wet seasons, this has been a limiting factor and may eventually force the abandonment of this work. It is possible that the making of silage may be a preferable pursuit but this also can be affected by soil being too boggy to support mechanical equipment. Such was the case at the Rocklea Animal Husbandry Research Farm this year.

In 1955 and 1956 heavy monsoonal rain held up mustering in the beef industry, causing the slaughtering season to be delayed and to extend to a late period in the year. In 1955, slaughtering continued in the north right through to December, which is some months later than usual.

Perhaps the most serious effect of the excessive and extended rain was shown in the increased infestation by internal and external parasites.

Cattle tick is always present in the humid coastal areas of Queensland. This parasite needs moisture to continue its life cycle. The cycle is divided into two main sections—(*a*) when the tick is attached to the animal and (*b*) when it is unattached. While unattached the tick will die out during the dry seasons of the year. This limits the spread of the tick from the humid coast to the drier inland areas. There is no sharp line dividing these two areas, there being an intermediate marginal area in which infestation is normally light to very light. It would appear that in a great deal of this country ticks are not present, but they nevertheless do exist in small numbers in isolated pockets. With a series of wet seasons, and particularly wet winters, such as have been experienced during recent years, the ticks multiply and then become obvious in what was thought to be clean country. It is, of course, necessary to accept that infestation does actually spread to clean country under these conditions. This causes tick fever in the previously non-infested areas, where the cattle have no immunity, and further adds to the work of the staff whose job is to eradicate the tick from these areas.

During the last few years, the cattle tick has become increasingly troublesome and this has been a serious embarrassment, as the staff is not sufficient to cope effectively with the many infested properties.

As would be expected, buffalo fly infestation extended southward and westward towards the end of summer and into autumn. This happens regularly following a prolonged wet season. While it did not reach its previous lowest limit on the coast this year, it penetrated further westward (to Charleville) than it had in the past and also reached a more southerly point—between the New South Wales border and the south-western railway line. It can be expected that if the continuing winter rain extends into the summer, next year will see a repetition of infestation in these new areas.

During the year, ephemeral fever (three-day sickness) recurred after a break of 20 years. The spread of this disease was, no doubt, helped by the prevalence of the vector-insects which cause its spread from beast to beast. This factor was probably responsible also for the disease extending further west than on the previous occasion. Similarly, Queensland itch (allergic dermatitis) of horses was more serious and widespread due to an increase in the vector

sandfly which causes this condition. The prevalence of sandflies can almost certainly be related to the wet conditions experienced.

On the other hand, sheep blowfly strike worries were not as serious as was expected. This could have been due to the increased use of the insecticides aldrin and dieldrin but was probably also due partly to excessive rain affecting the life cycle of the fly.

Internal parasites, particularly in cattle and sheep, caused considerable trouble. This, no doubt, was also largely due to the wet conditions, these being favourable for the hatching of eggs and the survival of larvae. Stomach worms were very troublesome but there was trouble also from lung-worms and hookworms. Footrot in cattle was widespread. Whilst this disease is met with in dry seasons, it is usually more serious in wet weather when yards and surrounding areas are boggy.

Footrot in sheep was reported in at least two districts. This condition is rare in Queensland but again was no doubt favoured by the excessively wet season. Foot abscess also caused trouble, probably for the same reason.

ADMINISTRATION.

In the husbandry branches and on the husbandry side of the Research Branch, investigations have been aimed at problems of increasing production and, at the same time, those directly responsible for lowering production.

To ensure that the industry is aware of what work is being undertaken and is given an opportunity of advising what are the more pressing problems of the livestock industries, advisory committees have been formed. One, the Poultry Advisory Board, has now been operating for some years. Another, the Pastoral Advisory Committee, has been operative for a shorter period. The meetings of both committees have been very useful, for through an exchange of views and discussion Departmental officers have a clearer grasp of industry problems and industry members a better knowledge of the work being done by the Department.

There are far more problems to investigate in the several animal industries than there are staff and facilities available to deal with them. There is also a natural tendency for staff to deal with the more interesting problems of short duration at the expense of important long-range work. To meet this situation and to decide on priorities for research projects, technical advisory committees are being appointed. These are made up of senior officers from the research and field staffs, with a biometrician and such other specialists who may, from time to time, be required.

These committees will, except in the early stages, probably meet only once or twice a year. They will, nevertheless, discharge a most important function in the planning of new work and in evaluating projects in progress and completed. The Poultry Technical Advisory Committee has been working for some time and has proved of great value. Similar results are confidently expected from the Pig and Cattle Technical Advisory Committees. Other such committees will be formed in due course. In this way it will be possible to co-ordinate the work of the Division so as to develop team work and make the most effective use of available resources.

CATTLE HUSBANDRY.

Dairying.

The kind of dairy farming practised in Queensland has been influenced by the rainfall being largely a summer one and the properties usually larger than in other places. With ample land and a reasonably certain annual summer rain, Queensland dairy farmers have developed a seasonal type of dairying based on native pastures. For the production of butter, much of which is exported, this has in the past been accepted as a reasonably satisfactory arrangement. It is a less expensive way of producing a product which has unfortunately to be subsidised to compete on the world market. During recent years, however, there has been a big increase in wholemilk consumption and there is every reason to believe that this could be further increased if more thought and publicity were given to the use of milk. A greater return from butter production could also be achieved if the by-products were used for human food. At present, animals are being fed valuable animal protein that could, as in other countries, be used to much better advantage for human food.

It is at least doubtful whether dairy farms need be as large as they are in some parts of the State. If high quality roughages were grown in quantity, the farmer could provide a much better ration and by conservation continue to feed that ration throughout the year. Under this type of husbandry smaller farms would be possible.

As the necessity to increase the population of Australia as quickly as possible is generally accepted, anything that would achieve a reduction in size of properties is worth considering; and this does not apply only to the dairying industry. The work of the Cattle Husbandry Branch has been aimed at encouraging the growing and conservation of high quality roughages on the farm wherever possible. Much of this work has been done through the Commonwealth Dairy Industry Extension Grant in association with the Divisions of Plant Industry and Dairying. Demonstration farms spread throughout the dairying districts have been used to show how improved pastures and crops can be produced under rainfall or irrigation. A total of 124 demonstrations is in progress. A small number of concentrate feeding demonstrations are also running on farms where high quality roughage can be assured throughout the year.

Somewhat similar work, but carried out with more detailed observations and records, is being undertaken on the Regional Experiment Stations. At Biloela, comparisons will be made between dairying with irrigation and dairying under dry farming practices, and at Kairi between dairying on country kept under pasture and dairying on country used mainly to grow maize as a grain crop but with the maize grown in a rotation with pasture.

The adoption of artificial breeding as a routine practice has not been favoured in the absence of proven sires. It has always been

felt, however, that the procedure should be used as soon as possible, for it has several advantages over natural breeding. It was therefore decided, with the co-operation and advice of the Jersey Cattle Society of Queensland, to commence a small artificial breeding project aimed at discovering a bull or bulls capable of siring high-producing daughters. Four blood lines shown by analysis of the Jersey breed to have had the greatest influence on the herds of the State were selected and bulls purchased. Semen is collected from these bulls and used in turn to inseminate Jersey cows in each of 60 herds included in herd recording groups in the Nambour-Maleny-Kenilworth area. Thus, the four bulls are tested in all 60 herds.

It has been observed that artificial insemination is advantageous not only from the improvement of production angle but also in the control of a number of diseases that cause infertility. Moreover, artificial breeding seems to subtly influence the farmer to improve husbandry generally. It could be a very useful extension tool and have a big influence in the Queensland dairy industry in the future.

An infertility survey was commenced in 1953 and the breeding charts completed by a number of collaborators are now being examined. Though far from complete, this examination is already giving some pointers. It would seem, for example, that where cattle calve at a time when the plane of nutrition is low they do not come in season again until an improvement occurs in the ration. This can at times be up to three months,. This may be a further argument in favour of "steaming up." Certainly some supplementary feeding in the final stages of pregnancy is necessary, if cows are to be calved down in the months prior to the summer flush of feed. As this is the period for calving recommended from a study of herd recording data, the need for the provision of fodder during the late winter and spring, either in the form of crop or by conservation, is emphasised.

Beef Cattle.

Production in the beef industry has shown a big increase during the last few years. This is no doubt largely due to the good seasons experienced, but higher prices have probably encouraged better musters and management. Prices have, however, declined sharply during the 1955 and 1956 seasons and the indications are that this decline will continue unless a better quality article is marketed.

The beef industry in Australia and more particularly in Queensland is at the crossroads. It must now decide whether it should continue to travel along a well-known road and market surplus meat for export as frozen beef, or take a turn-off along a much less familiar road and market as much of the surplus as possible in the form of chilled beef.

To travel the well-known road is much easier, but it does not appear to offer the same final reward as does travelling the less familiar, and in some respects the more difficult, road. It seems foolish to continue to produce an article which apparently is not wanted by the consumer either at home or abroad. If this is correct, and we are advised that it is, we can only look forward to low prices which could become even lower than at present if we continue to export frozen beef. As is well known, Queensland produces surplus beef for three to six months of the year, and as there is only a limited refrigerated storage space, much of the surplus meat must be sold fairly quickly. It is only natural, therefore, that if the buyer is more or less disinterested in frozen beef, then he is in a very favourable position and prices must tend to decrease. This state of affairs is accentuated when the carcases exported as frozen beef are of a type that is not particularly acceptable to the consumer.

Lately there has developed an increasing disinterest in overfat beef. In addition, it is evident that the consumer is rather more interested in tenderness than flavour. It would therefore appear that we must reduce the production of mature fat bullocks and concentrate on sending in for slaughter the young prime steer. Whether beef is marketed as chilled or frozen is an important consideration, but even more important is the breeding and sending forward for slaughter of this type of animal. It will require changes in the industry but those changes can and should be made.

Of extreme importance is the fact that during recent years the Australian consumer also has sought the type of beef that is obtained from the younger animal. In all parts of the Commonwealth, the sale of yearling beef has increased during the last 10–15 years. This does not seem to have received the same publicity as has the required quality of export beef, but it is nevertheless true. It would therefore appear unwise to continue with a set-up in the industry that results in the great bulk of the output being not sought after by either the local or overseas consumer. This presents fewer problems in southern Queensland, where good fattening areas are available and are being developed, but requires major re-organisation in North Queensland.

Some graziers in southern Queensland are well aware of the need for changes and are already producing high quality young steers, suitable for the city or overseas trade, on crops and improved pastures. There are indications that quite large areas exist in southern and central Queensland where this type of husbandry can be developed along profitable lines. The examination of this type of fattening by the Cattle Husbandry Branch is being given high priority and the portable weighbridges being supplied to field staff in the areas concerned are proving a useful means of checking on results obtained. Present indications are that high quality meat suitable for interstate or export trade can be produced in southern Queensland. It has been stated that if the export trade is to be developed and maintained, there should be chilled beef available for export throughout the year. This means smaller surplus production over local requirements in all months of the year, rather than a large surplus during a few months of the year. The cattle industry might therefore well pay more attention to the Australian trade.

It is realised that it will be easier and more economical for cattle to be marketed in some periods of the year than in others, but an attempt must be made to extend these periods

by the use of improved pastures and crops. In Australia the time of the year in which cattle are fattened depends on whether they are raised in a winter or a summer rainfall environment, but this has always been the case and should, in fact, make it easier to spread Australian production as a whole throughout the year.

It has been sometimes stated that as chilled beef has a limited life from slaughter to the consumer, uncertainty of shipping space and delays in transit due to various reasons, industrial and other, make the development of a steady chiller trade impracticable. This, however, is negative thinking and gives no thought to the future. In any event it is, I suggest, a very strong argument for planning beef production for the local trade as the primary consideration, with the exporting of the surplus not required for this trade as a secondary one. In other words, let us develop an industry which is built upon the local trade and not largely geared to supply a market which can be influenced so easily by so many factors over which Australia has little or no control.

The introduction of national grading standards common to all States and for export would do much to stabilise the industry and develop the Australian trade.

The effect of increased exports on the national economy is appreciated, but an industry integrated with a sound local trade is considered to be in a stronger position to develop increased production than—as is the case in Queensland—one integrated largely with the export trade.

Meat of suitable type cannot, of course, be produced in all the cattle country of Australia. Some areas are suited only to breeding and others are more suited to fattening. This situation is common to other parts of the world also. The production of animals suitable for frozen beef and for canning must, of necessity, continue in some measure. As younger cattle are required for slaughter, consequently younger stores are needed for fattening throughout the year. This may mean that the movement of young forward stores from one State to another will increase or that the transport of beef interstate will expand. The development of improved refrigerated cars in Queensland now makes the transport of chilled meat possible for much longer distances by rail than in the past. The air transport of prepackaged cuts from Queensland to other States and overseas is an interesting recent development which has possibilities. These considerations suggest that the need for killing facilities will develop in new areas, with perhaps a decrease in the need for existing facilities in some instances.

During recent months in southern Queensland, great interest has been shown by buyers in any cattle that are young and prime. Prices far above those usually paid for cattle for the local trade have been paid. This may be due to special circumstances in southern States, but the movement has been so persistent that it can be fairly assumed there is an increasing demand for this type and quality of meat and that this demand is likely to be sustained.

The biggest problem of the beef cattle industry (in common with other branches of the livestock industry) is seasonal drought during the winter months, which in the occasional year when monsoonal rains fail develops into a real drought. Long-range work has therefore been planned to try and overcome this defect. As a preliminary, growth rate measurements are being taken in various districts of Queensland. Until recently, fixed scales have been used for the purpose and observations limited to the coast and hinterland. With the development of the portable weighbridge, however, it is now possible to extend this work to inland areas. The information collected from these studies will make it possible to forecast the rate of gain or loss in the various seasons of the year and demonstrate when improved nutrition is needed. A record of the growth rates on native pastures in all types of seasons will gradually be built up. A study of weight gains made on improved pastures and crop is also being made, thus allowing comparisons to be drawn with those made on native pastures. This work is one of the most important projects being undertaken by the Cattle Husbandry Branch. From the records obtained can be developed recommendations for improved property management which cannot be made at present because of lack of precise information.

At the same time, opportunity is being taken to measure growth rates of Zebu hybrids, Santa Gertrudis and Santa Gertrudis cross cattle in comparison with British breeds. While the observations are not being made under fully controlled conditions, the information being obtained is proving of value as a guide to the extension staff. The indications at present are that the Zebu gains more quickly in early life and in seasons when pastures are not of high quality. It may be necessary, before final judgment is made, to compare crossbred British cattle with the Brahman crossbred.

One of the most interesting experiments carried out during the year was the feeding of bush hay made on a property at Springsure and fed during the winter of 1955 to stock on that property. The winter was better than usual but the experimental cattle nevertheless lost weight on native pasture. Despite this, they showed no interest in the hay and continued to lose weight. Some of this hay had been sent to the Rocklea Animal Husbandry Research Farm and fed to cattle in yards where no grazing was available. These animals maintained their weight for a period of six months. The experiment is to be repeated, but the indications are that feeding of bush hay would be satisfactory in drought time if the cattle were confined and forced to eat the hay, thereby not running off condition seeking out fodder.

SHEEP HUSBANDRY.

Fleece measurements for flock improvement is being continued as a major programme of work and forms a valuable part of the activities of the Sheep and Wool Branch. This is an extension tool as well as a service to the industry. There is clear evidence that the use of this service in conjunction with visual appraisal will bring about an improvement in scoured wool production much faster than when visual appraisal is relied on alone.

Work with fodder conservation on Toorak Field Station and on private properties has demonstrated its practicability. The interest shown by graziers in this work and the actual conservation of many thousands of tons of fodder is encouraging. Many aspects of the practice, however, require further consideration; these include the mechanics of feeding out, the palatability of the stored fodder and the relationship of costs to the size of a property. These matters will receive attention as opportunity presents.

Research work continues at Toorak, where interesting observations are being made concerning breeding for productivity in the area. In relation to this, a system of predicting the weight of wool that will be grown by a sheep (as devised by workers in New South Wales) is being studied. If found efficient, the system would be of very great assistance in sheep breeding, if only for the reason that more accurate selection of reserve rams would be possible.

An experiment concerned with copper deficiency of sheep, using different methods of supplementation, was continued. It would appear the ewes subjected to the stress of lambing and lactation gave a substantial response to copper supplementation as measured by the weight and quality of the wool produced.

POULTRY HUSBANDRY.

In common with most of the other animal industries in Queensland, poultry production over the years has been adversely affected by seasonal production. Excess production in some parts of the year and insufficient production in others have on the one hand caused surpluses which have been difficult to dispose of, and on the other resulted in shortages for the consumer. If production could be more evenly spread over the year, it would be of advantage to both consumer and producer and enable the development of a more stable industry. There are indications that something can be done in this direction by extending the period of hatching and by using artificial lighting in the laying pens.

Again in the poultry industry we see indications that Australia must look to her home markets to ensure stability. With United Kingdom farmers producing more than 90 per cent. of their country's requirements in 1955 and production said to be rising, it is unlikely that there will be any incentive provided for exports from Australia, particularly when the nearness of other suppliers is taken into consideration.

An encouraging new development is the continued and increasing production of young cockerels for the broiler trade. It is only a short time ago that male chicks were unwanted and destroyed in large numbers. Now we see a steady demand and a rising price for these chickens.

Research and investigational work has been directed at important problems of the industry, and in this the Poultry Advisory Board and the Poultry Advisory Technical Committee have been most helpful.

The feeding of various quantities of protein in mash with grain was aimed at finding whether grain consumption could be stepped up by using mashes with unusually high protein content. The group fed the lowest proportion of protein (17·5 per cent.) proved to be the most economical. All birds showed a decided preference for grain even in the low-protein mash group, although grain consumption did increase to some extent as the percentage of protein in mash rose.

A comparison of production by Australorps, White Leghorns and their crosses is again under way. The Australorp x White Leghorn crossbreds are showing to best advantage early in the trial.

PIG HUSBANDRY.

Some progress has been made with the provision of a pig testing station at the Rocklea Animal Husbandry Research Farm in that the plans of the building have now been completed. It is hoped that construction of this unit will be commenced next year, as in other countries, particularly in Denmark, similar units have been responsible for rapid improvement in the quality of pigs.

District pig carcase competitions, sponsored by the Australian Meat Board and supported by the Department, have been continued. They are a useful method of demonstrating to producers the results of different feeding schedules, but the pig testing station is necessary to demonstrate to breeders the breeding worth of their stock. Such demonstration is easier with pigs than most other farm animals, for measurement of production can be effected quickly.

It is regrettable that the voluntary pig grading system commenced last year has been prejudiced by a shortage of pigs for market. An incentive payment for first quality bacon brought a ready response from the industry, but during the past year heavy demand from the trade, coupled with an inadequate supply, has forced buyers to accept lower grade pigs. This has removed the incentive to produce pigs of a higher quality. The example set by the Northern Pig Marketing Board might be worth following and some form of compulsory grading initiated.

Commonwealth-wide surveys have demonstrated a heavy loss of suckers after farrowing. To help overcome this loss, circular farrowing pens built after the New Zealand pattern were tested at the Kairi Regional Experiment Station. This demonstrated reduced losses in young suckers, and similar pens are now to be tried out in other districts. Special moulds are being purchased and will be available on loan to farmers in most districts of the State where commercial pig raising is practised.

The extension of pig grazing demonstrations to fresh districts has created interest and the indications are that this system will be accepted by many farmers.

It has also been shown that deep litter pig raising, which is an entirely different type of husbandry, may have possibilities, especially if used in conjunction with small-crop farming.

ANIMAL HEALTH.

Tuberculosis.

Measures for the eradication of tuberculosis in the dairy industry were continued throughout the year. It is estimated that 800,000 cattle are concerned in the scheme. Thus, very little expansion is necessary to bring all the commercial dairy cattle of Queensland under test. The number directly handled this year was only 457,279, as many herds are now under biennial test. Of those tested during the year 0·52 per cent. (approximately 1 in 200) reacted to the test. In the herds that have been under test for some years, the number of reactors was only about 1 in 1,000.

This result can be compared with the testing of cattle outside the scheme by Departmental officers. During the year, these herds, many of them being tested for the first time, showed 2·7 per cent. of reactors.

Testing of some beef herds has also been carried out, 2 per cent. of reactors having been found. Two herds undergoing retest had originally shown more than 10 per cent. of reactors.

The incidence of tuberculosis in the beef industry is somewhat disturbing. As the incidence of the disease was shown to be heavy in some herds, a check was made at export abattoirs, which are not under our control. This showed a rather disquieting state of affairs and indicated that some more positive action would have to be taken. It will be impossible, of course, to test 5,000,000 cattle with available staff; in any event, special arrangements would be necessary to handle cattle run on open range. Nevertheless, in view of the widespread nature of the disease and its comparatively high incidence, it is accepted by the Department and the industry alike that a start should be made. Consideration is being given to the problem, the extent and amount of testing being limited by the manpower and finance available.

Available evidence suggests that the most likely method of spread of the disease in the beef industry is by the bull. It is considered advisable, therefore, to commence with the testing of sale bulls. This could later be extended to the whole of those studs where the incidence is shown to be high, and later still to all studs and, where possible, herds on a district basis.

Whilst the latter phases of the scheme might not be embarked upon for many years, the continued infection of properties by introduced bulls could be prevented if the first measure mentioned was observed in all cases.

Pleuropneumonia.

This disease is enzootic in northern Australia. As there is a continuing movement of stores to the southern States, it can be said that Queensland cattle are a constant threat to the cattle industries of New South Wales, Victoria and South Australia. With this in mind, the Department has, through the Veterinary Services Branch, planned and carried out a control campaign aimed at eventually eradicating the disease but initially reducing its incidence and preventing its spread to clean areas. Under the open range system of management, it is often difficult to diagnose the disease. To overcome this, a check is kept on abattoirs by meat inspection staff of the States and the Commonwealth. By this means, it has been possible to discover through slaughtered cattle the properties on which this disease exists and so the areas where it is endemic. With this knowledge a special staff goes out each year to the properties concerned to persuade the owners or managers to take active steps to inoculate their stock. It is pleasing to record that improvement in control measures had been made on half of the 300 properties visited during the year.

To prevent the disease breaking out and spreading in travelling cattle, all mobs moving from the infected areas and mobs of clean cattle moving into or through these areas are inoculated. Of course, this cannot entirely prevent spread of the disease to uninoculated cattle coming in contact with a mob in which infected animals are present, but by restricting its spread within the travelling mob the risk is greatly lessened.

The big job ahead is the inoculation of all cattle in the enzootic areas, but with the co-operation of owners and managers it is hoped that this will be achieved. It is significant that the disease seems to be less prevalent, and as it is normally bad in good seasons when more stock are moving, the campaign is proving worthwhile.

Abortion and Sterility.

For many years abortion due to brucellosis has been common in Queensland. It has long been suspected by veterinarians, however, that other forms of contagious abortion existed. This has been confirmed in recent years and it is now known that at least four different organisms cause abortion and sterility in Queensland. These are *Brucella, Vibrio, Leptospira* and *Trichomonas*. The first three are widespread and serious.

Abortion is a matter for concern even when considered on its own account, but it is the indirect effect that is of much greater concern. The loss of calves by a proven bull and from valuable high-producing cows is bad enough, but the general upset in the production programme and the wasteful months of infertility that often follow are in the long run of far more moment. Much has still to be learnt about these matters, but good progress has been made in the last few years and the indications are that further advances in our knowledge about them are not far off.

Work is continuing both in the field and at the Animal Research Institute. The field work, as already mentioned, is in the nature of a survey of the problem. It is reaching the stage where specific projects can soon be handed over to the research worker. The research work so far carried out has been largely concentrated on methods of diagnosis. The blood serum agglutination test for vibriosis was found to be unreliable and a more satisfactory technique depending on the use of mucus for the test has been developed.

Other research work carried out has been concerned with the transmission of diseases causing infertility.

The continuation of work associated with infertility in the dairy cow is of great importance to the dairying industry, for the condition is probably the greatest cause of economic loss in that industry.

The association of the Cattle Husbandry Branch, Veterinary Services Branch and the Animal Research Institute in this work represents team work such as is best calculated to bring results.

Sheep Blowfly Strike.

Trials with insecticides of the chlorinated hydrocarbon group and organic phosphates against fly-strike of sheep have been continued in association with officers of C.S.I.R.O. The length of protection afforded by jetting has been very satisfactory in the case of the organic phosphate diazinon, being up to 33 weeks, during which time 32 inches of rain fell on 56 wet days.

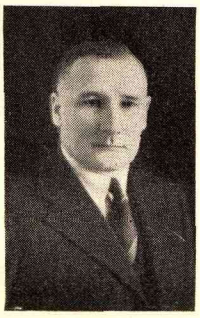
The subcutaneous injection of these insecticides mixed with peanut oil has so far given disappointing results. Whilst some injections will prevent sheep blowfly larvae growth for periods of 16-18 weeks, the bulky dose required and the risk of toxicity militate against their application.

Pullorum Disease.

Pullorum testing was continued, the incidence of infection in the birds tested (227,773) being only 0·002 per cent. This is a splendid achievement. Of the 117 registered stock suppliers' flocks, 57 are now completely free from infection and 60 had less than 0·5 per cent. reactors.

DIVISION OF DAIRYING.

Director: Mr. E. B. Rice.



The termination on 30th June, 1955, of the sale in Britain of Australian butter and cheese by Government-to-Government contracts, which had been in operation since 1940, caused a major change in the system of marketing of Australian dairy products in Britain. After that date sales on the British market reverted wholly to a trader-to-trader basis. As a consequence, there were, according to supply and demand, variations during the year in the prices paid on the London wholesale market for Australian butter and cheese in contrast with the uniform prices fixed during each period of review of the Government-to-Government agreement during its currency from 1940 to 1955. The average butter price in Britain for the year 1954-55 was 392s. 6d. per cwt. In 1955-56, under the trader-to-trader basis, the price averaged approximately 387s. 6d. per cwt. for stocks sold.

Contrary to the fears which had been felt in Australia regarding a decline in cheese prices in Britain during the year, there was an upward trend. The returns to Queensland cheese factories were thus higher than anticipated at the beginning of the year and cheese factory suppliers finally gained some monetary advantage over cream suppliers to butter factories.

The Australian Government guaranteed price scheme, which relates to the sales within Australia plus a quantity of exports equivalent to 20 per cent. thereof, remains in force until June 30, 1957. The guaranteed price to producers was continued at 49.29d. per lb. commercial butter for the quantity of produce covered by the guarantee. This price has not changed since 1952. The Commonwealth Government increased the ex-factory price of butter by 3¾d. per pound and provided £14,500,000 cash subsidy. The cash subsidy in the previous year was £15,900,000. Due to the cessation of the contract with the British Government for the sale of the exportable surplus, producers received a lower final payout than in the preceding year. The average payout by factories was 3s. 6½d. per lb. commercial butter for cream supplied to butter factories and 4s. 5d. per lb. butterfat for milk supplied to cheese factories, compared with 3s. 10½d. and 4s. 7d. respectively in the previous year. The falls in returns to producers were due to the lower butter prices received on export markets.

SEASONAL CONDITIONS.

Good seasonal conditions at the beginning of the year were followed by a dry spring and then an excessively wet summer. In the autumn, conditions were favourable for dairying in all districts and the year closed with farms generally having ample paddock feed and adequate supplies of water for stock and other purposes.

Production was affected to some extent by the delayed plantings of winter fodder crops because of the inability of farmers to prepare land during the wet summer season and an outbreak of three-day sickness in dairy herds.

BUTTER PRODUCTION AND QUALITY.

The better-than-average seasonal conditions are reflected in the satisfactory level of production attained during the year. The output of butter was 48,189 tons, compared with the average of 42,552 tons for the past five years. Quality still continues to be a matter of some concern, the official gradings of 38,044 tons, or 78·95 per cent. of total manufacture, being 38·21 per cent. choice grade, 51·75 per cent. first grade and 10·04 per cent. second and other grades.

The excessively wet summer season, which caused delays in cream receivals at butter factories through damaged roads, and the outbreak of three-day sickness in dairy herds contributed to the decline in the choice gradings.

A survey of the causes of the degrading of butter packed as choice grade at factories was carried out from January, 1955, to June, 1956, with a view to determining the major defects responsible for such butter not being officially graded according to the quality packed by the factories. The results are summarised in Table 1.

TABLE 1.

SUMMARY OF BUTTER DEFECTS.

Period.	Degraded Boxes.	Total Defects.*	Flavour.					Texture.		
			Unclean.	Weedy.	Stale.	Fermented.	Misc.	Mottle.	Open.	Misc.
1955—										
January–March ..	44,784	65,023	39,974	1,357	5,137	4,998	4,660	3,914	3,286	1,697
April–June	40,169	62,221	30,757	9,965	4,625	718	1,942	723	13,312	179
July–September ..	70,690	93,854	30,580	54,905	3,410	..	1,775	733	2,408	43
October–December..	72,665	97,719	47,038	29,935	4,725	3,679	4,014	4,628	2,583	1,117
1956—										
January–March ..	45,193	65,658	34,083	2,522	4,801	8,539	3,369	7,567	3,545	1,232
April–June	30,218	40,014	21,053	9,145	2,647	1,125	2,195	717	2,311	821

* A number of degraded boxes were affected by more than one defect.

It will be noted that the main defects were slightly unclean and weedy flavours. It is difficult for the factories to avoid some degrading through weed taint because the taint originally in the cream is accentuated in the resultant butter. However, the slightly unclean, slightly fermented and slightly stale flavours, which between them made up 58·35 per cent. of defects, reveal that some tightening up of cream grading standards is needed at factories. These defects are all indicative of a tendency amongst factories to place too much dependence on modern equipment and processing methods renovating the quality of cream and thus to include with the choice grade cream some cream which is incapable, even when blended with better quality bulk cream, of being converted into choice grade butter.

A pleasing feature of the survey was the relatively low proportion of defects attributable to faulty manufacturing procedures. This shows that generally processing is well controlled in Queensland factories. However, a few factories whose butter is frequently penalised by the official graders for manufacturing defects need to give more attention to this aspect of their operations. Mottle, open texture and streak are faults almost entirely controllable by efficient processing.

There was some improvement in the percentage of butter which did not grade true to the quality packed. This is a result of the more intensive pasteurisation practices adopted in recent years and the replacement of less efficient machines in some factories.

Two factories have installed a system of pasteurisation recently developed in Britain. There are few of these units yet in operation throughout the world. Intensive studies of all aspects of the process are being made. The grading results of the butter produced at these factories have been quite satisfactory, the steam demands for pasteurisation have been economical, and butterfat losses in the buttermilk have averaged 1·2 per cent., compared with the State average for all pasteurisation systems of 1·3 per cent.

Renovations of factory buildings and installations of new equipment involved Associations in an estimated expenditure of £192,835. At some factories schemes for major improvements have been approved by the Directors and the work will shortly be commenced. It is gratifying to note that Dairy Associations are mindful of the necessity for providing efficient equipment in order to produce butter of high quality and to attain lower manufacturing costs. There still remains, however, the basic problem of effecting an uplift in the quality of the cream supplied to Queensland factories. This is fundamental to improvement in butter quality.

CHEESE PRODUCTION AND QUALITY.

The outlook for the cheese industry was causing some concern at the beginning of the year due to falling prices on the British market. Fortunately, prices shortly afterwards commenced an upward trend and at the end of the year the position had so changed that actual returns received by suppliers to cheese factories for the year were relatively better than those received by butter factory suppliers.

Cheese quality declined slightly below the satisfactory results for the preceding year. There are a few small cheese factories which produce too high a percentage of lower grades and action is being taken to ensure that their premises and equipment are brought up to desirable standards. Lower quality grades of cheese are not readily saleable on the British market and if any decline in cheese prices occurs factories which produce inferior quality may be unable to continue operations.

The more attractive packaging of dairy products could stimulate consumer demand. Cheese, in particular, lends itself to such methods of merchandising and it is gratifying

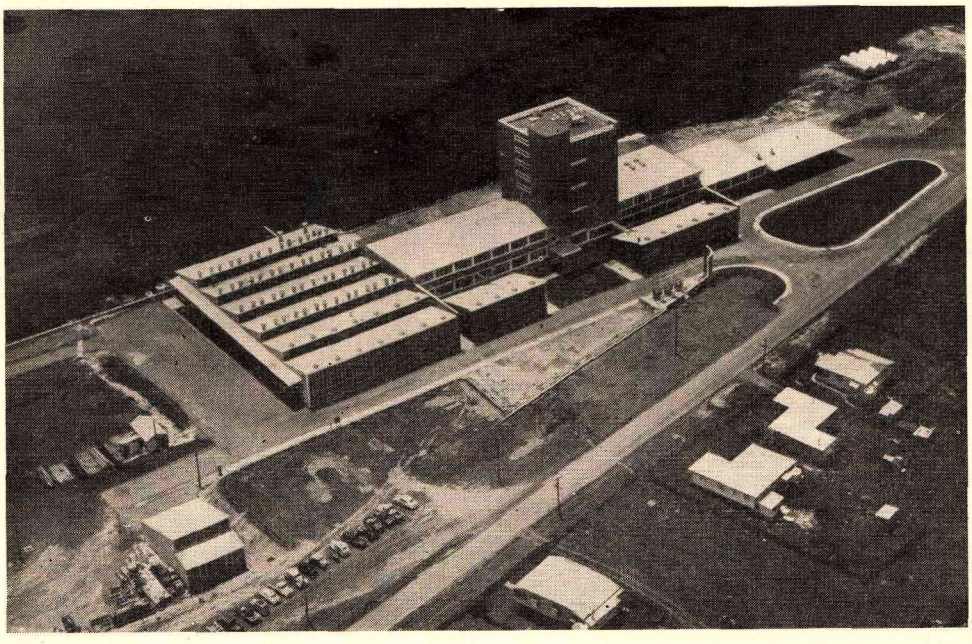


Plate 1.—Aerial View of Nestles New Milk Factory at Gympie.
[*Photo. by Brisbane "Telegraph."*

to report that some Queensland cheese manufacturers have already commenced to pack their product in more attractive packaging materials.

Experimental work was commenced on the production under Queensland conditions of some types of fancy cheeses, a greater demand for which has arisen mainly from the many people from overseas countries who have now become Queensland citizens.

OTHER PRODUCTS.

Plans were prepared by several milk pasteurisation companies for rebuilding or extensive remodelling of factories and the installation of new plant in order to cope with their substantially expanded trade. A number of modern milk distribution depots, equipped with necessary refrigeration plant, were erected in the Brisbane suburbs. These depots are now compulsory requirements under the Milk Supply Act.

During the year the new dried milk products factory of Nestles Food Specialities was opened at Gympie. This excellently designed and equipped factory is probably unsurpassed by any other similar factory in the Southern Hemisphere.

In one Brisbane factory the milk pasteurisation section is being completely rebuilt and equipped with the most efficient plant, including a crating and decrating machine for milk bottles. One Brisbane milk factory ceased operations following a merger with another company.

COMMONWEALTH DAIRY INDUSTRY EXTENSION GRANT.

The primary approach to the raising of the low average yield of Queensland dairy cows is by better feeding based on high-quality pastures and fodder crops. Accordingly, emphasis on the farm demonstration work being carried out under the Grant has been placed on these phases of farm practices; 128 farmers are co-operating with the Department in this work. The demonstrations carried out during recent years and the general extension programme of the Department have been responsible for a noticeable change in the attitude of farmers towards adopting improved farm practices. There has been, in particular, an accelerated trend in the planting of larger acreages of better pasture species and the renovation of pastures.

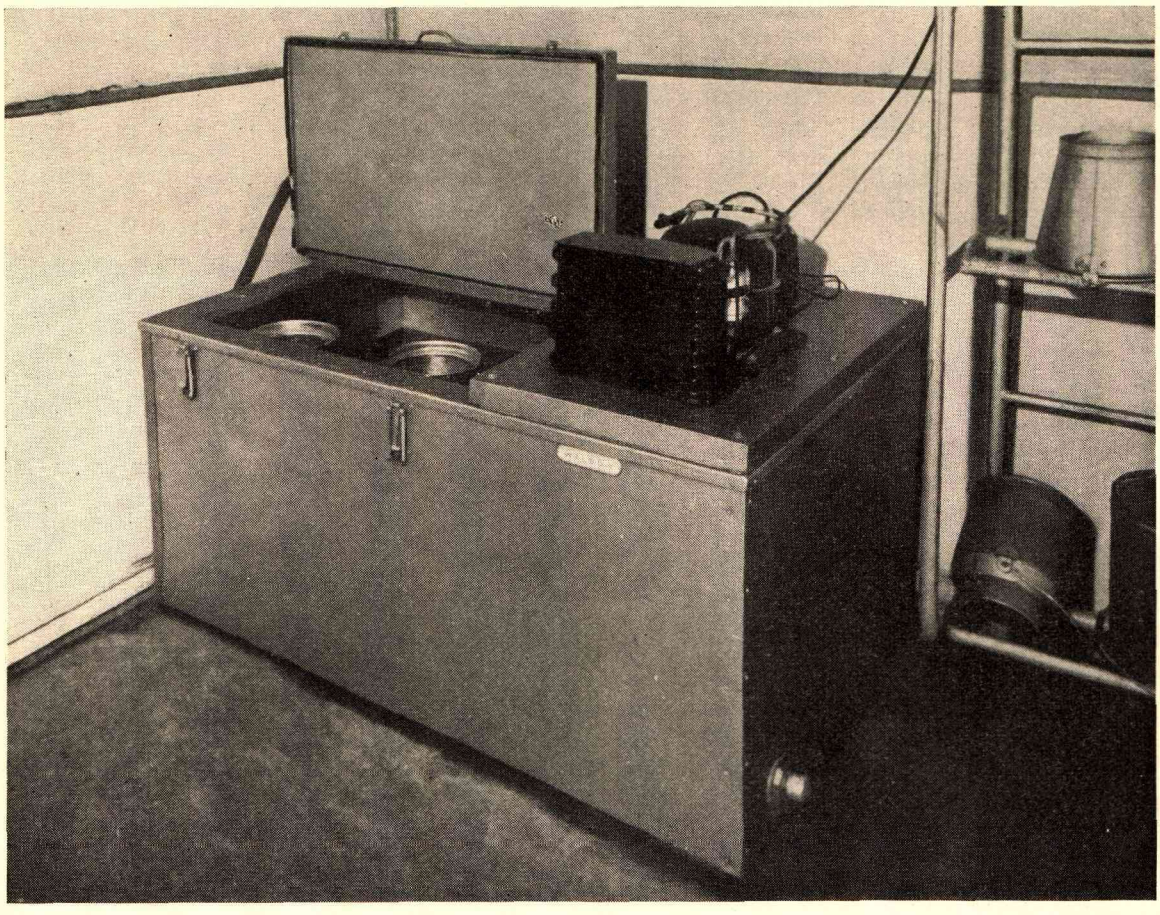


Plate 2.—An "In the Tank" Cream Refrigerator Imported from America in Use on a Queensland Dairy Farm.

Twenty field days were held on demonstration farms with an average attendance of 100 persons, and six successful conducted tours, the average attendance at which was 200, were organised.

Other demonstration projects dealing with dairy hygiene and the improvement of the compositional quality of milk were carried out on 45 farms. These projects included the use of improved detergent mixtures, the recirculation cleaning of milking machines, cooling of milk and cream by means of systems which give an appreciable degree of cooling at comparatively low cost of equipment, and the use of mineral supplements and improved pastures in effecting an improvement in the

compositional quality of milk. The latter is a problem of some magnitude during certain times of the year in milk supplied for the market milk trade and in the cheese-yielding capacity of milk.

The practices demonstrated have created keen interest among dairy farmers in the districts surrounding the co-operating farms and are leading to their adoption on an increasing scale.

FARM ACTIVITIES.

The numbers of new dairy sheds erected and old sheds renovated were higher than for many years previously. Reports of field officers indicate that generally these new or remodelled premises are of good structural standards and equipped with the facilities necessary for sound dairy hygiene.

A plentiful supply of water at the dairy premises and an efficient source of hot water are essentials for quality production on the dairy farm. The increasing numbers of dairy sheds which have been provided with a permanent water supply and steam sterilizers show that farmers are becoming more conscious of the necessity for these essentials, and as electricity is reticulated into further rural areas electric water boilers are becoming popular with farmers.

During the year about 450 new farm refrigerators and a similar number of other systems of cooling were installed. A satisfactory means of cooling is necessary on every Queensland dairy farm in order to protect milk and cream from the deterioration which is so rapid if they are kept at the prevailing warm atmospheric temperatures.

Orders under the Dairy Produce Acts totalling 818 were issued by officers to ensure compliance by farmers with instructions regarding hygiene or equipment.

An illustrated poster depicting good milking and hygiene practices was printed and copies are now being distributed to all dairy-farmers in Queensland. The farmer who experiences any quality trouble should be able to readily determine its source by reference to the poster.

Although milking machines have been used for many years, there was, until recently, no equipment available for testing their efficiency. Scientific apparatus developed and manufactured for this purpose in New Zealand has now become available in Australia. A number of sets was purchased by the Queensland Dairymen's Organisation and supplied to dairy Associations to enable the milking machines used by their suppliers to be checked. This equipment has been mainly used by field officers of the Department.

The tests performed have disclosed that the efficiency of many milking machines on farms is impaired through mechanical faults. The chief defects detected were inadequate air flow through the machine, faulty vacuum pumps, pulsators and vacuum gauges, air leaks and perished or fat-saturated rubberware. Many machines have defects which are not readily apparent to the farmer. These machines will extract milk from the cows, although, because of their defective condition, they are unable to ensure maximum recovery of milk. Faster milking, avoidance of a second let-down by the cow, elimination of hand-stripping and higher yields are possible if adjustments and repairs are effected to rectify any faults revealed by the testing equipment. Coupled with an efficient machine, there must also be good shed technique in the handling of the herd.

The recirculation system for the cleaning of milking machines, which was introduced into Queensland about two years ago, is proving popular with farmers and is steadily extending. The procedure necessary for efficient cleaning has been studied and a paper embodying the results of this investigation has been prepared for publication in the *Queensland Agricultural Journal*.

As a step in the direction of achieving a closer liaison between the Department and dairy industry organisations in furthering the extension activities of the Department, three committees were set up during the year, their headquarters being at Oakey, Gympie and Malanda, respectively. These local committees, known as Dairy Extension Advisory Committees, consist of three industry and three Departmental representatives. Their primary object is to foster the more widespread application by district farmers of practices proven by leading dairy farmers under the prevailing soil and climatic conditions. The continuance of the scheme and the possibility of extending it to other districts will depend on the experience gained during a trial period with the three committees already constituted.

Divisional officers pursued a vigorous programme of extension activities during the year under review. Three series of slides were prepared in sufficient quantity for use by officers in all districts for illustrated talks to dairy-farmers. The subjects for the series were dairy hygiene, care and operation of milking machines, and herd production recording. Field days, conducted tours, method demonstrations, press releases and radio talks were other extension media freely used.

The totals for each extension method are given in Table 2.

TABLE 2.
SUMMARY OF EXTENSION WORK.

—	Meetings.	Numbers.
Illustrated Talks and Films (Q.D.O. Branches)	232	7,277
Tours (Conducted)	5	1,100
Field Days and Method Demonstrations	76	3,378
Annual Herd Recording Meetings	22	906
Junior Farmer Club Meetings	94	3,304
Calf Clubs	15	356
Grand Total	444	16,321
Cheese Display (Toowoomba)	1	11,000 (estimated)
Dairy Display (Warwick)	1	5,500 (estimated)

HERD PRODUCTION RECORDING.

The number of cows submitted under the official pure-bred production recording scheme (1,913) was the highest yet entered in the State. Owners will be required to enter all registered pure-bred cows from July 1, 1957. This is to ensure that the scheme operates to the benefit of the dairy-farming community generally, for

it is now recognised that a soundly based scheme requires that the productivity of the whole herd and not that of a few selected animals should be determined. The average production per cow was 292 lb. butterfat.

The entry of further eligible cows into the Register of Merit has brought the totals since the Register was introduced in 1952 to the following—Elite section, 5 cows; lifetime section, 33 cows; intermediate section, 175 cows.

In view of the increasing number of goat herds in the State and the demand for goats' milk as a food for children and invalids, the recording of registered pure-bred goats was commenced during the year. Three herds were recorded.

Interest in recording of commercial herds continues, the number of herd recording groups increasing during the year from 65 to 79; 3 of these are groups catering partly for pure-bred herds and partly for grade herds. The rules governing this scheme were amended to bring them into conformity with advances in the herd recording movement throughout the world.

Lactations were completed by 45,734 cows in 1,266 herds in the year ended September 30, 1955. The average production per cow was 348 gall. milk and 150 lb. butterfat. This butterfat average exceeded that of the previous year by 16 lb., and 12.2 per cent. of the cows produced more than 200 lb. butterfat, compared with 7.0 per cent in the preceding year.

A survey revealed that continuous recording is conducive to higher yields, as there was a progressive increase in the average yield per cow with increasing numbers of years in which the herds were continuously recorded.

Surveys on mastitis, calf-rearing practices, calf wastage, the effect of the period between calvings and the length of the dry period on the subsequent lactation yield, and other subjects were commenced or continued. These surveys are providing useful information for Queensland dairy-farmers generally.

A dairy farm competition amongst members of the herd recording groups was finalised. Some farmers achieved very creditable increases in production in the competition year compared with the previous year.

INVESTIGATIONS AND LABORATORY SERVICES.

Butter.

The laboratory for the routine testing of butter under the Butter Improvement Service was transferred during the year to the new premises of the Queensland Butter Marketing Board at Hamilton. The more commodious and better equipped laboratory will now enable some research work to be carried out there in addition to routine control analyses.

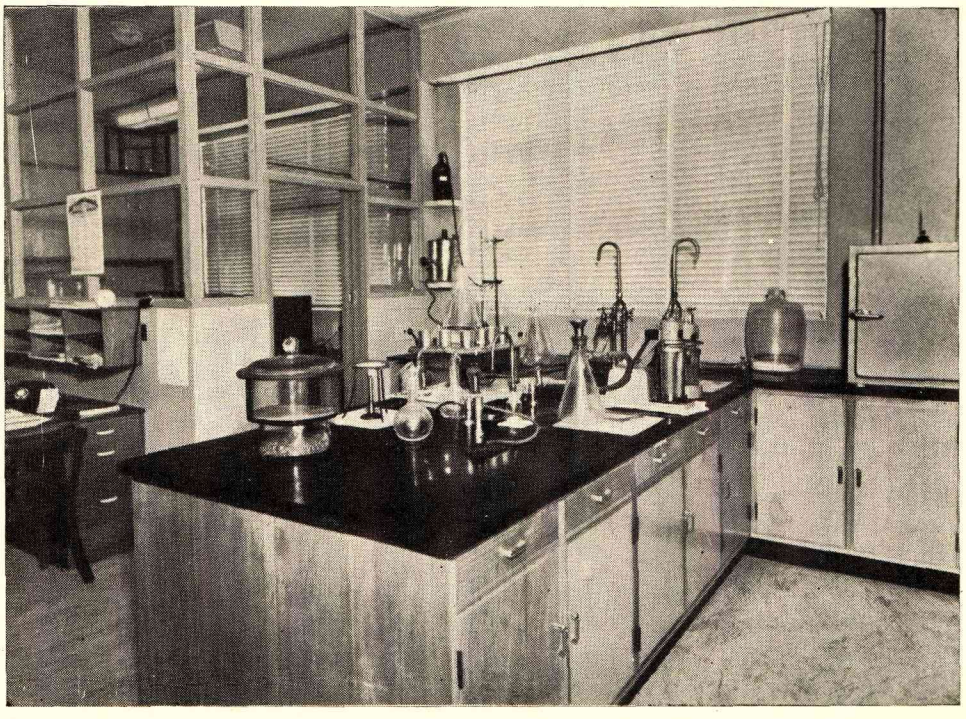


Plate 3.—New Dairy Laboratory at Hamilton for Research on Butter.

Studies on the acidity (pH) of butter in relation to its keeping quality in cold storage and of systems of cream pasteurisation are nearing completion. It is clear that a somewhat higher pH in butter than that previously recommended assists in maintaining the quality during cold storage, although there is a slightly higher loss of fat in the buttermilk during manufacture with a higher pH. The optimum to ensure butter of good keeping quality without incurring high losses of fat would appear to be pH 7·2-7·5.

A new system of pasteurisation is giving satisfactory results as assessed by butter gradings. Fat losses in the buttermilk are satisfactory and the steam demands are economical. In-place cleaning of this equipment is a feature which should assist in econo-

mising in labour costs and, by obviating tedious manual cleaning, lead to more contentment among factory operatives.

Triple vacreation of cream has been shown to effect some renovation of borderline choice grade cream, with consequent benefit to butter quality.

Cheese.

Better cheese packaging materials, which obviate the inedible rind characteristic of bandaged cheddar cheese, have been used in field trials and some Queensland factories have already commenced to package their cheese in these improved materials. Not only does the product have a more attractive appearance, but wastage is also reduced.

Trials comparing cheese made from cooled and uncooled milk showed that the former gives a better grading cheese and the grading margin widens as the cheese matures.

The control of the acidity during the manufacture of cheddar cheese by the high temperature, shortened process has been a problem in the investigations carried out with this modified cheesemaking process. Work is now proceeding in an endeavour to develop a method for more effectively controlling the acidity during processing.

The cheese-yielding capacity of milk is influenced by its chemical composition. It has been found that the feeding to cows of high-quality pasture gives milk of better compositional quality than the feeding of fodder crops, such as sorghums and Sudan grass. Some interesting trends are being shown from examination of the analytical data in this investigation.

Milk and Cream Quality.

Investigational work on farm production methods aimed at improving milk and cream quality and the compositional quality of milk for the market milk and cheese industries has been intensified in the past couple of years. Papers on some of these studies have been completed or are nearing completion and will be published shortly for the guidance of farmers.

Further trials aimed at perfecting methods for producing reconstituted milk from butter-oil and skim-milk powder have resulted in an improvement in the flavour of the milk. Reconstituted milk offers distinct promise for use in parts of the State where a plentiful supply of fresh milk is not always available and in countries where there are inadequate supplies of locally produced milk.

The establishment of branch laboratories in country centres in recent years has permitted an extension of the routine laboratory control services for the market milk, cheese and butter sections of the industry. The industry is becoming increasingly appreciative of the usefulness of these services in the control of the quality and the efficiency of processing of their products and in the solution of many *ad hoc* problems.

STAFF.

Two officers resigned during the year and no replacements were made. An examination was conducted in June to recruit officers for vacancies in the Field Services Branch. Officers of the Division have generally carried out their duties efficiently.

DIVISION OF MARKETING.

Director: Mr. H. S. Hunter.

OVERSEAS MARKETS.

With the termination of the long-term contract for dairy products on June 30, 1955, meat and sugar remained the only commodities exported to the United Kingdom for which guaranteed prices obtain. Even for these two commodities trader-to-trader conditions have been restored, while the level of guarantees is directly influenced by the actual level of prices on the free market. Under these free-trading conditions Australian rural exports are facing a strong buyers' market, with prices low relative to Australian production and marketing costs.

This situation is reflected in the unfavourable balance of trade which has resulted notwithstanding a continuation of the general increase in production and the volume of exports of the major rural products. In these circumstances, greater attention to quality and presentation is also necessary in a bid to gain maximum export earnings. The task in the face of a renewed upward trend in costs and internal prices is no easy one.

The unfavourable balance of trade has also served to draw close attention to a saving in imports. This is of particular concern to Queensland with its potentialities for increased production of such crops as tobacco leaf, cotton and oil-bearing seeds.

Factors contributing to the buyers' market position are mainly the continued influence of stocks accumulated on the North American continent as a result of the commodity price support policy, which although reduced are still an important factor, and also the implementation of policies of economic self sufficiency in various countries for strategic or currency considerations, such as in France, formerly an important importer but now a net exporter of wheat, and Great Britain herself, where the proportion of total food requirements from home production has assumed a marked increase since 1938.

Although generally at a lower level, export prices have attained relative stability. Australian wool production, increasing to record levels, realised an average price 13 per cent. lower than in the previous year. Beef and veal prices in the United Kingdom, in the face of quality competition from home production and Argentina and New Zealand, were also lower, and as in the previous year deficiency payments will be paid by the Ministry of Food in accordance with the guarantee under the 15-year agreement.

Butter prices, following the clearance of Ministry of Food stocks and reaping the opportunity which a free market short of supplies offered, rose to 400s. stg. Between Christmas and May, with a market more heavily supplied, prices fell to as low as 287s. Prospects have since improved. Smaller quantities of cheese on the United Kingdom market resulted in much firmer prices than prevailed in 1954-55. Overseas egg prices, in response to improved demand which resulted from shorter supplies, rose to return the Australian Egg Board an average of 4s. 0·559d. per dozen, in comparison with 3s. 3·48d. per dozen in 1954-55. The price pattern for dairy products and eggs illustrates a market determined by supply and demand conditions.

The Commonwealth Sugar Agreement has now been extended to 1963. With respect to the quota of 314,000 tons the price negotiated for the 1956 season's sugar is £40 15s. stg. c.i.f. per ton, the same as for last season's sugar. Negotiations, in which Queensland is taking part, have commenced for the renewal of the International Sugar Agreement which expires on December 31, 1958.

Canned Queensland pineapple met increasing competition on the Canadian market but it is expected quantity sold and values realised will be approximately the same for 1955-56 as for the previous year. The main outlet for canned pineapple is still the United Kingdom, which took 80 per cent. of the export pack.

The international grain market has been intensely competitive on all grounds except direct price-cutting. The volume of grain entering into trade is somewhat lower, particularly as regards wheat. This is attributed to former importing countries seeking increased economic self-sufficiency, notwithstanding relatively high production costs. The outlook for grain as far as Australian exporters is concerned is not bright. This was reflected in the lengthy negotiations preceding the writing of the new International Wheat Agreement which will operate for the three seasons ending 1958-59.

LOCAL MARKETS.

In this category are included the import-saving industries, which, with the possible exception of linseed, also have had their difficulties. Under the stimulus of a fixed price of £70 per ton offered by the crushers, the acreages planted to linseed have doubled in each of the last four years.

The Peanut Marketing Board, faced with rising costs and falling prices and their effect on profitability, is seeking tariff protection for both nuts and oil; while the cotton-growing industry, for which there is scope for expansion, seems unprepared to risk the investment which the necessary heavy mechanisation would involve without a long-term guarantee of price stability.

With tobacco leaf, the production of which has a high potential as an instrument for the conservation of foreign exchange, the problem is likewise one of attaining price stability at a level which will serve as an incentive to

Plate 1.—Aerial View of the C.O.D. Cannery at Northgate, Brisbane.
(Photo. by "Brisbane Telegraph.")

Plate 2.—Trimming, Slicing and Packing Pineapple at the C.O.D. Cannery, Northgate.

expansion. The 1955 sales resulted in a record average price of 162·38d. per lb., but the 1956 auction series began with little competition and substantially reduced clearances. The sales were discontinued pending discussion with buyers in an endeavour to reach agreement on minimum prices. Subsequently the Commonwealth Government announced that imports will be substantially reduced and has increased the percentages of local leaf required to be blended in order to qualify for concessional import duties.

MARKETING BOARDS.

During the year two marketing boards constituted under the *Primary Producers' Organisation and Marketing Acts* ceased operation, and a new board was established. The Plywood and Veneer Marketing Board and The Northern Plywood and Veneer Marketing Board were allowed to expire by effluxion of time on May 2, 1956. The statutory boards were set up in 1934 and 1935, when the plywood industry was experiencing marketing difficulties. These difficulties have since been overcome and the boards' statutory powers are no longer necessary in the interests of stability. The Grain Sorghum Marketing Board came into existence on March 8, 1956, following a petition from growers for a statutory marketing board, which was subsequently supported by ballot.

The chief difficulties encountered by marketing boards during the past year arose partly from the stringent financial position which made it difficult to secure financial accommodation for capital expenditure on storage buildings and even, in some cases, for crop finance, and partly because of the failure of all growers to loyally support their own marketing organisations. Many of the younger growers farming the land would have had no experience of the value of a marketing board in pre-war times of marketing difficulty.

The compulsory clauses in Queensland marketing legislation were put there because in periods of adequate or over-supply of a commodity a marketing board cannot function efficiently if some of the growers circumvent the board and sell direct to outside buyers. This practice also detracts from the security which the board might be able to offer from bank finance. Outside selling by unco-operative growers was the main reason for the failure of the canary seed, potato and onion marketing boards.

The State Wheat Board in April signed a contract for the erection of a modern bulk handling and storage terminal at Pinkenba which will have a storage capacity of 1,300,000 bushels of wheat. The cost of the terminal, complete with machinery, other equipment and railway sidings, will be approximately £1,000,000.

A detailed report of the operations of the various marketing boards and of the Council of Agriculture, with statistical and other information, will be included in the report which the Director of Marketing makes to the Minister each year as required by *The Primary Producers' Organisation and Marketing Acts.*

Retirement of Mr. C. W. Roseblade.

Mr. C. W. Roseblade, who retired from the Northern Pig Marketing Board during the year, is one of the pioneers of organised marketing in Queensland. He was first elected a member of the Northern Pig Board for the 1924-26 period and was re-elected in 1938, from which time he was Chairman until his retirement. He was a member of the Council of Agriculture in 1926 and a member of the Executive Committee of the Council from 1939 until 1953. Mr Roseblade was Chairman of the Council's Annual Conference in 1949. In addition, he served the farming community of North Queensland for many years in various other capacities.

Obituary.

It is with deep regret that the passing is recorded of Mr. J. P. Mahoney, of Yengarie, a member of The Butter Marketing Board, and of Mr. R. W. Dowling, who was the legal adviser for many years of the C.O.D. and to many of the marketing boards. Mr. Dowling was the legal architect of many of the existing farmer-controlled marketing measures.

AGRICULTURAL ECONOMICS.

With the increasing competition on world markets and the financial and economic problems which have resulted from the balance of payments situation, the accent has been on ways of reducing costs by increasing efficiency.

Under such circumstances attention is focused on economic analysis and research which might serve to guide industry leaders and those responsible for the well-being of an industry, and also to assist individual farmers in the planning of their farm activities. This necessity for planning springs from modern specialisation in farming and its greater capital investments, with the requirement of a very much higher appreciation of scientific business methods.

To meet these requirements the work of the Marketing Branch has been directed into the field of economic analysis, although, of course, with limited staff projects have not been extensive. However, during the year officers assisted the Commonwealth Bureau of Agricultural Economics in the planning and execution of a survey to investigate the structure of the cotton-growing industry and to assist in assessing the industry's prospects. In April, a survey was made by officers of the Branch of farms in the Atherton district. The survey was prompted by the problem arising from declining fertility and loss through soil erosion; its aims were to ascertain the economic considerations involved in any cultural changes, and to compare changes in financial results which could be expected from a change from the existing pattern of crop growing to mixed farming pursuits.

Statistical analysis was also undertaken during the year to record productivity trends in respect of the crop and livestock industries of the State. Preliminary work on further prices analyses of fruit and vegetable crops has also been undertaken.

The Branch has continued the monthly issue of *Reports on Production Trends* in rural industry and periodical forecasts in respect of wheat, barley, maize, grain sorghum, potatoes, tobacco leaf, peanuts and the poultry industry. Preliminary work has been done with a view to expanding the forecasts to include small grains, and also to enlarging the poultry industry report to include cockerel rearing. To assist interested parties, the issue of periodical digests of published material relevant to the grain market has also been commenced.

The Market Price Reports covering *Daily Official Market Quotations* at the Brisbane fruit and vegetable and produce markets and the *Weekly Market Report,* commenting on the week's activity, are issued through the post and continue to obtain wide publicity through radio and press.

In addition to the reports mentioned above, the staff prepared specialised radio talks and articles for publication in the *Queensland Agricultural Journal.*

AGRICULTURAL STANDARDS.

The Standards Branch actively pursued its main function of administering *The Agricultural Standards Act of* 1952 to ensure that commodities coming within the scope of the Act would, when offered for sale, be of a satisfactory quality.

The Branch achieves a close co-operation with the technical services of the Department by inter-divisional collaboration through the Agricultural Requirements Board and through the Departmental Seed Certification Committee. Seed certification schemes have operated for hybrid maize, sorghums, French beans, cowpeas and tomatoes.

The Agricultural Standards (Fertilizer and Lime) Regulations were introduced during the year to replace the regulations previously in force under the repealed Fertilisers Act. Certain anomalies were removed, and a regulation requiring trace elements and other newer materials to be declared on the label as active constituents when contained in fertilizer mixtures was included.

In addition, the Agricultural Standards (Marking Preparations) Regulations were introduced. These prohibit the sale of such preparations used for marking the fleece of sheep which do not readily scour out from the fleece when treated by scouring solutions, which are also prescribed in the regulations.

The Seed Testing Station was fully extended with, in addition to normal seed-testing work, the testing of representative samples of export lots of grass seeds, grains and other commodities for which buyers' terms of contract required a Government certificate of quality. Shipments of grain for which testing was done numbered 1,476, compared with 1,041 in 1954-55.

FRUIT AND VEGETABLE INSPECTION.

The Standards Branch as from May 14 became responsible also for the administration of *The Fruit and Vegetables Act of* 1947.

STAFF.

A marketing officer with experience as an officer of the British Ministry of Food joined the staff of the Marketing Branch in May.

In the Standards Branch, pressure of increasing functions for Standards Inspectors was aggravated by illness of some of the officers. In addition, the Branch was unfortunate in being without the services of the Standards Officer for a considerable period because of illness. Two additional female assistants were added to the seed-testing staff. A Horticulturist and 10 fruit and vegetable inspectors were seconded to the Standards Branch from the Horticulture Branch.

DIVISION OF PLANT INDUSTRY: BRANCH REPORTS.

AGRICULTURE BRANCH.

Mr. W. J. S. Sloan, Director of Agriculture.

The year was not wholly favourable for agriculture. In some areas, heavy rains, floods and cyclonic winds caused severe losses, but the State again enters the winter with ample subsoil moisture, abundant water supplies and prolific growth of pastures.

The January flood in the Inglewood-Texas-Yelarbon area was a major disaster for the tobacco growers and few crops were harvested. Autumn potato plantings in southern Queensland were reduced by waterlogged soils and the overall yield was well below average.

The maize crop on the Atherton Tableland was severely damaged by a cyclone in March and one of the poorest yields on record is anticipated. Very poor harvesting conditions caused a heavy reduction in the peanut harvest.

Widespread soil erosion occurred during the copious summer rains. Portions of the plains country of the Darling Downs, normally regarded as safe from severe erosion, were badly affected by runoff water from the hilly country.

On the other hand, pastures and fodder crops made luxuriant growth, the 1955 winter crops were mainly excellent, and good yields from summer crops were reported from a number of districts.

The total area of crops grown in the State in 1954-55 was 2,590,774 acres (excluding 327,456 acres under fallow), showing a rise over the previous year of over 230,000 acres. General agricultural crops (excluding sugar cane) occupied 2,035,253 acres, an increase of more than 200,000 acres, indicating that the major expansion in cultivation in Queensland is now taking place within these crops.

Increase in acreage in 1954-55 was mainly accounted for by expansion of wheat, but barley, canary seed and millets also showed marked rises in acreage.

A lower acreage was planted to wheat in 1955 and the 1956 sowings are expected to be further reduced. This reflects the difficulty in disposing of Australian wheat on the overseas market.

Compensating for the lower wheat acreage is the greater interest in the production of the winter grains, barley and canary seed, and the oil crops, linseed and safflower.

The 1954 barley crop was a record but was easily surpassed by the 1955 crop (115,000 acres, 3,250,000 bus.). The acreage sown to canary seed is also expanding and the 1956 crop is likely to be the highest on record.

The financial return from linseed has attracted wider interest and the 1956 sowings are expected to be the largest since the crop was introduced to Queensland. Safflower is a new oil crop for commercial production on the Darling Downs. As the result of an assured market for limited production, 1956 sowings are expected to exceed 3,000 acres.

Tobacco plantings again increased in 1955-56 to a record figure, but flooding in the Inglewood-Yelarbon-Texas area prevented record production of leaf. Additional farms will come into production in the Lower Burdekin, where 150 farms in all are expected to be producing in 1956. New growers are also expected in other tobacco-growing districts. A landmark in the progress of the industry has been the establishment of the Tobacco Industry Trust Fund which will provide finance for intensifying research and advisory services for tobacco growers.

Perhaps the most outstanding development in Queensland agriculture in the last decade is the practical interest shown by stock-owners in pasture improvement. Again this year tens of thousands of acres have been sown to improved pastures. The merits of good management of pastures are also being realised on a wider scale.

Steady progress is being made in newly settled districts such as Wandoan and the Springsure-Emerald-Clermont area. It is pleasing to note that most of the settlers are fully appreciative of the need to combine stock raising with cultivated crops.

In this regard the wider interest being shown in conserving fodder as silage and hay is worthy of note. More land-owners are adopting the practice; others who usually conserve fodder are tending to increase their reserves. There is still much scope for further improvement.

Fertilizer use on pastures is increasing, although still small. In 1950-51 about 20,000 acres of fodder crops and pastures were treated. In 1954-55 nearly 50,000 acres received fertilizer applications.

Advisory services remained in heavy demand. Four more field officers received additional training in advisory work at a special school conducted for this purpose.

FIELD CROPS.

The year under review has afforded yet another example of the overwhelming effects of vagaries of climate upon agricultural production in Queensland, and of the great difficulties in achieving stability of production under such conditions. The other major influence on crop sowing is the economic factor, and it is on the interaction of these two factors that our crop production largely depends.

This year has been the second successive year of above-average rainfall in all major agricultural districts of central and southern Queensland. While the percentage excess over average ranged from about 20 per cent. in the Callide Valley to nearly 100 per cent. in parts of the Goondiwindi advisory district, this figure is approximately 40-50 per cent. for the majority of districts. In some districts, above-average rain was received in as many as nine months of the year; however, in most areas, the big increase in total recordings has been due to the prolonged heavy rains of the December-April period.

Both major and minor floodings occurred repeatedly in virtually all agricultural districts, and in certain areas soils which had been saturated for months were not yet surface-dry by the end of May. The incessant autumn rains greatly delayed the harvesting of grain sorghums, particularly on the Darling Downs; this delay resulted in considerable weathering and loss in germination of the grain. Waterlogging of soils also caused serious losses in peanuts and multiplied harvesting difficulties with that crop. While floods were responsible for scattered crop losses on alluvial country in all districts, they resulted in the complete loss of a major section of the tobacco crop of the Inglewood district. Another district in which heavy losses were sustained is the Atherton Tableland, where maize crops were badly battered in a cyclone.

Yields were generally good for winter crops during 1955, since plantings were carried out on soils which were well supplied with stored water. Production from summer crops, on the other hand, has been most variable. Summer grain and fodder crops on the higher and better drained soils have given exceptionally good yields, but these benefits have been more than counterbalanced by harvesting difficulties and crop losses elsewhere.

The most important effect of economic pressures upon crop production is that evidenced on grain farms on the Darling Downs. Here profit margins with wheat have shrunk so greatly that farmers are exploring every possible alternative crop. The 1955 season saw a reduction in the wheat acreage under planting conditions which were ideal for the crop. This reduction was balanced to a considerable extent by a sharp rise in the areas devoted to barley, linseed and canary seed. These trends are expected to be even more marked in 1956.

A further example of the importance of the economic factor is afforded by such crops as soybeans and safflower. In each instance sufficient basic agronomic work has been done to enable the establishment of a new crop industry. However, neither crop can have any real significance for Queensland farmers until such time as long-time assured markets are found.

Agriculture Branch officers, in addition to providing an advisory service on all phases of crop production, are handling plant breeding (particularly in wheat, oats, sorghum, cotton and cowpeas), varietal and strain testing, soil fertility and weed control investigations, and pure seed production of a number of crops.

One important phase of pure seed work is that of seed certification, particularly in the crops of the sorghum group and hybrid maize. During the year under review, Branch officers were responsible for the handling of 1,032 acres of certified sorghum and Sudan grass and 265 acres of hybrid maize. The work entailed occupied well over half of the time of certain officers stationed in the major seed-producing districts. While it is considered that this work represents a major contribution of the Branch to our rural industries, it is felt that future trends should be towards a contraction of this service. Such contraction would involve the Department's concentration on producing much smaller quantities of elite or mother seed, and the industry's acceptance of a greater measure of responsibility in producing farmers' planting seed. Schemes of this nature already exist in respect of wheat, cotton, peanut and other crops.

Wheat.

The wheat season of 1955 was a most favourable one for grain yields. Planting was carried out on soils which were amply supplied with stored moisture, and, while early spring rains benefited the growing crops, the harvest weather was generally warm and dry.

In many districts, conditions suited the development of rusts (both stem and leaf) and in many instances susceptible varieties suffered considerable loss. It is possible that a new form of stem-rust may have appeared in Queensland last season, since a number of varieties which were hitherto resistant showed varying degrees of attack. The most noticeable change in reaction was that of Celebration, which for the first time showed a considerable degree of rusting. Festival was attacked to a lesser degree, while minor infection appeared on Spica. Changes such as this are very disturbing but there is consolation in the reports that the Queensland varieties Spica and Lawrence still appear highly resistant, and that the New South Wales variety Festival also retains a useful degree of resistance.

Considerable concern was also evinced at the widespread occurrence of a Fusarium crown rot. However, while this disease did cause serious loss in individual areas, its effects were largely offset by the fact that yields generally were very good.

The harvested crop is estimated at 15,000,000 bus. from a little over 600,000 acres, at an average yield of 24-25 bus. per acre. The principal varieties were Spica, Charter, Festival, Lawrence and Gabo in that order; these between them occupied nearly 70 per cent. of the total acreage.

A successful series of wheat varietal trials provided useful information to support Departmental recommendations. These trials also assessed the field characters of a number of new crossbred selections. At the present time, a few of these selections have given excellent results in terms of yield capacity and rust resistance; these now depend, for their release, on a favourable quality test.

In the plant breeding field, the back-cross method of breeding has now resulted in the incorporation within one variety (Puora) of three different factors for resistance to stem-rust, leaf-rust and mildew. Other similar projects under way are aimed at introducing leaf-rust or stem-rust resistance into other susceptible varieties which are otherwise high yielding and of good quality.

The 1956 season marks the commencement of more concerted investigations into soil fertility problems in certain areas of the Darling Downs, with particular reference to improving the protein content of the wheats from these areas.

Oats.

As has been customary for many years past, approximately 90 per cent. of the State's oat crop is grown for grazing purposes. The crop is preferred by dairymen to all other cereals for winter grazing by dairy cattle, and Departmental trials have shown it to be markedly superior to wheat in this respect.

Under these conditions, the crop's most serious diseases are those which reduce foliage bulk, viz., crown-rust and Victoria blight. No trouble is experienced with Victoria blight if varieties of Victoria parentage (such as Vicland, Acacia and the so-called Bligh oats) are not grown under wet coastal conditions. The variety in current use which is most highly resistant to crown-rust is the Department's new release, Bovah. This variety and Benton, an American introduction, were the two outstanding varieties in trials carried out last season at both Gympie and Moggill. As it is probably only a matter of time before these two varieties succumb to some new form of rust, breeding work to develop a series of new rust-resistant oats is now being intensified.

Barley.

Economic factors have been responsible for a greatly increased production of barley, particularly on the Darling Downs. In this district, during 1955, the crop ranked second in importance to wheat, though in State-wide production grain sorghum was considerably higher.

Production is based almost entirely upon malting-type barleys such as Prior and Chevalier, of which seed stocks have been introduced from southern States. Prior barley has a very high reputation for malting quality provided it is grown and handled satisfactorily. Grown in Queensland it has provided grain which is acceptable both to local maltsters and to the export trade. While there is no present indication of the necessity for an active breeding programme, Departmental attention is being directed towards plant introduction, varietal testing and pure seed maintenance.

Maize.

As has been indicated earlier, the 1955-56 maize yields should be good except on the Atherton Tableland. In the main producing districts of south-eastern Queensland, maize crops generally stood up better to the wet conditions than most other summer crops. In favoured areas, where good husbandry was practised, a number of yields exceeding 100 bus. per acre were recorded.

The use of hybrids is now firmly established in all maize-growing districts except the Atherton Tableland. In some areas, such as the South Burnett, nearly all maize fields are sown with hybrid seed. Even in conservative districts such as the Lockyer Valley, it is estimated, over 50 per cent. of the total acreage is now sown to hybrids. Certified seed production of 10 Q hybrids on 29 farms was handled during the season.

The 1954-55 season saw the second of a series of hybrid varietal tests ranging from centres as far north as Mareeba and Atherton to Beaudesert, Boonah and Warwick in the south. These tests fully corroborated those of the previous year in the following important respects:—

(1) Suitable Q hybrids can now be recommended for all districts except the Atherton Tableland.

(2) The Grafton (GH) hybrids show a similar range of adaptability.

(3) The DS and NEH hybrids are totally unsuited for Queensland conditions, except in the southern portion of the Darling Downs.

Sorghum and Sudan Grass.

The 1955-56 season was generally favourable for sorghum production. There were, however, two major drawbacks. In the first place, the dry late spring prevented an early general planting, with the result that a number of the later plantings were very subject to midge attack. In the second place, particularly on the Darling Downs, many excellent mature crops had to stand in water for weeks on end, with resultant loss of grain and deterioration in quality.

In the major producing districts, certified seed is in great demand, and it is estimated that over 80 per cent. of the grain sorghum crop is now planted from certified seed or seed one generation removed. On the Darling Downs, the varieties in major use are Alpha, Early Kalo and Martin. In most other districts Alpha and Wheatland are the principal varieties grown, with Martin and Caprock also in demand.

A feature of the seed certification programme this year is the planting of six acres for the production of the sweet sorghum varieties Sugardrip and Italian. This is evidence of a greatly increased demand for reliable seed of these fodder sorghums, due largely to the requirements of fodder conservation on western grazing properties.

The outstanding development in the Sudan grass field has been the rapid replacement of common Sudan grass by the Department's recent release—Sweet Sudan. The latter is preferred as a grazing crop in all districts of southern and central Queensland, its main features being higher palatability to stock and resistance to certain leaf diseases. In addition, Sweet Sudan is a more reliable seed producer than Roma or other standard varieties, having on more than one occasion produced 27 bus. per acre.

The sorghum breeding centre is now located at Biloela Regional Experiment Station, and here some dozens of crossbred strains of sorghum and Sudan grass are now being tested to determine their suitability for naming and release.

Lucerne.

Losses of some stands on the heavier soils in the main lucerne-growing areas occurred from waterlogging due to the prolonged wet conditions of late summer and autumn. However, the excellent performance of lucerne as a fodder crop is expected to influence extensive replantings next season. Wider interest is being shown in lucerne, not only for hay but as a grazing crop also.

Cotton.

An average yield of 370 lb. of seed cotton per acre was obtained for the 1954-55 season. This yield was obtained from slightly more than 15,000 acres, and represented 4,386 bales of lint. The lint percentage of 38.29 per cent. is the highest on record, exceeding the figure of 38.12 per cent. obtained in the 1952-53 season. This figure is mainly the result of breeding and selection work; unfavourable seasonal conditions which affected seed development also influenced the ratio of lint to seed.

Due to unsuitable seasonal conditions during harvesting, the percentage of lower grades was relatively high, cordage and bedding grades representing 46.8 per cent. of the crop, compared with 53.2 per cent. of the higher knitter and weaving grades.

Seed for a planting of 18,000 acres was supplied for the 1955-56 season. Prolonged wet weather in February and March, however, caused severe damage to the cotton areas in the Theodore district, where all irrigated crops were destroyed by flood waters. The continued wet weather has kept the cotton growing and frosts are needed in most areas to force the crop to maturity.

Interest in cotton growing has extended to the Darling Downs, where over 2,000 acres were planted last season, mainly in the Jandowae district. Two private cotton pickers have been purchased in this area, where prospects for the crop appear good. An increased acreage of cotton in this area appears certain next season.

Potatoes.

In the main potato-growing areas (Lockyer, Fassifern, and Brisbane districts) higher-than-average yields (approximately 5 tons per acre as compared with 3 tons per acre) were obtained from the spring crop, which was harvested under good weather conditions. The autumn crop suffered considerably from prolonged wet weather and light yields of 2-3 tons per acre were obtained. Ruling prices (£70-£100 per ton), however, were approximately twice as high as for the spring crop and compensated growers for the reduced yields.

Sebago is still the most popular variety (approximately 80 per cent. of plantings), followed by Exton. The newer varieties, Crana and Awaba, are not widely grown. Sebago is preferred for its ability to yield well, its relative freedom from scab, its good shape, and the availability of seed.

Onions.

The main 1955 onion crop was planted late because of continued wet conditions in February-March. Yields for the crop were lighter than usual (4-6 tons per acre as compared with 7-8 tons per acre), but higher prices per ton enabled satisfactory returns to be obtained. Seed crops were affected by mildew but sufficient seed was produced to meet local demands.

Early plantings in the 1956 onion crop were almost entirely destroyed by the prolonged flood rains of the February-March period. Heavy sowings were made in April and May and an area of 2,000 acres is expected.

Some interest is being shown in this crop on the Darling Downs, where alternative crops to wheat are being sought. Two areas of approximately 45 acres each have been planted as well as a number of smaller areas.

Canary Seed.

An increased acreage was sown on the Darling Downs during the past season. The estimated area of 30,000 acres produced an estimated yield of 11,000 tons of seed.

To provide a large-seeded strain sought by the export market, seed of three strains was introduced from Morocco. Seed was also imported by commercial seed firms. Seed of these introduced strains will be increased for field testing and comparison with local material.

Cowpeas.

The prolonged wet conditions of late summer and early autumn provided favourable conditions for the stem-rot organism (*Phytophthora* sp.), which practically wiped out cowpea plantings of the common varieties, Poona and Reeves. The varieties Giant and Cristaudo, which have in the past shown considerable field resistance to this disease, readily succumbed this season.

Several introductions are available which exhibit partial or complete resistance to stem-rot disease. The variety CPI 11044 is the best agronomic type and is proposed for immediate seed increase and release to farmers.

A breeding programme has also been initiated to produce good agronomic types resistant to stem-rot.

Peanuts.

An area of about 33,000 acres was sown during the 1955-56 season, and a yield of 13,000 tons is anticipated. Wet weather during aumumn not only caused harvesting difficulties but also reduced yields. In the Burnett district, which normally produces about two-thirds of the crop, a total yield of approximately 7,000 tons is expected. Some crops were a complete loss due to rotting of the mature peanuts before the plants could be pulled. Harvesting conditions were more favourable in the northern peanut growing areas (mainly Atherton Tableland), where approximately 15 per cent. of the crop is grown.

It is estimated that about 50 per cent. of the crop in the South Burnett was stooked, the remainder being left to cure in double rows as pulled or in windrows formed with side-delivery rakes. The chief harvesting difficulty was concerned with operating machinery on the waterlogged ground. For the same reason, losses occurred in stooked peanuts, rotting spreading upwards from the base of the stook.

Over a period of years a number of peanut introductions have been made. Tests to date with Virginia Bunch types have not shown that any of the newer strains are superior in yielding ability to the commercial strain in use at present. A number of the Red Spanish types, however, give promise of yielding ability superior to the present commercial strain. These, however, have white kernels and may not be readily accepted by the trade.

Tobacco.

The past season was rather similar to the preceding one. Weather conditions early in the season favoured blue mould development, the extended wet season produced thin bright leaf, and yields were relatively light. A high proportion of lower leaves was lost due to the effects of blue mould and hail.

Insect pests were kept under control on all but a few neglected properties. The campaign against tobacco pests was aided by publicity given at appropriate times to rising egg counts.

Blue mould still remains a serious hazard whenever seasonal conditions favour its development. Control can be obtained in seedbeds with benzol fumigation, but control of field infection is a difficult problem.

Most operations concerned with tobacco production have altered little until recently. Now there is keen interest in better methods and in mechanising operations. This is noticeable with power sprays, soil injectors, high-clearance tractors and cultivation

Plate 1.—A Tobacco Crop on the New Settlement on the Lower Burdekin.

implements. In curing there is a marked swing towards the use of liquid fuel burners and in the Lower Burdekin district particularly it is now difficult to find a wood-fired unit.

Floods in the Inglewood-Yelarbon-Texas area caused an estimated loss of approximately 1,000 tons of cured tobacco. Up to this stage a record yield from a record planting in Queensland was anticipated. Present prospects indicate that there will be a record planting in 1956-57.

PASTURES.

Yet another year of above-average rainfall has resulted in heavy pasture growth over most of the State. Only localised areas suffered from seasonal dry periods, while lowlying areas, particularly in the south-west, have been waterlogged for months with a resultant increase in sedge growth and a temporary deterioration in the native pastures.

A feature of the year was the vigorous spread of various native species, especially Queensland blue grass (*Dichanthium sericeum*), forest blue grass (*Bothriochloa intermedia*), early spring grass (*Eriochloa pseudoacrotricha*), and native legumes such as emu grass (*Psoralea tenax*), Bullamon lucerne (*P. eriantha*), *Rhynchosia minima,* and glycine pea (*Glycine tabacina*).

The advantages of establishing and maintaining sown pastures in many districts are recognised, and the question of reducing costs of establishment in comparison with returns is now the major problem. The increasing demand for young beef is emphasising the need for improved pastures which will give a longer grazing season of high quality fodder, thus reducing the period during which animals remain at constant weight or actually lose weight.

Approximately 200 pasture trials and demonstrations are now established throughout the State, including 140 being conducted on dairy farms with the financial support of the Australian Dairy Produce Board.

Conditions have been favourable for pasture establishment. Approximately 40,000 acres of sprayed, cleared and/or burnt-over brigalow country were sown from the air during the year, Rhodes grass being the main grass used, with some green panic and a small quantity of buffel grass. A very successful result was obtained at Wandoan on 1,000 acres of pulled brigalow scrub from an aerial sowing of 1,300 lb. of Rhodes grass seed.

A new buffel grass planter has been patented and an existing grass-seed planter was modified. Both will plant buffel grass seed without a diluent and without the need for constant stirring during planting. This represents an important advance in pasture establishment and will assist in the more efficient sowing of this grass on the extensive scale necessary in pastoral Queensland.

The second pasture improvement competition sponsored by the Royal National Agricultural and Industrial Association with the assistance of Departmental officers had 85 entries, three times as many as the first competition. A third competition for the 1956-57 season has been organised and this will include a class for sown pastures in the drier areas of the State.

Pasture Species.

The position with regard to pasture species in general use remains virtually unaltered from that obtaining in 1954-55.

Buffel grass continues to be the centre of attraction in the State owing to its general adaptability to most areas receiving less than 30 inches of rain per year. Three types are available on the market. These are Gayndah strain, Type D and Western Australian. Type D is more vigorous than Gayndah strain and in the 25-30 inch rainfall zone can be expected to produce much more bulk. Under limited test its protein level has been slightly less than that of Gayndah strain at comparable stages of growth. Its suitability for the more arid areas is not known.

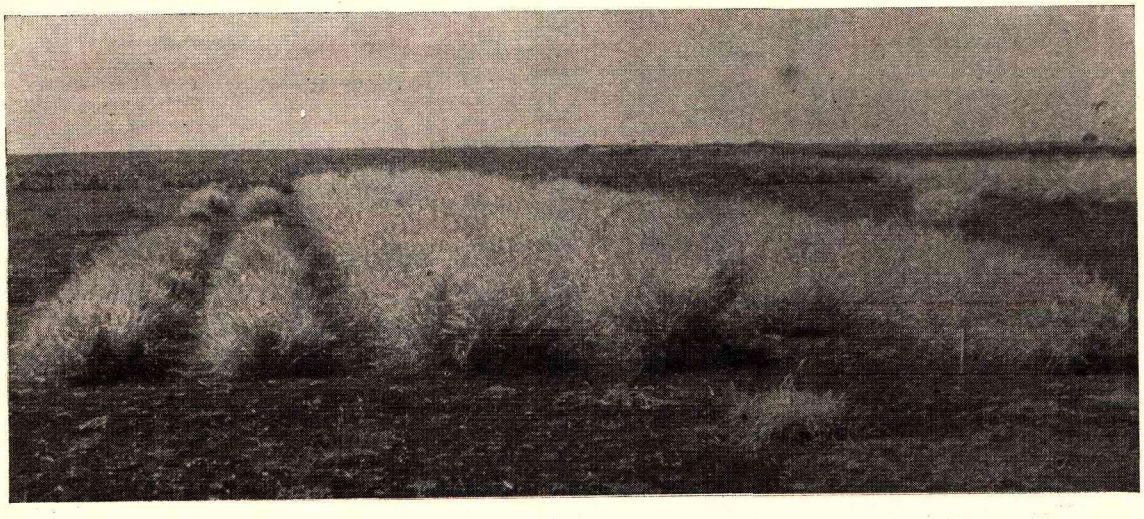


Plate 2.—Buffel Grass at Emerald. Western Australian buffel on left, Type D in centre and on right.

Present recommendations for buffel grasses are as follows:—

25-30 in. rainfall zone—Type D and Gayndah strain.

20-25 in. rainfall zone—Gayndah strain.

15-20 in. rainfall zone—Gayndah strain and Western Australian strain.

Under 15 in. rainfall zone—Western Australian and Gayndah strain.

Plate 3.—Buffel Grass in the Barcaldine District Established by Broadcasting on Ploughed Land and Trampling in by Stock.

Rhodes grass (*Chloris gayana*), green panic (*Panicum maximum* var. *trichoglume*), buffel grass, lucerne and phasey bean (*Phaseolus lathyroides*) are capable of providing valuable pasturage over a large portion of the State. Reports from districts ranging from the Darling Downs to Rockhampton indicate that each of the three grasses will combine well with lucerne and/or phasey bean. In the drier areas more suited to buffel grass none of the available pasture legumes are satisfactory. Where climatic conditions are suitable for all three grasses the usual practice is to sow Rhodes grass on the most fertile soils and green panic on the intermediate types, with buffel proving most valuable on the poorer and drier soils.

A winter and spring grass which has achieved great popularity is a strain of perennial prairie, known as Priebe's perennial prairie, which has persisted for many years on parts of the northern Darling Downs. Locally harvested seed was sown on at least 4,000 acres in the last 12 months.

Phalaris remains the most successful winter grass in the Warwick, Stanthorpe and Texas district, with the ryegrasses providing good first-year feed but giving irregular regeneration.

While the legume position overall in the State is much less satisfactory than that for the grasses, full use is not being made of the valuable pasture legumes which are available. Lucerne remains the State's most valuable all-purpose pasture legume, with phasey bean, centro, Townsville lucerne and stylo assuming increasing importance.

Following the development of more efficient rhizobium cultures, subterranean clover showed promise on the lighter soils of the southern Darling Downs and on heavier, lowlying soils on the northern Darling Downs. Various annual medics, particularly barrel medic (*Medicago tribuloides*), are being used over a wide range of southern Queensland.

Pasture Seed Production.

The pasture seed position remains acute for most summer-growing pasture species, but there are indications that supplies of many of these will increase steadily with a resultant decrease in prices. The Department has continually stressed the need for stock-owners to raise their own pasture seed requirements, particularly where it is desired to establish large areas of grassland. This practice is being adopted in several western districts for buffel grass and should become normal procedure for all extensive users of sown pastures.

Home-made seed harvesters capable of harvesting buffel grass seed at costs ranging from 8d. to 2s. 9d. per lb. have been developed in south-western and north-western Queensland. It has also been demonstrated that buffel grass seed can be harvested successfully with old wheat strippers, a few of which are available at low prices. Rhodes grass and green panic can also be harvested mechanically.

Seed merchants have made a major contribution towards increasing the quality of green panic seed by careful machine dressing and it is now possible to obtain seed samples of this grass with 20 per cent. germination.

With the release of Type D buffel grass, which has seed not readily distinguishable from Gayndah buffel grass although its habit of growth is very different, the need has arisen for a pasture seed certification scheme. These two buffel grass varieties will be the first species embraced in the proposed new scheme.

Seed of some winter pasture grasses has also been harvested in Queensland. These include Priebe's perennial prairie, phalaris and Wimmera ryegrass.

Little legume seed is hervested in Queensland. The mechanical harvesting of phasey bean is being encouraged but the excessively wet conditions this year spoilt the harvest. Townsville lucerne is harvested in bulk in Queensland, mainly in the Townsville district. The technique of harvesting seed of this species in the Gympie area is also being examined.

Seed of two important tropical legumes, centro and stylo, is now imported in commercial quantities. The cost of stylo seed is high. There is need for the production in Queensland of seed of this legume and of other promising legumes such as *Glycine javanica*.

Fertilizer Trials.

The marked responses being obtained in Queensland from fertilizer trials on pastures have resulted in greatly increased use of fertilizers, particularly on the southern Darling Downs and in south-eastern Queensland. Superphosphate is the most widely used fertilizer at present. It will continue to be a major component of soil amendments on account of the very low phosphate status of many of Queensland's soils.

Table 1 shows the increase since 1946-47 in area of pastures treated and the increase in amounts of fertilizers used. It will be seen that there has been a tenfold increase in both cases.

TABLE 1.

AREA OF PASTURES TOPDRESSED AND AMOUNTS OF FERTILIZER USED.

Year.	Area Topdressed.	Amount of Fertilizer Used.	
		Super.	Other.
	Acres.	Cwt.	Cwt.
1946–47	1,354	1,617	529
1951–52	2,811	3,489	2,718
1953–54	10,637	12,484	4,329
1954–55	13,810	17,615	5,666

The use of massive treatments of superphosphate (10 cwt. per acre) has produced startling results on the narrow-leaf carpet grass–paspalum–white clover pastures of south-eastern Queensland. In this area the presence or absence of lime, potash and one or other of the trace elements manganese, copper, magnesium, molybdenum, boron and zinc has no effect without superphosphate. It is also known that in some cases superphosphate alone will produce marked increases in yield.

Table 2 illustrates the type of results obtained during the 1955-56 season on South Coast pastures. It is also known that at Worongary 3-4 cwt. of superphosphate per acre will produce similar results to those recorded for 10 cwt. per acre.

TABLE 2.

PASTURE RESPONSE TO SUPERPHOSPHATE.
(Grass yields not available from Worongary.)

Treatment.	White Clover Growth (Spring 1955).		Yields of Grass in following Summer (1956).	
			Woongoolba.	
	Woongoolba.	Worongary.	Green Weight (tons/acre).	Proportion of Paspalum to Carpet Grass.
10 cwt. Super-phosphate per acre	6–9 in.	9–12 in.	9·56	9·4 : 1
Without Super-phosphate	1–2 in.	1 in.	5·4	1·7 : 1

At Cooroy, on a narrow-leaf carpet grass dominant pasture on a shallow yellow clay soil, the use of superphosphate at 10 cwt. per acre maintained vigorous clover growth and increased the proportion of paspalum in the pasture. Those plots receiving no treatment or receiving lime, potash and six trace elements but not superphosphate are almost pure stands of the carpet grass. The effect of the superphosphate is still obvious after three years.

Three fertilizer trials were laid down in south-eastern Queensland to investigate the practicability of using sulphate of ammonia on grass pastures without legumes in order to increase yields. The pasture types chosen are paspalum on the Coomera River, couch grass at Moggill and narrow-leaf carpet grass at Cooran. Each project involves a 12-acre grazing trial and a small cutting trial. Different levels of nitrogen, up to 4 cwt. of sulphate of ammonia per acre, are being used.

Results from work in the Warwick-Stanthorpe-Texas area indicate that pasture response to superphosphate is marked on the lighter soils of granitic or sandstone origin, but on most traprock soils response is variable.

Productivity of Improved Pastures.

Reports from many districts indicate that carrying capacity and/or productivity are being increased where pasture improvement is being carried out.

In the Mackay district, it is claimed that land costing £16-20 to clear and sow to pasture is capable of carrying 1 beast to 2 acres, compared with 1 beast to 7 acres for untreated country. In the Warwick district, sown

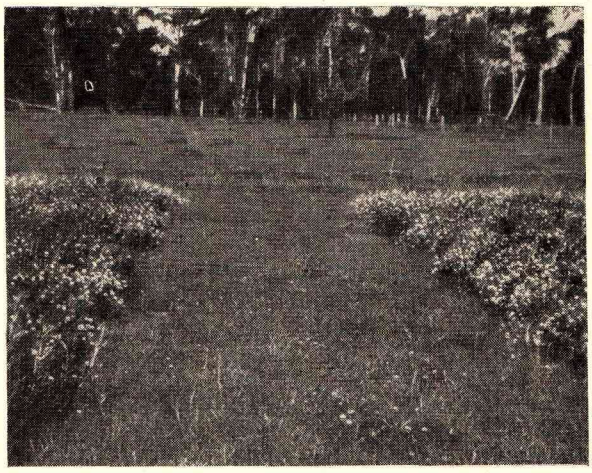


Plate 4.—Pasture Fertilizer Trial at Worongary, South Coast. The application of superphosphate to the plots on each side has stimulated clover growth, while the centre area not treated with superphosphate has very little clover.

pastures on the traprock, granite and sandstone country are enabling stock-owners to raise their own lambs, to fatten for market wethers otherwise sold as stores, and to fatten cattle where only stores were carried previously. One example of increase in stock values is the case where culled wethers normally fetching about 45s. off native pastures brought 72s. 6d. after a few months on improved pastures. In the Wandoan district, Rhodes grass pastures are giving a grazing season 3 months longer than native pastures.

Irrigated Pastures.

The acreage planted to irrigated pastures has increased, mainly on dairy farms. The need for irrigation was light except for a limited period in December, 1955, and January, 1956, when generally dry conditions prevailed. Continuous wet conditions from the end of January to June, 1956, depressed pasture yields and on alluvial land inundation by flood waters caused temporary loss of stand.

The capacity of clovers to regenerate from self-sown seed was again demonstrated. Many areas flood-damaged in February are now providing a large quantity of highly nutritious forage. Paspalum also regenerated very satisfactorily, while the limited plantings of reed canary grass which survived flooding indicate the suitability of this grass for inclusion in pasture mixtures where periodical inundation occurs.

A good assessment of productivity of irrigated pastures can be made by examining the increase in milk or butter returns when irrigated pastures provide the bulk of the forage. In the Toogoolawah district a

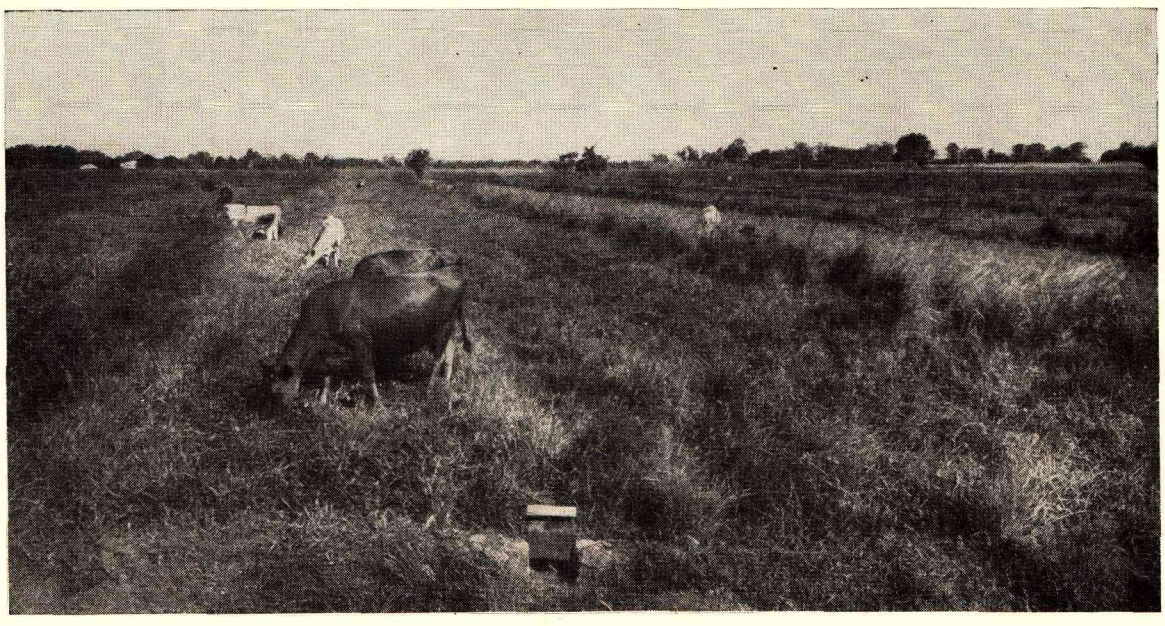


Plate 5.—Irrigated Pastures of Para Grass and Centro at Home Hill, on the Lower Burdekin.

dairy farmer planted 15 acres of pastures in August 1953. Production at that time averaged 120 lb. butterfat per cow, the herd having limited grazing on a lucerne field. The herd was then placed 14th in regard to production in the local herd recording group. During 1954, when grazing of irrigated pastures commenced, production per cow rose to 216 lb. butterfat and the herd was third in the recording group. Since October 1955 the herd has been either first or second in the monthly herd testing figures and an average of over 1 lb. butterfat per cow per day has been attained. This immediate increase of nearly 100 lb. in butterfat production per cow per lactation for a 30-cow herd grazed on 15 acres of irrigated pasture has given a substantial income lift from a mediocre herd of dairy cows.

In a number of irrigated pastures continuous rain during late summer was responsible for rank growth of grass species such as paspalum and Rhodes grass. Stocking to a capacity to reduce this heavy growth was not possible and suppression of clover growth occurred. The value of mowing rank growth during midsummer was demonstrated, a rotary type mower being suitable as a higher cut can be made with this implement. Stock refused to eat tall seeding grasses but when the pastures were cut the mown grass was readily eaten after haying for 24 hours. The fresh growth from mown pastures was readily eaten and in consequence selective grazing of clovers was reduced.

Further work with contour ditch irrigation has shown that efficient use of water is possible with this relatively simple method of surface irrigation. Some 20 pastures are now irrigated by the contour ditch system.

"BRIAN PASTURES" RESEARCH STATION.

The first turn-off of steers from a grazing trial assessing the productivity of pasture mixtures composed of lucerne and phasey bean with either Rhodes grass, green panic or buffel grass showed promising results. In this initial grazing year, little difference was displayed between the pasture mixtures, which were grazed at the rate of 1 beast to 4 acres under a system of eight weeks' spelling and two weeks' grazing. Weight gains were contrasted with those of a similar group of steers grazing on native pastures at 1 beast to 8 acres. Liveweight figures are shown in Table 3.

TABLE 3.
ANIMAL PRODUCTION FROM SOWN AND NATIVE SPECIES AT "BRIAN PASTURES."

—	Sown Pastures.	Native Pastures.
	Lb.	Lb.
Average liveweight of steer 7–1–55 ..	609	595
Average liveweight of steer 20–1–56 ..	1,077	889
Net liveweight gain per acre	117	37
Average liveweight gain per day ..	1·24	0·78

An important benefit from the improved pastures was the absence of winter drop in weight such as occurred on the native pastures. The average carcase weight of the 15 animals from the sown pasture plots was 633 lb. dressing 58.4 per cent. All these carcases received superior gradings.

The range of pasture species receiving their initial testing in rows and sward plots was increased. The nursery collection now includes 80 samples of buffel grass, in which 11 main types have been distinguished. An area of browse plants was established.

In a plant nutrient trial a small but highly significant response to the application of molybdenum was recorded in the growth of phasey bean, mean green weight yield being increased from 7.45 to 8.34 tons per acre.

An experiment to establish lucerne and phasey bean in pasture without final destruction of the native vegetation was conducted. Discing following broadcasting and burning was superior to both broadcasting and drilling into burnt pasture. In another trial to examine the establishment of mixtures of Rhodes grass, green panic or buffel grass with lucerne and phasey bean the most satisfactory results were obtained from sowing in cultivated land following a crop and chisel ploughing after burning.

Various derivatives of 2,4-D and 2,4,5-T were not effective in controlling bloodwood (*Eucalyptus dichromophloia*) regrowth when applied either to the frill of ringbarked trees or as a foliage spray on suckers up to 8 ft. in height.

FODDER CONSERVATION.

Statistics show that for the year ending March 31, 1955, 24,760 tons of silage was produced on 331 holdings, one-third more than in the previous season and more than double the production recorded in most other seasons. Hay and chaff stocks, held on 5,227 holdings, amounted to 156,115 tons, a 46 per cent. increase over the previous season. Compared with Queensland's livestock population, however, these stocks

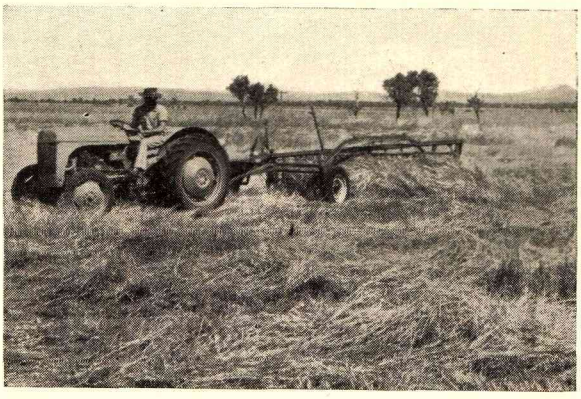


Plate 6.—Raking Native Pasture Hay in Central Queensland.

of conserved fodder are far too small. Much greater quantities are required if the State's herds and flocks are to be protected against recurring droughts and the frequent seasonal shortages of pasture.

Excellent crops of fodder sorghum varieties, Sudan grass and maize were grown and ensiled in all agricultural districts in 1955-56. On the other hand, much hay was lost on account of rain and some crops were over-mature before the ground was dry enough to permit operation of machinery.

There has been an increase in the number of properties on which hay and silage are being stored, as well as an increase in the average amount of fodder conserved per farm. This trend is undoubtedly due in part to the availability of modern fodder harvesting machinery. The Australian manufacture of smaller and cheaper forage harvesters has placed these modern machines within reach of the smaller grazier and dairy-farmer.

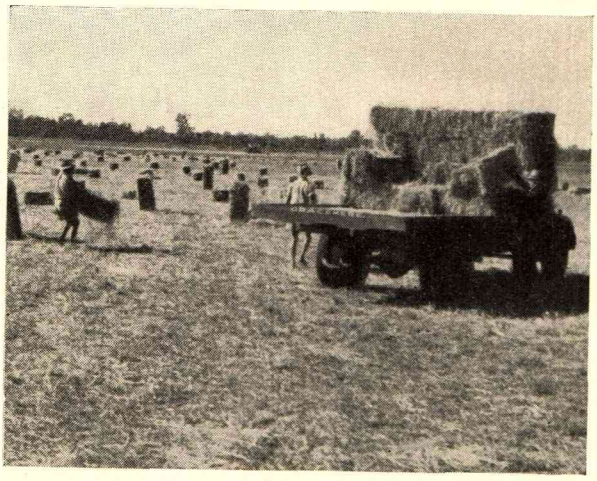


Plate 7.—Loading Baled Lucerne Hay on a Central Queensland Property.

SOIL CONSERVATION.

The devastation due to erosion which occurred this year on the agricultural lands of the State emphasises the need firstly for an overall change to more stable systems of land utilisation, and secondly for the rapid and extensive application of protective soil conservation structures.

The trend reported last year towards improved land use continued, but progress with respect to a changed pattern of land utilisation is far too slow. However, it is pleasing to report that in at least one major district (the Atherton Tableland) serious consideration is being given by farmers to a change from crop monoculture to a diversified farming system aimed at balanced land utilisation.

There is a debit column in the agronomic account for the Darling Downs, as there has been a marked increase in stubble burning. Various reasons were advanced for the wholesale firing of the crop residues, but any immediate justification which appeared to exist was certainly nullified when the wet season rains later caused erosion damage on a scale never before experienced in that region.

Plate 8.—Buckraking Saccaline Fodder Sorghum in Central Queensland.

The rains, however, afforded the opportunity to check on design procedures and to assess the effectiveness of mechanical control measures under conditions of maximum stress. In general, the control effected was good and the technical approach to the problem was proved to be sound. Where the results were unsatisfactory it was attributable to either inadequate maintenance of structures or failure to apply appropriate complementary agronomic measures.

Soil Erosion.

The damage recorded as a result of the heavy summer and autumn rains was beyond any expectation. Channels were eroded in many areas where erosion was not previously a serious problem and the erosion potential of these areas is now considerably greater. This applies particularly to the plains areas of the Darling Downs.

Serious soil losses were recorded in the South Burnett, Atherton Tableland and Isis districts during early summer storms and further erosion occurred on two or three occasions during the late summer rains. The most serious and spectacular soil losses occurred on the Darling Downs. An estimated area of 750,000 acres of cultivated land has been damaged in a region bounded by Toowoomba, Pittsworth, Dalby and Crow's Nest.

Sheet erosion losses of half an inch to 1 inch of soil were common over thousands of acres and many fields lost an average of 3 inches of topsoil. The runoff which caused this erosion also presented serious flooding problems on about 500,000 acres of agricultural land on the black-soil plains. Some areas near Dalby, Mt. Tyson and Cecil Plains have been inundated six times since January.

Extension Activities.

Soil conservation work is probably one of the most exacting fields of agricultural extension activity because it not only involves a drive to induce the whole agricultural community to change to a less exploitative system of farming but it also necessitates the production for each farm of a blueprint for future development.

There is no substitute for personal service to the farmer, because the officer preparing the farm plan must take cognisance of all the factors involved in changing the farm business from exploitative to conservation management and at the same time apply engineering precision in the design and survey of necessary earth structures. There is therefore an upper limit with respect to the total area of land which can be examined, planned and treated by an extension officer in a given time.

Ten field officers who were engaged continuously on soil conservation work have applied protective works to approximately 12,000 acres of land. A further aggregate of 1,000 acres was treated by agricultural advisory officers.

This is by far the best annual effort to date, but unfortunately only a small proportion of the total area of land requiring urgent protective treatment has yet received treatment. Of the total land treated, fields aggregating 5,600 acres were located in the Darling Downs regional area, 4,400 acres in the Burnett region and 3,000 acres elsewhere in the State, including 1,000 acres in the Atherton region.

There has been a substantial increase in the number of earth-moving contractors specialising in soil conservation work and this has assisted considerably in the more rapid application of mechanical control measures. At least 10 contractors now engage in this work in the Darling Downs and South Burnett districts, and local authorities throughout the State assist when their plant can be spared from road work.

Chisel ploughs continue to be a popular implement for cultivation work. Their use has made deep tine cultivation through crop residues more practicable. This is assisting in reducing the erosion potential. Infiltration rates have undoubtedly been improved, initially at least, by these deep-ripping techniques, but observations in the South Burnett have shown that severe erosion can occur on "chiselled" areas if the rainfall exceeds the water-holding capacity of the ripped soil.

Experiences this year justify the standard recommendation that interception structures should be used in conjunction with the chisel plough on sloping cultivation lands. On pasture land, contour chisel ploughing is proving very beneficial by breaking the surface soil crust and facilitating the penetration of rainfall. The hazard mentioned with respect to cultivated land does not apply in this case, since the soil is protected by the pasture vegetation and the runoff which occurs in critical rains does no damage.

Further progress is reported with respect to the establishment of improved pastures on agricultural lands in the Darling Downs, Atherton and South Burnett regions. In only a few instances, however, has the complete rotational cycle been completed, so little information is so far available relative to crops following pasture ley. Where this information has been collected, very obvious benefits have been recorded with respect to soil amelioration and crop yields, particularly in the red soils of the South Burnett and Atherton Tableland.

The key to the soil conservation extension programme on the Darling Downs is the stabilisation of water disposal systems. A vigorous publicity campaign has been carried out during the year in order to stimulate interest by farmers in the use of kikuyu grass for this purpose.

The area of land stabilised with mechanical structures in the Atherton and South Burnett districts has been doubled in the past year and this is attributable partly to the adoption of group planning techniques which stimulate farmer interest, partly to the more ready availability of earth-moving contractors, and partly to a modified approach with respect to waterways which permits the simultaneous installation of both waterways and contour banks.

Mass media have been utilised to the maximum extent in the extension programme and include 44 addresses to primary producers' organisations and others, 18 radio talks and 27 press articles. Instruction was provided at 16 field days and 19 inspection tours were conducted with respect to soil conservation projects in the Darling Downs and South Burnett regions.

Group Planning.

In order to standardise mapping procedures and to facilitate the preparation of group plans, a uniform grid reference system has been adopted for the Darling Downs and South Burnett districts. Maps are prepared

in conformity with this grid on the working scale of 10 chains to 1 inch. Each map covers an area of approximately 5,000 acres and initially records the property boundaries, paddock subdivision and topographic information concerning 30 or more farms. This enables conservation plans for individual farms to be prepared rapidly and facilitates the preparation of group conservation schemes.

The group conservation scheme is the most practical way of achieving rapid application of conservation measures and possesses the marked advantage that community leadership is developed. The Shire Councils could become the spearhead for district soil conservation programmes.

In this connection the Kingaroy Shire Council has established a Soil Conservation Committee which will co-ordinate the activities of the various catchment committees as they are formed and will act as a liaison between these committees and the Shire Council.

Plans were completed during the year for the Bones Knob-Mapee scheme (Atherton). Loans have been granted to the respective Shire Councils for the construction of this and the Booie Road (Kingaroy) scheme and it is anticipated that work will commence on these catchment areas in the coming year.

Investigations and Research.

Four land preparation trials were conducted on the Darling Downs during the year, including one at the Hermitage Regional Experiment Station. Results from the first year of two trials in the Allora district suggest that for the soil type represented the method of land preparation is unimportant provided it is sufficiently thorough to control weeds and permits adequate aeration and moisture penetration.

In the land preparation trial at the Regional Experiment Station there were no significant differences in yields for the second successive year.

In the fourth land preparation trial conducted on the more compact box soils near Dalby, the yields were significantly greater where the land had been deep ripped with a chisel plough (20.6 bus. per acre) or deep ploughed with a disc implement (20.2 bus. per acre) than where they were shallow ripped with a scarifier (17.7 bus. per acre) or shallow ploughed with a sundercut (18.3 bus. per acre). Where the surface soil was maintained in a coarse condition the yield of 20.0 bus. per acre was significantly greater than for the orthodox fine seedbed (18.4 bus. per acre).

These trial results indicate that it is possible on the Darling Downs to apply to erosion-reducing practices of stubble retention, deep working and coarse fallowing without prejudicing yields.

The gully and waterway stabilisation investigations were continued during the year and on the Darling Downs kikuyu grass has proved to be the outstanding grass for this purpose. Ten waterways were selected for trials with the Bermuda sprig planter in September and October last. By February all waterways were completely covered and were ready to receive discharge from contour banks.

Work at Atherton showed that the hard graded surface of unvegetated red soil waterways can stand water velocities of up to 10 ft. per second without scouring and this information has been immediately applied in field practice with very encouraging results. Further work has shown that a good kikuyu waterway can stand velocities of 10.6 ft. per second without damage. Retardance co-efficients determined during these investigations will have a wide application in design work.

Runoff measurements made at the Kairi Regional Experiment Station showed that the highest runoff occurred in the continuous maize plots and was six times that of the grass plot, 12 times that of the lucerne-grass ley plot, and 21 times that of a very roughly ploughed plot.

AGRICULTURAL MACHINERY.

The marked improvement during the year in the supply of all agricultural equipment has enabled the demand for machinery to be met by all distributors with a minimum of delay.

The interest being shown by stock-owners in fodder conservation has resulted in increased sales of forage harvesters and ancillary equipment.

Quick coverage of waterways by vegetation is an essential feature of soil erosion control in this State. Advantage was taken of the loan of a sprig planter imported from America by the Department of Primary Industry for this purpose. As a result of successful trials in planting kikuyu grass in waterways, negotiations are now taking place for the manufacture of these machines in Australia.

Further mechanisation in the tobacco industry is being studied. The Cockshutt transplanter and Bowen Auchincruive soil injectors for nematode control are undergoing trials in tobacco districts.

The artificial drying of peanuts to hasten harvesting operations and improve nut quality is receiving attention. With the assistance of the Department of Primary Industry it is likely that imported platform driers will undergo trials next year.

The demand from primary producers and trade organisations for advice on agricultural machinery problems continues to increase.

SOUTH JOHNSTONE EXPERIMENT STATION.

Weather conditions were reasonably favourable throughout the year, August being the only month in which less than 3 inches of rain fell. A cyclone occurred in March 1956, but the strong wind was not associated with heavy rains.

Pastures.

The rotational grazing trial was concluded after 10 years. Carrying capacity has ranged from 1 beast to 1.5 acres to 1 beast to 1 acre. Pasture composition has changed in a number of paddocks.

The overall results clearly showed that common Guinea grass, purple-top Guinea grass and para grass, together with the legume centro, were the best pasture species. Para grass was not planted but invaded the paddocks, and after 10 years now provides much of the grazing in the wetter parts of the fields. Molasses grass and legumes calopo and puero were less valuable. Molasses grass did not persist effectively, calopo was not very palatable, and puero, although quite palatable, was rather too vigorous for the grasses.

Grazing of the herd for 3-4 days every five weeks was satisfactory. Steers two years old made liveweight gains of up to 500 lb. a year on such pastures. At present 10 2-acre fields are being planted with guinea grass, para grass and centro to examine the best system of pasture management.

Carrying capacity was varied on the continuous grazing trial at Utchee Creek according to the seasonal abundance of feed. Some reserve of feed was accumulated in the field during the wetter months, but was not enough for the drier months and the stocking rate was reduced. The average carrying capacity (stylo did not persist) was 1 beast to 2.5 acres for molasses grass; 1 to 1.33 for para grass and centro; 1 to 1 for guinea grass and centro; 1 to 1.33 for a pure guinea grass stand; and 1 to 2 for the molasses and centro pasture mixture.

This trial confirms evidence that guinea grass, para grass and centro form the best pastures and that the growth of centro with a grass appreciably improves the carrying capacity.

The palatability trial with para, guinea and molasses grasses and *Brachiaria decumbens* was grazed. Para grass was the most palatable with molasses grass a close second. Young growth of *B. decumbens* and guinea grass was grazed but not older growth. Para and molasses grasses were soon invaded by the less attractive *B. decumbens* when grazed.

Elephant grass was established in a small area to observe its behaviour as a pasture. It was grazed four days a month at 11-17 steers per acre, and mown after every third grazing. The grass was over-sown with centro in January, 1956. The elephant grass alone was very productive and it may be improved by centro.

Observations show that stylo will replace blady grass (*Imperata cylindrica*) where the land is ungrazed and protected from fires. A preliminary study of several strains of *Rhizobium* isolated from centro did not show any differences in their efficiency.

Tea.

The hand-plucking versus machine-harvesting trial was concluded. Leaf was mechanically harvested without any loss of quality, but the annual yield of dried tea of about 1,300 lb. per acre with hand plucking was reduced to little more than 1,000 lb. where the machine was

used. The experimental machine in use, a modified electrically driven hedge clipper carried by the operator, cuts harvesting costs by only 50 per cent.

The tea hedges—three, four and five rows of plants either 1 ft. or 2 ft. apart and established between 1951 and 1953—have been maintained. These hedges will be ready for large-scale mechanical harvesting when a suitable machine is evolved. *Desmodium heterophyllum* has proved to be a better ground cover than *D. triflorum*. *Gliricidia maculata* was unsuitable as a shade tree between the hedges.

The old and new seed gardens were maintained but the seed crop was lost in the cyclone. The old plucking area was thinned to provide another seed garden. Vegetative propagation studies are projected so that eventually supplies of young plants will be available if required for commercial planting.

Seed Production.

A study of the low viability of guinea grass seed was begun. Purple-top guinea grass yielded seed at the rate of half a ton per acre in the summer, but the viability was very low.

The puero seed increase plot flourished before the March cyclone, which ruined the harvest.

A rice seed increase plot failed because of cyclone and bird damage.

Miscellaneous.

The named specimen plots of tropical grasses, legumes and other plants were maintained. They were appreciated by visitors.

Means of eradicating wild tobacco (*Solanum auriculatum*) from pastures were examined. Power kerosene applied to the ground around the base, by frilling, or by swabbing the cut stem was quite satisfactory. Spraying regrowth or swabbing cut stems with a 1 per cent. solution of 2, 4-D plus 2, 4, 5-T was fairly useful. Spraying the larger bushes with hormone sprays was ineffective.

TOBACCO EXPERIMENT STATIONS.

Work on the development of Parada Tobacco Experiment Station has progressed at a slower rate than anticipated due to difficulties in obtaining labour and the late operation of the Tobacco Industry Trust Fund. The property has now reached a stage where 4-5 acres of tobacco can be produced in the coming season by using a small irrigation plant on the Walsh River. A house and two implement sheds have been erected, while temporary installations include a domestic water supply and accommodation for two or three labourers.

In addition to the clearing near the Walsh River, 40 acres have been cleared and ploughed once. This land will be ready for cropping when water can be supplied from the Mareeba-Dimbulah irrigation channel. The area cleared for building sites is approximately 5 acres in extent; this has been levelled and laid out with roads and some shade trees have been planted.

The Inglewood Tobacco Experiment Station was officially opened by the Hon. H. H. Collins, M.L.A., Minister for Agriculture and Stock, in October and field days were held on the same day and in December.

Floods in January—the highest ever recorded at Inglewood—destroyed a promising crop of experimental leaf and ruined the long-term rotation trial. The bulk planting of Rhodes grass saved sufficient land from erosion to enable the main experiments to be re-established in the 1956-57 season. Rehabilitation of the flood damaged land is now in progress.

REGIONAL EXPERIMENT STATIONS BRANCH.

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

Very satisfactory results were achieved generally during the 1955-56 year, although climatic conditions were extremely variable throughout the districts covered by the Regional Experiment Stations. The experimental programme at Hermitage, near Warwick, gave valuable results, especially from the recently established rotations, and excellent yields were obtained from all crops and pastures. Similarly, at the Biloela centre in the Callide Valley the advantages of crop and grassland rotations were obvious and exceptionally high yields of cotton were obtained. Ayr, in the Burdekin delta, and Kairi, on the Atherton Tableland, experienced a wet year and cyclone damage to maize at the latter centre prevented near-record yields and completely ruined some areas. At the new Millaroo Station, on the Burdekin River 40 miles from Ayr, excellent progress has been made with the developmental programme and a range of crop and pasture experiments has been initiated.

The activities at each Station are briefly described in the following reviews, while details relative to the studies associated with the dairies, piggeries, poultry trials and beef fattening investigations are reported by the appropriate Branches. Table 1 reports the rainfalls.

HERMITAGE.

In addition to continuing investigations with the main crops of the region, such as wheat, grain sorghum, maize and lucerne, several long-term rotations were initiated and pure seed of several established and new varieties of crops was produced. The plant breeding programme was enlarged to allow production and study of a considerable range of new strains of wheat, oats and linseed.

The year was very satisfactory for cereals and grain sorghum and relatively high yields were recorded from these crops. Pasture production was also excellent and several new areas were established.

Results from experiments conducted in plant breeding are reported by the Agriculture Branch.

Crops.

Following almost 9 in. of rain in the preplanting period winter crops were successfully established and made excellent early growth. Timely light rainfalls during the growing period supplemented the reserves of soil moisture. The incidence of rust was slight and heavy frosts in July did not restrict grain yields.

Wheat.—In the standard wheat varietal trial, Spica was outstanding in the early maturity group with a yield of 50.7 bus. per acre, closely followed by Seafoam (49 bus.) and Gabo (49 bus.). In the mid-season and slow-maturing group, Charter yielded 53 bus. per acre, followed by Celebration (50 bus.), Lawrence (45 bus.) and Festival (44 bus.) in that order. Puseas was adversely affected by stem rust as in recent wet years.

In a second-year comparison of wheat yields following ploughing to 4, 6 and 8 in. depths with and without application of superphosphate on the plough sole, no significant differences were obtained between treatments. Deeper ploughing and superphosphate applications resulted in more luxuriant growth but grain yields were similar. This study was conducted on a shallow-phase soil representative of the valley slopes and grain yields averaged 34.6 bus. per acre.

The effect of the application of a commercial soil conditioner was studied for the third and final year. There was no significant improvement in grain yields due to treatment and there was no residual effect on the experimental area used.

In a trial to compare the effect of initial cultivation with either the sundercut or a chisel plough, grain yields were respectively 33.5 and 34.8 bus. per acre. Soil moisture movement and plant growth were similar under both treatments during the first season of this trial.

Oats.—Some 200 bags of seed of the Hermitage-bred oat variety Bovah was grown and distributed to seed growers. An introduced variety, Benton, is being multiplied after favourable results in trials conducted at this centre, and a sister strain to Bovah which matures later than Bovah on the Atherton Tableland is also being increased.

Safflower.—Studies of the agronomic requirements of a range of safflower varieties have been continued following different times of planting and this crop has also been grown in comparison with wheat and linseed. During 1955-56 tests seven of the eight strains included in the varietal trial yielded from 1,162 to 1,232 lb. of seed per acre. Spraying was necessary to overcome cutworm and armyworm attacks and frost caused some loss of seedlings. The frost damage was related more to size of seedling than to variety.

In the crops trial Gabo wheat yielded 2,930 lb. (almost 49 bus. per acre), Walsh linseed 911 lb. and the safflower varieties up to 1,260 lb. per acre. The safflower took 1½ months and 1 month longer to mature than wheat and linseed respectively.

Sowings of three varieties were made on June 7 and July 20 in a time-of-planting trial, and due to rapid maturity of the second lot both areas were ready for harvest at the same time. All three varieties yielded higher following July sowing, the best one producing 1,546 lb. per acre.

The work at Hermitage is closely associated with similar studies at Biloela and Ayr and it is now known that successful crops can be produced from varieties available.

TABLE 1.

RAINFALL (INCHES)—1955–56 SEASON.

Month.	Hermitage R.E.S.		Biloela R.E.S.		Ayr R.E.S.		Kairi R.E.S.	
	1955–56.	Warwick Means.	1955–56.	Means.	1955–56.	Means.	1955–56.	Means.
July	1·44	1·77	1·54	1·23	·07	1·64	·64	·80
August	·90	1·41	·36	·70	·01	·40	·37	1·38
September	1·36	1·76	·17	·94	·07	·17	1·76	·88
October	5·19	2·46	3·75	2·02	·11	·84	1·28	1·86
November	·49	2·64	1·21	2·94	1·20	2·02	·69	1·80
December	7·07	3·48	5·14	3·39	·18	·91	4·25	2·08
January	4·29	3·72	5·64	4·17	11·77	17·26	14·52	8·87
February	5·62	3·05	4·96	4·99	10·21	10·12	14·02	11·18
March	·91	2·59	4·84	2·79	13·75	8·44	13·41	10·24
April	3·40	1·56	4·06	1·63	3·66	3·17	1·89	4·51
May	2·80	1·49	1·14	1·68	4·42	3·20	2·14	2·01
June	2·77	1·84	1·95	1·59	3·26	·95	1·72	1·52
Total	36·24	27·77	34·76	28·07	48·71	49·12	56·69	47·13

Grain Sorghum.—Purity testing of certified seed stocks and production of mother seed of the Kalo variety were continued. In the standard varietal trial, yields (in bus. per acre) were as follows:—Martin, 74; Caprock, 73; Wheatland, 72; Redbine 60, 70; Alpha, 69; Kalo, 65; and Early Kalo, 62. Alpha grown in one of the rotation trials yielded at the rate of 88 bus. per acre.

Miscellaneous.—Other crops grown included maize, lucerne, malting barley, lucerne and pumpkins. Pure seed production was undertaken with sunflowers and Brown Beauty beans. Soil moisture and nitrate determinations have been completed as required in the Station laboratory.

Pastures.

Improved summer pastures gave excellent production. Rhodes grass combined with lucerne on the hillside area could not be fully grazed with the sheep available. In a new crop-pasture rotation on a shallow-phase slope, a mixture of green panic and lucerne was successfully established. In the winter pasture trials, phalaris has been superior to perennial ryegrass, while the combination of the annual grasses, Hl ryegrass and prairie, with lucerne has provided high-quality grazing. In row-cultivated winter pastures invasion by the annual Urochloa grass has been marked during the wet summer period.

Rotations.

In the G. series (an 8-year rotation of 4 years lucerne followed by grain sorghum, wheat, oats for grazing or grain, and wheat), on shallow slopes it was shown that soil nitrate nitrogen was appreciably higher in plots following lucerne than where wheat was the previous crop. This greater nitrogen content following lucerne resulted in a yield of 35.2 bus. per acre, whereas wheat following wheat yielded 28.3 bus.

In the C series (a 4-year rotation of wheat, wheat, long fallow with and without cowpeas as green manure, then grain sorghum) designed for fertile heavy alluvials, nitrate was lower in areas following cowpea green manure crops than in fallows when both were prepared for sorghum. Nodulation of the Poona cowpeas was poor, which may explain the difference in nitrate content. Sorghum following fallow averaged 59 bus. per acre compared with 42.8 bus. after cowpea.

Stock.

Sheep have maintained prime condition throughout the year and when shorn in February cut 12 lb. of wool per head.

In the Pig Section the feeding value of barley, wheat and grain sorghum was compared, the last being most promising. Grazing of standing crops of grain sorghum and maize is being studied.

Nursery.

Observations have been continued on a wide range of grasses and pasture legumes and seed collections have been made from the most imporant material of the 127 species and strains under study. Of the winter species, phalaris gave the greatest production. The ryegrasses produce forage of ephemeral value very quickly. Wimmera ryegrass is at its best during autumn; perennial ryegrass is more prominent in June and July; and the Italian ryegrass strains become more productive from August to October. *Bromus inermis* was the most promising of the brome grasses and an area has been established for spring pasture. Of the legume species, Hunter River lucerne was again superior and Tallarook sub-clover, Louisiana white clover and *Vicia dasycarpa* were promising.

For summer pastures, species of *Chloris, Panicum* and *Cenchrus* were superior. Common Rhodes grass and the Kenya, Kafue and Giant strains each had special characteristics, the last two contributing valuable late forage in January or February. Green panic produced heavily and combined well with lucerne. The vigorous *Panicum makarikariensis* spread well and was resistant to frost damage. Of the buffel grasses, the Biloela strain was the most productive and it was unaffected by the warm dry weather that normally occurs in early summer. Paspalum and para grass appeared to have some value for moist areas.

BILOELA.

The agricultural studies at this centre embrace summer and winter crops and pastures grown under natural rainfall and with supplementary irrigation. Crop and pasture rotations are practised and the principal crops are cotton, grain and sweet sorghums, lucerne, cowpeas, wheat and oats.

Above-normal rainfall in May, 1955 provided favourable moisture conditions for planting the winter crops and enabled them to withstand the following subnormal rainfall period that prevailed until early October, when good rains relieved the position and also allowed timely planting of the cotton experiments. A very favourable season was experienced for cotton and other summer crops and pastures. In addition to conducting crop and pasture investigations, the Station now conducts an experimental dairy herd and piggery.

Crops.

Oats.—The results of a grazing trial of nine varieties embracing a range of early and long-season types, which was planted early in May under favourable conditions, indicated the superiority of the quicker growing varieties. Bovah led at the first grazing (45 days after planting), but Vicland outyielded all other varieties at the second and third grazings and in the total production of green and dry material for the season. Unfortunately, Vicland is susceptible to Victoria blight and production is hazardous in districts likely to experience wet periods in the spring.

Wheat.—The high October rainfall resulted in severe lodging in all varieties in the standard varietal trial and some incurred heavy leaf rust damage. Under rather atypical conditions the usual leaders—Spica, Gabo, Pusa 4 and Puno—yielded lower than the mean of the trial (29.4 bus. per acre), but two hybrid selections, $K_1S.4604$ and $K_2P_4.4620$, with good rust resistance, led with respectively 32.6 and 31.3 bus. per acre. Puora, Seafoam, Charter, Saga and Festival produce 30-31 bus. Over the last five years Gabo has given the highest mean yield (33.9 bus.), followed by Pusa 4, Charter, Puno and Puora, all averaging over 32 bus. per acre.

In a time-of-planting trial embracing three of the leading early varieties sown on May 6, June 1 and July 19, the effects of subnormal June rainfall and soil of low nitrate-nitrogen content on late plantings were clearly indicated by the mean yields of 23.04, 21.3 and 3.1 bus. per acre respectively. The July-sown crop failed due to dry early conditions and severe rust to the light crop during the wet maturing period.

The testing of planting rates varying from 30 lb. to 70 lb. per acre was continued and once more the range of 40-50 lb. gave the best results. The 30 lb. rate was decidedly too light and no economic gain was obtained by sowing at 70 lb.

Safflower.—In 1954, near-record yields were obtained on a long-fallowed fertile soil. To study the agronomic requirements of this oilseed crop under conditions available under more common annual cropping systems, a similar varietal trial was conducted on land of lower moisture and nitrate-nitrogen content. The yields were up to 66 per cent. lower, whereas companionate wheat plots yielded only 20 per cent. lower. The safflower suffered from lack of moisture and nitrogen and exhibited more exacting requirements than wheat.

Cotton.—The seasonal conditions were very suitable for cotton growing and good yields appear possible in most experiments. (Late frosts and big top crops have delayed the harvest.). A mean yield of at least 1,500 lb. seed cotton per acre appears likely in the irrigated varietal trial, while some of the rain-grown experiments will equal or exceed this amount. The highest leaf fall was obtained with the imported water-soluble monosodium cyanamide in a trial of several leaf defoliants, but effect on the efficiency of machine harvesting and the resultant grade of raw cotton has not as yet been determined.

Grain Sorghum.—Yields in all plantings of grain sorghum on the Experiment Station were very satisfactory. In the regular standard varietal trial, yields greatly exceeded the means of the previous eight years of the trial, as shown in the following data (yields in bus. per acre, the previous means in brackets):—Martin 58.18 (30.5), Alpha 50.73 (36.3), Wheatland 50.2 (33.0), Caprock 48.89 (31.7), Early Kalo 46.94 (31.3) and Kalo 43.4 (31.3). Redbine 60, a new variety to the trial, produced 42.89 bus. The results in the

row spacing trial of Alpha confirmed previous findings that in a season when ample soil moisture prevails at planting time and rainfall is received at critical stages in the development of the crop, the 14 and 28 in. row spacings outyield the 42 in. row spacing.

Sweet Sorghum.—The Sugardrip variety of sweet sorghum when planted in 42 in. row spacing proved very suitable for silage harvesting with a one-row forage harvester, some 90 tons of good silage being obtained from six acres.

Cowpeas.—Stocks of pure seed of Mung bean and Reeves, Cristaudo and Black cowpeas were harvested. In a grazing trial of these varieties Mung bean was the most palatable to the dairy herd.

Lucerne.—In a productivity trial of a number of strains of lucerne grown under natural rainfall, the Hunter River strain was outstanding for the third successive year.

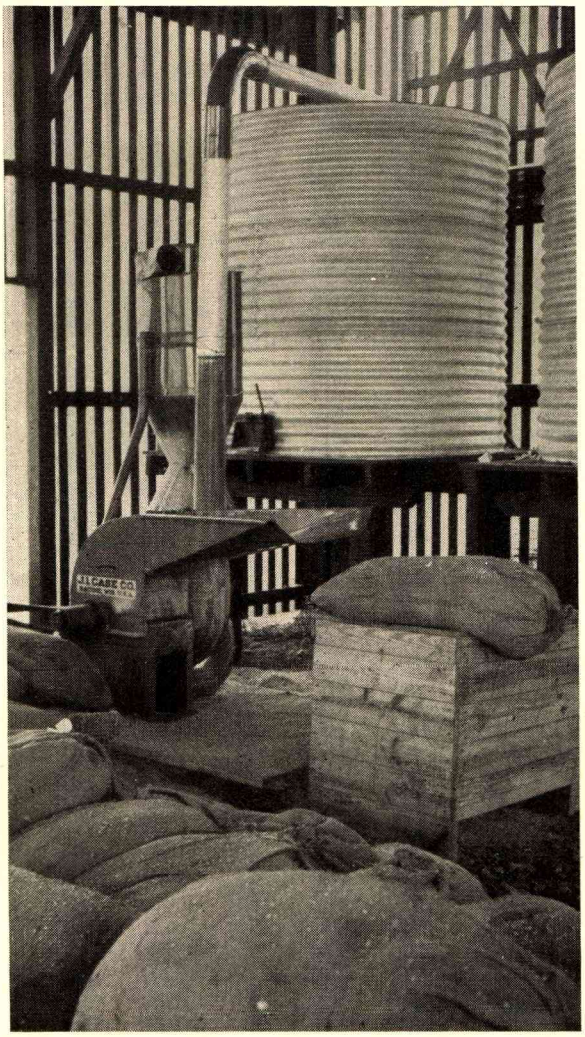


Plate 1.—Filling Tanks with Grain Sorghum Direct From Hammer Mill—Biloela Regional Experiment Station.

Pastures.

Hunter River lucerne has produced exceptionally high yields with irrigation in the Callide Valley and a comprehensive trial of mixed pastures of this legume and various grasses was established. The treatments with lucerne and grass rows sown in April, 1955, produced 32-70 tons of green material in the first year, the greatest production being from lucerne and elephant grass, which supplied highly palatable forage for the dairy herd.

In irrigated pasture experiments, combinations of Ladino clover with either reed canary grass or phalaris, and of lucerne with these grasses, have shown very high productivity in their first 10 months of establishment. The success of such pastures is largely due to the use of efficient strains of rhizobia to ensure effective nodulation of the legume by highly efficient organisms. Wherever adequate underground supplies of good quality water are available on farms situated on the alluvials of the Callide Valley, such irrigated pastures should be extremely valuable.

The value of lucerne in association with green panic when grown under rainfall conditions was again demonstrated. During the 12-month period from June 30, 1955, the grass-lucerne sward outyielded the grass sward by 3 tons per acre and the row grass by 3.35 tons. With such a good season the grass sward produced 1.58 tons per acre, compared with 1.28 tons in the rows.

Decided progress was achieved in grass seed harvesting. A modified wheat stripper proved to be very efficient in harvesting Rhodes grass, green panic and buffel grass seed. When treated in a hammer mill operating at 600-700 r.p.m., the stripper-harvested material of each species was broken sufficiently to allow of efficient sieving of the seed; the resultant seed when mixed with moist sawdust could be planted satisfactorily through a standard two-row cotton-maize planter. The discovery of a method of handling a roughly harvested sample of grass seed led to the development of buffel grass seed harvesting techniques with a standard All Crop harvester. By using a very low drum speed and collecting the rough sample over the back of the riddles in a wool pack, practically the whole of the potential seed crop was saved.

During the year sufficient seed of CPI. 6934 Type D buffel grass, which it is proposed to name Biloela buffel, was supplied to five commercial seed producers to plant a total of 115 acres.

Observations have been continued in the grass and legume nursery and the more promising species have now been established in larger plots for detailed observation and assessment of seasonal production and palatability under actual grazing conditions.

AYR.

Although this Station is located in an important sugar growing district the programme of investigations is directed towards supplementary or alternative crops. Where irrigation facilities are available the normal summer crops of southern Queensland can be grown at Ayr following an autumn planting as soon as the wet season terminates. The main summer agricultural crops studied are cotton, maize and sunflowers. Preliminary investigations have been conducted with many others.

In the winter plantings, wheat, oats for hay, safflower, linseed and potatoes have yielded very satisfactorily. The horticultural investigations deal with pineapples, bananas, beans, tomatoes, passion fruit and papaws.

Beef fattening on several irrigated grass-legume pasture mixtures is an important study at this centre and attention has also been given to development of techniques for growing and harvesting seed of tropical legumes and grasses.

During the first six months of the year under review only 1.64 in. of rainfall was received, but the wet season commenced in early January and persisted until mid-May, during which the precipitation totalled 44 inches recorded on 76 wet days. The wet season was characterised by numerous light falls of rain which allowed very little opportunity for cultivation or land preparation for crops. The summer temperatures were high, isolated readings of over 100 deg. F. being recorded in October, December, and January. A cyclone experienced in March, 1956, severely damaged the banana plantation.

Crops.

Cotton.—The prolonged wet season resulted in faulty germination of March cotton plantings and the main experiments were not established until April. Subsequent heavy May rainfall resulted in slow development of the crop. The experimental areas yielded an average of 1,395 lb. of seed cotton per acre and in the varietal trial Empire produced the top yield of 1,681 lb. per acre. In a study of the efficiency of machine harvesting it was found that an average of 72 per cent. of the cotton was collected by the machine, with 80 per cent. being contained in D & PL14, the variety of the most open habit of plant growth. In defoliation studies aimed at reducing the amount of leaf on the bushes at

harvesting time it was found that 3-amino-triazole (Amizol) gave promising results at 1 lb. per acre alone and as an additive to other formulations.

It has been found that boll shedding due to climatic or physiological influences can seriously reduce yields and in preliminary trials spraying of the cotton plants at specific growth stages with chemicals such as alpha naphthalene acetic acid at 10 p.p.m. or 2,4,5-T at 30 p.p.m. has restricted boll shedding and resulted in some favourable gains in yield of seed cotton.

Maize.—In a maize trial of 10 varieties the Queensland hybrids Q716, Q23 and Q719 and the New South Wales hybrids Victory and Jubilee gave the best results and produced 75-78 bus. per acre, approximately 10 bus. per acre more grain than the open-pollinated variety Fitzroy. Similar yields were obtained in a fertilizer trial in which gains of 12-15 bus. per acre were obtained with side-dressings of nitrogenous fertilizers; these represented increased returns of £6-8 per acre after allowing for the cost of fertilizers. There was also considerable difference in the protein content of grain from the fertilizer treatments.

An article dealing with selection of varieties, irrigation and fertilizer requirements for maize culture in the Burdekin area was published in the *Queensland Agricultural Journal* to summarise the results of experiments conducted at this Experiment Station.

Sorghum.—Previous studies have shown that Coastland is the most suitable variety for the Ayr region and a pure seed multiplication area was established this season. Seven strains of sorghum introduced from Africa showed little promise, but pure seed was obtained for testing in other districts.

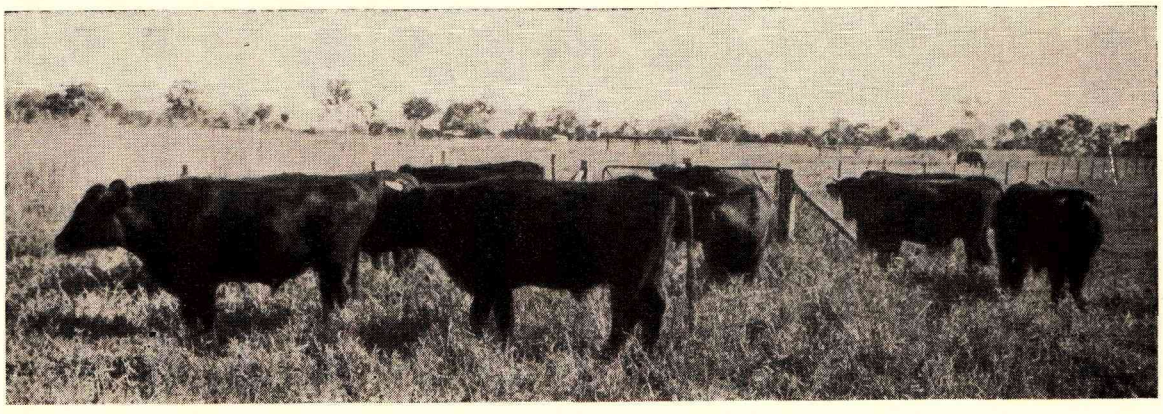


Plate 2.—Steers on Para Grass—Centro Irrigated Pasture at Ayr Regional Experiment Station. Average Weight 20th May, 1955, was 856 lb.

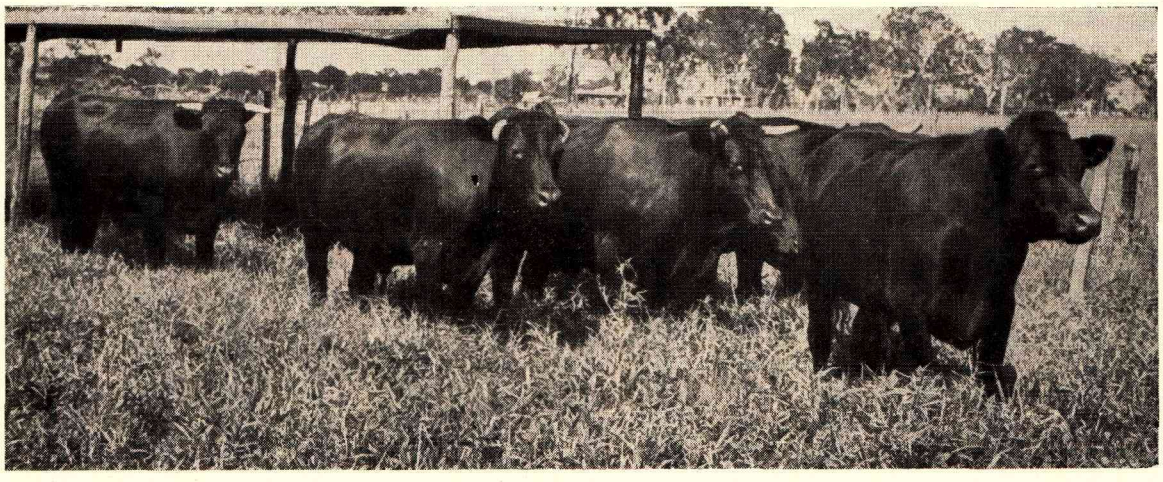


Plate 3.—Cattle of Same Group as in Plate 2, Photographed 24th November, 1955. Average Weight 1,128 lb., a Gain of 276 lb. in 188 Days.

Safflower.—The prolonged wet season and associated leaching of soil nutrients resulted in rather poor winter crops. Safflower yields ranged from 614 to 1,082 lb. per acre, while a comparison crop of wheat yielded only 719 lb. (11.5 bus.) per acre.

Wheat and Oats.—In a wheat varietal trial yields averaged 25 bus. per acre, the potential being reduced by excessive May rainfall. The varieties Festival and Saga gave the highest yields and significant increases in yield and protein content of the grain were obtained following application of 180 lb. of sulphate of ammonia per acre.

Further observations were made on 18 oat varieties. Orient was the earliest and carried mature grain in 78 days, while others varied from 110 to 130 days.

Miscellaneous.—Small trials with sunflowers and rice were continued.

Pastures and Stock.

Study of the five main irrigated pasture mixtures was continued throughout the year. The legume centro was superior to stylo in all cases and resulted in greater pasture production and greater cattle weight gains. The guinea grass-centro and para grass-centro mixtures have again produced the best returns.

The carcase weight of the animals sold in May when 26 months old averaged 710 lb., representing a dressing percentage of 56.8, and 90 per cent. were graded as excellent export quality.

The use of irrigated pastures for topping off cattle in this district must be considered with due regard to climatic and pasture conditions and the availability of suitable store stock. If stock must be retained during winter, when the productivity of tropical pastures seriously declines, it appears that provision for supplementary feeding with grain or green crops such as oats would be required to maintain satisfactory weight increases during that period. Accordingly, attention has been directed to studying the suitability of grazing crops. Other investigations have shown that maize yields of 80-100 bus. per acre can be obtained.

In addition to this winter hazard, it has been shown each year that soft fat cattle cannot maintain weight increases on the pastures produced during the wet season when high temperatures and extremely high humidity prevail. Under such conditions a full year's fattening programme appears inadvisable. At present it appears desirable to purchase two lots of cattle each year—firstly, good quality store cattle in late July or August when satisfactory pasture growth starts, for disposal by the end of December; and secondly, prior to the wet season, light store cattle which give satisfactory gains on flush pastures. As it would be necessary to dispose of these cattle before the July group is due, grazing crops and possibly grain would generally be required to supplement the autumn pastures.

On the Ayr pastures the yearling animals purchased in August 1954 and grazed on the para grass-centro mixture gained 800 lb. in weight in the 636-day period to May 14, 1956; this represented a liveweight increase of 1,340 lb. per acre when the stocking rate is recognised. On a daily basis the gains were 1.26 lb. per head or 2.1 lb. per acre liveweight. (See Plates 2 and 3.)

Horticulture.

Bananas and pineapples were again the major horticultural crops grown. A fertilizer trial is in progress to ascertain the effect of the three major elements at three different levels on plant growth and fruit quality. Fruit harvested during the January-March period, though of excellent appearance, does not carry well and may lack flavour. Flower induction with ANA is not reliable when applied during the February-April period and alternative methods of treatment are being investigated.

The 1956 autumn crop of bananas was completely destroyed by the March cyclone. Normal wind damage was reduced by windbreaks of the Ducassis and Lady Finger varieties.

An experimental area of passion fruit has been established to study the suitability of the several root-stocks available for commercial production of the crop in the Burdekin region.

Selection of papaw strains from local types is being conducted to obtain fruit with desirable characteristics for sale on the fresh fruit market and to canneries.

An area of Brown Beauty beans was again grown and 12 bus. of certified mother seed was produced.

MILLAROO.

In addition to carrying out an extensive developmental programme at this new Experiment Station, a number of crop experiments were conducted on the levee soil types initially cleared and graded during 1953-54. This work included cotton, maize, safflower and wheat sown in the autumn of 1955 and 1956 and a range of cowpeas during the past season. Rice has been grown on some 3 acres of the Oaky Sandy Loam soil type, and the legume centro was sown on 25 acres of the Barratta soil series for development of irrigated pastures.

Crops.

Cotton.—A trial of seven likely cotton varieties which was sown on April 5, 1955, required three irrigations each of 2½ in. of water during the August-October period. The second watering was somewhat delayed but satisfactory results were recorded, the leading varieties yielding as follows:—D & PL14, 1,649; Empire, 1,623; Miller 610, 1,483; and Miller 43-9, 1,426 lb. per acre.

The early growth of cotton sown in 1956 is rather poor, the prolonged wet season in conjunction with low temperatures and insect damage having reduced crop prospects.

Maize.—A varietal trial and a row spacing trial were conducted in the 1955 season. In the former experiment, five Queensland hybrids averaged 90 bus. per acre and outyielded the open-pollinated variety Fitzroy by almost 30 bus. per acre. The N.S.W. hybrid Victory performed quite well. The trial was planted on April 5 and 3 cwt. of sulphate of ammonia per acre and only 2.5 in. of irrigation water were supplied.

In the row spacing trial the 36 in. row spacing yielded 97 bus. per acre, compared with 85 bus. per acre from the 42 in. row spacing. This crop, sown on April 15, received two side-dressings of sulphate of ammonia totalling 3 cwt. per acre and was irrigated on one occasion only, when 2½ in. of water was supplied.

Safflower.—This promising oilseed crop was studied in a trial of six likely varieties. The average yield was 1,982 lb. per acre and the top strain (4-1BB) produced 2,506 lb. per acre. There do not appear to be any undue difficulties in growing or harvesting safflower except that torrential rains immediately after planting can result in poor germination. This season's crop was grown without added fertilizer and received three irrigations each of 2½ in. of water.

Wheat.—A bulk wheat crop produced approximately 35 bus. per acre. No fertilizer was applied and two irrigations each of 2½ in. were necessary. It has been difficult to obtain yields of over 40 bus. per acre from existing varieties and it would appear that wheat is of minor importance as a potential crop in the Burdekin. Certain varieties may be valuable for grazing and soil amelioration on areas of land where it is necessary to improve the rate of water infiltration.

Rice.—A satisfactory crop of Prelude rice was grown on typical Oaky Clay Loam soil. The physical characteristics of this soil type severely limit most crop production and the use of rice as a soil ameliorant is being examined. The area, sown on December 15, was ready for harvesting on April 24. It required 20 in. of irrigation in addition to 26.5 in. of rainfall during the growing period.

Yields of 2 tons pady per acre can be obtained with available swamp varieties following a mid-December planting. From 2 to 3 cwt. of sulphate of ammonia is required on soils of low fertility. In seasons when the wet season continues into late April, harvesting may be delayed, with consequent lodging of the crop and high grain loss.

Legumes.—Nine cowpea varieties were tested following January 1956 plantings. The introduced strains CPI 9432 and Q3004 gave promise as green manure crops, but seed setting was poor. Mung bean is also giving promising results.

Pastures.

A light sowing of centro was made on the 25 acres of Barratta soil prepared for pastures. Germination was satisfactory but some flooding due to incomplete drainage facilities in this region caused heavy plant losses.

KAIRI.

The programme at this Station is based on maize production in conjunction with dairy farming and pig raising. A wide range of grazing and fodder crops is under study, with emphasis on development of oat and wheat varieties for winter grazing and production of lucerne and silage crops for storage for spring feeding. Extensive pasture areas are under trial and rotations are in progress which provide for feeding of the animals and restoration of soil fertility to improve future maize yields.

The experimental dairy herd is fed on pastures, grazing crops and silage as required, and improvement in production by feeding, management and selection is being obtained. An August-November calving period is giving good results, provided silage is available for spring feeding.

Production of baconer pigs is being studied in the piggery section and attention has also been directed to management, housing and feeding systems to meet the conditions of the Tableland. The relationship of feeding systems and egg production is being investigated in a poultry section.

The wet autumn of 1955 was followed by a mild wet winter during which only nine light frosts were recorded. The spring months were typically hot and dry; storms commenced in November and continued throughout December. The main "wet season" occurred in January and February mostly as storms which produced very heavy downpours. In seven of these downpours intensities ranging from .4 to .57 in. in 15 minutes were experienced, resulting in some degree of erosion in recently planted areas on the steepest slopes of the

Station. The outstanding feature of the March conditions was a 5-day cyclonic storm characterised by light rainfall but very high wind.

Crops.

Maize (*1954-55 crop*).—The main Station crops averaged 37 bus. per acre of sound grain dried to 14 per cent. moisture, compared with 15 bus. per acre on 19 acres of newly acquired land which had grown maize repeatedly for many years. Maize in the first and third year after 4 years of a lucerne-Rhodes grass pasture yielded respectively 40.3 and 47.9 bus. per acre, in comparison with the district average of commercial crops of approximately 20 bus. per acre.

A test of various compounds of 2,4-D and M.C.P.A. demonstrated once again that a pre-emergence application gave no better weed control than that obtainable with an early cultivation embracing slight hilling up to the rows to smother weed and grass seedlings. After three years of experiments with these weedicides applied as pre-emergence sprays or as contact sprays at the last cultivation of the maize, it would appear that they would be useful only as contact sprays during seasons when soil conditions were too damp for normal cultivations. The sodium salt of 2,4-D tended to be superior in this respect.

In a continuation of the comparison of Durum and Dent types of maize there was practically no difference between the mean yields of three strains of the two types. However, there was less diseased grain in the Durum type.

In the fourth year of trials of combinations of plant spacings and side-dressings of 100 and 200 lb. of sulphate of ammonia in maize in the first and third year after mixed lucerne-Rhodes grass pasture, responses were greater to closer spacing than to the side-dressings. Apparently growing such pastures for four years improves the fertility of old cultivations sufficiently to support an increase in plant population requiring approximately 12 in. spacing instead of the normal 15-18 in. spacings.

Maize (*1955-56 crop*).—Conditions were very favourable for obtaining highly satisfactory results in all experiments until the cyclone severely lodged the crop in early March, with a resultant estimated reduction in yields of around 50 per cent. It will be impracticable to harvest most experiments.

Oats.—Crown rust (*Puccinia coronata*) again affected experiments with oats, the mild wet winter favouring development of the disease. In the hay varietal trial the strain B.V.H.4985 was the least affected by this disease and the sister strain Bovah escaped damage sufficiently to produce 3.4 tons of hay per acre. Vicland, Garry and Fultex failed to produce hay.

In a grazing trial of Vicland, Bovah and Klein, the quick-growing Vicland, although producing 8 tons of green fodder per acre, was sufficiently affected by crown rust to yield only two grazings, in which the cows consumed only 4.2 tons per acre in 708 cow-grazing-hours. Bovah produced 9.6 tons, of which 7 tons were consumed in 5 grazings totalling 1,050 cow-hours. Klein, although producing 11.2 tons of fodder, was not so efficiently grazed, the herd consuming only 6.6 tons per acre in 1,000 cow-hours. In a grazing trial of the same three varieties planted in April, May and June, the cows consumed the most fodder in Bovah at all three plantings, which provided respectively 1,300, 1,200 and 430 cow-grazing-hours per acre. These results and those of previous years illustrate that when a rust-resistant variety is available, planting shortly after the end of the wet season is advisable, as the early development of the plants enables their roots to maintain contact with receding moisture if dry conditions are later experienced.

With a pre-emergence application of 2,4-D at the rate of 1 lb. acid equivalent per acre, 75 per cent. or better control of weeds was obtained during the first three month's growth of a crop of Bovah planted for hay production. After this period this variety provided such shading effect on the weeds as to decrease their population steadily until hardly any were present at the end of the season. The results indicated that post-emergence application of weedicide is no longer necessary with a rust-resistant variety like Bovah, except possibly where the crop is repeatedly grazed in a very wet autumn and winter.

Wheat.—The merits of the rust-resistant Lawrence as a hay wheat were again tested in a time-of-planting trial embracing April, May and June plantings. The results confirmed previous findings that planting as close as possible to the end of the wet season is advisable, an April planting yielding 3 tons of hay per acre, compared with .54 ton from a June planting.

Green Manure Crops.—Following on the satisfactory results of previous trials, Mung bean (*Phaseolus mungo*) was substituted for Cristaudo cowpeas as the main green manure crop on the Station. Up to 6 tons of green material per acre was ploughed under and other areas of it provided valuable grazing for pigs.

Fodder Canes.—The growing of fodder canes on the Atherton Tableland was further developed by supplying disease-free planting material of either Co301 or Q50 sugar cane varieties to nine farmers selected by the Agriculture Branch as producers of planting material to meet district demands. Second ratoons of these varieties and the China variety produced respectively 63, 25.6 and 16.3 tons of fodder per acre when receiving applications of 440 lb. of Sugar Bureau ratoon mixture No. 2 during the wet season and 480 lb. sulphate of ammonia after the wet season. The China variety was successfully harvested with a forage harvester in testing its value for silage making.

Arrowroot.—Grown for pig feed, this crop yielded 23 tons of clean corms per acre after a growing period of 7 months. Planting material was distributed to seven commercial farmers.

Silage.—Three 50-ton capacity tower silos on the Experiment Station were filled with maize silage during the autumn, and experiments were continued with the conservation of excess pastures.

Pastures.

Legumes.—The tropical legume *Glycine javanica* continued to perform satisfactorily as a pasture for both pigs and cows. In a trial to establish it in old Rhodes grass pasture, it was found that either ploughing or sundercutting the grass early in the wet season and oversowing with glycine at the rate of 4 lb. per acre in 28 in. spaced rows gave a good stand of the legume and an excellent regeneration of the grass.

Grasses.—The growth of all grasses was favoured by the mild winter and as a result Rhodes grass, green panic and guinea grass performed well for most of the year. Rhodes grass demonstrated again its superior drought and frost resistance, while green panic excelled with leafy growth during the wet season when other species tended to become stalky and rank. Green panic at Kairi shows a tendency, however, to decline in productivity after two years of establishment and displays distinct symptoms of nitrogen deficiency. Biloela buffel grass made excellent growth in its first year of establishment on a badly eroded hillside of recently acquired land. Elephant grass, although having low carrying capacity during the coldest winter months, again produced a good leafy growth in the dry spring months.

Grass–Lucerne Mixed Pastures.—The rank, stalky, unpalatable growth of Rhodes grass during the wet season in the mixed lucerne–grass pastures has been a matter of some concern. Mowing after the wet season and removing the material has been only moderately successful in providing a good autumn pasture. Last season this pasture was heavily disced after the main wet period and an excellent regrowth of pasture was obtained; this may indicate considerable progress in overcoming this serious problem.

Nursery.—Expansion of the nursery testing continued during the season. Of the strains established for 12 months, *Cenchrus* spp. Q2953 and Q2948, *Setaria sphacelata* Q2968 and elephant grass Q2941 performed well during the main growing season and showed the most drought resistance and produced the highest yields of fodder during the dry spring months, the real problem period for pastures on the Station.

HORTICULTURE BRANCH.

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

Rains in the winter and early spring of 1955 were above normal but the late spring was dry. However, heavy and prolonged flood rains during the 1956 summer caused serious waterlogging in most horticultural districts, and in particular the vegetable crop at Stanthorpe was severely affected. A cyclone in March caused damage to bananas and papaws in the far north.

During recent years, land within 30 miles of Brisbane which was formerly considered unsuitable for vegetables and small crops because of its low fertility and poor drainage has been brought into production. The exploitation of this land has led to the development of unusual cultural practices—high ridging, liming and heavy fertilizer application—with surprisingly good results.

Prices for fruit and vegetables have been more competitive during the year and as a result the standards of farm management, particularly in the vegetable industry, have greatly improved.

PINEAPPLES.

Pineapple growers had an indifferent year. Winter rains in 1955 had a disastrous effect on ratoon crops in southern Queensland and the dry spring reduced overall fruit size in plant crops. Fortunately, increased yields from Central Queensland compensated for the reduced output in the south and the summer crop for the State was 1,672,757 cases, about 100,000 cases less than the previous summer's crop. The bearing acreage in 1956 is 8,053 acres, compared with 6,957 acres in 1955, and a total crop of about 2 million cases is expected.

In many producing districts the bulk of the pineapple crop is grown on replant land. The efficient use of such land poses a number of problems, but some of the results of recent experimental work at the Maroochy Experiment Station are rapidly being incorporated into current practices. They involve shortening the crop cycle, controlled cropping, and the use of green manures during the inter-cycle period.

It has been customary to harvest a plant and two ratoon crops. However, on replant land growth is less vigorous than on virgin land, and it has been found more profitable to restrict the crop cycle to a plant crop harvested in summer and one ratoon crop harvested in late autumn 14 months later.

Pineapple crop failures are not uncommon on land with a pH below 4.5. Improved cropping is obtained when such land is limed and cropped with a legume during the intercycle period.

No change has occurred in methods of controlling weeds in pineapples. However, the health hazard to men applying PCP (pentachlorphenate) in the field is considerable, and in any case this weedicide is not particularly effective when grasses are dominant. Parachlorphenyl dimethyl urea (CMU) shows considerable promise as a substitute for PCP in experimental work and commercial trials are now in progress. It may also be possible to increase the efficiency of PCP sprays by adding a selective weedicide such as trichloracetic acid (TCA), which is specific to grasses.

Trials with urea as a foliage spray have now been completed; nitrogen applied in this form has proved inferior to sulphate of ammonia applied as a soil dressing. Foliage sprays containing urea may be valuable, however, in winter and spring when lack of soil moisture is associated with sub-normal intake of nitrogen; this will be investigated during the coming year.

The 1955 winter crop was very severely affected by black heart and cannery wastage reached a very high peak in mid-August. Field trials were carried out with PCPA (para-chlor-phenoxyacetic acid) and ANA (alpha napthalene acetic acid) applied 60 days before the expected harvest. ANA, which has been used effectively to spread the summer crop, resulted in much less black heart wastage but this effect could have been due to an induced delay in fruit maturity. PCPA had no effect on black heart wastage or on fruit maturity. Meteorological records for the years 1953, 1954 and 1955 have shown that black heart development occurs about two weeks after a prolonged period of dull and cold weather.

BANANAS.

The banana industry has not yet recovered from the setback of the 1954 cyclone, which devastated plantations in southern Queensland. Plantations which were reconstructed after the cyclones encountered favourable growing conditions during the following two years and production per acre has been well above normal. Markets have been glutted for some considerable time, but grower returns are now becoming more remunerative. Plantings in 1955-56 were only about 25 per cent. of normal but the bearing acreage is 13,045, compared with 11,997 acres in 1954-55. The production in 1955 was 396,000 cases (1¼ bus.).

Abandoned and neglected plantations, which accentuate the problem of bunchy top control, have been a major concern of the Banana Industry Protection Board. The number of diseased plants recorded was 4,433, about double that of the previous year.

Plate 1.—The Mons Mari Banana. This semi-tall mutant from the variety Cavendish is now the dominant commercial type grown in Queensland.

The varietal position shows little change and the trend towards increased plantings of Mons Mari at the expense of Cavendish still continues. Increased Mons Mari plantings are particularly marked in areas where production of Lady Finger bananas has become difficult because of Panama disease. Many of these areas have water supplies available and the results obtained with supplementary irrigation have been very good. Further developments in this field can be expected.

Further work with plastic covers has confirmed earlier conclusions that yield and fruit quality are improved in bunches covered during the winter months. Their use is, however, restricted to plantations where leaf spot is not a hazard and adequate foliage is

present to protect the fruit from exposure to the sun. Growers generally prefer hessian to plastic covers on exposed bunches.

Low market values for bananas have tempted some growers to plant more closely than previously. In close plantings it is more difficult to set followers for the ratoon crop at the right time. In addition, close spacing is only practicable in areas where the risk of interplant competition for soil moisture is reduced to a minimum by irrigation.

Bits continue to increase in popularity as planting material in southern Queensland. In the most recent trial, bit plants were slightly taller, bunch size was greater and fruit grades were better than in sucker plants. Bit plantings have a deeper root system than sucker plantings and show a greater ability to withstand the strong winds which occur during the summer months.

Previously, marketing of bananas in bunches, which saves cases and labour in packing, had been confined mainly to near markets because of the abrasions which occur during long transport. Experiments have shown that bunched bananas packed in plastic sleeves can be carried from North Queensland to Brisbane without skin damage and with considerably less weight loss. Successful results have also been obtained in commercial trials interstate. Waxing the fruit has proved very satisfactory for long-distance transport of bananas packed in bunches and the delay in ripening has been equivalent to an increase in life of about 100 per cent. This delay in ripening, however, may favour the development of anthracnose, which can occur when the weather is hot and humid.

DECIDUOUS FRUITS.

The deciduous fruit industry continues to expand and substantial numbers of young trees have been planted during the past five years. The main concern of the industry is now to stabilize production at the new high level. Production for 1955-56 from about 9,000 acres in bearing was as follows:—apples, 732,477; pears, 22,976; plums, 48,508; peaches, 66,135; and apricots, 11,935 bushel cases.

The heavy rains during the later part of the wet season further emphasized the importance of drainage in the Granite Belt, for tree mortality from waterlogging was very high. Growers now recognise the importance of soil conservation and drainage in soil management practices.

The preliminary results obtained last year in the control of pre-harvest drop in apples with trichlorphenoxy propionic acid (2,4,5-TP) were confirmed in 1955-56 and use of this product should soon become an established practice. When applied at a concentration of 50 p.p.m. in water just before fruit drop is expected, the spray remains effective until the end of the harvesting period. The results are also less influenced by the vagaries of the weather and vigour of the tree, which sometimes make the material formerly used—alpha naphthalene acetic acid (ANA)—of little value.

Trials over three seasons with foliage sprays containing urea have been completed but none of the spray schedules have proved entirely satisfactory. Urea sprays may, however, be of value as a supplementary source of nitrogen in trees showing obvious symptoms of nitrogen deficiency due to root injury or waterlogging.

Problems associated with replant orchards are under investigation and present evidence suggests that some of the alleged replant hazards are due to neglect. In replant land previous cropping has reduced the nutrient reserves in the soil considerably and soil structure has deteriorated.

Approximately 200,000 cases of Granny Smith and Delicious apples, or about one-third of the total 1956 crop, were in cool store by the end of May. Pre-harvesting conditions were not conducive to good keeping quality and bitter pit has already developed in some of the larger Granny Smith apples in cool store.

Further experiments were conducted with Delicious and Granny Smith apples of the 1955 crop to determine the effect of picking maturity, locality, tree age and storage conditions on keeping quality. Results over three seasons indicate that the optimum picking date for cool storage is approximately the first week in March for the Delicious variety and the third week in April for the Granny Smith variety. A tendency to pick these varieties at a much earlier stage has been largely responsible for some storage troubles in the Stanthorpe district. Fruit from old trees was of better keeping quality than fruit from young trees, while wastage varied considerably from orchard to orchard.

Detailed studies on the cell number and protein content of apples will be necessary in future investigations in order to determine why apples from some orchards have been of consistently better keeping quality than apples from other orchards.

Further work has been carried out in relation to air purification, ozone content and the composition of the storage atmosphere. There was no difference in wastage between samples kept under normal storage conditions and those kept in rooms equipped with air purification and ozone generators. Storage in artificial atmospheres containing more carbon dioxide and less oxygen than in normal storage increased by two months the storage life of Granny Smith apples picked towards the end of April. This method of storage will enable Granny Smith apples to be marketed in November and December when the market is practically bare, provided the fruit is picked at the right stage of maturity.

Superficial scald usually develops in apples picked before the optimum stage of maturity. Oiled wraps control this disorder in normal storage but they are not successful in atmospheres containing about 5 per cent. of carbon dioxide. The remarkable control of superficial scald obtained in 1955 in the U.S.A. and Tasmania by dipping fruit in an alcoholic solution of diphenylamine is therefore of considerable interest and this treatment has been applied to Granny Smiths of the 1956 Stanthorpe crop in store under artificial atmospheres.

The possibility of using cull apples for the setting of jams is under investigation. The breaking strength of jellies made from factory apples of Jonathan, Delicious and Granny Smith apples has shown considerable variation both within and between the varieties. The properties of these jellies for setting jam will be evaluated at a later stage.

STONE FRUITS.

Commercial developments can be anticipated from experimental projects in which the triethanolamine salt of 2,4,5-T has been applied to developing apricots at the pit hardening stage. Treatment not only increased the size of the fruit but also improved the skin colour.

Peaches and plums are cool stored to some extent in the Stanthorpe district in order to regulate market supplies. Storage experiments with the past season's crop have shown that the life of Wilson plums is about two weeks and of Santa Rosa plums four weeks at 32 deg. F. The Santa Rosa variety often fails to ripen normally but this abnormality has been overcome by placing the fruit in cool storage for one week prior to marketing. The storage life of peaches at 32 deg. F. has been increased 2-3 weeks by pre-storage treatment with ethylene for two days at atmospheric temperatures.

GRAPES.

The year was a difficult one for grape growers. The Muscat Hamburg variety encountered dry weather in the later stages of fruit development at Stanthorpe and much of the fruit withered on the vines. The later varieties, Waltham Cross and Purple Cornichon, matured under very wet conditions and the fruit was unsuitable for long-distance transport. From 2,251 acres, about 150,000 half-bushel cases were produced in 1956.

Experimental work with Phylloxera-resistant stocks has reached an interesting stage and differences in cropping performance and fruit quality are now apparent. The most promising stocks at Stanthorpe are Richter 99 and 420A, whilst at the Redlands Experiment Station vines on Richter 99 and R. du Lot are attractive types. It is already clear that the performance of vines on the several stock types will vary with the soil on which they are grown.

Zinc sulphate swabbing treatment of the vines in winter to correct zinc deficiency is rapidly becoming standard practice in the district. The value of this practice was again demonstrated this year, for vines swabbed in 1954 produced substantially greater yields than untreated vines.

CITRUS.

Price levels for citrus fruits have receded during the past two years, costs of production have increased substantially and competition from the southern States

is becoming more formidable. Current production has been above average but the proportion of blemished fruit has been rather high. Production from 4,622 acres in bearing was 567,428 bushel cases.

The Departmental investigation on citrus varieties and strains is developing rapidly at the Newtown nursery near Maryborough and trees propagated at that centre will be ready for transplanting to pilot plots in the more important citrus districts next spring. The scion material includes a range of new local selections and introduced types.

One new mandarin variety, as yet unnamed, will be released next year for commercial production as a replacement for the Emperor mandarin in districts where brown spot is troublesome. The tree has some of the characteristics of the Glen Retreat but matures earlier. Other potential commercial types may also be obtained from the mandarin project at Lawes, where many of the trees are now starting to bear.

The citrus budwood and seed distribution scheme functioned satisfactorily during the year. The demand for strains of Valencia Late and Washington Navel oranges which are free from exocortis virus is increasing. However, some trees of these strains on trifoliata stock are now available in Queensland as sources of budwood, and the supply position should ease considerably in the near future.

There were considerable mould wastage and skin blemishes in the 1956 crop of Washington Navel and Joppa oranges following extremely wet seasonal conditions. A survey of handling methods is being made to determine the nature and extent of injuries which occur before harvesting and at various stages during preparation of the fruit for market. The technique involves immersing the fruit overnight in a 0.05 per cent. solution of 2,3,5-triphenyl tetrazolium chloride (TTC), which shows up injuries as bright red spots. In this season's crop many skin injuries occurred before picking and these could be attributed to seasonal conditions. The importance of careful market preparation has been indicated by the large increase in skin injuries when faulty handling methods are employed.

The fumigation of citrus fruits against fruit fly is now of Commonwealth interest following an outbreak of this pest in southern States and a restriction on citrus exports to New Zealand. Tests have been carried out with the fumigant ethylene dibromide to determine its toxicity to Washington Navel and Joppa oranges picked at weekly intervals from the Gayndah and North Coast districts. Examinations made one week after treatment for two hours with concentrations of ethylene dibromide ranging from ½ lb. (the effective dose for Oriental fruit fly) to 2 lb. per thousand cubic feet of air space at 70 deg. F. have revealed no skin injuries or abnormal flavour in any of the treated samples. Tests will be continued on other varieties of citrus fruit.

PAPAWS.

Fruit quality in 1955 was better than average and the harvesting season longer than usual. Fruit setting in the 1956 crop is rather uneven, and in some areas large numbers of trees collapsed after the heavy rains. The area under crop is 1,060 acres and production for the year amounted to 435,012 bushel cases.

Market values depend on fruit quality, the main defects being an insipid flesh during the colder months and susceptibility to ripe fruit rots during the warm weather. Considerable importance is therefore attached to the Departmental plant improvement programmes. Few of the varieties introduced to Queensland have proved suitable for local conditions and further improvements in fruit quality will depend on the commercial exploitation of strains which have been developed from local material.

Arrangements are in train for the production of seed of Hybrid No. 5 bred at Nambour. In addition, pure lines of locally selected strains known as Sunnybank and Brookfield are now available. These strains are less subject to wastage from fruit rots than existing commercial types.

In spite of the recent interest by processors in hermaphrodite papaws such as Guinea Gold, trials at the Maroochy Experiment Station have revealed erratic setting in this variety. Hermaphrodite papaws may be of value to the industry in supplying fruit when the dioecious types are not on the market. Selections within the hermaphrodite material are therefore being retained in the plant improvement programme.

STRAWBERRIES.

In spite of the difficulties encountered in preparing the land for planting, the 1955 strawberry crop was comparatively good and overall returns to the grower were satisfactory. Price levels for the berries remain attractive and the acreage planted in 1956 is at least 25 per cent. greater than that of last year. Production in 1955 amounted to 549,485 lb. and the area under crop in 1956 is about 350 acres.

The relatively high production in Queensland can be attributed to healthy planting material supplied by the Strawberry Runner Approval Scheme and the practice of growing the crop as an annual.

Although heavy basal fertilizer dressings and regular side-dressing after the inception of flowering are recognised as essential by strawberry growers, rates of application and formulations vary considerably in commercial practice. A trial at the Redlands Experiment Station during 1955 indicated that the current recommendation (viz., 10 cwt. per acre of 5:14:5 before planting and 1-2 cwt. per acre of a quick-acting 5:13.5:5 fertilizer at monthly intervals after flowering) is sound. Although additional nitrogen in the mixture increased the number of berries harvested it reduced average fruit size and had no effect on total yields. A response was obtained to molybdenum in the presence of high amounts of potash.

AVOCADOES.

The 1955-56 crop was above average, market demand was good and grower returns were satisfactory. Approximately 2,000 bushel cases were harvested in 1955.

Strenuous efforts are being made to expand the industry to meet the current demand for good quality fruit. Propagation difficulties have now been overcome and worked trees are available from commercial nurseries. Nevertheless, progress in the industry is being retarded because of excessively high mortality in young trees after they have been established in the orchard. Tree failures were relatively high after the 1956 wet season. Future expansion of the industry may therefore depend on the establishment of commercial orchards on well-drained sandy loams or in finding rootstocks which will withstand moist conditions.

For some time past, nurserymen have propagated the avocado on Mexican stock which has some resistance to root rot, but only a few trees are available from which seed can be obtained for stock purposes. Steps are therefore being taken to establish trees of this type in Departmental orchards.

Although many seedling trees are now being re-worked to established varieties such as Fuerte and Nabal, there is still a need for earlier or later maturing varieties. Growers have therefore been asked to submit promising strains for chemical and tasting tests. Four of the 24 samples so far tested, which are rich in oil, of high flesh content, good texture and colour, are now being propagated for field observations.

Chemical work to determine a satisfactory and rapid method of evaluating fruit maturity has shown that the measurement of refractive index gives an approximate oil value which may be suitable for assessing maturity. The oil content of Fuerte samples was 7 per cent. in mid-February, when this variety is sometimes marketed, and 19 per cent. in mid-May, when a satisfactory palatability was first attained.

PASSION FRUIT.

Passion fruit crops were good and the market demand was satisfactory. The 1955 production was 16,919 half-bushel cases.

Diseases are the main hazard in the crop but recent investigations may lay the foundations for a more stable industry. Officers of the Pathology Section have shown that some species of the genus *Passiflora* possess considerable resistance to root rot caused by Fusarium. Two of these species—*Passiflora edulis* var. *flavicarpa* and *P. coerulea*—can be used as rootstocks for the commercial *P. edulis*. The use of grafted plants may therefore become standard practice in future. *Flavicarpa*

seems the more desirable stock for it does not show the aggressive suckering from the roots which is characteristic of *coerulea*.

Few established vines are free from the woodiness virus and the only way to ensure that scions are healthy is to take them from seedling material. Procedures have been worked out by which seedling *edulis* can be grafted on to seedling *flavicarpa* by a relatively simple approach graft.

Natural hybrids between *edulis* and *flavicarpa* occur in North Queensland. Selected material from such plantings, together with the progenies of crosses made by Departmental officers, is being checked for inherent resistance to Fusarium and for agronomic characters.

MACADAMIA NUT.

No major increase in acreage has taken place recently in the Macadamia nut industry and about 24 tons were produced in 1955.

No satisfactory solution to the problem of nursery propagation has yet been reached and the scope of the work on this subject has therefore had to be extended. Seedling trees are now established at Redlands, Maroochy and Newtown to check the effects of grafting seedlings of different ages with various types of scion wood at several periods of the year. Until this problem is solved, orchard plantings must necessarily be limited to seedling trees, which are extremely variable in cropping habits.

Investigations have been continued on evaluating the processing qualities of selected samples of the *tetraphylla* (rough shell) and *ternifolia* (smooth shell) types. Three selections from each of the two types are now being propagated in a number of selected areas. Processed nuts of the *tetraphylla*, the more common type in Queensland, have a better flavour, but the *ternifolia* type so far has given better storage results. Chemical tests have shown no differences in oil characteristics between the two types but it is possible that cooking procedure may be a factor in keeping quality.

Considerable time has been devoted by Departmental officers to organising and supervising the commercial processing of 2 tons of nuts from selected growers. The roasted and salted kernels sold readily at an average retail price of 14s. per lb., giving a net return to the grower of 6s. per lb. of kernels. Arrangements are now in hand to process a large portion of the 1956 crop, comprising 17 tons. An additional return is expected from the 10 tons of shells, valued at approximately £60 per ton. These will be ground into a very fine flour and manufactured into plastic adhesives.

MANGO.

Mangoes were more freely available on the Queensland market last summer than for some years past. A crop of 31,851 bushel cases was marketed, and the quality of the fruit was very good.

In the dry tropics, a few growers are now growing mangoes as a major crop. The areas planted are reasonably large and include several local and introduced varieties which mature at different periods of the year. These orchards are large enough to justify efficient fertilizer use, irrigation and careful supervision of marketing operations. They may, therefore, set new standards in the management of the crop.

GINGER.

Interest in ginger growing in the Buderim district has been revived but shortage of suitable seed prevented plantings on an extensive scale in 1955. A crop of about 120 tons is expected, of which 50 tons will be reserved for seed for next season's crop.

Experimental work has been concerned with time of planting in regard to yield and processing quality. Crops were planted at Maroochy Experiment Station in August and October, 1955. Both flowered in February and the average yield of stringless material per plant reached its peak about two weeks later. In the first planting this peak coincided with the full development of the rhizome but in the second planting the rhizome was not fully developed till about two weeks later. Higher returns and better quality were obtained by planting and harvesting earlier than is customary.

A crisper texture has been obtained by reducing the cooking time, while a continuous evaporation process gave a much higher yield and better texture than the normal re-syruping method. Flavour has been greatly improved by allowing slight fermentation to proceed during the syruping process and by using honey or raw sugar in place of refined sugar.

FIGS AND CUSTARD APPLES.

The fig industry had a comparatively good year. The crop is, however, so subject to disease and so liable to rain damage during the harvesting period that costs of production are high. Production during 1955 was 5,829 bushel cases.

A revival is apparent in the custard apple industry and many unproductive trees are being replaced. The 1955-56 crop was good, with a long harvesting period and fruit of above-average quality. Production in 1955 was 14,193 bushel cases.

Production per tree is still far too low in the custard apple and faulty stock material appears to be the contributory cause. This problem is under investigation and the Pink's Mammoth and Island Gem varieties are being propagated on several selected stocks at the Redlands Experiment Station.

TOMATOES.

Tomato supplies were generally short and market prices high for long periods. Production at Bowen was below average; at Stanthorpe, the crop was virtually a complete failure following waterlogging of the soil during the wet season. Production in 1955 was 749,131 bushel cases, from an area of 5,327 acres.

The varietal position remains fairly stable in southern Queensland, where Q2 and related strains provide the bulk of the crop. In North Queensland, however, Q3 is being more widely grown; it represents about 30 per cent. of plantings at Bowen. At Stanthorpe, a new strain of Rutgers known as Q5 has been released; it retains good fruit size until late in the harvesting period.

Various methods of trellising have been investigated at the Redlands Experiment Station and the results favour the parallel wire trellis with plant spacings of 9-18 in. in the row.

Methods of seedbed management have improved considerably during recent years, largely as a result of work at the Redlands Experiment Station. Molybdenum treatment of the seedlings is now standard practice and soil fumigation with ethylene dibromide (EDB) before sowing is becoming increasingly popular in some districts. However, greater attention needs to be given to the composition of seedbed soils. One project at the Station showed a substantial improvement in plant growth and root development in seedlings raised on soils compounded of 25 per cent. sand, 25 per cent. loam and 50 per cent. of conditioners such as sphagnum, peat moss and vermiculite.

The work on nematode-resistant strains of tomatoes has been carried a step further. Selections now available are of acceptable fruit quality and highly resistant to the pest. Unfortunately, they are pale-skinned types in the green-mature stage and thus encounter some prejudice on the market. Work on other strains is now in progress.

BEANS.

Green bean production remains one of the most important horticultural industries. The area planted in 1955 was 4,810 acres and production 517,688 bushels.

Varietal trials carried out at Gympie and Nambour have shown (a) that the differences in pod quality between varieties may be more important than differences in yield; and (b) that potential yields vary greatly with the soil type.

The production of winter beans in coastal southern Queensland is rather hazardous, for even crops on frost-free land are subject to the effects of cold winds which upset pollination and seed development in the pods. Differences have been noted in the cold tolerance of individual strains of Brown Beauty and a project has been started to segregate cold and heat-tolerant strains. The data so far obtained suggest that different strains of Brown Beauty may eventually be used for the production of autumn, winter and spring crops respectively.

Since bean seed production policy was altered in 1955, certified seed has been grown in limited quantities to supply mother seed for commercial seed producers. This arrangement has worked very well so far and has led to closer Departmental co-operation with grower organisations interested in the production of approved seed.

LEAF VEGETABLES.

Production of leaf vegetables is now distributed over a wider area than hitherto. In 1955 approximately 432,000 dozen cabbages and cauliflowers and 226,201 bushel cases of lettuces were produced from 2,056 acres.

The culture of new early-maturing varieties has necessitated changes in production methods; some have been devised at the Redlands Experiment Station.

The cabbage industry is now based on three varieties—Early Jersey Wakefield, Enkhuizen Glory and Succession. Cauliflower varieties are reduced virtually to Russian 2A for the early crop and Phenomenal Four Months for the main crop.

Nutritional and disease troubles are very pronounced in the lettuce crop, particularly during wet, humid weather, and these may be associated with the practice of repeated planting on the same land. Either a better rotational system should be adopted or the land should be fumigated before planting.

ROOT CROPS.

It is pleasing to record a marked improvement in production methods of carrot and beetroot crops during recent years. The main changes are more thorough land preparation for the crop, fumigation of the soil with ethylene dibromide (EDB) in the final stages of land preparation, and planting on raised beds. In 1955 the production of these crops was 58,879 cwt. from 897 acres.

One noteworthy development in the carrot crop is the practice of using a supplementary weedicide after sowing but before germination takes place. The inclusion of this earlier treatment effectively suppresses weeds and thus reduces competition for soil moisture and plant nutrients in the earlier stages of growth.

The beetroot crop is now oriented on the varieties Green Top Bunching for the fresh vegetable market and Detroit Dark Red for the processing trade. Boron and molybdenum are now being applied by most growers in their cultural programme.

CUCURBITS.

In 1955, the production of cucurbits was as follows:—cucumbers 122,720 bushels; watermelons 4,104 tons; rockmelons 754 tons. The total area was 2,126 acres. The pattern of production in cucumbers and watermelons shows little change from that of the previous year. In the rockmelon crop, the main variety grown (Hale's Mildew Resistant) has insufficient resistance to downy mildew. Varietal trials during the past two years have shown that two introduced varieties—Rio Gold and Conqueror—are outstanding for their resistance to downy mildew and their flesh quality is comparable with that of Hale's Mildew Resistant.

COVER CROPS.

There is room for a winter cover cropping programme in coastal southern Queensland when land is idle between crops. Cereals are frequently used but results with legumes are often far from satisfactory.

Experience at the Redlands Experiment Station has shown that New Zealand blue lupin usually germinates well but fails to make adequate growth. Later, a considerable percentage of the young plants die. A range of cultural and other treatments was therefore investigated in 1955. Normal growth was obtained with high levels of phosphorus (equivalent to 5 cwt./acre of superphosphate) and it is almost certain that past failures with this crop in coastal areas were due primarily to a deficiency of phosphorus. Plants suffering from a shortage of this nutrient seem more susceptible to seedling disease than are healthy plants.

Lack of available phosphorus in the soil may not be the whole explanation of poor growth in New Zealand blue lupins. A deficiency of sulphur may also be involved and this is to be investigated in the coming year.

EXPERIMENT STATIONS.

Field investigations are largely concentrated at Maroochy Experiment Station, Redlands Experiment Station, Kamerunga Experiment Station and Ayr Regional Experiment Station.

The work at Maroochy Experiment Station is concerned mainly with plantation crops. Since irrigation facilities were installed two years ago, the cropping programme has become less subject to the vagaries of the weather. The more important projects in progress are:—(1) Pineapples—(*a*) methods of crop management on steep slopes; (*b*) plant spacing in the crop row; (*c*) urea sprays as a source of nitrogen; (*d*) ANA influence on fruiting size; (2) Bananas—(*a*) types of planting material; (*b*) methods of de-suckering; (*c*) varieties; (3) Papaws—(*a*) plant breeding and selection; (*b*) hormone sprays and fruit set.

After a period of intensive varietal studies on vegetables, work at the Redlands Experiment Station has been modified to permit more detailed studies on soil and crop management problems. As part of this work, additional land has been cleared, preparatory to planting next year. Experiments on avocadoes, grapes and passion fruit are also in progress.

At Ayr Regional Station the more important projects are fertilizer requirements of the pineapple, crop control by flower induction in the pineapple, and times of planting for bananas.

At Kamerunga Experiment Station, tropical crops under observation include mango, citrus, pepper, coffee, avocado and litchi.

Facilities for experimental work are also provided on land specially leased at Maryborough for the propagation of subtropical tree fruits and at Stanthorpe for root-stock-scion investigations on grapes.

The work on the storage and processing of fruit and vegetables is considerably restricted in scope with existing facilities. Final plans and specifications of experimental cool storage chambers and laboratories are now nearing completion and it is anticipated that building will commence in the next financial year.

EXTENSION WORK.

Advisory Committees on the main fruit and vegetable crops have met regularly to discuss growers' problems. Considerable progress has also been made in developing discussion groups in which growers are the main contributors while Departmental officers supply technical comments.

Press and radio facilities are being more widely used in the main horticultural districts, while topical articles are published weekly in *Queensland Fruit and Vegetable News*. The text of Volume II of the *Queensland Agricultural and Pastoral Handbook* has been completely revised and the new edition should be available in the near future.

In conjunction with the Department of Public Instruction, school packing classes have been held in the Stanthorpe district on deciduous fruits, in the Bowen and Metropolitan districts on tomatoes, and in the North Coast district on citrus fruits. Over 500 children have attended these classes and competed for trophies in the district Shows.

About 4,000 growers have attended screenings of movie colour films prepared by Branch officers on the major horticultural crops.

PACKAGING.

The difficulty of obtaining adequate supplies of case timber has focussed attention on fibreboard packages as alternative containers for fruit and vegetables. Many improvements in design have been made by the manufacturers and a large portion of the 1955 Gayndah citrus crop was marketed in these cartons. The latest design by the Australian Paper Manufacturers Limited has overcome the problem of opening and closing a carton and appears to meet trade requirements. Departmental officers have assisted the manufacturers in planning and organising large trials and in making the necessary inspections.

A number of plastic materials has been tested to determine their suitablility for pre-packaging vegetables. These plastics have reduced weight losses in peas, beans and lettuce from 8 per cent. to 1 per cent. and maintained the fresh condition of these vegetables for a much longer period than those unwrapped. The high humidities

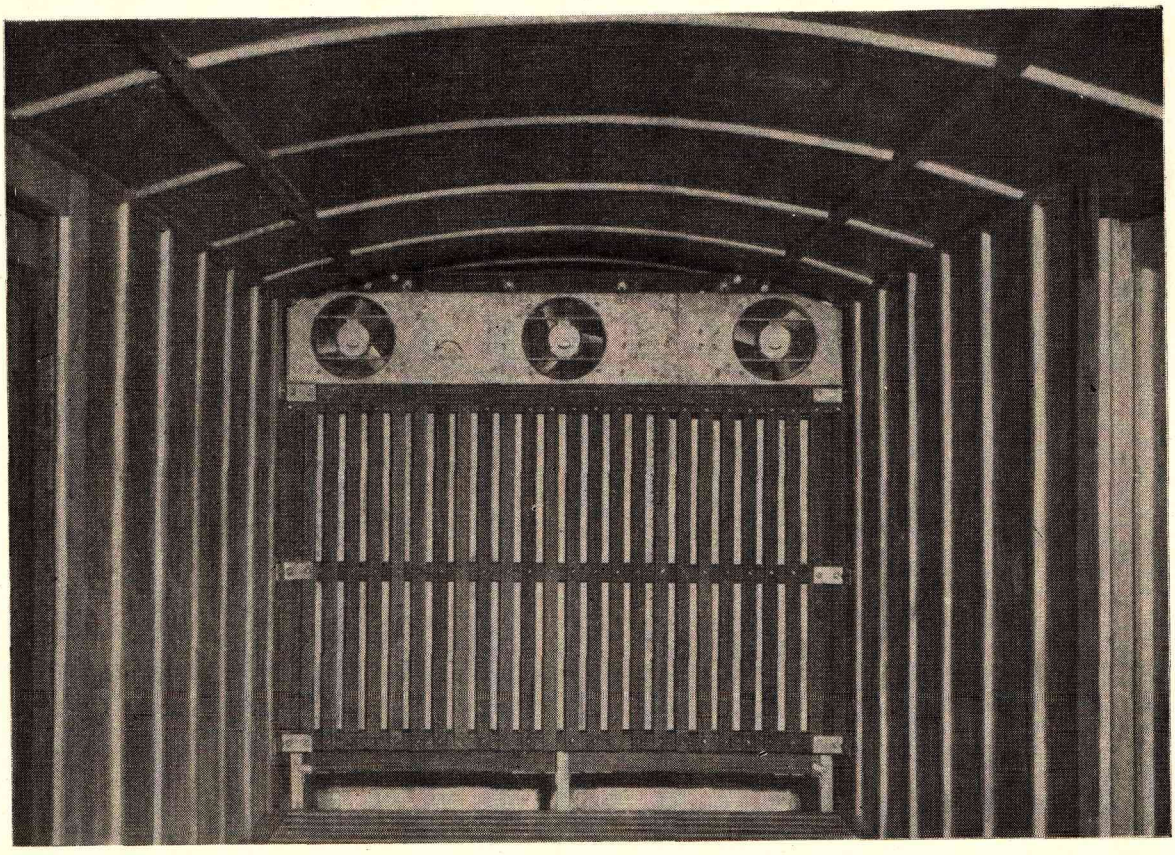


Plate 2.—Interior of a New Fan-type Insulated Railway Car, Showing Three Fans Above the Ice Bunker.

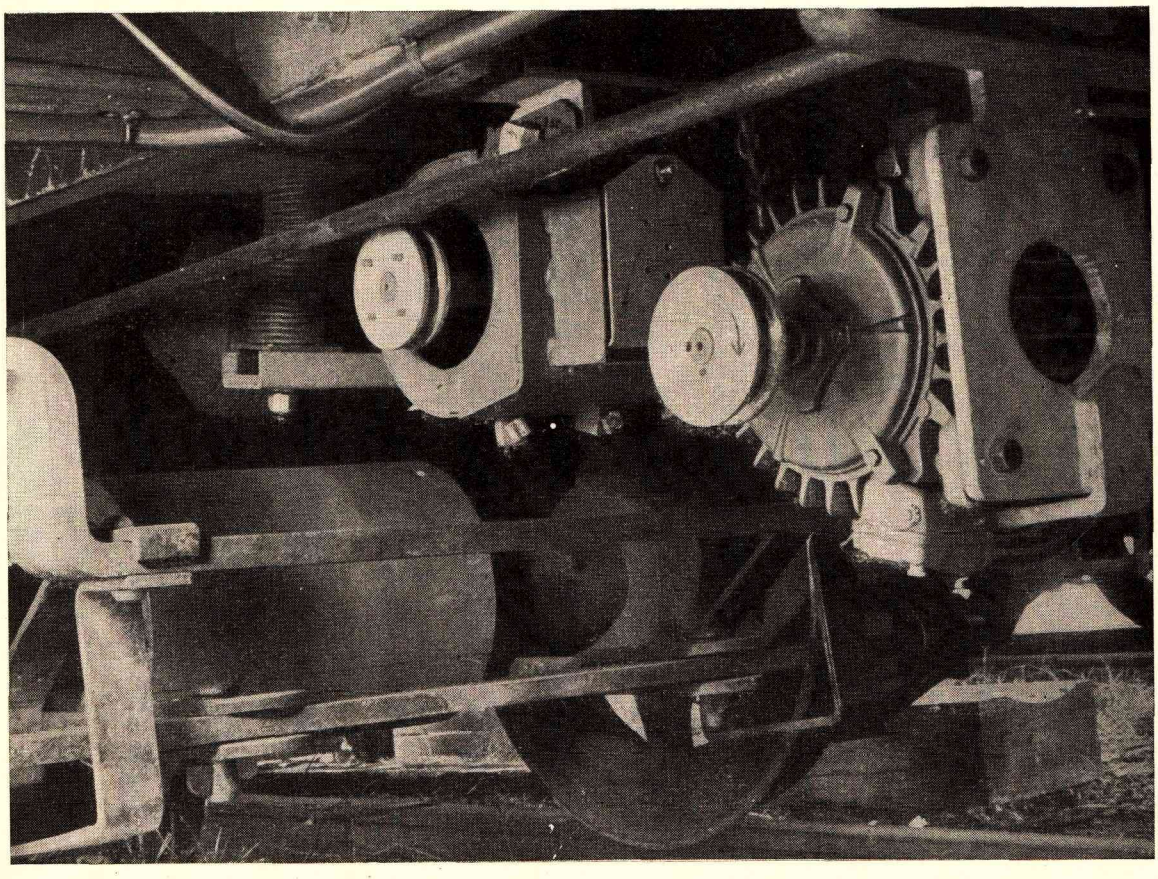


Plate 3.—Equipment for Driving Fans in the Insulated Railway Car. The drum on the axle has a flexible rubber drive above it. The alternator and the auxiliary motor are also shown.

in the package favour development of moulds and bacteria when these organisms are present at the time of harvesting, which sometimes happens with winter beans and summer lettuce.

During the year, trial shipments of pre-packaged vegetables to New Guinea and Darwin demonstrated that provided refrigerated facilities are available pre-packaged vegetables can be carried satisfactorily to some distant markets by sea transport.

REFRIGERATED TRANSPORT.

The fan equipment imported by the Department from the Preco Company of California has been installed in an insulated railway wagon by the Queensland Railways Department. The unit consists of six electric fans mounted at the top of the ice bunkers and charged by a flexible rubber drive in contact with the wheel axle. An auxiliary motor mounted under the wagon can be connected to power points at the main stations to operate the fans when the train is stationary for long periods. The unit is designed to cool loads during transit and thus obviate the need to pre-cool consignments several days before the train departs.

In the type of wagon now in general use, temperatures near the roof are at least 10 deg. F. higher than those at floor level. The initial tests with the fan wagon have shown only 0.2 deg. F. difference in temperature between the highest and lowest reading in 24 different positions in the wagon. Temperature records in a loaded wagon will be taken during transit to Longreach and to Mt. Isa over the winter and early summer months of 1956.

MARKET INSPECTION.

The Stanthorpe apple crop has been above average quality and except for isolated hail marks the condition has been particularly good. Peaches and plums were showing slight brown rot at the beginning of the season and this became more prevalent as the season advanced. Mould wastage and skin blemishes in citrus fruits were particularly severe following wet seasonal conditions. At one stage, tomatoes were in such short supply that supplies were air-freighted to Brisbane from South Australia. An adverse season resulted in considerable rots in seed and table potatoes imported from other States.

A considerable improvement can be recorded in the standard of produce being offered for sale in barrows and shops. The large volume of perishables now travelling interstate by road has greatly increased inspection difficulties at border crossings.

Fumigation with methyl bromide of one shipment of Tasmanian apples was ordered because of mite infestation. Owing to the risk of injury through fumigation, Tasmanian apples are now inspected prior to loading and consignments for Brisbane carry a certificate of freedom from mite.

EXPORTS.

During the year, 1,189,149 packages of fruit and 813,733 packages of vegetables were exported interstate.

At the commencement of the season prospects for a record export of apples to England seemed bright but because of spray residue on the apples the quantities eventually despatched were considerably below expectations. A shipment of about 3,000 cases, the first to be made in the post-war period, arrived in England in very good condition. Substantial orders have been received from eastern countries for apples and citrus fruits but lack of shipping space has prevented export on a major scale. The standard of cases submitted for export has been particularly good following the import of case timber from New Zealand.

Approximately 20,000 cases of fruit and 7,500 packages of vegetables were consigned to overseas countries during the year.

PLANT QUARANTINE.

Imports of plant material have increased considerably during the year and totalled 12,500 logs, 20 million super feet of timber, 2,280 bales of cotton and 3,000 plants of various species. The condition of logs is showing general improvement as a result of the co-operation of exporting countries. Wooden crates for merchandise, formerly a source of timber pests, are now arriving in sound condition following the incorporation of crates under timber quarantine regulations. Nursery stock regulations restricting imports to an approved authority and requiring fumigation and post-quarantine treatment after arrival are providing safeguards to floriculture.

A Quarantine Publicity Campaign, embracing films, posters, leaflets, press releases, radio talks and Show exhibits, is now operating.

Co-operation of importers, Customs, Postal and Transport authorities has greatly facilitated the work of Departmental officers in quarantine inspection at the approved ports of entry. Plans have been formulated to cope with the large influx of overseas visitors expected to land in Brisbane en route to the Olympic Games in Melbourne.

SCIENCE BRANCH.

Botany Section: Mr. S. L. Everist, Government Botanist.

Entomology Section: Dr. W. A. McDougall, Chief Entomologist.

Plant Pathology Section: Mr. J. H. Simmonds, Chief Pathologist.

BOTANY SECTION.

Accurate identification is essential in all work on plants so that research workers may draw on the experience of others and pass on their own results in turn. The primary function of the Botany Section is to determine accurately the names of all plants in Queensland, native, naturalized and cultivated, and to make this knowledge available to all who seek it.

In addition, the section studies the relationships of plants to one another and to their environment, carries out research and advisory work on the control of weeds and certain undesirable native plants, and gives such advice on the properties of plants as may be requested.

IDENTIFICATION AND ADVISORY WORK.

Some 10,000 specimens were received during the year for identification. These came from officers of State and Commonwealth Departments, farmers, graziers, schools, home gardeners and others interested in plants. Most of the specimens were accompanied by requests for information on the properties of the plants and, in the case of weeds, methods of control. Examination of stomach contents and identification of plants suspected of poisoning stock were carried out. There was a demand for advice on trees and shrubs for fodder, shade and ornament, particularly from inland areas.

TAXONOMY.

In order to keep our knowledge of the plants in the State up to date, taxonomic studies of particular groups were continued. Genera studied included *Austrocarpus, Corynocarpus, Denhamia, Eremophila, Eucalyptus, Hemichroa, Melaleuca, Mesembryanthemum, Paspalidium, Phalaris, Pilidiostigma, Plectranthus, Rhodomyrtus* and *Xylopia*. New species were identified in some of these groups and descriptions were drawn up ready for publication. During the course of these studies, briefer accounts of each genus and keys to the species are being written as part of the preparations for a new handbook to the flora of Queensland.

Descriptions of five new species were published. Four of these are native plants and the other is a grass species synthesised by geneticists of C.S.I.R.O. which was formally described to validate the name being used for it by workers in other fields.

WEEDS.

Enquiries on weed control followed the usual pattern. Because of the wet summer, certain weeds such as nut grass, Johnson grass and broad-leaf carpet grass were particularly troublesome, the last chiefly in suburban lawns.

A few weeds of particular interest are worth noting. *Brassica fruticulosa*, a mustard native to southern Europe, was received from the Toowoomba district. This plant appeared in a linseed crop on the Darling Downs in 1949 and all plants observed then were destroyed before the seeds ripened. Its reappearance is a reminder that new weeds can be introduced at any time and that any strange plant should be identified at once. This is borne out further by the appearance of *Crotalaria anagyroides* and *Ipomoea triloba* in different areas of land sown to centro seed imported from Singapore. Both of these plants are common weeds in tropical Asia and Indonesia but neither has been known to grow spontaneously in Queensland. Two plants of opium poppy (*Papaver somniferum*) came up in a lucerne crop at Kerry.

SUSPECTED POISONOUS PLANTS.

About 50 plants were received which warranted recording as plants suspected of poisoning stock. A few of the more interesting ones are as follows. *Morinda reticulata*, received from Cape York Peninsula as the cause of "changed hoof disease" in horses, was found by the Toxicologist to contain selenium. Purple plume grass (*Triraphis mollis*) appeared to be the cause of sudden death in rams in the Quilpie area when the animals were confined to sandhills by floods. Samples of the grass were found to yield HCN. Seeds of crowsfoot grass (*Eleusine indica*) were found in quantity in paunch contents of young sheep which died suddenly in the Brisbane district. Field study and chemical tests confirmed that this mortality could have been due to HCN in the seeds.

BRIGALOW.

Brigalow (*Acacia harpophylla*) is a native tree which grows in dense scrubs on good soils with 20-30 inches of rain per year. Since 1951 experiments have been in progress to determine whether it is possible to use hormone herbicides applied by aircraft to kill the brigalow. A winter spraying programme, postponed from July 1954 because of unseasonable weather conditions, was completed, so far as spraying is concerned, in July 1955.

Although no final assessment of this winter trial is yet possible, it is interesting to compare it with similar sprayings in November 1953 and March 1954 and a single series in July 1954. These results are set out in Table 1. They show that on big virgin brigalow, different esters of 2,4,5-T at $\frac{1}{3}$, $\frac{2}{3}$ and 1 lb. acid equivalent per acre, mixed with diesel distillate and applied by aircraft at a total volume of 2.7 gall. per acre, gave a high percentage kill of trees to ground level, irrespective of the amount of 2,4,5-T used. Similar materials emulsified in water and applied at similar rates gave less consistent results. Undergrowth brigalow in some of these tall scrubs (not shown in Table 1) was not consistently affected, but there was a very marked response of ground vegetation in all plots. Root suckers have appeared in some. In those treated in November 1953, most of the root suckers which came up in 1954 and 1955 are now dead and results appear to be very good.

On dense sucker regrowth results are less encouraging. There has been a good deal of variation from place to place but in every area this type of brigalow has proved difficult to kill. Results, expressed as the percentage of trees completely defoliated, have been poor to moderate. The figures in Table 1 do not show trees partially defoliated by spraying which produced new shoots later. In almost every case there has been marked response of ground vegetation and in some areas this would justify aerial spraying as a commercial proposition.

Half the virgin brigalow blocks in the Yuleba district which were sprayed in April 1951 were burnt in February 1955. In these there has been virtually complete control of the brigalow, the few suckers remaining being quite insignificant. In the sucker blocks sprayed at the same time, burning was not possible except for one small piece burnt in July 1955. In these blocks there is a dense growth of grass and many suckers also. The small burnt piece looks promising.

A further small set of trials carried out in April 1954 has given interesting and significant results. This was on new suckers eight weeks after a good burn in brigalow pulled down by machinery. Aerial spraying with $\frac{1}{2}$ lb. 2,4,5-T per acre in diesel distillate has given more than 85 per cent. complete kill of brigalow, and with 1 lb. per acre a 95 per cent. kill. The same chemicals emulsified in water and put on with ground equipment gave comparable results at 1 lb. per acre but at lower rates were markedly inferior, though even at $\frac{1}{3}$ lb. 2,4,5-T acid equivalent per acre, 55–60 per cent. of the brigalow suckers were killed, and at $\frac{2}{3}$ lb. the percentage was 80–90. The significance of these observations is that it appears likely that burning, combined with aerial spraying of 2,4,5-T at low rates, will prove a useful technique for clearing brigalow, provided both the burn and the spraying are properly timed.

Further intensive study of these problems is needed, particularly the possibility of developing a technique which will combine aerial spraying, judicious burning, pasture sowing and livestock management. Preliminary steps towards such a study are being taken by assigning one botanist full-time to a study of the effectiveness of all existing methods of treating brigalow.

Assistance in planning and supervision was given to the Department of Native Affairs in spraying 2,000 acres of brigalow at Foleyvale Aboriginal Reserve. Of this area, 600 acres was treated at lower rates as a check on results of small-scale experiments.

HERBARIUM AND LIBRARY.

Rearrangement of the herbarium was continued. Specimens totalling 3,337 were received from other herbaria and 650 were sent in exchange. Specimens sent on loan to other institutions totalled 533. The catalogue of periodicals in the library was completed and the task of listing the books begun. Additions to the library totalled 67 volumes (excluding periodicals), and 85 volumes were bound during the year.

With clerical assistance from C.S.I.R.O., about 6,500 botanical specimens collected by New Guinea forestry units during the war years were labelled. These can now be incorporated in the herbarium and the duplicates distributed.

VISITING BOTANISTS.

During the year botanists who worked in the herbarium were Dr. R. Cooper and Miss Mason of New Zealand, Mr. J. S. Womersley of New Guinea, Miss N. T. Burbidge, Dr. R. D. Hoogland, and Messrs. M. Lazarides and R. Pullen of Canberra, and Messrs. G. Chippendale and N. Forde of Alice Springs.

PUBLICATIONS.

All parts of "The Honey Flora of South-eastern Queensland" were completed. Most of them have been published and the collected articles will soon be available in booklet form. A handbook with descriptions and illustrations of more than 100 common weeds was completed and will be published shortly.

TABLE 1.

PERCENTAGE OF BRIGALOW TREES COMPLETELY DEFOLIATED.

Material and Rate.	Water.						Oil.					
	Tara–Condamine.			Taroom–Wandoan.			Tara–Condamine.			Taroom–Wandoan.		
	November.	March.	July.	November.	March.	July.	November.	March.	July.	November.	March.	July.
Mixed 2, 4–D/2, 4, 5–T 1 lb.	..	..	0	*5	*5	0–10	0–5	10	10–50	20–40	*5–30	40–45
	10–20	50	0–10	90–95	70–90	10–30	90	90	95	95	95	70–95
Mixed 2, 4–D/2, 4, 5–T 2 lb.	..	..	15	*5–20 (40)	5–30	20–55	5–10	10–70	60	40–50	50	10–15
	60–70	80	10–15	90–95	95	5–30	95	95	95	95	90	85–90
Butyl 2, 4, 5–T ½ lb. ..	..	..	0–5	*5	*5	0	0–5	0–5	10–15	10–15	25–60?	5–10
	10–30	5–10	0–5	80	85	*5	95	90	70–95	80	90	70–85
Butyl 2, 4, 5–T ⅔ lb. ..	..	..	0–5	*5 (30)	5–20	30–40	5–10	10–50	30–40	10–15	25–60?	40
	50–90	10–50	20	40–80	75–90	*5–35	95	90	70–95	90–95	95	85
Butyl 2, 4, 5–T 1 lb. ..	..	..	5–10	*5	5–30	30–40	5–10	45–70	30–40	10–20	20–50	25–50
	50–70	30–80	30	40–70	20–90	95	95	90	95	90–95	95	95
Butoxy-ethanol 2, 4, 5–T ½ lb.	..	..	0–5	5–25	*5	0	0–5	10–15	5	5–10	5	*5–20
	50	10–15	10–15	60–80	50–60	10	95	70–80	95	90	95	60–95
Butoxy-ethanol 2, 4, 5–T ⅔ lb.	..	..	5–10	5–20	5–20	0–5	0–5	20–50	20–30	10	30	15–20
	30–50	10–40	50–70	95	95	5–70	95	95	95	95	95	70–90
Butoxy-ethanol 2, 4, 5–T 1 lb.	..	..	10–50	*5	*5–30	*5	5–10	40–80	30	30	20–60	10–15
	50–90	30–80	90	95	40–95	80	95	95	95–100	95	95	95

Figures on the upper line in each case apply to sucker regrowth; those on the lower line apply to virgin scrub. In the latter case the effect on understorey brigalow has not been included in the figures.

No figures are given for water treatments of sucker regrowth in the Tara district for November and March. Through a misunderstanding the owner of this property had them resprayed in 1955, using 2, 4, 5–T in oil at 1 lb. per acre.

* Is less than.

ENTOMOLOGY SECTION.

Above-average rainfall in most districts interfered with farm routine, including pest control. Infestations of some important pests, however, were not severe during the year, and no unusual widespread pest outbreak was experienced. Although field experiments were limited severely by weather conditions, the year's work has been one of progress in evaluating pests and improving economic control.

During the past 12 months, the application of insecticides by aircraft in Queensland has increased considerably, and for the first time small field crops were given appreciable attention.

DECIDUOUS FRUITS.

Although rain interfered with spraying during January, codling moth (*Cydia pomonella* (L.)) was not serious in most orchards. The grape scale (*Eulecanium persicae* (F.)) and the grape thrips (*Haplothrips froggatti* Walk.) were prevalent in the Stanthorpe district, and controls were necessary. An extensive research programme covering insecticide, miticide, arsenic residue, and uniformity trials in apple orchards and insecticide screenings against grape pests has been carried through. A revised spray programme for the control of pests in apple and pear orchards was published in time for the 1954-55 season.

TROPICAL FRUITS.

Advisory service in banana plantations has been concerned mostly with insecticide application timings most suited to present economic conditions. Investigations of the relationship between nematodes and root rots in bananas and pineapples and the status of root-knot nematodes in the latter crop have been initiated. The large field trials established in the Tully district, and concerned with the banana root rot nematode (*Radopholus similis* (Cobb) Thorne), were damaged severely by a cyclone during March. Results from pot experiments with pineapples indicate that poor drainage is an important predisposing factor for at least one form of "wilt." Work with the mealy bug (*Dysmicoccus brevipes* (Cockrell)) is proceeding in the Far North. An eriophyid mite damaging banana fruit on the South Coast late in 1954 has been named by Keiffer *Phyllocoptruta musae*. The Maori mite is the only other species of the genus in the State.

CITRUS.

The two outstanding occurrences in citrus orchards during the past season were the upsurge of wax scales (*Ceroplastes destructor* Newst. and *C. rubens* Mask.) in most southern districts, and in some coastal areas widespread infestations of red scale (*Aonidiella*

aurantii (Mask.)), which were heavily attacked by entomogenous fungi. The satisfactory cleaning up of the wax scales will require special efforts during the coming early summer. Results from the 1954-55 large-scale orchard trials in the Gayndah district demonstrated that further attention should be given to scale control on mandarins.

FRUIT FLIES.

In the Brisbane area fruit fly damage was much more severe early in the season than in previous years. Peaches, grapes and passion fruit were heavily attacked. Enquiries on fruit fly control were again numerous from widely scattered localities. Laboratory and field work with these pests is making steady progress. Large-scale orchard trials, although laborious and costly, are now yielding valuable data and experience. The results are a sound measure of the degrees of control obtained with specific spray programmes under known conditions, an essential step towards improving commercial controls. Field work, both as ecological studies and as insecticide screening, is still expanding to cover the diverse conditions to be encountered throughout the State.

TOBACCO.

In most districts pests caused negligible damage. Looper (*Plusia argentifera* Guen.) infestations were halted effectively by judicious spraying, and growers using old land are now fumigating against nematodes. Budworm (*Heliothis* sp.) was in evidence where controls were neglected. Although there was a welcome respite from serious pest attacks during the past season, the years of naturally heavy infestations will come again. To protect adequately a quality crop such as tobacco, timely applications of insecticides with thorough coverage will then be essential. Trials with insecticides and nematicides in seedbeds and fields were conducted at Tinana Creek, S.Q., and Clare, N.Q. The results indicated that, at present, changes in commercial recommendations would not be warranted.

FORESTRY.

Attention has been given to the importance of the bagworm (*Hyalarcta hubneri* (Westw.)) in *Pinus* plantations at Passchendaele, and to the possibility of mites being associated with maple seedling gall in North Queensland nurseries. Insecticide trials against the cedar shoot borer (*Hypsipyla robusta* Moore) have been continued in the Imbil area. By examinations of monthly samples, a close watch has been kept on the native rat populations in young pine plantations in the Yarraman district. The problems associated with infestations of the European house borer (*Hylotrupes bajulus* L.) in imported houses are being dealt with by an inter-Departmental committee which includes an entomologist as a member.

NEMATODES.

The State-wide survey of plant parasitic nematodes commenced the previous year has been continued, and a specialist officer with assistance has been occupied full-time investigating these important pests. In addition to the relevant work mentioned elsewhere in this report, special and detailed attention is being given to *Meloidogyne hapla* Chitwood, which infests strawberries, and to those nematodes responsible for reducing yields and quality of citrus, tomato and other small crops.

VEGETABLES.

Adverse weather interfered with the planting of vegetables in some coastal districts, and consequently enquiries about pest control were fewer than usual. During October, a looper (*Plusia* sp.) severely damaged tomato crops in the Brisbane area. This pest is not controlled by the usual tomato dusts and sprays, but requires either endrin or dieldrin. In the Bowen district most tomato growers used the new Departmental spray programme, and although plantings were late mite damage was negligible. The mite *Hemitarsonemus latus* (Banks) was prevalent on potatoes during March in the Boonah and Lockyer districts. Further trials confirmed previous findings that this pest is controlled by sulphur treatments or by spraying with dieldrin: commercial sulphur dusting by aircraft proved of little value in reducing pest numbers. Investigational work during the year has been concerned mainly with pests of beans and sweet potato.

MISCELLANEOUS FIELD CROPS.

Plagues of cutworms and armyworms, following the same pattern as in 1952, occurred in cereal and linseed crops on the Darling Downs from mid-July to October; Heliothis was prevalent in linseed, much of which was planted late; sorghum midge (*Contarinia sorghicola* (Coq.)) caused appreciable damage on the Downs and in the central districts; during September, aphids (*Brevicoryne brassicae* (L.)) heavily infested rape and canary seed in the Jondaryan-Bongeen area but were ultimately controlled by parasites and predators; and the aphid *Capitophorus elaeagni* (Del Geurcio) appeared in safflower crops without noticeably affecting plant growth where adequate soil moisture was present. Commercial aircraft spraying achieved some success with cutworm and armyworm control, but was less effective against Heliothis. This pest in some instances was killed by a virus disease.

Results from further field trials against onion thrips (*Thrips tabaci* Lind.) again demonstrated that insecticidal applications for the control of this pest are unnecessary in well-grown onion crops. The blue oat mite (*Penthaleus major* (Duges)) was associated with a cutworm and *Bryobia praetiosa* Koch infestation of wheat at Texas. Sunflowers on the Darling Downs were attacked by the green vegetable bug (*Nezara viridula* F.) and Heliothis: under prevailing conditions this allowed the entry of rots, and plant collapse was not uncommon.

Cotton pests have not been serious, although in most districts loopers were active and in the more northern areas mild attacks by the rough bollworm (*Earias huegeli* Rog.) (which is not controlled by DDT) were experienced. Intensive laboratory and field investigations of pests of linseed (against which DDD-DDT is now recommended), sorghum, cotton, and pastures have been continued. A new approach to the control of cotton pests has been attempted, but this season boll rots interfered with the large-scale field trials.

MISCELLANEOUS.

During autumn, heavy infestations of the green vegetable bug were recorded from Poona pea, sorghum and maize. Further liberations of parasites of this pest were made. The speckled cockroach (*Nauphoeta cinerea* (Oliv.)) was a pest of hay at Murgon and Boonah: treatments with chlordane gave satisfactory results. The passion vine hopper (*Scolypopa australis* (Walk.)) swarmed over a square mile near Montville in December, and although various crops carried large populations the infestations were unimportant. *Lygaeus hospes* F. was also present in large numbers in several parts of south-eastern Queensland, causing more concern than economic loss. In the Rockhampton district the plain pumpkin beetle (*Aulacophora abdominalis* (F.)) caused severe leaf damage to Noogoora burr. Enquiries on the control of slugs in gardens and orchards were more than usual, and infestations of plaster walls and ceilings by book lice (*Liposcelis divinatorius* (Mull.)) were numerous.

Further steady progress has been made with the studies of the Coccoidea and Agromyzidae.

BEEKEEPING.

Early in the year conditions were favourable for beekeeping and good quantities of choice grade honeys were harvested. Later, the extensive wet season adversely affected honey forage plants, starvation seriously weakened many apiaries, and in flood areas some 600 colonies were washed away. At March 31, 1,118 beekeepers were registered. Extension and inspectional work covered 3,205 colonies in 85 apiaries at 33 localities. Nosema disease (*Nosema apis* Zander) was found in three districts, and addled brood at Stanmore; heavy adult mortality with symptoms of insecticidal poisoning occurred in an apiary at Rochedale.

The Honey Flora of South-eastern Queensland, which has been published in parts over two years, is now complete and will be available shortly in book form.

FAUNA AND FLORA CONSERVATION.

For the year ending December 31, 1,600 permits and licenses had been issued under *The Fauna Conservation Act of* 1952, and 305,616 kangaroo, wallaroo and wallaby skins had been marketed. Statistical information for a complete year on the marsupial skin

industry is now available, and with observations provides for the first time a reliable outline of the commercial use of this natural resource. Studies of the range and economic status of the various species of deer in Queensland have been commenced, and the mapping of fauna sanctuaries is progressing. Twenty-six honorary protectors were appointed during the year, and four prosecutions for shooting in sanctuaries were recorded.

Provision has been made under *The Native Plants Protection Act of* 1930 for a special permit to collect protected native plants for scientific purposes.

PLANT PATHOLOGY SECTION.

In South Queensland the past summer was one of the wettest on record and was noteworthy for prolonged periods of rain and absence of dry days. This resulted in waterlogging of soils normally considered to be adequately drained and favoured soil-borne diseases of the root rot type, which appeared in situations where they had been unknown previously. In coastal districts this was particularly the case with papaws and avocados affected by *Phytophthora palmivora* and *P. cinnamomi*, respectively, while in the Stanthorpe district root failure resulted in the loss of many deciduous fruit trees. The wet conditions were also responsible for an exceptionally severe epidemic of brown rot in late stone fruit varieties and in some orchards scarcely a fruit escaped infection.

CEREALS.

Wheat.

Crown rot (*Fusarium culmorum*) appeared in a more severe form than at any time during the previous six seasons and caused considerable concern in the Cecil Plains-Brookstead area, where infections as high as 30 per cent. were recorded. Fortunately, the disease was present to only a slight extent in the more western districts. Field and laboratory studies on crown rot have been continued with a view to finding means of reducing losses in the future. The disease was found to be more severe in heavier soils and in the more low-lying portions of the fields subject to temporary waterlogging. The host range of the fungus in Queensland has been extended to include barley, canary seed, oats and a weed, *Phalaris paradoxa.*

In a field experiment 20 varieties of wheat were artificially inoculated and sown on badly infected soil to determine their susceptibility to the disease. All varieties were affected but there appeared to be a distinct range in susceptibility. Further work is being carried out along these lines.

Seed treatment with mercury, copper and hexachlorobenzene dusts did not give any control of the disease on heavily infected soil in two trials. No response was obtained from the foliage application of a range of trace elements and this work will be repeated, substituting a soil method of application.

Maize.

On the Atherton Tableland the hot humid summer coupled with above-average storm rains early in the season provided ideal conditions for the development of diseases such as leaf rust and brown spot (*Physoderma zea maydis*). Some crops were seen where plants commencing to tassel had already lost 30 per cent. of their foliage through brown spot. This disease was particularly serious where maize had been grown for several years in succession.

FIELD CROPS.

Cowpea.

With the assistance of officers of the Agriculture and Horticulture Branches, field trials were carried out in the South Burnett, Redlands, Lockyer Valley and Boonah districts to supplement the glasshouse testing of cowpea varieties for resistance to stem rot (*Phytophthora* sp.). Blackeye 5, C.P.I. 12153, and C 521 showed a level of resistance sufficiently high to offer promise of successfully combating this disease. The varieties Giant, Anderson's Early Giant, Cristaudo, and Soutter exhibited fair to good field resistance under normal epidemic conditions and offer some temporary relief until more promising material becomes available commercially. A start has been made in testing a further 300 strains of cowpea obtained through the Commonwealth Plant Introduction Service.

Peanuts.

In the Kingaroy district there was a relatively high incidence of the two virus diseases, chlorosis and bunchy plant, with the latter predominating. In some fields losses were as high as 2–3 per cent. Leaf spot (*Cercospora* sp.) has been severe following favourable weather conditions and definitely caused a premature leaf fall which may have had an appreciable effect on yield.

Lucerne.

A rot affecting the main tap root which is associated with the thinning out of young lucerne stands has been shown to be caused by the fungus *Phytophthora cryptogea.* This disease is most serious in areas subject to waterlogging and where the soil is somewhat heavy. Other diseases occurring in lucerne were summer black stem (*Cercospora zebrina*) and anthracnose (*Colletotrichum trifolii*).

Tobacco.

A wet period in early November was responsible for an epidemic of blue mould in irrigated crops on the Burdekin abnormally late in the season. A feature of the disease was a high incidence of lodging due to a weakening of the stalk by the fungus. Current experimental work on the control of blue mould includes a fungicide screening trial at Kamerunga and a field trial at Parada. Field surveys have confirmed previous observations that in northern tobacco areas volunteer tobacco plants and undestroyed portions of the previous year's plantings provide the most serious source of infection for the new season's crops.

Stem and root rots of tobacco, taken over the years, are of appreciable importance. Attention paid to these diseases in recent seasons has revealed the presence of three distinct types and the pathogenicity of the associated organisms is at present being investigated.

Sunflower.

Owing to the increased interest being shown in sunflowers a survey of the diseases of this crop was made last season. The most spectacular are the two rusts, *Puccinia helianthi* and *Cystopus* sp. Other minor diseases present were a Septoria leaf spot, crown and stem rots caused by *Sclerotinia sclerotiorum, Sclerotium rolfsii* and *Macrophomina phaseoli,* and head rots caused by *Rhizopus* sp. and *Sclerotinia sclerotiorum.* The last-named organism forms sclerotia in the head roughly the size and weight of sunflower seed and a sample of seed inspected showed the presence of these intermixed with the seed.

Ginger.

Only two records of stem rot (*Fusarium* sp.) were made during the season. One affected area was planted contrary to recommendations with infected "Chinese" seed and the other was grown only a few yards from where the disease had occurred last year. An opportunity was taken to compare rhizome rot, which has occurred for many years in Queensland, with the recently introduced stem rot.

PASTURES.

The incidence of rugose leaf curl virus in white and red clovers and lucerne is causing some concern in the Lockyer Valley. The tomato big bud virus has been recorded in a number of legumes.

TEMPERATE FRUITS.

Citrus.

Fungicidal trials against brown rot of the Emperor mandarin at Palmwoods and black spot of oranges at Charters Towers are in progress and results will be assessed when harvesting the fruit.

Avocado.

A failure of mature avocado trees with a symptom picture closely resembling the American description of avocado decline has been known in South Queensland for a number of years and the soil organism *Phytophthora cinnamomi* has been found associated. More recently, controlled inoculation with pure cultures of this fungus has reproduced the wilt symptoms and it is now assumed that the Queensland and American diseases are the same.

Passion Fruit.

Passiflora edulis grafted on to *P. flavicarpa* stock has shown complete field immunity to attack by Fusarium wilt in highly infected soil. It is considered that this stock is worthy of recommendation for commercial use in affected areas. *P. caerulea,* which also exhibits field resistance, is not favoured for Queensland conditions as its suckering habit might provide a dangerous source of the woodiness virus as well as adding to cultural costs. Moreover, this species is susceptible to base rot.

TROPICAL FRUITS.

Pineapple.

The severe root rotting which occurred during the wet January-June of 1955 resulted in a decline of many ratoon pineapple areas on the North Coast. The dry spring following accentuated the trouble. Leaf wither tip and die-back was pronounced and suckering and fruit production were retarded.

Serious losses from top rot (*Phytophthora cinnamomi*) have been experienced in recent years in the late summer and autumn plantings. An experiment involving a comparison between strong Bordeaux mixture and five of the newer organic fungicides used as a preplanting treatment was laid down at the Maroochy Experiment Station on an infected site. Wet weather ensured a satisfactory incidence of the disease and useful information should result.

Banana.

The fall in prices for bananas has brought into question the economics of spraying for the control of leaf spot (*Cercospora musae*), even in North Queensland. Experimental work has therefore been concentrated on efforts to reduce the cost of this operation. There is some evidence that a few cover sprays later in the life of the plant may enable it to hold sufficient foliage to fill the bunch. Detailed work on the biology of *C. musae* indicates that the behaviour of this organism in Queensland is rather different from that in the West Indies and this is having an important bearing on the design of control measures.

Two fungi previously described from the West Indian region, *Chloridium musae* and *Ramichloridium musae,* are associated with speckle diseases in North Queensland.

Papaw.

The virus disease yellow crinkle was more prevalent than usual. It is some years since this disease reached epidemic proportions and its prevalence, especially in the central districts, caused some concern.

A detailed assessment of ripe fruit rot incidence was made in the papaw variety trial at the Redlands Experiment Station. Previous work of this nature was confirmed in that susceptibility to these rots was shown to be a definite varietal characteristic.

The northern leaf spot, *Corynespora cassiicola,* was recorded for the first time in South Queensland during the year.

VEGETABLES.

Tomato.

Three virus diseases—tomato leaf shrivel, tomato yellows and tomato fern leaf shrivel—were investigated. It has been established that the first-mentioned is caused by the leaf shrivelling strain of *potato virus Y,* while the last two are produced by this virus in combination with the Aucuba strain of *tobacco mosaic virus* and *cucumber mosaic virus* respectively. A comprehensive report on these important diseases has been prepared for publication.

An interesting record from North Queensland was that of a tomato fruit rot caused by *Corynespora cassiicola.*

Thirty-three introduced varieties and lines have been screened in glasshouse tests for Fusarium resistance and selected parents were hybridised with a view to adding imported disease resistance to locally acceptable varieties. This material has been made available to field officers concerned with tomato improvement work.

Beans.

The programme designed to incorporate resistance to rust and angular leaf spot in the Brown Beauty type of French bean is making satisfactory progress. Two field trials at the Redlands Experiment Station and one seed-increase planting at Stanthorpe were devoted to this work. An increasing number of lines of good agronomic type are now being assembled for field resistance tests. At the same time, screening for mosaic and anthracnose resistance is being carried out in the glasshouse and it is hoped to provide some lines resistant to all four diseases.

A comprehensive article on the hitherto undescribed bacterial pod twist disease of beans is ready for publication.

SOIL MICROBIOLOGY.

Field trials in conjunction with other Branches have shown that inoculation has been the major factor in establishment of red, white and subterranean clover pastures in several areas. On the other hand, studies of poor white clover growth at Maleny have indicated that this is not a Rhizobium problem.

A major expansion in the inoculum service has been the establishment of inoculum distribution centres at Gympie and Warwick. The amount distributed by these centres indicates appreciation of this service by farmers and it has substantially increased the use of inoculum in these areas.

Laboratory and glasshouse investigations have been concerned mainly with nodulation of tropical legumes and in particular with that of *Centrosema pubescens.* Questions pertaining to specificity and the influence of various environmental factors are being studied.

CHEMICAL LABORATORY.

Mr. C. R. von Stieglitz, Agricultural Chemist.

Most people will agree that chemistry has played, and must continue to play, an important part in the solution of the many and varied problems associated with agriculture. Its uses are so manifold that it is not surprising we find an ever-increasing demand for chemical services from those engaged in scientific research. This demand has resulted in the specialization or grouping of chemists in sections to ensure that recent advances in the methods used in chemical research are not overlooked and that new techniques as they are developed are applied, whenever practicable, to current investigations.

During the year the Biochemistry and Toxicology Sections were combined to form a Branch. As most of the work of this new Branch is associated directly with investigations involving animals, it has been transferred to the Division of Animal Industry, and the annual report of the Branch is grouped with those of other Branches of that Division.

PLANT NUTRITION SECTION.

Brisbane Laboratory.

Linseed Studies.—A particularly interesting case of a nutritional disorder of linseed was brought to the notice of the Plant Nutrition Section during the year. The linseed was grown at Brookstead on the Darling Downs on a black soil containing very high amounts of available phosphorus. The foliar symtoms associated with the disorder were typical of zinc deficiency. This deficiency affects the plant most in the cold weather and results in the death of the growing point of the young plant. Fresh side shoots are then made and the foliage becomes bronzed in colour in some parts and flecked with white in others. Samples of leaves and stalks from healthy and affected plants were analysed separately for their zinc content but no significant difference could be established between them. However, the phosphorus/zinc ratio differed greatly between the two types of material and this agrees with parallel work in Victoria. The actual figures obtained were:

Healthy plants—P/Zn ratio 98 to 1
Affected plants—P/Zn ratio 310 to 1

In order to confirm the field observations, a pot trial with linseed using the radioactive tracer P32 has been commenced. Leaf symptoms will be observed and the leaves analysed at different stages. In addition, a field trial in which zinc sulphate is applied to the soil has been established on the Brookstead property in collaboration with the Agriculture Branch.

It is interesting to note here that zinc deficiency in citrus as recorded from Griffith in New South Wales was considered to have been induced by high annual applications of superphosphate.

During a visit to the Darling Downs, made partly in connection with the above disorder in linseed, other examples of nutrient deficiencies were observed. It is evident that soils on the Downs which have been under cultivation for many years and which have received little, if any, fertilizer to date are now becoming deficient in plant nutrients, particularly certain micro-nutrients and nitrogen.

Boron Studies.—A pot experiment designed to determine the minimum essential amount of water-soluble boron which it is necessary to have in the soil for beetroot (a boron indicator plant) was conducted during the year and was followed by a field trial in which plants were given various amounts of borax. The maximum application was equivalent to a rate of 100 lb. per acre. Leaves from plants on all plots were analysed to determine the amount of boron taken up. This was found to be proportional to the amounts applied. The following were the results obtained in parts per million boron: Control, 14; 10 lb./acre, 16; 30 lb./acre, 25; 50 lb./acre, 30; and 100 lb./acre, 51. In no case did toxic symptoms develop even with the 100 lb. per acre application.

An interesting observation was that multiple top formation, which is almost always listed in the literature as being one of the foliar indications of boron deficiency in beetroot, occurred at all levels of boron application and is thought to be associated with the variety and not with boron deficiency. The variety used in these studies was Early Wonder.

Molybdenum Studies.—Some of the vegetable-growing areas in the vicinity of Brisbane are highly deficient in molybdenum and it frequently happens that plant material, trials have been established at Redlands for diagnosis. In order, therefore, to accumulate reliable data on the molybdenum content of plant materials, trials have been established at Redlands Experiment Station with tomatoes and cauliflowers. Leaf samples will be taken periodically throughout the growth cycle and analysed for molybdenum content. It is hoped by this means to establish limits of deficiency and sufficiency.

Soil Fertility Investigations.—Two par-time projects were commenced during the year to study the nitrogen requirements of certain pasture soils and the phosphorus fixing properties of these same soils. Unfortunately, the work on nitrogen has had to be suspended.

Appreciable differences in the fixing powers for phosphate have been shown to exist between the surface and sub-surface layers of these different soil types, as might be expected. The soil having the greatest fixing power was one from Maleny.

It is hoped that the results when complete will have an immediate application in regard to phosphate fertilizer placement on different soil types and also to the form of phosphate which might be considered to be the most suitable one for each soil group.

Soil Salinity Experiment.—A conjoint investigation with the Agriculture Branch is being carried out on reclaimed salted land on the South Coast near Currumbin. This was planned to study the tolerance of pasture plants to high levels of salt in lowlying areas. Unfortunately, the abnormally wet season has been responsible for the removal of a greater amount of salt than would normally be the case. Observations to date show that kikuyu and para grasses, planted as runners, exhibit high tolerance to saline conditions; phasey bean was the most promising of the legumes; lucerne and Townsville lucerne were complete failures.

Of the grasses which were seeded, Rhodes, *Paspalum dilatatum* and *P. scrobiculatum* have all done well; guinea, buffel and African star grasses performed unsatisfactorily. Germination of these grasses followed heavy rain which removed sufficient salt to allow of their germination.

Routine Analyses.—Totals of 2,658 soil samples and 636 waters were analysed during the year. Reports on these were issued to the various Branches and institutions concerned. In addition, the assessment of 525 water analyses for irrigation and/or stock use was made for the Irrigation and Water Supply Commission.

Wallum Investigations.

In the spring of 1953, a quarter-acre block of land previously covered with banksia, some stunted eucalypts and a few tea-trees was planted to pineapple slips These made good growth and a successful first harvest was taken off in February and March, 1955. The block was allowed to ratoon to test the ratooning qualities of pineapples on this country and a further successful crop was harvested, mostly in February and March, 1956, with a few bearing in the later months, as is usual with

ratoon crops. Unfortunately, when the fruit were about half mature, cyclonic winds caused a considerable amount of lodging, which resulted in an increase in the incidence of sunburn. Following thinning, this area will be taken on to a second ratoon crop as a test of ratoon plant stamina.

Subsequent to the establishment of the original quarter-acre a second quarter-acre was planted to tops in the autumn of 1954 and a third to slips and suckers in the spring of 1955. The second and third plantings bore successful crops of good quality fruit, so present indications are that land similar to this, of which a lot exists in the wallum, is highly suitable for pineapple culture.

The experience with bananas has not been as satisfactory, although spring 1955 plantings are doing well.

The apparent success of the present crop is believed to be due to firstly, the provision of a satisfactory cover crop of velvet bean during the summer, which kept the surface of the soil from becoming too hot, and secondly, light but frequent applications of a nitrogenous fertilizer whenever foliar symptoms suggested the need for it. Fertilizer applications have otherwise been standard, with a slight increase in potash. The bananas were planted on the same type of country (deep sand) on which the pineapples have thrived.

The plan of pasture work at Coolum has been as follows. Initially a pasture variety trial was established with selected summer grasses oversown with lucerne, strawberry clover and centro. Simultaneously pilot rows of other summer grasses and legumes were planted. These were followed by similar trials of winter grasses and legumes as well as pilot rows of winter species.

The grasses and legumes showing most promise in the pilot rows were then tried in small plots or in further variety trials.

In the original summer grass variety trial the best results in 1954-55 were obtained with para grass, but in 1955-56 green panic and Rhodes grass both outyielded it. The 1955-56 yield from four harvests (in cwt. per acre) were: green panic 78.1, Rhodes grass, 74.1, para grass 60.0, and paspalum 31.8. Of the associated legumes, lucerne did best but centro is now growing well in most plots; strawberry clover did not survive.

In October 1954 a new summer grass trial was established, including three grasses which had shown promise in the original summer grass trial. The new ones selected were *Paspalum notatum*, *P. secans* and buffel grass. These were compared with *Paspalum dilatatum*, green panic and Rhodes grass. The total weights of each of these (in cwt. per acre) obtained from four harvests, of which the last was on April 12, 1956, were: green panic 65.4, Rhodes grass 64.0, *Paspalum secans* 50.9, *P. dilatatum* 23.5 and *P. notatum* 4.5. *P. secans* outyielded all others in the last harvest. This grass is attractive in the young stages but becomes coarse and stemmy if allowed to mature.

Winter pasture grasses have not been successful to date, as growth is made too late in the season; phalaris and cocksfoot were the most promising. More success has attended the planting of oats as a winter grazing crop and this appears to have distinct possibilities. Cowcane as a standby fodder has also been grown successfully.

Two fertilizer trails with lucerne, established in September, 1954, were harvested during 1955-56. These were designed to determine respectively the optimum amounts of nitrogen, phosphorus and potassium required as plant foods and the optimum amount of dolomite needed in addition to a fertilizer containing ample major and micro-nutrients.

In the former case it was not possible to establish lucerne without phosphorus, and without potash a most inferior plant developed. Initial growth was benefited by nitrogen but this was not reflected in the yields. Significant increases to superphosphate and potash were obtained; 6 cwt. of super per acre was slightly superior to 3 cwt., and 126 lb. of muriate of potash per acre gave a highly significant yield increase over 42 lb.

In the dolomite trial, there was an indication that an application of 2 tons per acre was more beneficial than 1 ton per acre, but the increase in yield obtained was not significant. No establishment of lucerne was obtained in the absence of dolomite.

In order to test the carrying capacity of several of the more promising grasses, blocks approximately two acres in extent on drained heath land were planted late last summer. The grasses selected were para, molasses and green panic; associated legumes were lucerne and red clover with para grass; stylo, red clover and white clover with molasses grass; and lucerne, red clover and centro with green panic. All the grasses have made good growth but most of the legumes (although good germinations were obtained) succumbed to waterlogging in the excessively wet weather experienced in February and March.

Soil Surveys.

Good progress was made during the year with soil surveys in the Mareeba-Dimbulah district and a tentative map of most of the irrigable land on both sides of the Walsh River to beyond Dimbulah has been compiled.

A report with accompanying soil map has been completed recently in reference to 17,000 acres of land in a section known as "Left Bank Walsh." In this report the soils have been placed in six groups to facilitate planning based on possible land use.

Groups I and II contain 12,260 acres suitable for tobacco, and of this area 4,490 acres is also suitable for general agricultural crops. Groups III and IV account for 1,970 acres and are less suitable for tobacco; some parts of these, because of an underlying hardpan, would need careful handling under irrigation and others are deep sands on which water use would be expected to be high. Group V soils, which occupy 1,760 acres, will, if cultivated, almost certainly bring problems of drainage and fertility, and those of Group VI are skeletal soils having very little agricultural potential. Most of the soils are poorly supplied with plant nutrients with the exception of potash, but with high-priced crops such as tobacco and certain small crops, it should be economical to apply heavy dressings of fertilizer.

A reconnaissance soil survey of the Gilbert River alluvials was made during the year in collaboration with the Bureau of Investigation of Land and Water Resources. The climate of this region is monsoonal, with an average annual rainfall of 30 inches. In the area surveyed, which extends from 8 miles above "Prestwood" to 9 miles below "Strathmore," an extensive levee system exists with soils very similar to those of the Burdekin. In the report, with accompaying map, the soils were divided into four groups. Of these, Groups A, B and C, representing an estimated area of 40,000 acres, consist of attractive agricultural soils dissected to some extent by drainage lines which are subject to waterlogging during the wet season. Group D soils comprise about 11,000 acres of less attractive types. These usually occur towards the outer edge of the levee soils, are badly structured, and tend to become powdery when the surface is disturbed.

Water of suitable quality exists for the irrigation of the levee soils but would have to be lifted 30 feet from the deep river sands; the quantity available is as yet unknown.

Although the levee soils under irrigation should be suitable for a wide range of crops or pasture it is likely that, owing to difficulties of transport and marketing, tobacco is at present the only crop that would justify any more than a very limited development.

Non-survey Field Duties.

As no large-scale soil surveys were under way, more co-operative work with other Branches was undertaken by the Chemist and his assistant, who visited 34 farms in connection with suspected soil problems. It was also possible to examine the soils in several horticultural centres in the lower rainfall areas of coastal North Queensland and to co-operate in pasture work.

Atherton and Ayr Laboratories.

In addition to conducting analytical work associated with samples from the soil survey unit, it was possible at Atherton to make a start with systematic pasture analyses and investigations in connection with chlorides in tobacco soils. Both these projects were done in collaboration with the Agriculture Branch.

Soil chloride determinations were carried out during the tobacco season at Clare in collaboration with the Agriculture Branch. In all, 760 samples were analysed. In addition, chloride analyses were done on leaves from each pick and on the cured leaf. Analytical checks on the irrigation water used were also made.

It was shown that a significant increase in chlorides took place in the top 12 in. of soil despite the fact that it was initially low in chlorides and the amounts in the irrigation water were very small. This emphasises the problems associated with the growing of a specialized crop, such as tobacco, under irrigation in a period of the year when evaporation rates are high.

Although no large areas were required to be surveyed in the Burdekin during the year, the soils staff was called upon to check the soil boundaries on two farms in newly settled areas where crops have not been up to expectations. The original soil boundaries were found to be correct, the crop failure in one instance being associated with topographical features and in another with the employment of unsuitable cultivation methods.

Other field work included obtaining profile samples of the different soil series of Dalbeg for analysis.

The analytical results of soils from Dalbeg show that the surface and sub-surface layers of all soil series sampled have reaction values which are suitable for the growth of most cultivated plants, but that certain of them have subsoils of alkaline reaction associated with high exchangeable sodium; this indicates solonized clays which would be expected to be highly impermeable to water. All soils are low in total nitrogen, but in general are fairly well supplied with potassium. Available phosphorus is variable; most levee soils contain fair amounts, whereas the flood plain series are all low and should respond to added phosphates.

GENERAL ANALYTICAL SECTION.

Arsenical Residues on Apples.

Experiments in 1954-55 were designed to obtain information concerning the persistence of arsenical residues on sprayed apples. In the first experiment, arsenic as lead arsenate was applied in February and results indicated that it was not appreciably removed from fruit in six weeks. A further experiment was then designed to gather information in connection with apples sprayed in November with lead arsenate at normal and twice normal strength. The results obtained in 1955-56 show that, although the arsenic residues persist, because of the increased size of the fruit the amount present on the fruit at maturity was well within the limits prescribed by the regulations under the Health Acts.

Agricultural Standards Act Samples.

The examination of samples taken under the Agricultural Standards Act occupied the full time of one analyst. These samples consist mostly of stock foods and fertilizers and it is pleasing to be able to record that the registered products which were examined were well up to standard. As a number of fertilizers registered under the above Act now contain small amounts of various "trace" elements, the Senior Chemist has recently been investigating methods for their accurate determination. Most of the difficulties associated with sampling and analytical techniques have now been overcome and it is planned to check the trace element content of these special fertilizers in the coming year.

Miscellaneous Samples.

Dipping fluids containing arsenic and/or chlorinated hydrocarbons were examined as usual for Stock Inspectors and producers, and results were reported to the Division of Animal Industry. In general, these were up to standard and the difficulties associated with accurate sampling by the senders now appear to be largely overcome.

In all, 432 samples of dips were analysed. The insecticidal ingredient was arsenic in 141 cases, DDT in 192, BHC in 57 and both arsenic and DDT or BHC in 42.

The submission of pasture samples has shown an increase from 206 in 1954-55 to 345. This is due to the expansion of agrostology work within the Agriculture Branch and further increases are expected during the coming year.

The examination of seeds for oil, particularly safflower seeds, on behalf of Regional Experiment Stations has continued. The oil content of safflower varied appreciably, the highest value being given by variety 47.53 BB (40.1 per cent.) and the lowest by 48.89 BB (28.3 per cent.); iodine values varied from 151 to 128. The average figures for all varieties were 34 and 138 for oil and iodine values respectively.

CEREAL SECTION.

Wheat quality investigations has been the main project of the Cereal Section. One of the difficulties associated with the examination of large quantities of wheat samples during the year has been that of holding such samples for periods of up to six months without deterioration of quality. This has been largely overcome by storing samples at low temperatures, but a further project is planned to determine the efficacy of various insecticidal treatments. This will be done in collaboration with the Entomology Section.

The period following the wheat harvest is a particularly busy one, as many of the samples received for quality testing are in connection with plant breeding work and results are required before the next planting period.

Quality testing in connection with the competition arranged by the Royal Agricultural Society, Toowoomba, was continued, and a number of wheats was also received from the Australian Wheat Board. In all, 80 samples were received for quality and baking tests.

The wheat which won the wheat quality competition was a sample of Charter which had a protein content of 14.3 per cent. The bread baked from the flour of this wheat was of good colour, shape and volume.

Partial Quality Testing.

Partial quality testing for protein and bushel weight was carried out for the Australian Wheat Board, 60 samples; Royal Agricultural Society Toowoomba, 84; Agriculture Branch, 2; Cereal Chemist, Inglewood, 18; wheat quality surveys, 220; and State Wheat Board, 7.

Miscellaneous.

Miscellaneous work included the calibration of a Lambrecht moisture meter, calibration of our own Farinograph using the standard bar received from overseas, and an investigation to determine the optimum dough consistency for Queensland flour quality studies.

The Cereal Chemist also collaborated with the Royal Australian Chemical Institute's Cereal Chemistry Group in an endeavour to standardize chemical and physical tests for cereals and was present at the Toowoomba Royal Agricultural Society Show in connection with its wheat quality competition.

CONFERENCES.

Two officers of the branch attended the Australian Plant Nutrition Conference in Melbourne, one the Wheat, Flour and Bread Convention at Gunnedah, N.S.W., and another the Chemex Exhibition in Melbourne.

DIVISION OF ANIMAL INDUSTRY: BRANCH REPORTS.

VETERINARY SERVICES BRANCH.

Mr. C. R. Mulhearn, Director of Veterinary Services.

Extremely high rainfalls were registered all over the State, and winter conditions have been mild. Serious and repeated flooding has occurred in the south-west and central-western areas, with loss of fencing and livestock. Northern and Gulf areas were swept by a cyclone in March which caused heavy stock losses from drowning.

Excessively wet conditions during the summer encouraged rank growth in pasture and stock are not producing as well as expected. So far in 1956, a mild winter has prevented even more serious loss of production.

STAFF AND ADMINISTRATION.

One Divisional Veterinary Officer was lost to the Branch by his appointment as Director of Cattle Husbandry. One Assistant Veterinary Officer was appointed and a new position of Divisional Veterinary Officer at Cairns was filled from existing staff.

One new Inspector was appointed and a number of temporary positions in the inspectorial staff were filled in connection with buffalo fly and slaughtering duties. Three Inspectors resigned; the death of two efficient officers is reported with regret.

Examinations for Stock and Slaughtering Inspectors were held late in the year and the appointment of 10 Stock Inspectors and three Slaughtering Inspectors recommended; if all these positions are filled, the staff position should be reasonably satisfactory. There still exists a marked shortage of trained veterinarians.

STOCK MOVEMENTS.

The stock routes in north-western Queensland remained in good condition owing to the favourable winter in 1955 and stock movements continued until the end of that year. Meatworks continued operating until December, as fat cattle were still available. Heavy flooding early in 1956 restricted mustering, and this, together with uncertainty as to the overseas market, has prevented full use of export killing facilities. Shortage of shipping space and consequent strain on cold storage facilities has also delayed killing.

Demand by southern buyers has maintained store market values.

Exports of breeding and slaughter cattle from Queensland to Eastern and New Guinea markets have increased. Six thousand cattle for slaughter were exported to the Philippines and 200 Hereford females and six bulls for breeding purposes to Okinawa.

Racehorses were exported to Hong Kong, Singapore and New Guinea.

Movements of stock between Queensland and New South Wales and the Northern Territory are shown in Table 1.

TABLE 1.

INTERSTATE STOCK MOVEMENTS, 1955–56.

—	Cattle.	Sheep.	Pigs.
Entered from Northern Territory	66,463	..	..
Entered from New South Wales	19,454	244,210	485
Removed to Northern Territory	6,334	..	..
Removed to New South Wales	434,171	296,639	58,798

CATTLE DISEASES.

Tuberculosis.

Dairy Herds.—No new areas were gazetted under the tuberculosis eradication scheme during the year, but a new practitioner commenced practice at Gympie and took over an existing zone. The volume of records necessary with continued testing is creating filing problems in some offices, but sufficient clerical staff is now available to deal with necessary checking and compensation claims.

Some 800,000 head of dairy cattle are under regular test and more than 450,000 tests were carried out by practitioners during the year. Biennial testing is being implemented in a number of areas as the reactor rate is reduced. Tests as shown in Table 2 were carried out in gazetted areas.

TABLE 2.

TESTS UNDER TUBERCULOSIS ERADICATION SCHEME FOR DAIRY CATTLE, 1955–56.

District.	No. of Herds.	No. of Tests.	No. of Reactors.	Percentage of Reactors.
Brisbane Division—				
Southport-South	130	10,205	45	0·44
Coomera-Southport ..	151	11,972	55	0·46
Beenleigh-North	184	6,243	2	0·03
North Brisbane and Petrie	173	9,875	108	1·09
Moggill-Kenmore	76	2,746	14	0·51
Samford	50	2,248	5	0·22
Beenleigh-Beaudesert ..	148	10,212	51	0·50
Beaudesert-Border ..	127	12,388	276	2·23
Dayboro	47	3,978	22	0·55
Dayboro-Mount Mee ..	23	1,851	3	0·16
Woodford	60	5,610	67	1·19
Caboolture	27	3,044	6	0·20
Southern Ipswich	254	10,239	10	0·10
Chambers Flat	16	1,171	7	0·60
Maroochy Shire	162	11,333	25	0·22
North Ipswich	322	13,711	26	0·19
Boonah	238	12,803	132	1·03
Maleny-Landsborough ..	345	23,836	117	0·49
Esk	252	20,576	216	1·05
Laidley-Lowood	62	3,099	20	0·65
Divisional Totals ..	2,847	177,140	1,207	0·68
Maryborough Division ..	2,587	162,155	762	0·47
Rockhampton Division ..	225	15,407	70	0·45
Cairns Division	481	22,094	39	0·18
Townsville Division ..	40	2,795	12	0·43
Toowoomba Division ..	1,593	77,688	283	0·4
Grand Totals ..	7,773	457,279	2,373	0·52

Progress in this scheme has been very satisfactory, for in most districts where testing has been in operation for two or more years the incidence of tuberculosis in the animals now being tested has been reduced to less than 1 per cent. In a number of zones where testing of all animals has been carried out for four years or more, the number of positive animals was less than 1 in each 1,000 head tested.

In general, tests were carried out by Departmental officers in cases of milk supply herds, certified herds and infected herds outside gazetted areas. The following are the figures for 1955-56.

Herds.	Animals Tested.	Number Positive.	Percentage Reactors.
166	12,588	324	2·6

Beef Herds.—Tuberculin-testing of beef herds was continued in selected infected herds, the details being as follows:—

Herds.	Animals Tested.	Number Positive.	Percentage Reactors.
16	9,947	186	2

In two of these herds which initially showed infection rates of more than 10 per cent., the incidence has been reduced to less than 1 per cent. In order to reduce the dissemination of tuberculosis by herd bulls, several beef studs are under test.

Contagious Pleuropneumonia.

The number of quarantines imposed was further reduced to 10, of which five involved travelling cattle. One quarantine involved suspect mobs entering Queensland for immediate quarantine and one was following the finding of suspicious lesions in a cow on slaughter.

The extension methods initiated in 1954 were continued and four experienced officers are now employed full-time during the cattle season in visiting properties in the enzootic areas and advising on methods of control. A total of nearly 300 property visits was made and on at least half of these properties it has been found that control measures have been improved since the last visit. A definite reduction in the incidence of contagious pleuropneumonia lesions in cattle slaughtered at northern works is considered to reflect increased inoculation. The results have been sufficiently encouraging to continue the project in the coming year.

Recording of lesions of contagious pleuropneumonia at export meatworks in co-operation with the Commonwealth Department of Primary Industry was continued. These inspections showed that 1.4 per cent. of carcases of cattle from properties in the suspected areas showed lesions indicative of previous infection. Old lesions showed in up to 15 per cent. of cattle from some properties, and approximately 1.4 per cent. of fore-quarters of these cattle were rejected for export in carcase form. Field investigations showed that a good correlation existed between the known incidence of contagious pleuropneumonia on the property and the incidence of adhesions shown on slaughter. A total of 107 head from 39 properties showed lesions in which the presence of viable contagious pleuropneumonia organisms was suspected.

The evidence of infection obtained from these surveys, combined with field inspections, has enabled the delineation of "suspect" areas in which the disease is regarded as enzootic. All store cattle originating from or passing through these areas must have been properly inoculated during the preceding six months.

It is hoped that in the long term this restriction combined with increased education of stock-owners will effect a marked reduction of infection in the enzootic areas, as well as minimise outbreaks in clean areas.

Abortion and Sterility.

Brucellosis.—This is still a source of serious herd wastage and it is to be hoped that stock-owners will not be diverted from control measures for this disease by the increasing recognition that there are additional causes of abortion and sterility in Queensland cattle. In many cases, dual infection with brucellosis and vibriosis has been shown to exist. Approximately 30,000 Strain 19 vaccinations were performed, of which approximately 8,000 were carried out by Departmental officers and the remainder by practitioners.

Vibriosis.—Blood agglutination has been abandoned in favour of the mucus agglutination test. Previous difficulties in collecting suitable mucus samples appear to have been overcome by the use of absorbent tampons left in the vagina for 30 minutes. A special applicator is used to deposit the tampon in proximity to the cervix. Wherever possible, diagnosis is based upon a consideration of breeding records as well as serological tests. In many herds, however, no reliable records are kept.

Results from mucus agglutination testing, although thought to be more reliable than blood agglutination, have not shown the disease to be present in any new areas.

Treatment of animals in infected herds has given encouraging results. Standard treatment is by intra-uterine infusion of streptomycin combined either with penicillin or sodium sulphadimidine solution. Sexual rest alone is difficult to implement and the period of three months generally adopted has sometimes been insufficient.

In one Departmental herd in which vibriosis occurred, searching examinations (including test mating of heifers) after sexual rest and antibiotic treatment failed to show persistence of infection. In another herd where cows had required a minimum of three services before conception prior to treatment, an average of only 1.3 services was required after treatment. Four cows in this herd were discarded as permanently sterile.

In a series of 235 sterile cows treated in 21 herds, successful treatment of 70 per cent. has been claimed.

Leptospirosis.—Abortion in cattle during a clinical attack of leptospirosis has been recognised for some years, but more recent investigations in fulminating abortion storms have shown consistently high agglutination titres to leptospira without any other symptoms. The serological picture is complicated in some cases by a few positive reactions to vibrio and brucella. In one series of 17 herds showing abortions, 156 blood samples were submitted, of which 129 were positive to *Leptospira pomona* and 35 to *Brucella abortus*.

Field evidence generally strongly supports the occurrence of an otherwise symptomless leptospiral abortion in cattle very similar to that occurring in pigs. In such cases leptospira have been recovered from two series of the relatively small numbers of urines examined but the organism has not been isolated from the aborted foetus or foetal membranes. *L. pomona* is the organism most frequently incriminated, although several aborting herds show high titres to *L. hyos* and this organism has been recovered from the urine of an aborting cow.

In an affected herd abortions take place, usually at 5-7 months of pregnancy, over the space of 1-2 months. In one herd, however, 19 of 21 pregnant cows aborted within 10 days.

Trichomoniasis.—No further outbreaks of trichomoniasis have been detected and all herds previously quarantined for this disease have been released.

Leptospirosis of Calves.

In contradistinction to the prevalence of this disease in adult cattle and pigs, calf mortalities for the year were relatively light, especially in view of the favourable seasonal conditions.

Tick Fever.

The usual sporadic cases in ticky country have occurred, usually in cattle introduced from clean country, but the overall number has not been large. Although ticks spread to a large area of previously clean country in Central Queensland and on the Darling Downs, overall losses from tick fever were light, suggesting that the majority of ticks were non-pathogenic. Even where outbreaks did occur, only a small proportion of the presumably susceptible cattle were affected. Some confusion occurred where tick fever cases were diagnosed by owners as ephemeral fever; in some instances the animals died.

Anaplasmosis was shown to be a limiting factor in the importation of bulls to one North Queensland herd. Aureomycin administered intravenously has given some indication of being useful in the control of the disease. Cases were confirmed at Ingham, Charters Towers, Hughenden, Boondooma and Maryborough.

Ephemeral Fever.

The first cases of the recent wave diagnosed in this State were seen early in October in travelling stock at Julia Creek. It is possible that earlier cases occurred but this could not be confirmed.

The disease then spread rapidly and generally in an orderly south and south-easterly direction until it reached Brisbane in December. The disease spread further west than in 1936-37 in the Longreach-Jundah area, but in general it followed the spread of the earlier outbreak. All country within 200-300 miles of the coast was affected.

By the end of December, the disease had achieved its maximum distribution and the incidence declined fairly suddenly. As late as March, the disease was spreading rapidly in a few isolated districts, such as Millmerran, which had previously not been affected, but only sporadic cases were reported from the rest of the infected area.

Generally, mortality was extremely light (less than 1 per cent.), although heavier mortalities occurred in individual herds. The morbidity rates varied very widely from 10 per cent. in some north-western districts to almost 100 per cent. in some dairying districts. No doubt many cases would be unobserved in grazing districts.

Recurrences and recrudescences have been very marked, especially in south-eastern Queensland, and were characterised by much more serious symptoms than the original outbreak.

Mastitis was observed as a fairly common complication. Some abortions were ascribed to ephemeral fever. Small quantities of blood in the faeces were frequently observed in infected animals.

Economic losses in beef cattle were mainly attributable to dislocation of railing and droving schedules. The outbreak towards the close of a good cattle season, when considerable numbers of cattle were still available, was particularly unfortunate. Some of the affected animals had to be held over until the current season. Experimental cattle under regular Departmental weighing were shown to have regained their normal rate of gain by the following monthly weighing.

Losses in milk production were claimed to be up to 35 per cent. of normal production. Evidence indicates that although production loss on individual farms may have reached this figure for short periods, the overall loss in any district would not have exceeded 5-10 per cent. at the height of the outbreak.

In view of the transient nature of the disease, evaluation of any treatment methods is difficult. No method used by Divisional officers appeared to give sufficiently consistent results to warrant adoption. Dipping in DDT, as used to control cattle ticks, did not prevent the appearance of the disease.

Neonatal Mortality of Calves.

Neonatal loss of calves was reported from some 30 properties in the Kingaroy district and on isolated properties in the Toowoomba and Laidley districts. This condition first came under notice in the Burnett and Brisbane River Valleys in 1952. A number of properties were affected in both years.

Clinically, most affected calves are apparently normal at birth but die within 24-48 hours. Some are born dead at full time. In many cases there did not appear to be any definite symptoms and in fact affected calves are frequently extremely strong and active at birth. In a number of cases, however, central nervous symptoms such as convulsions, opisthotonus, hyperaesthesia and periodictonic spasms were reported. These symptoms may be due to haemorrhages within cerebral areas. There is some bleeding from the nose, mouth and anus, and, in the Toowoomba cases, excessive bleeding from the umbilicus. The outstanding pathological feature is massive haemorrhage into the musculature, particularly in the femoral area, as well as extravasation of free blood into the body cavities. This syndrome was also noted in a cow at Kingaroy.

A vibrio was detected in one outbreak but is not regarded as being implicated in the etiology of the condition. Blood clotting time studies showed an apparent increase in clotting time in some affected calves. No correlation was found between the blood clotting time of the dam and the probability of bearing abnormal offspring.

A search for plants which may have caused liver damage at some stage of foetal life threw some suspicion on *Erigeron floribundus* (fleabane) and *E. bonariensis.*

Miscellaneous.

The usual troubles associated with calf scours and pneumonia were encountered and were controlled by standard methods. Footrot in cattle has been troublesome and extremely widespread. Mycotic dermatitis was reported from the Burnett.

Mastitis is still a problem; most of the cases coming to the notice of Departmental officers are caused by staphylococci, as penicillin in the hands of the owner gives good control of most cases of streptococcic mastitis. *Streptococcus zooepidemicus* and *Strep. uberis* were incriminated in outbreaks. Aureomycin and terramycin are being widely used in treatment, but have by no means replaced the essentials of good management and hygiene in the control of the disease.

Phosphate and copper deficiency work was continued. Extremely good results have been obtained by copper therapy, both orally and intramuscularly, in cases where clinical symptoms of scouring, anaemia and faded coat colour are evident, but little response has been obtained where the main symptom is simply a failure to do well, although blood and liver coppers may, in these cases, be even lower than in the obvious clinical cases.

The prevalence of epitheliomata of the eye in cattle was reviewed. Although there is no objection to the removal of such growths to enable an animal to be fattened for slaughter, it is considered that in view of the hereditary nature of the predisposing factors involved, every effort should be made to induce cattlemen not to breed from such animals.

HORSE DISEASES.

Queensland itch (allergic dermatitis) was particularly prevalent. This may be related to heavy incidence of sandflies following flood rains in late summer.

Several severe outbreaks of strangles occurred in station horses. Vaccination, although it reduced the severity of symptoms, was not effective in preventing the spread of infection.

A condition in horses characterised by severe laminitis and sloughing of the hooves, main and tail was investigated at the extremity of Cape York Peninsula. This condition is of considerable economic importance in the area, as frequently insufficient horses are left for working cattle. It is strictly seasonal and occurs late in the year, after burning off. Selenium to the extent of 8 p.p.m. was found in hoof material and approximately 70 p.p.m. in a plant under suspicion, *Morinda reticulata.* These amounts are consistent with the occurrence of chronic selenium intoxication. Only transient lameness was produced by feeding the plant.

PIG DISEASES.

Although outbreaks of erysipelas were confirmed the incidence was much lower than in the previous year. Glassers disease, virus pneumonia, paratyphoid, avitaminosis A and ulcerative spirochaetosis were commonly diagnosed. Isolated cases of sparganum infestation were detected at slaughterhouses. Acute mastitis, which is readily amenable to antibiotic treatment, was frequently observed in the Toowoomba area. Streptococcal endocarditis and septicaemia due to haemolytic streptococci were diagnosed. Deaths associated with extensive liver damage, icterus and haemorrhage occurred in the Killarney and Jandowae districts.

Melioidosis was confirmed in a commercial piggery. The agglutination test showed promise as a diagnostic tool at titres of 1 in 320 and over. Allergy tests were unsatisfactory in pigs.

SHEEP DISEASES.

True foot-rot of sheep is extremely rare in Queensland but the presence of the causal organism (*Fusiformus nodosum*) was confirmed at Beaudesert and strongly suspected at Barcaldine. The former outbreak was associated with the purchase of a small line of sheep from Cannon Hill saleyards. Owing to the abnormally wet conditions, a number of outbreaks of foot abscesses were recorded, particularly from coastal areas.

Urethral calculi were responsible for losses in wethers. Two thousand wethers were drenched with ammonium chloride and 1,000 kept as controls. Further cases ceased in both groups after they were mustered into a small bare paddock and given regular exercise.

Approximately 10 per cent. of rams examined by members of the Branch during the year were found to be completely infertile. Major causes were epididymitis, atrophy of the testes and cryptorchidism.

Cancer of the vulva was seen in a number of flocks and appeared to be associated with very short tails.

Suspected cobalt deficiency characterised by poor condition, anaemia, bilateral ocular discharge and break in the wool was noted in the Aramac-Stonehenge areas

Pregnancy toxaemia and hypocalcaemia caused losses. Enterotoxaemia was confirmed in both sheep and goats.

POULTRY DISEASES.

Over 10,000 fowls on infected properties were inoculated with infectious laryngo-tracheitis vaccine from Queensland strains. Where the virus cannot be isolated, the challenge method to detect infected flocks has been used to a limited extent. A mixed vaccine containing I.L.T. and pigeon pox viruses, which reduced the time required for the vaccination with the separate viruses, was used in some 3,000 inoculations. Stickfast flea (*Echidnophaga gallinarum*) was detected at Charleville, Lucinda and Beachmere. Infected area restrictions were removed from the Boonah and Helidon districts.

Field investigations have suggested that chronic respiratory disease (C.R.D.) of poultry is an important source of economic loss in Queensland. Injections of streptomycin sulphate considerably increased egg production in infected fowls and is economically justified on a weight-gain basis in cockerels. The treatment of pre-laying pullets affected with C.R.D. will increase egg production in the subsequent laying period.

Trials with terramycin and aureomycin in the treatment of blue comb gave inconclusive results, but promising preliminary trials have been carried out with furazolidone.

Piperazine derivates in the mash have shown good results as indicated by removal of worms and clinical improvement following treatment. It appears to be a satisfactory flock treatment for removal of large roundworms.

Spirochaetosis and coccidiosis were prevalent, as well as botulism, which showed an increase in northern areas.

Fowl pox, leucosis, crazy chick disease and vitamin A deficiency were quite prevalent. One outbreak of vitamin K deficiency was reported.

EXTERNAL PARASITES.

Cattle Tick.

Seasonal conditions were very favourable for cattle tick propagation and infestations were heavier than usual in most coastal areas. There were also slight extensions of the infested area at several centres, the most serious being in the Alpha, Roma, Wandoan, Kingaroy and Toowoomba districts. In most areas, new dips have been established to cope with this spread, but on the eastern Darling Downs, where many new outbreaks were recorded on small properties, additional equipment and personnel was made available from Departmental sources for control purposes.

The extension of restrictions for control purposes to the newly infested areas, where facilities for treatment are not readily available, resulted in inconvenience to stock-owners and economic loss to the dairy and beef cattle industries.

Strategic dips, as in past years, were maintained by the Department on the principal stock routes, at the cleansing centres and in marginal country. Most of these dips are charged with a DDT preparation.

Tick tolerance to arsenic, BHC and toxaphene, and to a lesser extent dieldrin, was recorded during the year. There was also field evidence to suspect isolated instances of tolerance to DDT.

In conjunction with the Animal Research Institute, field trials were undertaken to test the organic phosphate insecticides, and promising results obtained. As these preparations are unsuitable for use in dipping vats, tests were restricted to spraying.

Buffalo Fly.

A series of good wet summers and warm winters have provided ideal conditions for propagation of the buffalo fly. As a result, the parasite has made exaggerated southerly advances in the summer and meagre withdrawals in the winter. The consequence has been a steady southerly migration culminating in a major advance this year. Until the first heavy frosts occurred later in May, the fly had extended below Charleville, Roma and Chinchilla. Along the coast, it had been arrested by control measures in the more closely settled areas near Maryborough.

The southerly spread in the Chinchilla district had necessitated the employment of extra staff and transport to operate an additional mobile spray and rail spray. The rail and mobile spray plants were maintained in the Maryborough district, where further spread of fly under extremely favourable conditions was halted. Frosts have pushed back the fly boundary, but a short winter and warm spring could nullify these gains.

The general policy of spraying all infected cattle moving from infected to clean country is being maintained.

Sheep Parasites.

In spite of favourable conditions, no major wave of fly strike has eventuated. Percentage strike has been in general below 0.5 per cent., although in individual flocks it has reached 20 per cent. While much credit for this position must be given to the widespread use of the new insecticides, other control measures such as Mulesing, correct tailing and crutching must have had considerable effect. A particular hazard is the presence of sheep carrying more than 12 months' wool as a result of delayed shearing.

Lice infestation is still a major problem in the central-west. Eradication requires careful attention to details. It is claimed that back-line jetting with dieldrin and aldrin gives adequate control of lice, but this has not yet been accepted by the Branch. Careful inspections are being made of travelling sheep and all lice-infested mobs are ordered to be dipped.

The presence of *Psorergates ovis* was suspected in the Muckadilla area.

INTERNAL PARASITES.

Parasitism in calves has been widespread, mainly with *Haemonchus contortus*. Lungworms and hookworms have caused losses in the south-eastern dairy districts and several pathogenic infestations with tapeworms have been found in the Rockhampton division.

Paramphistomum ichykiwi, one of the conical flukes, was reported from cattle at Goondiwindi.

Worm infestation of sheep has been heavier than usual in most of the sheep country. The main losses have been from *Haemonchus contortus* and *Oesophagostomum columbiarum*. Some trichostrongylus infestations were noted. *Oestrus ovis* and *Monezia expansa* were occasionally troublesome. Hydatids and *Cysticercus tenuicollis* occurred in ruminants.

POISONING.

Nitrite poisoning caused deaths in pigs at Townsville. Potentially lethal quantities of nitrate were found in vegetable tops used for soup, but only 3 p.p.m. nitrite was found in the actual soup fed. Analysis was delayed for some days and it is considered that further reduction of the nitrites had occurred.

A leaking tin of disinfectant was blamed for deaths in pigs. Lesions were consistent with carbolic acid poisoning. Creosote poisoning was also recorded in calves. Following a confusion in labelling, some sheep died following drenching with 1 oz. of 20 per cent. DDT containing 10 per cent. carbolic acid in mistake for phenothiazine mixture. It is considered that deaths were due to the carbolic acid.

Sodium fluoride as an anthelminthic caused deaths in pigs.

Two outbreaks of salt poisoning in fowls were recorded and 40 pullets were lost after eating DDT residue.

Losses occurred in calves following spraying or dipping with BHC, toxaphene and dieldrin for tick control. In view of the difficulties associated with interpretation of tissue analysis for these compounds, definite proof of the cause is lacking, but symptoms were consistent with poisoning by these compounds. Stock-owners should realise that although these substances are considerably safer than arsenic, they still must be handled with care.

Arsenic still remains the main source of losses from inorganic poisoning. The fact that farmers have changed over to an organic tickicide often makes them very careless in the disposal of residual drums of arsenical concentrate.

Losses from sawfly larvae were light and confined to the Rolleston-Springsure area, where poor communications hindered investigation.

Miscellaneous causes of poisoning were nicotine sulphate, carbon tetrachloride and lead.

Investigations were made in the Georgetown district into the role of rubber vine (*Cryptostegia grandiflora*) in a local disease of cattle characterised by sudden death.

The incidence of yellowwood (*Terminalia oblongata*) poisoning in the McKenzie River area was lower than usual, due to good seasons, but heavy mortality occurred amongst sheep in the Emerald and Springsure districts. These sheep showed marked photosensitization, with swollen heads and jaundice. As far as can be determined, this is the first description of symptoms of photosensitivity in this disease in sheep, although they are common in cattle.

Miscellaneous losses were caused by *Cestrum parqui, Solanum laciniatium, Cheilanthes sieberi, Trema aspera, Datura stramonium, Anagallis arvensis, Alstonia constricta, Melia dubia, Lantana camara, Pteris aquilina, Passiflora* spp. *Xanthorrhoea* spp. *Gastrolobium grandiflorum* and *Xanthium pungens.*

Losses in sheep at Cairns were ascribed to *Crotalaria mucronata,* but feeding trials with this material were negative.

Losses from Georgina River disease were light in spite of heavy podding of *Acacia georginae.*

BREACHES OF ACTS.

In general, stock-owners have acknowledged that compliance with the Acts administered by the Veterinary Services Branch is in the interests of their industry as a whole and only minor infringements, best dealt with by warnings and education, have occurred. However, in some cases it has been necessary to resort to legal action to prevent abuses. There were 16 prosecutions under the Stock Acts, mainly in relation to travelling stock without the permission of an Inspector; all were successful.

Twenty prosecutions were launched under the Slaughtering Act, which represents an increase on previous years. Some of these involved slaughtering on unlicensed premises and in view of the lack of proper facilities for hygienic handling of meat and removal of opportunity for inspection were regarded seriously. All prosecutions were successful.

There were no prosecutions under the Brands Act.

EXTENSION SERVICES.

A conference of Divisional Veterinary Officers and senior staff was held in Brisbane, where various facets of current extension projects were discussed.

Visual aids such as coloured transparencies and moving pictures are being increasingly used at field days.

Films were shown at annual meetings of the Central and Northern branches of the United Graziers' Association. Co-operation is being obtained with all Branches of the Department in extension work, with consequent increase in efficiency.

MEAT INSPECTION SERVICES.

During the year the "*Slaughtering Act of* 1951" and Regulations thereunder were consolidated. The Regulations for the control of meats pre-wrapped in approved transparent wrappings were gazetted. These Regulations permit pre-wrapped meats to be sold from the open-top self-service refrigerators installed in registered pre-wrapped meat shops and registered butcher shops.

Minor amendments were made to the Regulations to adjust slaughtering fees and to allow of more hygienic and economic disposal of offals from slaughter-houses.

The Toowoomba Local Abattoir has continued to operate successfully throughout the year and the Department's grading service at both this works and the Brisbane Abattoir has been satisfactorily maintained. Centralised slaughtering facilities are now in the process of being erected in the Bundaberg and Townsville Local Abattoir Areas.

Associated Canneries' meatworks at Dinmore began operations during the early part of the year and the throughput has gradually been stepped up from 60 to 180 head of cattle per day. This works operates for the interstate, local and export trades. The old Winton meatworks was reopened and local shipments, principally of mutton, have been forwarded to various markets.

The marketing of pre-cut and pre-wrapped meats continues to be popular in Brisbane and has extended to North Queensland, where meats are prepared in this form and forwarded by air to the Sydney market.

An extensive survey of cattle supplies and slaughtering facilities in various parts of Queensland was undertaken during the year. It indicated that at all centres facilities for processing meats are more than keeping abreast of the increased numbers of cattle that are becoming available.

Investigations were also undertaken into the loss of weight and bruising of cattle during rail transport.

Continued close co-operation between meat inspection services and field disease control services has been a feature of the year's activities. The valuable co-operation of Commonwealth officers at export works in collecting such information is much appreciated.

The year has seen a marked improvement in the standard of country slaughterhouses due in large measure to a special drive by officers of the Branch.

BRANDS.

Details of registration, transfers, etc., for the year 1955-56 are as follows:—

Item.	Number.	Number since inception of Legislation.
Ordinary three-piece horse and cattle brands registered ..	..	92,242
Cancelled horse and cattle brands re-allotted	809	17,782
Horse and cattle symbol brands registered	125	3,130
Horse and cattle brands transferred	1,436	86,393
Cattle earmarks registered ..	543	37,857
Sheep brands and earmarks registered	336	15,128
Sheep brands and earmarks transferred	239	10,107
Distinctive brands registered ..	..	1,355
Alteration of address of brands ..	229	..
Brands cancelled	20	..
Earmarks cancelled	132	..

There has been an increase in the number of registrations of sheep brands and earmarks and a decrease in the registration of cancelled horse and cattle brands and cattle earmarks, and transfers of horse and cattle brands and sheep brands and earmarks.

An amendment was made to the Regulations during the year, giving the right to owners of black paint brands to use blue to imprint their registered brands. This amendment was deemed necessary because in an effort to eliminate the use of black in branding sheep, the new lanolin-based emulsion brands are not being produced in black and owners of black brands would have been forced to use other branding preparations which are not easily scoured out of the wool.

The Horse and Cattle Brands Directory complete to the end of 1952 and the Sheep Brands and Earmarks Directory to 1954 are being awaited from the Printer.

TABLE 3.

STOCK SLAUGHTERED FOR LOCAL CONSUMPTION, 1955–56.

Bacon Factories.	Bullocks.	Cows.	Calves.	Sheep.	Swine.
Bacon Factories	23,673	47,346	40,645	7,659	265,467
City of Brisbane (Abattoir)	69,272	80,691	101,792	432,929	37,999
Larger Population Centres	86,290	76,639	106,732	269,000	77,263
Country Centres	35,790	35,297	22,413	81,024	18,446
Totals	215,025	239,973	271,582	790,612	399,175

RESEARCH BRANCH.

Dr. J. Legg, Director of Research.

This report covers the activities of the Animal Research Institute, Yeerongpilly, with its sub-station, the Animal Husbandry Research Farm at Rocklea, and the Animal Health Station, Oonoonba, Townsville.

BUILDINGS AND IMPROVEMENTS.

Conditions within the laboratory at Yeerongpilly have been improved by the partial completion of a new autopsy room. Outside, pens for bulls for work on infertility have been erected and a new sheepyard is under construction. Further extensions have been approved and it is hoped that during the coming year a new storeroom and building to accommodate small animals will be commenced.

At Rocklea, construction of four drought-feeding yards has been completed and work is under way on four similar yards for bulls used in the bull proving project. Two large paddocks have been subdivided into eight smaller ones to allow more effective utilization of the pasture and permit the commencement of grazing experiments. An amenities room to provide facilities for labouring staff is almost complete, and construction of the cattle working yards incorporating a steel dip and cattle weighing scales has begun.

Officers of the Agriculture Branch have surveyed the farm preparatory to devising a long-range plan for draining as much of the area as possible. This work has commenced, and two large swamps have already been drained. A flood gate has been built and drainage is proving very effective.

At Oonoonba a new staff residence has been erected.

The number of specimens examined, vaccines supplied, &c., are shown in Tables 1 and 2.

TABLE 1.

SUMMARY OF SPECIMENS EXAMINED.

—	Yeerongpilly.	Oonoonba.	Total.
Number of batches of specimens ..	3,497	350	3,847
Complement fixation tests for contagious bovine pleuro-pneumonia ..	1,236	..	1,236
Brucellosis agglutination tests—			
Bovine	6,424	71	6,495
Porcine	1,640	173	1,813
Leptospirosis agglutination tests—			
Bovine	1,874	..	1,874
Porcine	651	..	651
Vibriosis mucous agglutination tests	466	6	472
Milk samples, bovine mastitis	815	36	851
Autopsies—			
Cattle	52	15	67
Sheep	101	6	107
Pigs	112	26	138
Horses	..	3	3
Fowls	966	52	1,018
Goats	5	5	10
Other animals and birds	44	11	55

TABLE 2.

VACCINES SUPPLIED.

—	Yeerongpilly.	Oonoonba.	Total.
Contagious pleuro-pneumonia (doses)	292,875	312,525	605,400
Infectious labial dermatitis (doses) ..	243,000	..	243,000
Brucella abortus Strain19 (doses) ..	10,100	..	10,100
Tick fever blood (doses)	22,613	6,402	29,015
Infectious laryngo-tracheitis vaccine (doses)	7,700	..	7,700

DISEASES AND PARASITES OF CATTLE.

Tick Fever.

Table 3 sets out the number of cattle immunised and "bleeders" sold over the last 10 years.

TABLE 3.

BLEEDERS SOLD AND CATTLE IMMUNISED.

(Yeerongpilly.)

Year.	Bleeders Sold.	Stud Cattle Immunised.
1946–47	76	170
1947–48	134	187
1948–49	110	312
1949–50	156	467
1950–51	214	569
1951–52	111	364
1952–53	234	423
1953–54	149	643
1954–55	160	489
1955–56	193	272

At Oonoonba, 85 stud cattle were immunised and 17 bleeders sold.

Control of Cattle Tick.

This work has been continued, expanding in some directions and contracting in others. It is becoming abundantly clear now that ticks resistant to the chlorinated hydrocarbons are widespread in Queensland and many owners are looking for something else to control the pest. The position in regard to both arsenic and the chlorinated hydrocarbons has been therefore gradually altered, although these preparations in their various forms are still used very widely and do in many places keep the parasite in control.

Spraying trials with preparations like chlordane and toxaphene, which had been in progress for 6-7 years, have been abandoned because of tick resistance, although ticks which have been controlled by dieldrin for some five years are still susceptible to that compound.

Work with new organic phosphate preparations has been extended and it has been found that some of them are capable, at suitable levels, of destroying ticks. Moreover, they do not discriminate between parasites resistant to the chlorinated hydrocarbons and/or arsenic and those susceptible to these preparations. In fact, the limited evidence suggests that the tick resistant to a chlorinated hydrocarbon might be slightly more susceptible to the phosphate than the normal parasite. All these findings are of some importance.

During the past summer, which was a very wet one, a trial was carried out with cattle exposed to very heavy larval tick infestation, and treated every 14 days with one or other of the various preparations used in tick control. Treatment was applied by spraying, irrespective of the weather conditions prevailing when the day for treatment arrived, the result being that many animals were exposed to wet, showery weather or even heavy rain at the time of, or immediately after, treatments. Moreover, many of the larvae used were the progeny of resistant ticks. The overall results showed that the organic phosphates were superior to the chlorinated hydrocarbons.

Some work has been started with organic phosphate using double treatments with an interval of 24 hours. The idea behind this work is to see if treatment at very short intervals is effective, so that cattle can move through a clearing point to non-infested country without delay. It would be of the greatest benefit to stockowners if they knew that they could get cattle through a clearing centre with a delay of no more than 24 hours —or 48 hours at the most—for they could then be relieved of the problem of finding agistment for animals awaiting a second or third treatment at intervals of several days. The first results have been most encouraging.

Infertility Diseases.

Vibriosis.—Investigations into vibriosis were continued. No evidence of infertility has yet been produced in three experimental heifers, two of which were mated to a bull from an infected herd and the third in addition given an intra-uterine inoculation of *Vibrio fetus* culture. All three heifers calved normally.

Two herds from which vibrio-infected foetuses were received have also been studied. In the first of these, a herd of 80 milking cows (20 with current histories of breeding trouble) was sampled. Of the 80 cows, nine gave positive vaginal mucus agglutination tests. Four months later, 15 cows, including some not previously tested, were negative to the mucus agglutination test.

In the other herd, which was free from brucellosis, leptospirosis and trichomoniasis, the 12 animals tested, including the one from which the foetus was obtained, gave negative results to mucus and serum agglutination tests for vibriosis. The organism recovered from the foetus from this herd was tested together with stock strains. All of them gave biochemical tests accepted as being typical of *Vibrio fetus*.

As a result of the investigations during the year, the serum agglutination test has been discarded as a diagnostic procedure. The mucus agglutination test using vaginal mucus collected by the tampon method is now in routine field use.

Whilst this work was in progress the opportunity was taken to observe the bacterial flora in the vaginal mucus from experimental animals. In 5 per cent. of specimens examined no organisms were detected. Beta-haemolytic streptococci and gram-negative organisms, somewhat similar to those associated by certain overseas workers with vaginitis, were most commonly seen. Coliforms and gram-positive bacilli were less often noted and occasionally *Proteus* and *Pseudomonas* were present.

Trichomoniasis.—Infection in two experimental heifers persisted for five months after initial mating with an infected bull. Three months after they ceased to show organisms they were mated to the same bull. They showed trichomonads in vaginal mucus for a few days after service but became pregnant. One aborted at the fifth month but no trichomonads were recovered from the foetus nor from vaginal mucus.

Neonatal Mortality.

Similar mortalities to those seen in 1952-53 occurred again from October to January. Heaviest losses were reported from the Burnett and, to a lesser extent, the Darling Downs districts. Affected calves were usually born dead or died within a few hours of birth, though some survived up to four days.

Calves born dead were well developed and carried to full term. Those seen alive showed nervous symptoms, including hyperaesthesia and tetanic spasms. At autopsy the characteristic lesions were massive extravasations of blood beneath the skin and involving internal organs. The body cavities contained considerable unclotted blood and the liver was yellowish and hard.

The condition could not be regularly associated with any of the known infections which produce abortion. Following an investigation with a botanist and field veterinary officers, suspicion centred on two common weeds, *Erigeron floribundus* and *Erigeron bonariensis*, but a feeding test with the former plant gave negative results.

Paralysis.

A sporadic disease in young cattle usually from 5-12 months of age has been recognised in the Ipswich area since 1952. The symptoms consist of a variable nasal discharge, sometimes with peeling of the nose, and inco-ordination of gait progressing to paralysis over several days; diarrhoea may be present. Apart from slight meningitis no lesions have been seen at autopsy. Microscopically, there is a well-marked myelitis of the medulla and spinal cord. Transmission tests have been negative and a serological test on one dead animal showed no antibodies to infection of the psittacosis-lympho-granuloma type.

A paralytic disease which usually affects older cattle in the Townsville area is also being studied.

Mastitis.

Streptococcus zooepidemicus was recovered from several milk samples from a herd at Pilton in which 55 of 62 milking cows were affected over about four weeks. The milk showed marked changes, being brownish with clots and having an offensive odour. The cows suffered acute mastitis with systemic effects including fever, listlessness, inappetance and arthritis. This organism has not been previously detected in cases of mastitis in Queensland. Outbreaks of mastitis in an epidemic form are characteristic of this infection.

DISEASES AND PARASITES OF SHEEP.

Body Strike Trials.

Jetting Experiments.—These experiments have been continued in association with officers of the C.S.I.R.O. Veterinary Parasitology Laboratory, Yeerongpilly. The value of aldrin and dieldrin in preventing sheep body strike has been confirmed and experiments have been extended to evaluate two of the less toxic organic phosphate insecticides, malathion and diazinon.

Malathion proved inferior to both aldrin and dieldrin. Jetting along the back with 0.25 per cent. malathion gave protection against experimentally induced fly strike for 11 weeks, whereas aldrin and dieldrin under the same conditions gave protection for 17-18 weeks. At a concentration of 0.05 per cent. malathion gave protection for eight weeks, while aldrin and dieldrin were effective for 12-13 weeks.

Diazinon proved a remarkably efficient insecticide. In one experiment a concentration of 0.05 per cent. jetted along the back gave protection for 33 weeks. The sheep were exposed without shelter of any kind to 32 in. of rain over 56 wet days during the last 14 weeks of the experiment. The group jetted with 0.01 per cent. diazinon was protected for 23 weeks, but protection was lost four weeks after the onset of the wet period. In the same experiment 0.05 per cent. aldrin did not give protection beyond nine weeks.

In a second experiment commenced two weeks before the beginning of the wet period mentioned, 0.025 per cent. diazinon lost its efficiency after 16-18 weeks and 0.025 per cent. dieldrin after 7-9 weeks. Since climatic conditions similar to the above may be encountered in the field, it would be desirable, in the initial stages, to use diazinon at a concentration of not less than 0.025 per cent. to ensure adequate protection through a long wet period.

The length of wool appeared to have no effect on the persistence of dieldrin and diazinon in this experiment. No difference in protection could be found between groups of sheep with wool length of less than 1, 1¾-2 in. and over 2½ in. This is contrary to the South African findings, where BHC persisted for much longer periods in sheep carrying long wool.

Systemic Administration.—Aldrin, dieldrin and BHC dissolved in peanut oil were injected subcutaneously into groups of sheep at a dose rate of 50 to 100 mg/kg. A dose of 50 mg/kg of any of the insecticides is not efficient in preventing larval development. A dose of

100 mg/kg will prevent larval development for a period of 16-18 weeks, but because of the large and bulky dose required and the risk of toxicity the method does not appear to have practical value. The method has no value in treating struck sheep, since insufficient insecticide is present in the fleece to prevent larval development for 7-8 days after injection.

Internal Parasites.

Outbreaks of acute parasitism due to larval forms of the large stomach worm (*Haemonchus contortus*) were very common in young sheep during the early part of 1956. The prolonged wet season favoured survival of the larval forms on the pasture and sheep were subjected to a gross intake of infective larvae. Burdens of up to 2,000 fourth-stage larvae (but no adults) were frequently found in the abomasum of lambs 7-8 days after drenching with phenothiazine. Frequent drenchings would not stop death unless the sheep could be moved to an uncontaminated environment. These losses demonstrated very forcibly the need for pasture management in the control of internal parasites, as reliance on frequent drenching, even with efficient anthelmintics, is unsatisfactory.

Foot Rot and Foot Abscess.

The diagnosis of foot rot was confirmed for the first time since 1950, when specimens were received from outbreaks at Beaudesert and Barcaldine. Foot abscess was prevalent and in some outbreaks was accompanied by brisket abscesses.

Ovine Brucellosis.

A flock of merino ewes was used to determine whether infection with Brucella-like organism occurs in ewes after mating with an infected ram.

Twenty-nine ewes were mated with a ram shown by repeated semen examinations to be excreting the organism; 23 ewes conceived. Four of the ewes were killed during pregnancy and examined for infection. No Brucella-like organisms were isolated from them or from the foetuses. Two of the 19 lambs born were stillborn. Examination of the foetal membranes, foetal tissues and the milk from the ewes failed to show infection. Thus there was no bacteriological evidence that the ewes became infected. Serological testing of sera from the ewes and lambs has still to be done.

Pregnancy occurred in 80 per cent. of the ewes, but as only one ram was used no conclusions on the effect of infection on fertility of rams can be drawn.

DISEASES OF GOATS.

Peritoneal Infection.

Pleuropneumonia-like organisms were recovered from a specimen of fibrin collected from the peritoneal cavity of a goat which died as a result of peritonitis. Transmission experiments showed that intraperitoneal injection of cultures of this organism caused death of both sheep and goats. The lesions were in keeping with those seen in the field case, but the experimental animals showed arthritis as well. The organism has some antigenic relationship to that which causes contagious pleuropneumonia of cattle.

DISEASES OF PIGS.

Leptospirosis.

The experiment mentioned in last year's report was concluded. Three of the four sows which were infected with *Leptospira hyos* excreted leptospira in the urine and developed agglutinins in their blood. Those three sows produced 29 piglets, of which four were mummified and six born dead. The fourth sow showed no evidence of infection at all and gave birth to a healthy litter. Three control sows produced one mummified and 30 healthy piglets.

A further series of experiments is planned and efforts are being made to obtain a more virulent strain of *L. hyos*.

DISEASES OF FOWLS.

Bluecomb.

This disease is becoming increasingly important in Queensland. It has a world-wide distribution, and investigation everywhere, up to the present, has failed to show the cause, though some workers have produced some evidence in support of an infective agent. Transmission tests carried out at Yeerongpilly have not been successful.

As antibiotic therapy is reputed to be of value in controlling the disease, two groups of fowls on two farms were treated during an outbreak. The drugs were prepared for oral use. Observation on severely affected birds suggested that administration of the drugs in food or drinking water would be of little value because these birds did not eat or drink for at least two days. Even when given directly into the crop in severe cases no improvement was noted.

Further tests will be carried out as outbreaks occur.

Caecal Coccidiosis.

Experiments on the effect of diet on the severity of caecal coccidiosis have been continued. The incorporation of 8 per cent. dried buttermilk powder in a ration reduced the mortality in experimentally infected chickens reared under good conditions. However, this effect could be nullified by increasing the dose of oocysts, by exposing the birds to severe cold, or by starvation before and after dosing.

Experimentally, the course of the disease changed with the season. During the colder months high mortalities were experienced usually on the sixth and seventh days after inoculation; then the survivors grew rapidly and approached the controls in weight. During the summer the disease was much more chronic. Frequently death did not occur till after the seventh day and would continue up till the 14th day. Morbidity was high and prolonged. Negative weight gains were often recorded on the 14th day after dosing.

PLANT POISONING.

Plants which came under suspicion during the year in connection with sickness and death of animals are set out below. Several of them were fed to experimental animals in an attempt to establish their toxicity.

Podolepis longipedata.—This plant came under suspicion as a cause of deaths in sheep in the Roma district. In a feeding test, 5½ lb. of the plant ground up, soaked in water overnight and given by a stomach tube over a period of 10 days produced no ill effects in a sheep. The plant was most unpalatable and even when only a small quantity was mixed with lucerne and oaten chaff was not eaten.

Ranunculus sceleratus.—This plant is new to Australia. According to Pammel, contact with skin may cause blisters and the leaves if eaten produce severe inflammation of the intestinal tract. The sheep, after three days' starvation, was offered fresh whole plant. It avidly ate a few leaves, after which it licked its lips rapidly and thereafter attempted to avoid the plant whilst selecting the small amount of grass given with it. However, the plant was later eaten. Examination of the lips showed no evidence of irritation. The sheep subsisted for three days on this plant alone, eating up to 1 lb. of whole or chaffed plant daily. No ill effects were produced.

Erigeron floribundus.—Field investigations suggested that this plant may have been involved in neonatal mortalities of calves. It was fed to a calf over a period of 47 days, 107 lb. being eaten. No ill effects were produced.

Pratia concolor.—A total of 246 lb. of this plant was fed over 38 days to a bovine without producing ill effects.

Cupressus goveriana.—The seeds of this pine were suspected of causing deaths of fowls at Blackbutt.

Xanthium pungens.—This was suspected of causing deaths in pigs showing staggers and convulsions.

Myoporum deserti.—Pigs at Jandowae showed jaundice, liver damage and haemorrhages in the muscles and viscera. Leaves of *M. deserti* were found in the stomach.

Alstonia constricta.—Deaths occurred in pigs at Murgon after showing inco-ordination and vomiting. Autopsy showed myocardial haemorrhages in the digestive tract and urinary bladder. Leaves of *A. constricta* were present in the stomach contents.

Terminalia oblongata.—Two outbreaks of yellow-wood poisoning were reported from Springsure and Emerald in sheep. Photosensitisation was a prominent feature in both outbreaks but typical "fits" were seen in one outbreak only.

Morinda reticulata.—This plant was thought to be the cause of a disease of horses referred to as "change hoof" disease in the Cape York Peninsula area. A total of 165 lb. of leaves was fed to a horse without producing the disease.

HUSBANDRY RESEARCH (ROCKLEA).

Investigations during the year were confined to cattle.

Nutrition.

Drought Feeding Experiment.—A preliminary experiment on the possibility of using bush hay as a drought reserve fodder for beef cattle was undertaken. The hay used was largely composed of shot grass (*Paspalidium globoideum*), early spring grasses (*Eriochloa* spp.), Queensland blue grass (*Dichanthium sericeum*) and feathertop (*Aristida leptopoda*), plus a small percentage of Flinders grass (*Iseilema membranaceum*) and native panics (*Panicum* spp.).

Chemical analysis showed that the crude protein content was low (4.6 per cent.) and crude fibre high (34 per cent.). A sheep digestibility trial indicated that the apparent digestible protein content was only 1 per cent., but the digestibility of the fibre was fair (54.6 per cent.).

Four groups, each of six Hereford heifers (18-24 months of age), were fed long chaffed bush hay *ad lib* in yards for a period of six months. One group was fed bush hay *ad lib* only; two groups also received in addition prime lucerne chaff; and the fourth group was fed bush hay *ad lib* plus a small supplement of meatmeal. The rates of supplementation are shown in Table 4.

All animals were individually dosed with 1.25 million units of vitamin A as a fish-oil preparation at the beginning of the experiment. All groups had free access to a mineralised lick containing equal parts of coarse salt and degelatinized bonemeal to which was added 8 oz. copper sulphate and 2 oz. cobalt chloride per 100 lb.

At weekly intervals animals were weighed and the consumption of bush hay and mineralised lick was recorded. The changes in the group average body weight and mean consumption of bush hay and lick during the period of 26 weeks are given in Table 4.

The supplements increased the average consumption of bush hay, the greatest increase being in the group receiving the meatmeal—a 16 per cent. increase. The total intake of bush hay and supplements was, however, approximately the same for the meatmeal supplemented group and the group which received 1.3 lb. lucerne as a supplement. (The 1.3 lb. of lucerne chaff and the 0.4 lb. meatmeal contained the same quantity of crude protein.) The higher level lucerne group, however, had a greater intake than either of these groups.

The mean average consumption of lick was greatest in the unsupplemented group, being approximately double that of the high-lucerne group. A further experiment is planned to investigate the part played by the mineralised lick.

The animals receiving a small quantity of supplement in addition to bush hay gained in weight during the experiment. There was very little change in the average weight of the group receiving bush hay and lick only, and the cattle were still strong at the conclusion of the experiment.

It is considered that closely confined cattle having free access to water and fed good quality bush hay and lick could survive a drought of six months' duration. However, further intensive and field experiments will be necessary before practical recommendations can be made.

TABLE 4.

RESULTS OF FEEDING HEIFERS ON SUPPLEMENTED AND UNSUPPLEMENTED BUSH HAY.

Group.	Supplement 1 lb./head/day.	Average Body Weight (lb.) After Feeding Bush Hay.			Intake Average/head/day Over 26 Weeks.		
		Initial.	1 Week.*	26 Weeks.	Bush Hay. (lb.).	Lick. (oz.).	Total on Air-Dry Basis. (lb.).
(1)	Nil (control)	523	546	526	13·1	5·3	13·4
(2)	1·3 lb. lucerne chaff ..	523	559	580	14·1	2·2	15·6
(3)	3·0 lb. lucerne chaff ..	532	561	644	14·3	2·8	17·5
(4)	0·4 lb. meatmeal ..	526	558	596	15·2	1·9	17·7

* This increase in weight is attributable to rumen "fill". Animals prior to the experiment were fed a sub-maintenance diet.

Bagomolasses Feeding Experiment.—Large quantities of molasses and bagasse, which are by-products of the Queensland sugar industry, are not at present fully utilized. An experiment was undertaken using bagomolasses for fattening beef cattle. Bagomolasses formed half of the ration whilst the other half consisted of lucerne chaff, linseed meal and mineral supplements. The cattle were brought from store condition to a carcase quality of first grade in 3½ months, gaining 1½-2 lb. per head per day.

As this was a preliminary trial to obtain information on the feeding value of bagomolasses for beef cattle, the cost of the ration was not considered. The indications are that although liveweight gains were very satisfactory, the high proportion of lucerne and linseed meal in the ration makes it commercially uneconomic on present prices.

To reduce costs, the possibility of using bagomolasses as the sole source of roughage, together with a protein concentrate such as meatmeal, was examined. As the supply of prepared bagomolasses was limited it was only possible to do a small-scale experiment using two animals in each of four groups. The results were promising and it is planned to repeat this work with larger numbers of cattle when a supply of bagomolasses becomes available after the current cane crushing season.

Paspalum Silage Feeding.—The stocking rate in the coastal dairying areas of Queensland is not sufficient to utilize the rapid growth of paspalum that occurs during most summers. The possibility of conserving the excess growth as silage and feeding it during dry times was examined. The digestibility was determined using sheep, and liveweight gains were studied in cattle fed silage made from young paspalum.

The sheep digestibility trial indicated that the carbohydrate portion of the silage was well digested (63.8 per cent. for crude fibre and 50.8 per cent. for carbohydrate) but the digestibility of the protein was low (34 per cent.).

Young stalled animals (200-480 lb. initial weight) gained an average of 0.8 lb. per had per day over the final 12 weeks of a 14-weeks' feeding period. It is suggested that the low digestibility of the protein limited the liveweight gains.

Phosphate Supplementation Experiment in Cattle.—An experiment of 11 months' duration to study the effect of a bone flour lick on liveweight gains and on the marginal blood phosphate status of breeding cows was completed. For the major part of the period the voluntary consumption of the bone flour/salt (2:1) lick was insufficient to have any beneficial effect. There were no indications of an elevation of blood phosphate, better liveweight gains of the cows, or higher birth weights in calves from the supplemented group compared with the unsupplemented group.

These results indicate that the provision of a bone flour lick may not be sufficient to raise a marginal to low blood phosphate status of dairy cows on coastal pastures of southern Queensland.

Breeding.

Structure of Dairy Breeds.—Generation length (that is, the average age of parents when their young are born) has been studied for five Australian dairy breeds —Jersey, A.I.S., Friesian, Ayrshire and Guernsey. The generation length for all breeds approximates five years and may be taken as this for all practical purposes.

The parent-offspring intervals and average generation length in years for the five breeds are shown below.

Parent Offspring Relationship.	Jersey.	A.I.S.	Friesian.	Ayrshire.	Guernsey.
Sire-son interval	5·0	4·89	4·17	4·98	4·60
Sire-daughter interval	4·60	4·87	4·39	4·78	4·78
Dam-son interval	6·34	6·19	5·86	6·32	5·96
Dam-daughter interval	5·57	5·63	4·88	5·70	5·34
Average generation length	5·38	5·39	4·96	5·45	5·17

It will be noted that the parents of registered males are, on the average, older than those of registered females. This could be due to deliberate selective registration of bulls from older cows with several lactations sired by older bulls with progeny records.

The distribution of the parent-offspring intervals shows that bulls are used mainly as 1-year-olds and 2-year-olds, after which most of them are lost to pedigree breeding. There is apparently some selective registration from older cows. The extent of this selection could, however, be greatly increased, as all the bull calves now being registered could be the offspring of cows that have completed two or more lactations.

Bull Proving Project.—Four young Jersey bulls, 16-21 months of age, were used to provide semen for artificial insemination in Jersey herds in herd-recorded units in the Maleny-Nambour area. Inseminations were carried out over a period of 109 days from Sept. 26, 1955. Herd recording figures showed that more cows were mated in the area in the last quarter of the year than during any other quarter.

Semen was collected with an artificial vagina on three days each week. The bulls were rotated, each being used every nine days. To ensure that all semen used was of good quality it was examined for motility and density, and in addition sperm numbers and live/dead percentages were determined. The semen was diluted with buffered egg yolk-sodium citrate diluent containing 0.4 per cent. sulphanilamide and the antibiotics penicillin and streptomycin at the rate of 500 units per c.c. The diluted semen was cooled to 5 deg. C. over approximately three hours in a household refrigerator. It was then packed in vacuum flasks with balloons containing ice and despatched by rail to the inseminators. Forty-eight batches of semen were despatched during the insemination period and 1,769 inseminations were made.

Field aspects of the project are dealt with in the report of the Cattle Husbandry Branch.

The bulls for use in the 1956-57 project have been purchased and are being handled at Rocklea preparatory to training. Assembly of equipment for the deep freezing of semen is almost complete.

SHEEP AND WOOL BRANCH.

Mr. G. R. Moule, Director of Sheep Husbandry.

Favourable seasonal conditions prevailed over the sheep pastoral country during the year. In many districts this was the eighth favourable year in succession and in a large part of central-western Queensland it was the sixth such year. It is doubtful if such large areas of the sheep pastoral country have previously had such a long run of good seasons.

At the close of the previous financial year the sheep country was well grassed. Extremely widespread and heavy rains had fallen in May, 1955, but severe frosts in July destroyed a good deal of feed. Further rain fell in the Maranoa pastoral district in July and again in September and October. The October rains also extended to the Darling Downs. Falls of up to 7½ inches were recorded on the Darling Downs in December, when the Maranoa and the Central Highlands and some parts of the Central-west recorded falls of between 1 and 2 inches. The rains of January, 1956, were widespread and heavy. In most districts they exceeded 4 inches, although Richmond and Julia Creek were not so well served. Further heavy rain occurred in February, when Emerald, Julia Creek and Cunnamulla all recorded over 10 inches. Heavy rains occurred again in March and by the end of that month many districts had received falls in excess of their average annual rainfall.

At the end of June, 1956, the whole of the sheep pastoral country was well grassed except for a restricted area north and west of Winton. Here there was adequate pasture although it was a little drier than in other parts of the State. Herbage was growing profusely in most of the southern Queensland and the outlook for the winter was good.

Moderately successful lambings have been reported from most districts, although worm infestation has caused some losses. Severe flooding that followed the January and February rains caused some heavy stock losses. Sheep carrying more than 12 months' wool were also lost when they became bogged. However, Queensland sheep numbers have increased and at March 31 the State's flock totalled 22 millions. The sale of 623,363 bales of wool returned £52½ million. The 267,555 bales of wool sold during the first six months of the year attained an average price of 62·84d. per lb. However, the market firmed towards the end of the year and at the last sale wool commanded an average price of 76·07d. per pound. One wool sale was postponed and there will be a considerable carryover of unmarketed as well as some unshorn wool as the result of disturbed industrial conditions.

Wool remains the State's principal export commodity.

STAFF.

Inability to provide adequate advisory staff remains the greatest problem facing this Branch. The loss by resignation of a Senior Husbandry Officer, a Husbandry Officer, a Senior Adviser, and an Assistant Wool Technologist must have serious effects.

On the laboratory side of the Branch, the Assistant Wool Technologist resigned to take up a position with another organisation. This officer had filled a vital role in the Branch for some years.

A position of Assistant Director of Sheep Husbandry was created. The successful appointee took up duty in December. The Branch has a nominal establishment of some 40 members, including graduates for advisory, laboratory and research work, non-graduates for extension work, technical officers, laboratory assistants, clerical officers and station hands. There are, however, vacancies in all categories except the last two.

Since 1950 the Commonwealth has made Wool Funds available for the training of under-graduates who wished to finish either their Veterinary or Agricultural courses and enter Sheep and Wool Extension Services. Undergraduates were offered £350 p.a. plus their training. Since the inception of the scheme, scholarships have been offered in nine instances. However, only two men have been appointed.

The accepted division of labour between the States and Commonwealth in the field of agricultural research and extension is clear. The results accruing from fundamental research by C.S.I.R.O. should be tried and refitted by State Departments to meet field conditions. The State's extension services should transmit to the industry the results of their findings and details of applying new methods. Owing to the present shortage of experienced graduate staff, this Branch is unable to discharge adequately the responsibilities implicit in this arrangement.

EXTENSION WORK.

Extension officers contacted 2,869 woolgrowers during the year and conducted 979 demonstrations on private properties. Eight field days were held, and two in-residence schools were conducted.

Field days proved useful in publicising new ideas as well as for reviewing accepted practices. They were followed by visits by field officers to the properties of woolgrowers interested in pursuing the suggested methods. The field days concentrated upon the control of parasites, fat lamb production and fodder conservation.

Woolgrowers who attended two in-residence schools were given further instruction in fodder conservation, supplementary feeding and fleece measurement. The first school was organised by the Australian Estates Company on its "Terrick Terrick" property at Blackall. This was attended by about 30 members of the Company's staff, including managers, overseers, jackeroos and senior executives. The school reviewed the information that had been placed before students at the initial school held during the previous year. This proved extremely useful, as managers and jackeroos were able to give first-hand information of their experiences in applying some of the methods that were suggested at that time. They were also able to indicate the benefits that had accrued from the application of newer techniques. An innovation at this School was the inclusion of field trips, one of which dealt with applied botany and the other with fodder conservation.

A school for young woolgrowers, financed from Commonwealth Wool Funds, was held on "Buckinbah" Merino Stud, St. George, in September. This school concentrated on fertility and infertility of sheep and the use of fleece measurement. It was attended by 25 Queensland woolgrowers in the 30-40 year age group, as well as by some observers from the extension services in Western Australia, South Australia and Victoria. Two representatives from the Commonwealth Wool Research Committee also attended and the School was happy to be able to welcome the International Wool Secretariat's Director of Promotion (Mr. A. Ogilvie).

Extension Programmes.

The extension forces within the Branch have concentrated during the year on three major programmes—fleece measurement, blowfly control, and mitigation of drought.

Fleece Measurement.—The fleece measurement programme was initiated last year. It aims at increasing the rate of genetic improvement in the State's flock. The simplest way of doing this is to work through the Queensland Merino stud sheep industry, which has shown remarkable advancement in the last 20 years. However, the rate of genetic improvement resulting from the selection of sheep for breeding purposes by visual appraisal alone is probably as low as $\frac{1}{2}$ oz. of clean scoured wool per head per year. By combining fleece measurement with visual appraisal it has been possible to maintain breed standards and to treble the rate of genetic improvement. This means that the rate of improvement can be increased to approximately 1 oz. of clean scoured wool per head per year. Fortunately, the progress that is made in the studs is transmitted to the flocks that purchase their rams. Although the increment of 1 oz. of clean scoured wool per head per year does not appear to be very great, it must be remembered that this is a genetic gain. It should also be remembered that had fleece measurement been available 50 years ago, the State's clip may have been at least 20 million lb. greater than it is at present.

The fleece measurement programme has progressed well. In all, 5,607 wool samples were handled for the studs using the services that are available to them through the Fleece Measurement Laboratory. An increasing number of flock masters are using it as an adjunct to the classing of ewes. It is not proposed that fleece measurement should be used by flock men as an aid to breeding their own rams. Provided the stud sheep industry uses the most modern methods available to it there is no need for flock owners to go to the trouble of carrying the additional sheep involved in a ram-breeding programme.

The extension programme on fleece measurement has aimed at acquainting all woolgrowers with the advantages accruing from its use. By doing so it is hoped that they will have a greater appreciation of some of the difficulties involved in sheep breeding. It is also felt that the demand for the use of fleece measurement by the studs should come from the sheep industry itself. The only way of ensuring this is to be certain that every woolgrower understands the rationale behind its use. The extension work on the fleece measurement programme has been satisfactory and field officers have been consulted freely about the breeding plans that might be followed by both stud and flock masters.

Prevention of Blowfly Strike.—Blowfly strike is one of the oldest problems facing the sheep industry in Queensland. It was first reported in this State in 1883 and during the ensuing 60 years was responsible for serious losses. Scientific research into the prevention and control of blowfly strike was co-ordinated in the early 1930's when the Joint Blowfly Committee was founded. This consisted of representatives from C.S.I.R. and the State Departments actively working on the blowfly problem. Within 10 years reasonably efficient methods for preventing blowfly strike were available. Immediately schools were conducted to acquaint woolgrowers with the details of these methods and credit must go to Queensland for having initiated schools of this type. The series commenced in 1941 and during the next eight years no less than 40 schools dealing with the prevention and control of blowfly strike were conducted.

After World War II newer insecticides opened another phase in the prevention of blowfly strike. The need for greater protection against body strike of sheep was clearly demonstrated during the fly wave of 1950, when DDT and BHC were just becoming available. Recently three more insecticides—aldrin, dieldrin and diazinon—have commanded attention.

Because of the extremely heavy summer rains and the unusually prolonged series of good seasons, a severe autumn fly wave was anticipated. Extension work aimed at warning woolgrowers of this possibility and at encouraging them to take reasonable precautionary measures. For the first time since the blowfly control measures campaign started in Queensland practically the whole industry acted together. Aldrin or dieldrin was used as a protective jet against both body and crutch strike. Research by C.S.I.R. had clearly shown that the green blowfly that initiates strike breeds in struck sheep. As the result of the industry's collective action blowflies were deprived of their main breeding ground and although seasonal conditions were favourable no major fly wave occurred.

This is probably the most notable achievement that has been attained in the prevention of blowfly strike in the State's history. From the extension viewpoint it has also been a notable achievement. The Branch's influence was exerted quickly over a large part of the industry through the press and radio and field officers were relieved of the responsibility of numerous personal contacts—a method which is extremely effective in conveying information to individuals, but is slow and inefficient when the State-wide dissemination of knowledge is required.

Mitigation of Drought.—The extension programme on the mitigation of drought that was launched last year has continued. Despite the long run of extremely bounteous seasons that has been experienced in central and north-western Queensland, woolgrowers appreciate that drought is a recurring problem. Some have forebodings that the corollary to the long run of good seasons is a long run of bad ones! Two methods of drought mitigation were under consideration—the growing and conserving of fodder crops and the conservation of bush hay. The industry now realises that the yield per acre is far greater from agricultural crops than it is from bush hay. Similarly the cost per food unit conserved as silage is far lower than the cost per food unit conserved as bush hay. In these circumstances, the interest in bush hay has been waning but that in the growing and conserving of crops has been increasing.

The commencement of agriculture by pastoralists is a big step. It is a completely new way of life and calls for new skills and for more labour, which is not readily available in the sheep pastoral country. In addition, it requires a high capital outlay. Despite this, the number of people who are growing and conserving crops continues to increase. Some have been outstandingly successful. One man, for instance, during the year under review harvested approximately 1,000 tons of silage from 100 acres. In all, something over 40,000 tons of silage are now conserved in the semi-arid sheep pastoral country. A good deal of the research work into the growing of crops has been undertaken by the University's Department of Agriculture. Field officers in the Sheep and Wool Branch have co-operated with senior lecturing staff from the University in the conduct of field days designed to popularise the growing and conserving of fodder crops.

General Extension Work.

Besides carrying out these three main programmes, field officers were called upon to advise woolgrowers about a wide variety of general subjects. The most noteworthy of these are discussed hereunder.

Control of Internal Parasites.—The long run of particularly bounteous seasons and the extremely heavy summer rains led to a marked increase in worm populations. In addition, worms occurred in districts where they are not enzootic. Unfortunately, many woolgrowers failed to appreciate the nature of the trouble besetting their flocks and some quite heavy losses occurred. The rapid growth of the pastures contributed to the problem this year. As the grass became long and rank the sheep were virtually herded together on restricted areas. Here, because of severe local overstocking and the rather favourable conditions that prevailed for the hatching of worm eggs and the survival of larvae, the sheep became rapidly re-infested. Extension work on worm control aimed mainly at acquainting woolgrowers with the nature of this problem and encouraging them to incorporate rotational grazing in their flock management.

Control of External Parasites.—The range of body lice of sheep has extended considerably during the last few years. These parasites can cause quite serious economic loss, but they are one of the easiest of the parasites of sheep to kill. An extremely dilute solution of either aldrin or dieldrin will probably suffice to kill the majority of body lice. Unfortunately, it has been difficult to arrange dipping on many properties. Further, many sheep are carrying more than 12 months' wool and in some circumstances lice infestation has reached serious proportions. On the other hand, the widespread use of aldrin and dieldrin in the prevention of blowfly strike has probably assisted in the control of lice. It is no exaggeration to say that with modern insecticides it would be possible to exterminate body lice from Queensland's flocks. However, there are considerable practical difficulties associated with organising dipping and ensuring complete musters.

Management of Breeding Flocks.—The management of breeding flocks is not easy in Queensland. A large number of activities have to be integrated into a workable plan. However, this may be seriously affected by seasonal conditions or other circumstances beyond the producer's control. It is not surprising, therefore, that a large part of field officers' activities is taken up in advising woolgrowers how to adjust their management to meet changing circumstances.

Infertility of Rams.—It is well known that Merino rams suffer from temporary infertility as the result of hot weather, fly strike and chronic infections. This condition is particularly common in tropical Queensland, where sheep are exposed to high atmospheric temperatures for many months each year.

The examination of semen samples produced by rams in southern Queensland during the autumn of this year indicated that many animals might be suffering from seminal degeneration. This may be of considerable importance, as the rams' fertility seemed to be extremely low during April and May, when many flocks are mated. The cause of the infertility has not been determined, but it seems likely that it may be associated with the heavy infestations of sandflies that occurred following the floods in late summer.

Field officers were able to advise owners on the appropriate management to adopt in such circumstances, as well as to assist them in recognising evidence of permanent infertility amongst rams.

Improvements in Shearing Techniques.—Over half a century has elapsed since the introduction of machine shearing, but during this time comparatively few advances have been made in the techniques used in sheep shearing.

Shearing is highly skilled but arduous work and comparatively few men remain in the industry for a lifetime. It is little wonder, therefore, that sometimes there is insufficient skilled labour available.

Considerable interest is attached therefore to the invention of shearing tables that control the sheep while they are being shorn. Two cradles have been suggested by Queensland woolgrowers and both were in commercial production by the end of the year under review. It seems highly likely that cradles of this type will eliminate a good deal of the hard work involved in shearing.

RESEARCH WORK.

Despite the shortage of trained staff an active programme of research work has been pursued.

Two international conferences dealing with the raising, welfare and productivity of animals in the tropics were held in Brisbane during the year. The first, held in August, was convened by the Food and Agriculture Organisation of the United Nations. A paper dealing with problems of sheep husbandry in tropical Australia was prepared from information obtained by this Branch.

The second conference was convened by the Australian Academy of Science and was held in May. A paper dealing with the impact of the physical environment upon sheep in tropical Queensland was presented by this Branch.

Results obtained from the principal lines of investigation pursued during the year may be summarised as follows.

Sheep Breeding.

The selection from within the flock of Peppin strain Merinos on the Toorak Field Station of sheep capable of producing and reproducing in the tropical environment has continued. Four selected rams were joined with 137 ewes born in 1950 and 61 ewes selected from the 1953 drop. The ewes lambed under surveillance in September-October 1955. In the older group, 80 per cent. of the ewes mated lambed to produce 98 lambs. Only 36 per cent. of the younger ewes lambed to produce 17 lambs. The male lambs were heavier at birth than the female lambs by almost 1 lb. The single lambs were heavier than twin lambs by over 2 lb. The lambs sired by one ram were almost 1 lb. lighter at birth than those sired by the other three rams.

At marking time the lambs were weighed and statistical analysis of all available records showed:

(*a*) Up to the age of 4 weeks the average growth rate of the lambs was 0.54 lb. per day.

(*b*) Male lambs were 2.8 lb. heavier than female lambs—this difference is highly significant.

(*c*) Single lambs were 7.4 lb. heavier than twin lambs —a highly significant difference.

(*d*) Offspring of the older ewes were not significantly heavier than the offspring of the younger ewes.

(*e*) No significant differences were observed between the marking weights of the lambs sired by different rams, but those by ram B6 that were about 1 lb. below average at birth were still below the average of the rest of the lambs.

No differences in the number of lambs reared as a percentage of those born to the four different sires were noted. This may not indicate, however, that selection for this character is not important. The lambs were born during a favourable year and under more adverse conditions appreciable differences in the survival of lambs sired by different rams may have been noted.

A positive selection differential of 0.23 lb. of clean scoured wool was achieved in choosing the older ewes, and of 0.47 lb. of clean scoured wool in selecting the younger ewes. The average cut per head of the four rams used was 8.24 lb. of clean scoured wool. This compares more than favourably with that of grass-fed rams of comparable age selected as reserves in the studs using fleece measurement. Considering the disabilities of the Julia Creek district for the growing of heavy fleeces, this is an extremely satisfactory result.

An opportunity presented itself to compare the cuts per head of the young ewes bred in the nucleus with those of comparable sheep whose parents had been chosen with the same intensity but without the aid of fleece measurement. This showed that the ewes whose parents had been selected by fleece measurement cut 0.7 lb. of clean scoured wool more than the offspring of sheep selected by visual appraisal. This increase was in keeping with those that could be anticipated from the difference of 1.75 lb. between the selection differentials that were achieved for the two groups and clean scoured fleece weight's accepted heritability of 40 per cent.

This work is proceeding and further matings were arranged during April-May 1956. A feature of this year's matings was the selection of the rams on the ratio of their clean fleece weight to their body weight, as well as on breed type and productivity. The ratio of the clean fleece weight to the liveweight of the sheep gives some indication of a ram's ability to convert feed to wool, because the animal's liveweight is a fair indication of his food consumption. In the matings arranged in autumn, rams born in September 1954 were used. (No animals less than 100 lb. liveweight at shearing in early May 1955 were mated). The rams had clean fleece weight: liveweight ratios that ranged between 0.0825:1 and 0.13:1.

Final selection was made on clean fleece weight, liveweight and clean fleece weight, liveweight ratios, staple length, fibre diameter and its variability, trade count and the animal's conformation. It is possible, of course, that from the point of view of land use it may be preferable to select rams with lower body weights, but higher clean fleece weight: liveweight ratios. This could lead to a greater number of smaller but more highly efficient sheep grazing a unit area. While this could mean greater wool production, it would also increase the labour required and for this reason may not be as economical.

Gains From Fleece Measurement.

Data are now available from studs that have been using fleece measurement as an aid to selection for more than five years. In addition, Merino flocks on the Toorak Field Station, Julia Creek, have been mated in such a way as to allow a comparison of progress achieved following selection on visual appraisal and on visual appraisal aided by fleece measurement.

Data are also available on the selection of ewes by over 100 sheep classers and woolgrowers. These have shown:

(*a*) That only small selection differentials can be achieved through ewe selection, unless the selection intensity is high.

(*b*) That the use of fleece measurement as an aid to selection of rams can treble selection differentials for fleece weights and ensure that other characters are kept within desired tolerances.

Ewe Selection.—A flock of 1,751 ewes was classed by visual appraisal and 21 per cent. were culled. The sheep were subsequently shorn and their fleeces weighed. Culling in this way resulted in a positive selection differential of 0.06 lb. of greasy wool. The distribution of the fleece weights of the whole flock and of the culls is shown in Fig. 1. Sheep were culled on account of one or more of 17 faults, including bad hocks and/or feet, bare points, bad shoulders, wool too fine, too strong or too short, light cutter, harsh handle, black or brown wool, etc. It is clear that the culls were drawn from sheep in most fleece weight groups, although there was a slight bias against sheep with low fleece weights. Short staple length, wool too strong and harsh handle were responsible for most of the culling—346 out of the total of 368 culls exhibited one or more of these faults.

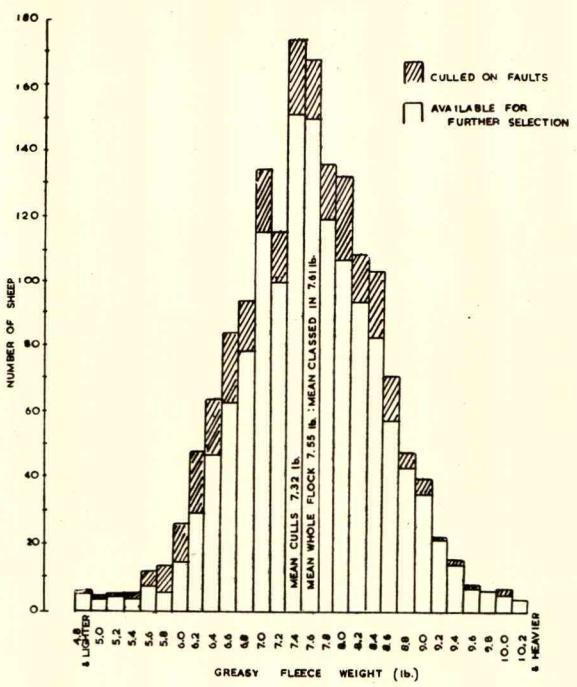


Fig. 1.—Diagram Showing How Culling of Ewes on Visual Appraisal Resulted in a Selection Differential of 0.06 lb. of Greasy Wool. By using fleece measurement in addition, the differential would have been 0.24 lb.

Had it been possible to cull more heavily, using fleece measurement as an aid, a positive selection differential of 0.24 lb. of greasy wool would have been obtained by the culling of a further 10 per cent. of the ewes.

In a second observation, 416 Merino ewes were classed on visual appraisal and 85 were culled. Forty-nine of these were removed because the classer considered they had bare heads and/or points, their wool was slack or light, their withers or sides were lightly covered or they were light cutters. Actually, the average clean cut per head of the unclassed flock was 6.04 lb.; that of the 49 sheep removed for the above faults was 5.55 lb. Had they been retained and the 49 sheep with lowest fleece weights been culled, the selection differential would have been increased by 0.10 lb., i.e. from 0.08 to 0.18 lb.

In a third observation, 500 2-tooth Merino ewes were classed and 112 were culled. This resulted in a positive selection differential of 0.26 lb. of greasy wool. A further 57 ewes were culled after their fleece weights had been examined. This increased the selection differential to 0.37 lb. of greasy wool.

Selection of Rams.—Although rams can be selected with greater intensity, the initial choice of the reserves may give but small selection differentials.

In one observation a flock of 511 2-tooth rams was submitted for classing by visual appraisal; 144 were culled and another 53 selected as reserves. All the fleeces were weighed at shearing time. The average cut per head of the flock, excluding the culls, was 14.3 lb. of greasy wool, but the average cut per head of the "reserve" rams was only 14.0 lb. The distribution of fleece weights of the reserve rams within the flock after culls had been removed is shown in Fig. 2.

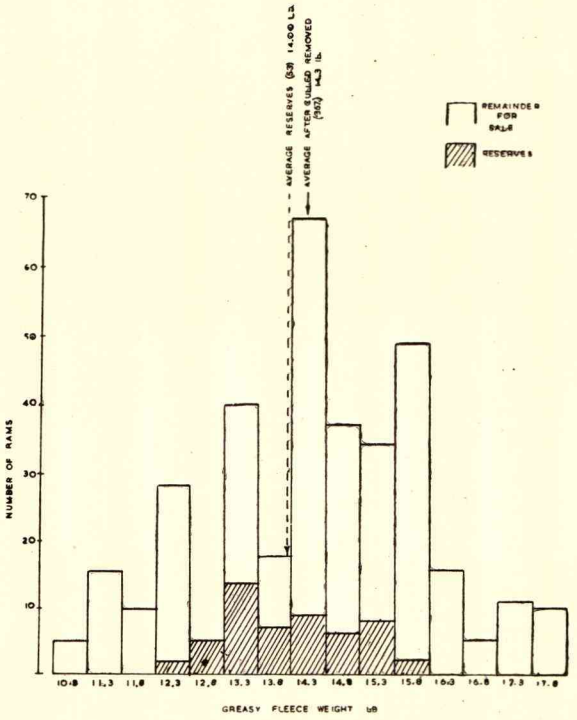


Fig. 2.—This Diagram Shows That the Initial Choice of "Reserve" Rams May Not Give a Satisfactory Selection Differential. Final selection of the "Reserves" on fleece measurement figures added 0.5 lb. to the selection differential.

The final selection from the reserves of the rams to mate with the "first" stud ewes was made with the aid of fleece measurement. This resulted in a positive selection differential of 0.5 lb. of greasy wool (and 0.8 lb. of clean scoured wool), while the other characters such as fibre diameter, trade count, etc., were kept within desirable tolerances.

These results are typical of those obtained from the use of fleece measurement. They confirm the statement that only small selection differentials can be achieved through ewe selection unless the intensity of selection is high, and that large selection differentials can be achieved in the choosing of rams. They also demonstrate the greater accuracy that can be achieved from the use of fleece measurement in selection, and indicate that the faults for which sheep are culled have relative values.

In reaching a decision whether to cull or retain a sheep, it is necessary to assess the significance of a fault in relation to the animal's immediate productivity, as well as to the effect its retention or removal from the flock will have on the improvement of future generations. Best results are likely to come from concentrating the available selection pressure towards characters of high heritability and economic importance rather than against those of doubtful significance.

Some indication of the differences of opinion that exist on the way the available selection pressure might be used can be obtained from Fig. 3. This has been compiled from the opinions expressed by two groups of woolgrowers—one of which comprised studmasters—asked to select the five best and cull the five worst from flocks of 35 sheep. It shows the number of votes recorded for and against the sheep according to their clean fleece weights, which were subsequently determined.

Prediction of Fleece Weights.—A method of predicting the amount of wool sheep grow without actually shearing them is an urgent requirement of the fleece measurement programme. Observations on the selection of the reserve rams have shown that their fleece weights are usually grouped around the average for the unclassed flock.

While it is quite important to maintain breed type it is highly desirable to be able to recognise the heavier cutters in any flock of rams submitted for classing. Workers in New South Wales have shown it is possible to calculate fleece weight from a sheep's body weight and the amount of wool grown on a unit area of its skin. Their work indicated that it did not matter very much if the sheep were carrying as little as 3½ or as much as 11 months' wool when these estimates were made.

This method of predicting fleece weights has been tried under different conditions in Queensland. One group of rams was hand-fed, the other was grass-fed. A group of wethers was also examined.

The method, which consists of shearing the wool from a small area on the sheep's mid-side and measuring the area shorn, is quite expeditious. It has given fair predictions of actual fleece weight—more important, it has differentiated the heavier cutters from those that are average or light cutters. The widespread use of this method could increase the accuracy of selection of the reserve rams, thereby ensuring that greater increases in the cut per head of sheep are wrought through better breeding.

Copper Supplementation.

Trials to determine the best way to administer supplements to sheep suffering from copper deficiency were commenced in north-western Queensland in conjunction with the Research Branch in 1953. For this purpose young sheep were introduced from another district. At the commencement of the trials their mean liveweight was about 48 lb.; by the end of the year the ewes weighed about 78 lb. and the wethers about 88 lb. There were no significant differences in the average liveweight or the cut per head of the sheep in the various groups, despite their respective treatments, which consisted of subcutaneous injections of copper salts and drenching with solutions of copper sulphate each month and each quarter. One group was untreated to provide a comparison.

Each group cut about 6½ lb. of greasy wool and between 3⅜ and 3½ lb. of clean scoured wool. No detectable difference occurred in the earning capacity of the sheep in the five groups. However, they had come from another district and had adequate copper liver stores when the trials began. It was not until the first year's observations were concluded that differences in the copper status of the various groups were apparent.

The sheep were regrouped in September 1954 to provide for the following treatments:

(*a*) Injection of copper salts.
(*b*) Administration of drenches containing copper sulphate every quarter.
(*c*) Untreated controls.

A number of sheep that were in the group originally drenched once a month were placed in the group to be drenched quarterly in the subsequent observations. The analysis of liver samples removed by biopsy showed that these sheep started the trial with liver copper levels as high as 240 p.p.m. The liver coppers of the biopsied sheep in the untreated control group at the same time ranged from 22 to 80 p.p.m., while those biopsied in the injected groups had liver coppers of between 50 and 80 p.p.m.

The ewes in the various groups were mated in 1954 and by September 1955 it was apparent there was no difference in the number of lambs born, the birth weight and survival to marking, or daily gain of the lambs as between groups. Similarly, there was no difference in liveweight between the three groups. A large difference occurred between the weight of the ewes that lambed and the weight of those that did not. This might be expected, but the range of the difference was rather surprising. The ewes that did not lamb gained about 7.8 lb. Those that lambed, but lost their lambs, gained about 3½ lb., and those that lambed and reared their lambs lost nearly 7 lb. Differences occurred in fleece weight, depending on lambing and the group to which the ewes belonged. The untreated controls that did not lamb cut 8.76 lb. Those that lambed but lost their lambs cut 8.56 lb., and those that lambed and reared their lambs cut 7.88 lb. of greasy wool. When subdivided into similar groups the ewes that were treated with copper sulphate drenches cut 9.25 lb., 8.8 lb. and 8.59 lb. of greasy wool.

The wool was all typed on the A.W.R.C. standards and the prices for the December 1955 sales for each type were used in calculating the earning capacity of each group.

Substantial differences existed between the groups of ewes subjected to the stress of lambing. Those from the untreated controls that lambed and reared their lambs earned 560d., those from the group given copper injections 574d., and those from the group drenched with copper sulphate 601d. These differences became even greater when the data were examined on the basis of the new and original groups of the sheep. The ewes that were in the untreated control group for two years and that did not lamb earned 626d. Group mates that lambed and reared their lambs earned 555d. Those whose liver coppers had been kept at a high level throughout the two years of the trial by drenching with copper salts and that did not lamb earned 711d. Those that lambed and reared their lambs earned 622d.

These observations are being continued and the body weights and productivity of the lambs born to the ewes in the different groups will be examined.

Effect of Thyroxine on Wool Growth.

It has been shown in New Zealand that sheep given thyroxine implants at the time of the autumn equinox produce more wool than untreated controls. The animals were fed a standard ration and were kept under pen conditions.

A field trial was commenced on the Toorak Field Station, Julia Creek, in April, 1956, to test the effects of thyroxine administration upon Merino sheep grazing the open Mitchell grass downs country of north-western Queensland. Two tablets of L-thyroxine, each of 30 mgm., were administered to each sheep in the treated group.

One hundred 1954 drop Peppin strain Merino wethers are being used in this trial. A small mid-side wool sample was clipped from each of 30 sheep of comparable liveweight. The wool samples were scoured and fibre diameters were measured. Subsequent clippings will be made in early July and again in October, when the sheep will also be weighed. At shearing time in July the weights will be recorded and those from the two groups will be compared. The wool production per unit area for the treated and untreated sheep will also be compared and body weights examined every three months.

Protection Against Breech Strike.

Practically 30 years have elapsed since jetting was first used in Queensland to prevent blowfly strike in sheep. Until the commencement of the present decade, arsenic was the only larvicide used for this purpose. More recently the chlorinated hydrocarbons have been used extensively and the results of field observations on the protection afforded by aldrin, BHC, dieldrin and endrin were reported last year.

Besides being the oldest, arsenical preparations are the cheapest jetting fluids. It was considered, therefore, that the protection afforded by aldrin, dieldrin, diazinon and arsenic should be compared. The results of two trials designed to do this, and conducted on the Toorak Field Station, Julia Creek, in the spring and early summer of 1955 and the autumn of 1956, are now available.

Observations were commenced on August 23, 1955, when 250 ewe weaners were drafted at random into 5 groups. The sheep were Peppin strain Merinos born in April-May of 1955. They had not been shorn or crutched, nor had they been treated with the Mules operation. The sheep were identified by numbered ear tags and the groups were treated as follows:

Group 1—½ gall. 0.04 per cent. diazinon.
Group 2—½ gall. 0.05 per cent. aldrin.
Group 3—½ gall. 0.05 per cent. dieldrin.
Group 4—½ gall. 0.8 per cent. sodium arsenite.
Group 5—Untreated controls.

The fluid was applied at a pressure of 60 lb. per sq. in. through a 3-jet nozzle, each having a diameter of 1/16 in. The sheep were jetted from head to tail, down the back line for about 4 in. on each side of the spinal column, and in over the breech. It took about 14 seconds to treat each sheep. The sheep were examined each week during the ensuing 13 weeks, and the incidence of blowfly eggs and larvae was recorded.

Observations to compare the protection against breech strike afforded by dieldrin, applied as a tip spray and as a jet, and diazinon and arsenic, applied as a jet, were commenced on Feb. 16, 1956. A flock of 236 unshorn, uncrutched ewe weaners were divided into 5 groups and given the following treatments:

Group 1—Jetted with ½ gall. 0.04 per cent. diazinon.

Group 2—Jetted with ½ gall. 0.05 per cent. dieldrin.

Group 3—Tip sprayed with 20 oz. 0.05 per cent. dieldrin.

Group 4—Jetted with ½ gall. 0.8 per cent. sodium arsenite.

Group 5—Untreated control.

The machinery and methods for jetting were the same as those used in the previous treatments. The jetting plant was also used for the tip spraying; a U-shaped boom carrying 7 fish-tail nozzles was substituted for the multi-jet handpiece. This delivered a fine spray that wet the tip of the wool over the withers, back and breech. Approximately 20 oz. of fluid was applied to each animal. No fluid was re-used. Every animal in the trial was examined each week until April 1956. The incidence of blowfly eggs and larvae was recorded.

The results obtained in both trials demonstrate the superiority of dieldrin and diazinon, when jetted on to the breech wool, to protect against blowfly strike and against re-strike. At the strength used aldrin did not compare favourably. Similarly, tip spraying with dieldrin did not protect susceptible sheep. It is possible that higher concentrations of dieldrin, applied as a tip spray, would give better results, but this may not be as cheap as applying a larger volume of low concentration fluid. Similarly, applying a larger volume of aldrin at a concentration of 0.05 per cent. to the breech wool may have resulted in longer protection.

Better results would probably be obtained from the use of arsenic and of 0.05 per cent. aldrin if the sheep had previously been treated by the Mules operation. However, the protection that the chlorinated hydrocarbons and diazinon afford against re-strike, and the impunity with which they can be applied to struck sheep, are strong points in their favour.

In conjunction with the Shell Chemical Company of Australia, who kindly arranged some analyses, field observations were made on the rate at which the active ingredients strip from aldrin and dieldrin dips. Stripping rates vary, depending upon whether the active ingredient is present in emulsion, in colloidal form, or dispersed. About 50 per cent. of the active ingredient strips from an emulsion when about 25 per cent. of the total fluid in the bath is used. By the same time about 35 per cent. of the active ingredient has gone from colloidal preparations and 25 per cent. from dispersible powders.

CATTLE HUSBANDRY BRANCH.

Mr. D. N. Sutherland, Director of Cattle Husbandry.

Throughout the dairy and beef cattle districts, seasonal conditions were generally favourable, although adverse effects from flooding occurred in some areas early in 1956. Conditions for pasture growth throughout 1955 were relatively good, with well distributed rainfall and mild winter conditions. The position has been much the same to date in 1956, but excessive rainfall in most areas has seriously hampered agricultural practices such as pasture improvement, crop planting and fodder conservation.

Livestock numbers in both the beef and dairy cattle industries have been maintained at high levels. This is due not only to a succession of favourable seasons but also to the considerable investment which has taken place in property improvements over the past 10 years. Improvements in watering facilities, fencing, yards, parasite control, and increasing establishment of improved pastures and crops, have enabled owners to make fuller and more efficient use of their land. These have had their effect not only on stock numbers, but also on overall production, particularly in the beef industry. In each of the past three years production of beef in Queensland has been approximately 40 per cent. greater than the average production during the immediate pre-war years.

During 1955, prices for beef exported to the United Kingdom declined sharply from the high levels which ruled during 1954, and in the current year prices have stood at a somewhat lower level. This price change has had a greater effect in Central and North Queensland, where the only outlet for the great bulk of the beef produced is the export market. In these areas prices fell to as low as 80s. per 100 lb. dressed weight for first grade ox beef in April, 1956. The position has been improved somewhat by the payment of a bounty of 14s. per 100 lb. bringing prices more in line with guaranteed minimum prices under the Fifteen-Year Meat Agreement.

In South Queensland the decline in prices has not been so marked. The requirements of the local and New South Wales markets have tended to keep prices more stable. The movements in prices for beef at Cannon Hill saleyards are shown in Fig. 1. Even in this area, however, there has been an appreciable decline in prices since 1954.

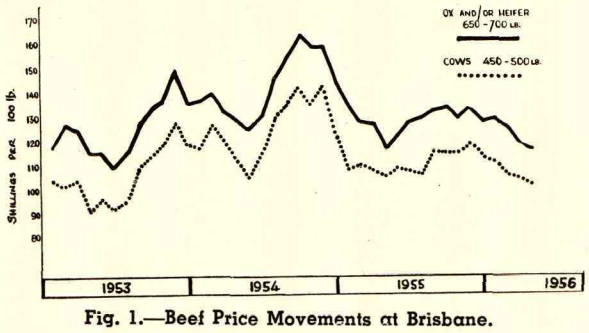


Fig. 1.—Beef Price Movements at Brisbane.

Although minimum prices are guaranteed by the United Kingdom for all of Australia's exportable beef for the next 11 years, it is clear that if Australia is to meet the demands of the United Kingdom market, a change in the type of beef carcase produced and its method of handling is required. With increasing supplies of home-killed beef and chilled beef from Argentina and New Zealand, United Kingdom customers have shown very little demand for frozen beef. For the past 16 years, practically all the beef exported from Australia has been frozen.

Over the past 12 months there has been an increase in the amount of beef which has been exported in chilled form, but as yet it has only amounted to a very small proportion of total exports. However, it is expected that a much greater proportion will be shipped in this form in future years. This will require the production of younger, light-weight cattle in much greater numbers. The increasing demand for cattle of this type will undoubtedly cause marked changes in systems of management in many of the State's beef-raising areas. Some growers who have in the past produced cattle suitable for slaughter and export as frozen beef will probably find it more profitable to concentrate on breeding store cattle for sale as yearlings or even as weaners. It appears that efforts must be made in all breeding areas to turn stores off at an earlier age. In the fattening areas, the use of either improved pasture or fodder crops to fatten younger cattle throughout the year has shown a great increase in recent years and will undoubtedly increase even further.

In the Queensland dairy industry the level of production on the basis of either production per acre or production per cow is low in comparison with that of other States and other major dairying countries. This is due largely to the seasonal nature of the rainfall in most dairying areas and the dominance of pastures by rapidly growing summer species which are of very low nutritive value in winter and early spring. Some dairy farmers have shown by their own efforts that seasonal feed shortages can be overcome by improved agricultural and husbandry practices, and the Department has, in recent years, established demonstrations of improved methods of dairying both on private properties and at the Regional Experiment Stations. An increasing number of farmers are adopting such improved methods and it is confidently expected that this will result in better levels of production throughout the State in future years.

STAFF.

During the year the overall staff position in the Branch improved, with a slight increase in numbers of both graduate officers and agricultural college diplomates. Mr. D. N. Sutherland was appointed Director of the Branch, and a re-allocation of duties was made within the Branch, with Messrs. J. G. Young and G. I. Alexander assuming duties as Senior Husbandry Officers supervising the work of the Branch in relation to the dairy and beef industries respectively.

The position of Husbandry Officer at Rockhampton became vacant during the year, but it is hoped to fill it in the near future. Senior Advisers were appointed during the year to Rockhampton and Emerald, and Assistant Advisers were appointed to the Biloela Regional Experiment Station and to Gympie.

A number of officers of the Branch have now undergone special training at Departmental schools conducted to train officers in extension methods. Training in this sphere of activities is considered important, as one of the major functions of the Branch is encouragement of improved practices within the dairy and beef cattle industries.

During the year a school of one week's duration was arranged at the request of The Australian Estates Co. Ltd., at the Company's beef cattle property, "Canobie," in the Julia Creek district. The school was attended by the managers and other members of the staff of a number of the Company's properies in north-western Queensland and talks were given by officers of the Agriculture Branch, Veterinary Services Branch and Cattle Husbandry Branch of the Department, and by Professor W. V. MacFarlane of the University of Queensland and Dr. N. T. M. Yeates of C.S.I.R.O.

Subjects discussed at the school were the effects of the climate of north-western Queensland on pastures and animals, the establishment and management of pastures in the region, factors affecting adaptability of cattle to tropical environments, the control of major diseases affecting cattle in north-western Queensland, and husbandry methods generally. In addition to the formal talks given by the lecturers, a frank discussion of various problems of the industry was held and much benefit was obtained by both the Departmental officers and the staff of the Company attending the school.

BEEF CATTLE INVESTIGATIONS.

Growth Rate Trials.

The activities of the Branch in the beef cattle field have been expanded considerably during the last 12 months. Fixed weighbridges are now installed on 11 privately owned properties throughout the State, three portable weighbridges have been purchased, and an order placed for a fourth portable weighbridge. The portable weighbridges will considerably increase the scope and extension value of the weighing projects undertaken by the field officers to whom they are allotted.

Growth rate trials have been and are being carried out on 12 properties. Basically, these trials are to measure the rate of fattening of beef cattle as affected by the seasonal productivity of pastures. These trials will need to proceed for a number of years before a complete picture of the variability of growth of cattle grazing on native pastures emerges.

As mentioned in previous Annual Reports, cattle on native pastures at all centres have been found to suffer a serious loss of weight for a varying period during winter and spring of each year. The following methods of overcoming these seasonal weight losses are being studied.

Provision of Improved Pastures or Grazing Crops.—The performance of cattle on improved pastures is being studied at the Bureau of Tropical Agriculture, South Johnstone; at the Regional Experiment Station, Ayr; at the Pasture Research Station, "Brian Pastures," near Gayndah; and at "Texas Station," Texas. At South Johnstone, guinea grass and para grass, each in association with a number of tropical legumes, are being used. At Ayr, similar species mixtures are studied under irrigated conditions. At "Brian Pastures," buffel, Rhodes, and green panic grasses, each in association with lucerne, are under study. Pastures of winter-growing grass and clover species are used at "Texas Station."

At "Eulogie Park," Dululu, and "Yandarlo," Miles, the value for fattening of winter grazing crops such as oats is being studied. It had been previously established that satisfactory weight gains throughout the year can be obtained by the use of either winter grazing crops or the various pasture mixtures under investigation. Further work is developing to investigate the economics of these practices and to ascertain the optimum age at which to turn cattle on to grazing crops or improved pasture.

Use of Exotic Breeds of Cattle.—This has been the subject of much discussion in the industry. In order to assist in studying these breeds and their crosses and to determine whether they will be of benefit to the industry as a whole or to any locality in particular, a number of trials have been commenced.

One such trial is proceeding at "Wairuna," near Mount Garnet, to compare the growth rate of Zebu-type crossbreds and British-type crossbreds. At "Belbroughton," Kunwarara, 50 miles north of Rockhampton, halfbred Zebu-Hereford bulls have been used in a good quality Hereford herd alongside Hereford bulls. The resulting quarter-bred Zebu-Hereford and Hereford male progeny are being weighed regularly to compare growth rates. One draft from each of the above trials has been turned off during the current year. At Eidsvold, the growth rates of crossbred Santa Gertrudis-Hereford steers are being compared with those of a comparable group of Hereford steers, whilst at "Risdon," near Warwick, Shorthorn, Santa Gertrudis and crossbred Shorthorn-Santa Gertrudis heifers are used for comparison.

In each of these trials (Fig. 2), the overall rate of gain of the Zebu-type crossbred cattle has been greater than that of the British-type cattle. However, the following interesting features of the relative growth rate of the two different classes of cattle have emerged—

(*a*) The Zebu-type crossbred cattle have shown a greater rate of gain during the first two years of life, but thereafter both types have gained at approximately the same rate.

(*b*) The British type of cattle have generally gained at very nearly the same rate as the Zebu-type crossbreds during the period of the summer when feed is of good quality. This suggests that the difference in performance of the two breeds is not due solely to greater heat tolerance of Zebu-type crossbreds. Some of the results of the comparisons between Zebu-type crossbred cattle and British-type animals are represented in Fig. 2.

Bush Hay.—One feature of the beef cattle industry in Queensland is the low weaning weights of calves compared with those in other parts of Australia and overseas.

In order to determine whether the feeding of bush hay with or without various supplements can prevent this unsatisfactory position, trials are in progress at "Albinia Downs," near Rolleston. Bush hay containing 5 per cent. crude protein has been used for two years as a supplementary feed in winter and spring for cows and calves. In the first year, a molasses-protein lick was used as an additional supplement for one group. In the second year, which is the one under review, hay alone, hay plus urea and molasses, and hay plus cottonseed meal were fed as supplements to the cows and calves. These two winter and spring periods have been such that better-than-average performance has been possible under range conditions, although some weight losses were experienced over short periods.

Refusal to consume appreciable quantities of the hay supplements under these field conditions has been a problem. It was apparent, however, that the hay that was treated with urea and molasses was rather more palatable than the untreated hay, and consumption was somewhat greater as a result.

In the coming winter, it is proposed to feed:—

(*a*) hay milled in a roughage mill and incorporated with meal;

(*b*) meal alone; and

(*c*) hay to which urea and molasses have been added through the roughage mill.

Mineral Deficiencies.

Phosphate Deficiency.—Phosphate deficiency in varying degree of severity affects beef cattle over much of the State. Efforts of the Branch have been directed towards finding a satisfactory and economic method of supplying phosphates to the stock and towards evaluating the response achieved by this supplementation.

Two types of devices for incorporating phosphate supplements in the drinking water of cattle at required concentrations have been designed by officers of the Department. One device, which works directly off the windmill, has now been under test for several years and has given generally satisfactory results, although some difficulty has been experienced through deposition of sediment on its moving parts. Modifications designed to counter this difficulty have now been incorporated in devices being tested in the field.

The second type of device operates directly off the float valve of the drinking trough and feeds the phosphate supplement directly into the trough. One device of this type has already been installed in the field and orders have been placed for the supply of a number of others.

Trials involving the use of the various methods of phosphate supplementation are in progress on properties in the Townsville, Charters Towers, Clermont, Rockhampton, and Landsborough districts. Fixed weighbridges have been installed on several properties, and on others a portable weighbridge is being used to compare growth rates of supplemented and unsupplemented cattle.

Copper Deficiency.—Investigations into the copper deficiency problem that occurs on the marine plains of Central Coastal Queensland have proceeded. Initial work pointed to the good and encouraging results to be obtained from copper therapy by intramuscular injection. Treatment at intervals of 3-4 months gave spectacular results, with a marked improvement in condition and rate of turn-off.

It has been noted on occasions that some cattle that received eight treatments during their lifetime have shown a fibrous reaction in the muscle at the site of injection. Alternative methods of treatment, such as oral drenching, are not nearly as efficient as injection and are more laborious. The possibility of using larger volumes of weaker solutions of copper sulphate at each injection to overcome the muscle reaction is being investigated.

As reported previously, in other areas of Queensland where copper deficiency in cattle has been diagnosed on biochemical analysis, the response to copper therapy has not been as spectacular as was expected. Satisfactory levels of copper in blood and liver have been achieved, but differences in liveweight gains between

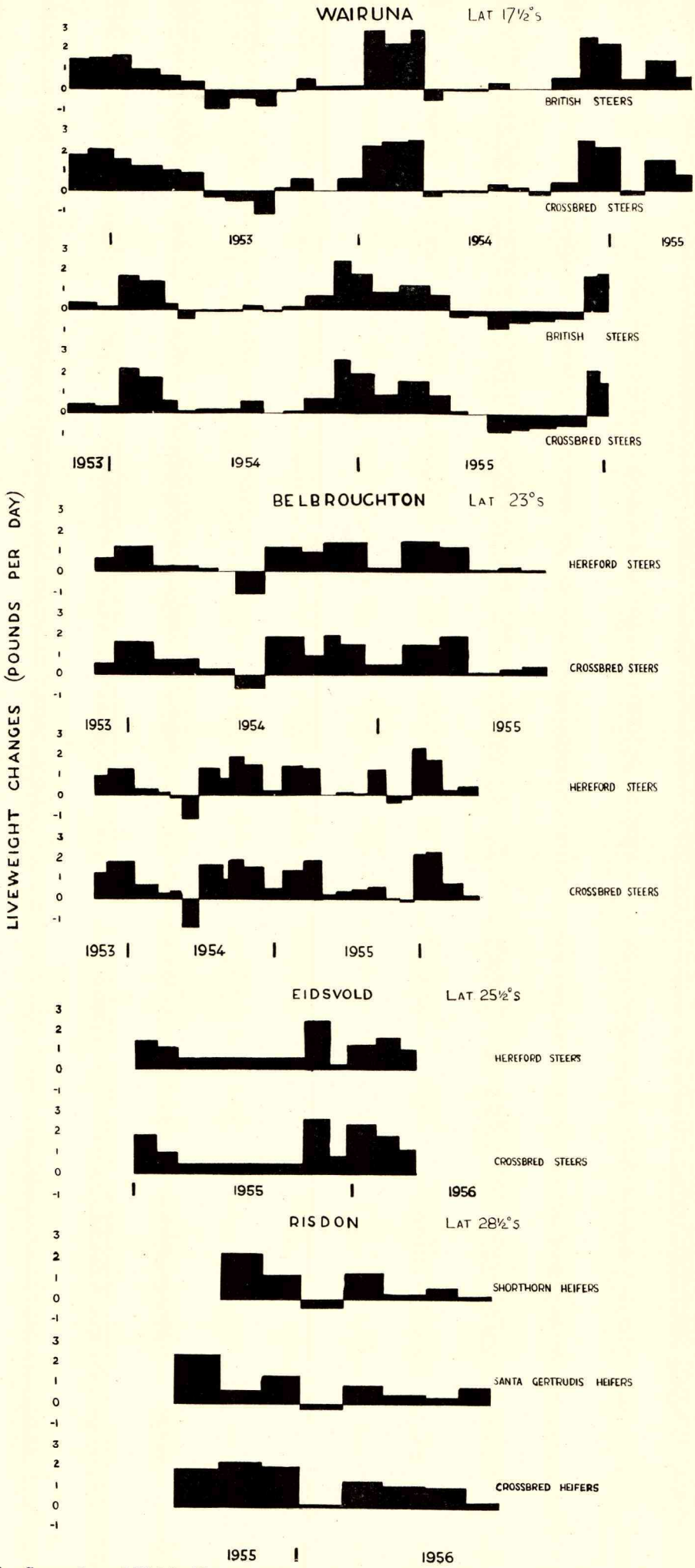


Fig. 2.—Comparison of Weight Changes of British Breeds and Zebu Crossbreeds at Various Stations.

treated and control animals have not been marked. The possibility that other trace elements might be involved in these areas has been investigated, but no significant response to treatment with trace elements has been obtained to date. On some of the properties involved, the problem is complicated by a low plane of nutrition for long periods each year, and investigations of this aspect of the problem are now being carried out in co-operation with the Agriculture Branch and the Biochemical Branch.

Carcase Appraisal.

Carcase appraisal data have been obtained on most of the cattle involved in the various growth rate trials when they have been slaughtered. Carcases have been appraised mainly on the system evolved by Dr. N. T. M. Yeates, but some data have also been collected on the system evolved in New Zealand by Dr. McMeekan and his co-workers. The former system is a method of obtaining comprehensive data on carcase composition of all types of carcase, but it does not provide a rapid method of comparing the merits of carcases on a score card. Under the New Zealand system, points are allotted to each carcase for various desirable features and they can be evaluated in order of merit. However, it is designed essentially for use on carcases of cattle fattened at a relatively early age and is not generally applicable to many of the cattle treated at Queensland meatworks. The results of the data obtained on this system to date indicate that cattle raised under normal systems of management in Queensland, even in favourable seasons, do not score well on this method of appraisal.

Pasture Research Station.

At "Brian Pastures," work has been continued on the system of herd classification and on the growth rate observations on the whole herd. For two breeding seasons, all calves have been identified and weighed at birth. This will be of particular value in production performance recording of the cattle on the property and in culling the herd. In addition to the regular monthly weighing of all cattle on the property, a system of herd classification which has been developed on a number of studs with Branch co-operation has also been put into practice on this property. Classifications are carried out twice yearly. The breeding cows are graded in November each year and the progeny in May each year at approximately six months and 18 months old.

By the use of these grades and the growth rate information an accurate assessment can be made of the value of individual cows, and where the bulls are mated in single bull paddocks, these animals also. A system of progeny testing will be developed, based on these quantitative measures of performance and production.

The regular monthly weights, although an adjunct to this selection programme, are designed primarily to measure the fluctuating gains and losses in cattle liveweights on native pastures throughout any one season as well as over a variety of seasons. The data will form a useful basis for evaluation of pasture management methods and the usefulness of new pasture mixtures.

Routine observations on the dentition of a number of steers and heifers have been undertaken as part of the beef cattle work on the property. All calves born in 1954-55 were examined at birth. Two groups of 20 steers and 20 heifers were selected and are being examined regularly to observe the eruption times of their permanent incisor and temporary teeth.

Since climatological information does not clearly indicate the property as being in an area subject to heat stress, a series of observations of the cattle on the property is being made to determine the correlation existing between the adaptive mechanism of the individual animal and its growth rate. This exploratory study will be largely based on the results of recent C.S.I.R.O. experimental work and will be aimed at comparing the rates of hair shedding of various cattle. These data, along with other criteria, will be compared with growth rate.

A small trial has been commenced to study the practicability of early weaning of calves and is aimed at determining whether early removal of the calf enables the cow to withstand the winter nutritional stress and so calve in better condition during the next season, and whether the early weaning (5-7 months) of the calf stunts it and has a lasting detrimental effect.

DAIRY CATTLE INVESTIGATIONS.

Solution of the problem of the relatively low production of the State's dairy herds depends largely on the provision of a better plane of nutrition throughout the year. In the different areas of the State this may be done by pasture improvement, better pasture management, provision of grazing crops or fodder conservation. In co-operation with the Agriculture Branch, the Division of Dairying and the Regional Experiment Stations Branch, investigations into all these methods are being carried out, and a number of demonstrations of each have been set up on privately owned properties and at Regional Experiment Stations.

The demonstrations on private properties are distributed throughout all the major dairying districts of the State and at the present time 124 such demonstrations are under way. Of these, 86 involve the use of rain-grown improved pasture, 23 the use of irrigated pasture, 6 the use of forage crops and 6 the use of conserved fodder.

Trials on the use of purchased concentrates for increasing production are also being carried out on the Atherton Tableland. Some years ago, a number of trials involving the use of concentrates for supplementary feeding were established throughout the State. It was found that little benefit in the way of increased production was obtained when the supply of roughage available was of poor quality. In the case of the present trial, farms have been selected on which the supply of roughage from the pasture is of relatively high quality for the greater part of the year. It is anticipated that in these trials in a better response to concentrate feeding will be obtained.

Work on Regional Experiment Stations.

Biloela.—On the completion of dairy premises, fencing and waterside points and other facilities necessary for the management of a dairy herd, a group of 20 Australian Illawarra Shorthorn heifers was purchased from the Burnett and Callide areas and assembled on the Station at the commencement of the year. A young A.I.S. bull, "Cedar Valley President" was also acquired. The herd came into production during the late spring and early summer period and matings to the bull were made in the late summer and early autumn period. Matings were made by artificial methods during the season and this procedure will be followed at each subsequent mating.

It has been demonstrated in the Nambour work that frequent practice in insemination procedures is essential if a high degree of proficiency is to be attained by those engaged as inseminators. The regular use of artificial breeding procedures at Regional Experiment Stations thus provides an opportunity for a nucleus of Divisional officers at each centre to obtain such training.

The average production level of the cows during the first 100 days of their lactation has been approximately 90 lb. of butterfat.

The productivity of the pastures, both rain-grown and irrigated, that have been established recently on the Station is such that more rapid herd expansion is needed than would be possible by natural increase. Attempts are at present being made to acquire by purchase a further group of 20 pregnant A.I.S. heifers. It is proposed to maintain ultimately two milking herds on the property, one to be run on irrigated pasture and the other on rain-grown pasture.

Kairi.—The outbreak of vibriosis in the Jersey herd of this Station is being brought under control by means of sexual rest in the post-calving period, the use of artificial breeding procedures and therapeutic methods.

The herd was considered to be free of other conditions that affect fertility, such as brucellosis, trichomoniasis and mineral deficiencies. In association with officers of the Veterinary Services Branch and the Animal Research Institute, as much information as possible on the course of the disease and its effects on breeding efficiency was obtained during the control and treatment period.

With the expansion of the liquid milk trade of the Tableland, there is growing a marked preference for the heavier breeds of dairy cattle rather than the lighter-weight Jerseys. The Australian Illawarra Shorthorn and the Friesian, the latter being especially popular in the Millaa Millaa area, are the main breeds involved.

With this breed movement in evidence, together with the inevitable change to a mixed husbandry enterprise in

the lands formerly used virtually exclusively for maize production, it is planned to establish two herds on the Station. The Jersey herd will be maintained as a separate entity on a portion of the farm comprising nearly 100 acres, where a well-proven maize and pasture rotation has been developed. Good agronomic and husbandry methods that are especially applicable to the maize-growing region will be demonstrated on this section. The A.I.S. herd will be confined to the remaining portion of the Station and to the newly acquired lands adjoining the Station. This herd will be available for other husbandry and agronomy experimental purposes. Negotiations are at present proceeding for the purchase of a nucleus of A.I.S. heifers from Tableland breeders.

Bull Proving Project.

During the year, a bull proving project was established in the Nambour district, with the object of identifying bulls capable of siring high-producing daughters. The project involves the use of artificial insemination to produce in a cross-section of recorded herds a large number of daughters of each bull tested.

Approximately 60 herds in the Nambour-Maleny-Kenilworth area are co-operating in this project. This area was selected because it had a high density of recording herds and there was a predominant breed—the Jersey. The bulls under test were selected from the stud herds which have been proved on an analysis of the Jersey breed to have the greatest influence on the State's Jersey herds.

Four young bulls are used each year and it is the objective to inseminate at least 250 cows with semen from each bull and spread the inseminations by each bull as evenly as possible in each herd. In order to reduce fluctuations in production between daughters due to nutritional factors, as far as practicable, the inseminations are all restricted to one quarter of the year.

The project is essentially a long-term one. Records of production of the first completed lactation of daughters resulting from the first inseminations in 1955 will not be available until the 1959-60 season. However, apart from its value as a means of identifying herd-improving sires, the project is of great value in providing experience in techniques of artificial insemination both from the scientific aspects and from the administrative side. In addition, contact between co-operators and Departmental officers is having a definite effect on animal husbandry practices in the region, there being already clear evidence of improvement.

Inseminations under the scheme were commenced on Sept. 26, 1955, and continued until Jan. 13, 1956. The total number of first inseminations carried out was 1,275, with a non-return rate of 62 per cent. This figure is based on the percentage of cows which had not returned to service for at least 60 days after insemination.

In Table 1 data on the influence on non-return rate of month of operation, age of semen, and interval between calving and first insemination are presented.

Infertility Survey.

The survey into the problem of infertility in dairy herds has progressed during the year and additional staff has been provided to tabulate the information obtained from the herd breeding charts completed by individual dairy farmers.

One of the features which has been disclosed by some of the charts completed has been the serious problem presented by long periods of anoestrus (absence of heat

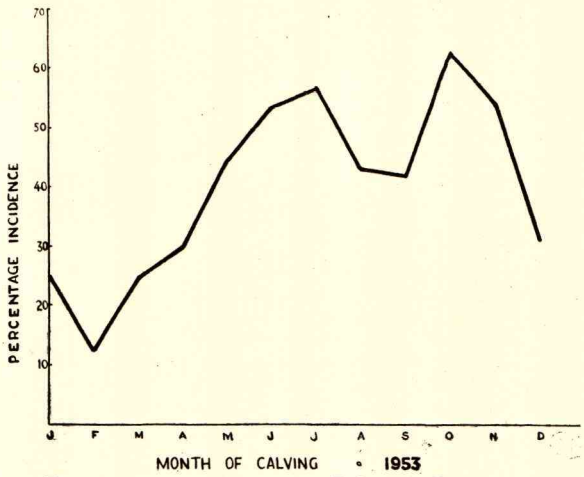


Fig. 3.—Graph Illustrating Delayed Oestrus in Dairy Herds. The graph shows the percentage incidence of periods of over 100 days between calving and oestrus.

periods) which occur at certain times in a number of herds in coastal areas of South Queensland. The accompanying graph (Fig. 3), shows the incidence of anoestrus in nine affected herds for cows calving in each month of the year during 1953. In that year, 43 per cent. of the cows in these herds failed to show oestrus for over 100 days after calving and 14.5 per cent. for over 300 days. The condition shows a marked seasonal trend and is apparently associated with nutritional status. The high incidence of anoestrus seriously impedes efforts to achieve annual calving in a dairy herd.

TABLE 1.

INFLUENCE ON NON-RETURN RATE OF MONTH OF OPERATION, AGE OF SEMEN, AND INTERVAL BETWEEN CALVING AND FIRST INSEMINATION.

Month of Operation.	Non-Return Rate. (Per cent.)
1st	59
2nd	63
3rd	64

Age of Semen. (Days).	First Inseminations.	Non-Return Rate. (Per cent.)
1	549	64
2	548	60
3	178	60

Interval Between Calving and First Insemination. (Days).	Number of Cows.	Non-Return Rate. (Per cent.)
11 – 45	120	54
46 – 55	113	65
56 – 65	97	64
66 – 75	117	61
76 – 90	123	60
91 –105	101	63
106 –150	109	71

BIOCHEMICAL BRANCH.

Dr. J. M. Harvey, Biochemist.

A Biochemical Branch was established within the Division of Animal Industry in January, 1956, the nucleus of staff coming from the biochemical and toxicological sections of the Chemical Laboratory, Division of Plant Industry. The emphasis is thus on animal biochemistry but there must be a broad overlap into the sphere of plant biochemistry.

The livestock industry in Queensland is largely dependent on the quality and quantity of pasture. With development of more intensive systems of production, pasture improvement and fodder conservation are of prime importance. Protection against drought also rests to some extent in fodder conservation. A knowledge of the chemical composition of the feed is essential. Metabolism trials are necessary to determine the availability of the nutrients to animals. Long-term feeding trials are required to assess maintenance and production values of conserved fodder.

Nutritional disorders in animals can often be elucidated by analyses of blood, liver, urine and faeces. While the correction of such disorders may then be possible by direct treatment of the animal, a more lasting and more economic remedy may often be effected by soil treatment to improve the quality of pasture. Thus the overlap into plant biochemistry is inescapable.

In this report it will be apparent that there has been a close liaison between this Branch and animal and crop husbandry Branches. Joint investigations are outlined, more detail being given in reports by other Branches.

The Biochemical Branch consists of two sections, biochemistry and toxicology. Both sections assist in the diagnosis of disorders in livestock due to deficiency or excess of elements in the diet. The Toxicology Section also examines specimens, both plant and animal, where extraneous poisons are suspected. The analyses of arsenical and chlorinated hydrocarbon dipping fluids are now made by this section. Both sections are engaged on investigational projects.

TOXICOLOGY SECTION.

Diagnostic Service.

As in previous years arsenic was responsible for most of the positive findings. Forty cases of arsenical poisoning in livestock were confirmed. Five cases of lead poisoning were established by chemical analysis. In some cases follow-up specimens were submitted to identify the source of poison.

In four confirmed cases of arsenical poisoning it was shown that careless disposal of arsenical weedicides or dipping fluids was responsible. In one case of lead poisoning the source was paint containing lead.

Evidence of cyanide and nitrate poisoning was supported by analysis of plant specimens submitted.

Toxic levels of selenium were demonstrated in plant specimens from two localities in Cape York Peninsula. Samples of liver, hoof and hair from horses affected with "change hoof" disease showed levels of selenium consistent with those recorded in cases of "alkali disease" in U.S.A. This is the first demonstration of naturally occurring cases of selenosis outside the North American continent.

Investigations.

Studies have continued in collaboration with the Veterinary Research Branch on the toxicity of lead in fowls and the findings are being assembled for publication. It has been demonstrated that poultry are particularly tolerant of lead except when feed intake is restricted, as in a disorder such as respiratory infection. In the case of birds the amount of lead in the liver is a function of time since exposure to lead, and as such is of doubtful diagnostic value. Preliminary studies with pigs indicate a high degree of tolerance of lead.

The section has formulated a preliminary investigation into sources and extent of selenium toxicity. It has also collaborated with the Veterinary Research Branch in a feeding trial at the Animal Health Station, Oonoonba.

With the recent appointment to the toxicological section of on honours graduate in organic chemistry, studies are being initiated on the chemistry of the toxic principles of certain poison plants.

BIOCHEMISTRY SECTION.

Diagnostic Service.

Blood samples were submitted from 221 herds where a deficiency of phosphate was suspected. The field diagnosis was confirmed on 98 properties while a further 62 showed a marginal phosphate status.

Blood for copper analysis was received from 185 herds. The field diagnosis of copper deficiency was confirmed on 42 properties and a further 71 showed marginal levels. Liver samples were submitted from 52 herds, of which 24 were found to be copper deficient.

Liver vitamin A levels confirmed the field and pathological diagnosis of vitamin A deficiency in fowls from 15 properties. A marginal vitamin A status was indicated on a further nine poultry farms. Both blood and liver were examined from a number of pig farms where vitamin A deficiency was suspected. This was confirmed on one farm and a further five showed a marginal vitamin A status.

Hypocalcaemia in cattle affected with milk fever was established in 15 areas. Hypomagnesaemia was confirmed in four cases. Hypermagnesaemia was also confirmed on five occasions.

A wide variety of some 500 miscellaneous samples were examined. These included pasture, silage and stock feeds to determine feeding value. Other determinations in relation to certain specific disorders in livestock were cobalt, manganese, molybdenum, inorganic sulphate, flourine, carotene, riboflavin, thiamin, ascorbic acid, serum albumin and globulin.

Investigations.

Phosphate.—The Branch is associated with a number of field trials by husbandry Branches to examine methods of phosphate supplementation for grazing animals under Queensland conditions. Topdressing, mineral licks and supplementation of drinking water are being used. Production responses are being assessed.

Copper.—A long-term copper supplementation trial with sheep in north-western Queensland has been continued in association with the Sheep and Wool Branch. In this locality copper deficiency in sheep is due partly to the low copper status and partly to the presence of molybdenum and inorganic sulhphate in the predominant vegetation. In these studies copper therapy has been by oral and parenteral administration. Supplementation is necessary at intervals of three months. There is no response in lambing performance by copper-supplemented ewes and the growth rate of lambs and weaners is not improved. There is, however, a marked response in wool quality and quantity.

In association with Cattle Husbandry and Agriculture Branches a long-term copper supplementation trial with beef cattle on the Near North Coast has continued. In this locality topdressing at the rate of 14 lb. copper sulphate per acre at intervals of six months is necessary to maintain an adequate copper status in grazing cattle. Production response, in terms of increased bodyweight in cattle grazing topdressed pastures, has not been satisfactory. The pasture is predominantly narrow-leaf carpet grass, and present studies are designed to examine economic measures of soil treatment to encourage the growth of other pasture species, particularly clovers.

A number of copper metabolism studies in both sheep and cattle are in progress in association with the Research Branch at the Rocklea Husbandry Farm. Although the copper status in this predominantly paspalum and clover pasture appears satisfactory, grazing cattle show biochemical evidence of copper deficiency. Dry sheep show adequate liver copper reserves but lambing ewes show a marked fall in liver copper reserves. The interference of molybdenum and inorganic sulphate with copper metabolism is being examined in both sheep and cattle. The effect of phosphate and phosphate plus cobalt, superimposed on copper therapy, is being investigated, using identical twin cattle.

Some further copper chelate compounds have been tested for parenteral copper therapy by subcutaneous or intramuscular injection. Toxicity is a limiting factor and so far none are markedly superior to copper amino-acetate previously reported.

Vitamin A.—The Branch is engaged in five trials involving vitamin A:

(*a*) A survey of the vitamin A status in 12 dairying districts using the vitamin A and carotene content of butterfat as the index.

(*b*) The correlation of carotene in pasture with the vitamin A and carotene content of butterfat in the grazing cow.

(*c*) A short-term trial to examine the effect of vitamin E on the availability to cattle of carotene in pasture.

(*d*) A survey of the incidence of vitamin A deficiency and the relation to diseases in fowls from some commercial flocks.

(*e*) A study on the effect of vitamin A in the diet of laying fowls in relation to hatchability.

The data from (*a*) and (*b*) are being assembled. The findings from (*c*) are inconclusive and this trial will be repeated. A report on (*d*) was submitted for publication in the *Queensland Journal of Agricultural Science*. Trial (*e*) is in progress.

Digestibility.—A number of digestibility trials on pasture, hay and silage have been completed. The use of the chromic oxide marker technique has been employed to assess feed intake and digestibility in a number of grazing trials with cattle. Faecal analyses have also been used to provide additional data on the mineral status as well as organic matter digestibility of the diet of grazing cattle.

PIG BRANCH.

Mr. F. Bostock, Officer in Charge.

Conditions differed considerably in the main pig producing areas during the past year.

In North Queensland, conditions in the spring and early summer months were average, but from the commencement of the wet season in January until the end of March rainfall was more than the annual average. Numerous local floodings occurred and a cyclone which passed over the area in March caused considerable general damage. Structural damage to piggeries was light, the greatest losses by pig producers occurring through deaths and injuries caused by the wind and rain. Many litters were farrowed prematurely and either did not survive the shock and cold or were drowned. No cold weather occurred to the end of May and as a result plant growth has been continuous.

In Central Queensland, except for comparatively small isolated areas, rain was above average, resulting in local floodings and consequent dislocation of transport. In many instances farmers were unable to harvest grain crops when ready and loss was experienced through shedding and damage by birds.

Conditions in the Burnett area were good during the first half of the year, but from January excessively wet conditions prevailed, with the result that grain stocks were low as farmers awaited favourable weather to commence harvesting.

On the northern Darling Downs frequent heavy rains since early in January contributed towards a bad season.

The southern Darling Downs has also had a wet summer and during January extensive floodings occurred, resulting in severe damage particularly in the Inglewood area. Fencing, stock and cultivation were lost on the majority of farms in this area. The prolonged wet weather handicapped the planting of cereal grazing crops and in many cases oats were not planted until May.

The Moreton area generally experienced favourable conditions throughout the year; short dry spells occurred during August and again in November. A very wet period between mid-December and April caused the heavier soils to become waterlogged and in many instances the planting of winter fodder crops was delayed.

FEED SUPPLIES.

Feed supplies were generally adequate in all districts and due to extensive damage by the cyclone a large portion of the year's maize crop in North Queensland was available as pig feed. In Central Queensland, due to the favourable weather conditions, wheat and grain sorghum were available at reasonable prices, while in the Warwick area barley and grain sorghum were as in previous years the chief grains used. In the Burnett, feed grains were in fair supply during the early portion of the year, but during the latter part stocks were rather low, farmers awaiting favourable weather to commence harvesting. Thus many will have to purchase grain to tide them over until harvesting is completed.

Protein meals have been available in sufficient quantity to meet the demands of the industry. In North Queensland, the Queerah meatworks commenced the manufacture of a 50 per cent. protein and bonemeal, and the North Queensland Co-operative Bacon Association installed a dry-rendering plant for a similar purpose. These plants should meet local requirements for some considerable time.

During the first half of the year dairy by-products were in good supply, but due to the outbreak of three-day sickness in dairy herds and seasonal decline, supplies were limited to some extent during the second half of the year.

Green feed and forage crops were available in varying supply and during the last half of the year became less palatable and deteriorated in feeding value due to excessively wet conditions.

PRODUCTION.

Pig production decreased, the total number of pigs forwarded for slaughter being in the vicinity of 414,000, compared with 442,692 in 1954-55.

Throughout the year the attention of producers was again drawn to the seriousness of marketing overfat pigs and it is disappointing that the trend is again towards the production of such pigs.

In the second half of 1954 an over-supply of overfat pigs on the local market caused a heavy fall in consumption; also the termination of the contract with the British Ministry of Food closed this avenue as a profitable outlet for pigmeats.

A move was made to restore trade on the local markets by the introduction of a grading system on a voluntary basis. This system effected a marked improvement in quality which resulted in increased consumption of pork and bacon products.

Unfortunately, towards the end of 1955 a marked change developed and the overfat pig is again causing concern. It is thought this change was brought about largely because of the higher retail price of bacon and ham on the Sydney market, making it very profitable for New South Wales operators to buy pigs in this State, and probably the improved quality of Queensland pigs was an added attraction. One effect of this interstate buying was that prices were forced up for pigs at auction sales and co-operative factories had to advance their prices to meet the competition. Higher prices were welcomed by producers, but where previously producers had been required under the grading system to market their pigs in prime condition, they found that at auction sales buyers were paying top prices for pigs in overfat condition. This naturally tended towards a breaking down of the grading system. While the supply of pigs is short and co-operative factories are forced to buy at auction in order to keep up supplies, it is unlikely any serious attempt will be made to grade pigs.

Under such marketing conditions producers are not forwarding their pigs in the condition which experience should have taught them is necessary if the industry is to remain profitable, and the increased consumption gained as a result of marketing pigs in accordance with the 1954 grading standards will be steadily lost.

The price of baconer pigs has remained very firm throughout the year, ranging from 2s. to 2s. 3d. per lb.; however, at auction sales up to 3s. per lb. has been recorded during the later months of the year.

In the Northern Pig Marketing Board's area prices were stable at 2s. to 2s. 1d. per lb., this price including ¾d. per lb. road freight to the factory. The Board is grading all carcases received and quality has remained at a high level, top grade being in excess of 85 per cent. of all pigs supplied.

In Central Queensland prices also remained firm; however, at certain periods the price offered on southern markets exceeded the local price, which resulted in a loss of pigs to the local factories by pigs being transported by rail and road either to Cannon Hill or to southern factories.

At Beaudesert, Toowoomba and Warwick, interstate buyers were very active throughout the year and large numbers of pigs were sent over the border.

STUD SALES.

Field officers of the Branch have reported the demand for breeding stock to be very firm; this has resulted in this class of pig being in short supply.

Country Show Societies and the Royal National Association have continued the policy that only stock from brucellosis-tested herds be accepted for exhibition. This provides an opportunity for farmers to purchase sound breeding stock and for breeders to compare their pigs without the risk of exposure to this disease.

Pig Branch officers are receiving an increased number of requests for their services in selecting breeding stock, not only at Shows but also on breeders' properties. This service is much appreciated.

Progress has been made in respect of the Pig Testing Station to be established on a site which has been selected at Rocklea. Plans have been completed by the Department of Public Works Architectural Branch and estimates are being prepared.

When in operation the Testing Station will do much to improve the standard of the State's breeding pigs. Factual information relating to commercially important factors such as weight for age at slaughter, food conversion efficiency and carcase quality will flow from the Station to breeders, thus enabling much of the guesswork to be taken out of breeding programmes.

CARCASE COMPETITIONS.

The ninth annual baconer carcase competitions sponsored by the Australian Meat Board, in association with the Department, were conducted as usual on a district basis. Judging was carried out at Mareeba, Rockhampton, Brisbane and Toowoomba.

The State championship was awarded to a pig sired by a Berkshire boar and out of a Berkshire-Large White cross sow and bred in the Burnett area. The carcase of 128 lb. dressed weight was awarded 87 points. It was nicely proportioned, scoring well in all points except leg length, which measurement was too long.

Field Days were arranged to coincide with the judging at all centres except Brisbane. However, arrangements were made for the winners in the South Queensland competition to be exhibited at the Toowoomba Field Day. There was a good attendance of farmers in all districts.

The number of entries was slightly below last year. The general quality of the entries was good, but it was noted in all districts that the hams and shoulders were not up to the usual standard. These points were emphasised at all field days. The Hammond system of carcase appraisal was again used for judging and conditions for entry were the same as in previous years.

Cured baconer carcase competitions were again popular with country shows and an increased number of societies, mainly in Central Queensland, included the competition in their schedules.

Now that grading is not being carried out in some areas and is considerably relaxed in others, it is felt that these competitions will become even more popular. They provide a very useful means of demonstrating to producers, who would not otherwise be able to see the quality of the article produced from their pigs, the types of carcase required by the trade and afford them an opportunity of comparing their carcases with those of other producers.

This type of competition also affords the progressive farmer the opportunity of learning at first hand the faults exhibited in the carcases, thus providing information which should enable him to improve his product.

WORK AT REGIONAL EXPERIMENT STATIONS.

The stud herd of Tamworth pigs at the Kairi Regional Experiment Station has been maintained. Three new concrete pens, designed for experimental work, were completed by the farm staff towards the end of May.

Activities in the Pig Section at the Biloela Regional Experiment Station commenced with the arrival in May last year of three Large White sows in pig and the purchase of an unrelated Large White boar. The first litters were disappointing as regards numbers, and males predominated, but five of the female progeny were retained for breeding and have been mated. These first pigs were not used in experiments due to staff shortage. A Field Assistant was, however, appointed in May, 1956, to run the piggery under the direction of the Adviser at Biloela.

All paddocks allotted to the piggery section have been cropped and grazed by pigs. Observations revealed that pigs show preference for elephant grass, can handle Sugardrip sweet sorghum in all stages of growth, have grazed, without ill effects, on a regrowth of this crop, and show preferences for vetches in a wheat and vetches mixture.

At the Hermitage Regional Experiment Station piggery the stud Berkshire herd has been maintained. Eleven automatic water fountains have been installed. Three portable sheds constructed by the staff have had the roof height lowered to 5 ft., and a 2 ft. wide full-length shutter has been built into the back wall. In their new form these sheds have proved to be very satisfactory. An electric fencer has been installed and in the near future an overhead wire will be erected for the distribution of electric current to all pig grazing blocks.

A trial to determine the feeding value of sorghum grain was carried out. Results indicate that sorghum grain had a food conversion rate of 3.56 lb. from weaning to bacon weight, which is comparable with most meal mixtures used under similar conditions.

A trial involving the hogging down of a grain sorghum crop was also carried out; the results, even if the estimated yield was too high, were very much in favour of mechanical harvesting. The variety Alpha has a small grain which does not help the effectiveness of this method of harvesting. It is intended to plant the area again, but with a larger-grained variety such as Caprock or Hegari, and repeat the trial to see whether a better result from hogging down can be obtained.

Early weaning trials have been commenced. The rations used are based on those adopted in New Zealand at the Ruakura Animal Research Station. Extra warmth has been provided by making use of a kerosene heating lamp enclosed in a walled-off section of the pen. Indications so far are that scouring of the pigs may be expected after four or five days, but that in spite of this initial setback good weaners will be secured.

GENERAL.

As previously reported, a circular farrowing pen was constructed at the Kairi Regional Experiment Station to study the effectiveness of the principles involved. The pen is designed with the object of eliminating as far as possible losses sustained from overlying and accidents soon after farrowing. Losses between farrowing and weaning are estimated by the Bureau of Agricultural Economics as being approximately 20 per cent. of all pigs born. The majority of these losses generally occur during the first few days after farrowing, so any means of appreciably reducing this figure would be of substantial benefit to the industry as a whole.

Tests at Kairi, when wood shavings were used as bedding and records kept over an equal number of litters farrowed in the orthodox and circular pens, showed that 8 per cent. of piglets died in the orthodox type pen, while the losses in the circular pen were 1.5 per cent.

Following these tests, an order was placed for the construction of six sets of moulds for use in the construction of circular farrowing pens. One set of moulds will be forwarded to each of six pig raising districts where an Adviser is stationed. The Advisers will have charge of the moulds, which are to be made available free of charge to farmers in the area who are desirous of constructing one or more circular pens on their property. A full set of instructions on the construction of the circular pen will be issued with the moulds. It is hoped that by this means a considerable reduction in the percentage loss at present suffered by the industry will be effected.

Though circular farrowing pens represent a considerable advance in combating early losses of piglets, they are not a substitute for good management. Piggery hygiene and good husbandry methods will still be of prime importance in raising healthy litters.

During the past 12 months all the Commonwealth Extension Services Grant projects in the Moreton area, except one, have made good progress. The farmers in the various districts have followed the development of the grazing demonstrations with keen interest; they have visited the farms and discussed their merits with the Commonwealth Extension Services Grant co-operators. In many instances they have copied the layout and are changing over to this method of pig raising after having seen pigs produced under it grade well and show a very satisfactory growth rate.

In other instances the control and elimination of diseases, better feeding practices and selection of breeding stock have been demonstrated to farmers through the projects.

The more advanced projects will be at a stage in the coming year where wider advertisement through the press and field days should bring good results. The only demonstration to be discontinued is one at Upper Caboolture, where the farm has changed hands.

A project at Mt. Beppo is considered a most successful undertaking. Under efficient management, this demonstration is popularising the grazing system throughout the district.

The farmers in the Kilcoy district are observing the demonstration on a property in that area with interest, as the portable farrowing sheds featured therein are overcoming the setbacks caused by disease.

It is anticipated that interest in hogging down of maize and the grazing of lucerne will be stimulated in the Laidley district, where a demonstration is situated, and where an electric fence and portable sheds, self-watering unit and trough are being used. Six young sows and a boar were selected some time ago for improved breeding purposes and they are now coming into production with good results.

Two deep litter demonstrations have been carried out during the year. In conjunction with one at Ormiston a manurial trial was conducted with the deep litter collected. Applied at the rate of 8 tons per acre to a crop of tomatoes it gave results comparable with those obtained with standard fertilizer practice. The opinion of small-crop farmers in the district is that the difficulty of obtaining sawdust for deep litter pig raising counteracts the value of the manure.

The other demonstration on a dairy farm at Cryna, in the Beaudesert district, proved to pig raisers on dairy farms that this system has labour-saving possibilities, especially when unhusked maize in conjunction with skim-milk is fed. On this diet, satisfactory growth rate and grading were secured.

A new project on a property at Riverview is well under way and it is anticipated that this demonstration will be a good example of housing and restricted feeding practice for prospective deep litter pig raisers.

A new grazing demonstration on a dairy farm at Rosewood has already brought some results, as pigs have been produced and sold at very favourable prices, although the eretcion of fences and sheds is not yet complete.

The observations made during the year are very encouraging, and the demonstrations are serving their purpose, as many pig farmers are adopting the method used. This in time will be beneficial to the pig industry as a whole.

In the Atherton area a trial involving finishing pigs without milk, and a trial to determine the cost of producing weaners, were completed. At a field day staged on the property results obtained from the two pens built proved to the satisfaction of those present the advantages of good equipment.

Brucellosis testing of stud herds has been continued in conjunction with the Veterinary Services Branch. Eighty-nine herds have been issued with appropriate certificates and placed on the list published in the *Queensland Agricultural Journal* each month. A further five herds have entered the scheme, but still have to complete the necessary tests.

The health of stock has been generally satisfactory and disease was not a serious problem, but owing to the excessively wet conditions experienced, respiratory diseases have been responsible for some losses. However, the incidence of worm infestation does not appear to have increased. Generally, most losses were caused by lack of adequate accommodation and faulty nutrition. In North and Central Queensland several cases of sparganosis were noted, and in the North kidney worms continue to be the worst parasite. On the Downs, post-parturient fever was rather prevalent in the early part of the year.

In the southern Darling Downs area, film evenings have occupied a prominent place in extension work. In association with other Departmental officers, 15 such evenings were arranged throughout the district. These evenings have proved popular, and apart from disseminating information they are a useful means of meeting farmers not previously contacted.

POULTRY BRANCH.

Mr. F. N. J. Milne, Senior Poultry Husbandry Officer.

There is some evidence of a change in the seasonal pattern of egg production. The use of artificial lighting in late autumn and winter is becoming increasingly popular with "early" pullets hatched from March to June and with birds in their second year of production. This and the widespread use of the so-called "late"-hatched pullet (August, September and October hatched) will eventually reduce the present wide difference between autumn and spring production.

Hatchings in 1955 were a record and production generally seems to have been well maintained. In Central and North Queensland there was a distinct upward trend, especially in the former area.

COMMONWEALTH EXTENSION SERVICES GRANT.

During the period under review, two types of demonstrations have been in progress. On one farm, a demonstration is being conducted to show the extra egg production that can be expected in the winter months from the use of artificial light. On eight hatcheries, sets of laying cages have been installed to be used for the testing of potential breeding birds.

Lighting Demonstration.

Three hundred hens and 300 pullets were subjected to artificial early morning lighting from 1/4/55 to 30/9/55 and the egg production from these groups compared with the production of groups similar with respect to age and quality but without early morning light.

During the months of May and June, production of the hens under lights was double that of the control hens, but as spring approached the production in the groups of hens which were not under lights overtook that of the "lit" groups. Similar trends were observed in the production of the groups of pullets used in this demonstration.

Although the average production per bird for the 6-months period for both the "lit" groups of hens and pullets only exceeded that of the "unlit" hen and pullet groups by 4.3 and 2.9 eggs respectively, the groups under lights were far more profitable because of the volume of eggs produced during the late autumn and winter months when egg prices were high.

The demonstration is being repeated on this farm with groups of second-year hens and May-hatched pullets. Lighting commenced on 1/3/56. The production in the early-hatched pullets from 29/1/56 until 3/6/56 under lights reveals that a very good response occurred almost immediately after bringing on the lights and that the decline in production has not exceeded 7 per cent. during the period. In the unlit groups, production has declined by 22 per cent.

Laying Cage Demonstration.

Eight sets of 96 single-bird laying cages have been installed on eight hatcheries and a further 10 sets are being installed. These cages are being used to test the individual egg production of potential breeding birds and will also be used by breeders under the Poultry Improvement Plan to test families.

On four of the eight hatcheries, complete records are available for the first lot of birds tested and a second lot of birds is now under test. The records show considerable differences between the production of different birds, and the highest and most consistent producers can therefore be selected and used for breeding.

These cages are also proving useful in convincing hatcherymen that breeding birds cannot be selected on type alone, as many "show birds" are proving poor producers.

EXTENSION WORK.

Officers of the Branch paid over 3,000 visits to farms for the purpose of extension work, conducted 451 demonstrations, and delivered 22 lectures. Of the demonstrations, chemical caponising was in greatest demand; this was to be expected in view of the interest being shown in table poultry production. Fowl pox vaccination was also in demand. Articles have been published in the *Queensland Agricultural Journal* dealing with caponising, stickfast flea, poultry house building, vitamin A supplements and bloodtesting.

EXPERIMENTAL WORK.

Antibiotic Experiment.

During the year under review, one antibiotic feeding trial concerning the growth-promoting effects of procaine penicillin when fed in conjunction with meatmeal and a combination of meatmeal and buttermilk powder was carried out at the Rocklea Animal Husbandry Research Farm. This experiment was a repetition of trials previously carried out at the Kairi Regional Experiment Station in 1953 and at the Rocklea Farm in 1954.

As it was thought that the vitamin A and D3 fish-oil emulsion previously used in this work might in some way interfere with the action of the penicillin in the ration, the opportunity was taken to test this possibility by feeding rations with vitamin A and D3 added in the form of fish-oil emulsion and/or "stabilised" powder. Table 1 sets out the average weights at day-old and eight weeks and the linear growth rates.

TABLE 1.

LIVEWEIGHT OF CHICKENS FED RATIONS INCLUDING BUTTERMILK POWDER AND/OR MEATMEAL WITH AND WITHOUT PENICILLIN AND WITH EITHER FISH-OIL EMULSION OR "STABILISED" VITAMINS AS A SOURCE OF VITAMIN A AND D3.

	Weight at Day-old.	Weight at 8 weeks.	Linear growth* rate.
	Oz.	Oz.	Oz.
M.M. + A.	1·5	32·3	7·8
M.M. + A. + P.	1·5	33·4	8·1
B.M.P. + A.	1·5	33·0	7·91
B.M.P. + A. + P.	1·5	33·8	8·27
M.M. + V.	1·5	31·8	7·63
M.M. + V. + P.	1·5	35·0	8·36
B.M.P. + V.	1·5	32·3	7·70
B.M.P. + V. + P.	1·5	33·2	7·94
Average for groups receiving penicillin	1·5	33·8	8·17
Average for groups receiving no penicillin	1·5	32·4	7·76

M.M. = Meatmeal; B.M.P. = Buttermilk powder; A. = Stabilised vitamin; V. = Fish-oil emulsion; P. = Procaine penicillin.

* Linear growth rate represents what is virtually average weight increase per fortnight.

Under the conditions of this experiment, procaine penicillin produced a fairly constant growth response irrespective of the quality of the ration (that is, the presence or absence of buttermilk powder) and irrespective of the type of vitamin A and D3 supplement used.

Dried Whale Solubles for Chickens.

Dried whale solubles (D.W.S.), which are now being produced by the whaling industry, have a high total crude protein content of 81.2 per cent. In view of the poor growth obtained previously with condensed whale solubles (C.W.S.), two feeding trials with the dried material were carried out. Each of the four groups in each trial consisted of 9-day-old White Leghorn and 15 day-old Australorp cockerels.

During the first week of the experiment the chickens were fed a depletion ration to partly offset parental nutritional influences, and at the end of the week all chickens were individually weighed and randomised amongst four groups in each experiment on a class-weight basis.

Table 2 sets out the experimental rations and the results. The rations were formulated so that the total crude protein contribution from dried whale solubles, meatmeal, and a combination of dried whale solubles with either meatmeal or livermeal, was approximately the same. The calcium and phosphorus contents of the rations were balanced by varying the amounts of ground limestone and bonemeal used.

TABLE 2.

DRIED WHALE SOLUBLES FEEDING EXPERIMENT—EXPERIMENTAL RATIONS AND RESULTS.

Ingredient.	Ration 1. (Control).	Ration 2.	Ration 3.	Ration 4.
	Lb.	Lb.	Lb.	Lb.
Wheatmeal	42	44	43·6	43·2
Bran	15	15	15	15
Pollard	26	26	26	26
Meatmeal	15	..	3·8	..
Livermeal	..	..	..	3·2
Dried whale solubles	..	10	7·6	7·6
Ground limestone	1·5	2	1·5	2
Bonemeal	..	5	2	2·5
Salt	·5	·5	·5	·5
	100	100	100	100
Supplements.				
Manganese sulphate (grams)	8	8	8	8
Synthetic riboflavin (milligrams)	160	160	160	160
Stabilised vitamin A and D3 (oz.)	·5	·5	·5	·5
RESULTS OF FEEDING—AVERAGE OF TWO EXPERIMENTS.				
Average net gain over 8-week period (oz.)	26·1	17·5	18·6	24·4
Average feed-to-gain ratio	3·3	3·6	3·8	3·6

It will be noted from these results that as the amount of dried whale solubles was increased in the ration, the weight gains decreased; also that the addition of a small quantity of livermeal appeared to correct this. The overall picture from this work is very similar to that obtained with condensed whale solubles, except that there was no evidence of dermatosis on the feet and the death rate was negligible.

In view of the supplementary value of livermeal, it would appear that one of the main factors which limit the use of whale solubles as a suitable protein food for chickens is its low vitamin B-complex status.

Free Choice Feeding for Layers.

An experiment designed to see whether pullets on a protein level higher than 17.5 per cent. would eat more grain in relation to mash and so cheapen feeding costs was commenced at the Kairi Regional Experiment Station in December, 1954.

Three mashes, the composition of which is set out in Table 3, were used, containing 17.5 per cent., 22.5 per cent. and 27.5 per cent. total crude protein respectively, and with whole wheat were each fed to a group of 90 birds divided into six sub-groups of 15. Mash and wheat were placed in two similar troughs in each of the 18 pens and the birds allowed free choice at all times.

TABLE 3.

FREE CHOICE FEEDING EXPERIMENT—EXPERIMENTAL RATIONS.

——	Ration 1. (17·5% protein).	Ration 2. (22·5% protein).	Ration 3. (27·5% protein).
	Lb.	Lb.	Lb.
Maizemeal	46	35	24
Bran	20	20	20
Pollard	15	15	15
Meatmeal	14	25	36
Lucerne meal	4½	4½	4½
Salt premix (as per chickens)	½	½	½
Stabilised vitamins A and D3 (oz.)	½	1	2
Shell grit	ad lib.	ad lib.	ad lib.
Insoluble grit	ad lib.	ad lib.	ad lib.

On the assumption that, as the protein level of the mash increased, there would be a lowered intake of mash and consequently a lowered intake of vitamin supplements, additional amounts of the vitamin A and D3 concentrate (APAC) were incorporated in mashes with 22.5 per cent. and 27.5 per cent. protein.

The experiment ran for a period of 51 weeks. Table 4 sets out the data obtained.

TABLE 4.

FREE CHOICE FEEDING TO LAYERS—RESULTS.

—	17·5% protein mash + grain.	22·5% protein mash + grain.	27·5% protein mash + grain.
Number penned at beginning of test	90	90	90
Deaths	4	10	11
Average egg weight (oz.)	2·06	2·04	2·04
Hen housed average production	172·9	158·3	173·9
Grain as percentage of total feed intake	63·6	67·5	69·0
Lb. feed/dozen eggs	5·87	6·36	5·95
Lb. feed/lb. egg weight	3·78	4·12	3·86
Cost of feed per lb. intake	3·82d.	3·85d.	3·88d.
Cost of feed per dozen eggs	22·43d.	24·49d.	22·73d.

It will be noted that the group fed the mash with the lowest protein content proved to be the most economical one under the conditions of this test. Had the death rate in the 27.5 per cent. protein mash group been lower, it is quite conceivable that this group would have been as economical, if not more so, than the one fed 17.5 per cent. protein mash.

It will be seen from the results that there was evidence of an increase in grain consumption as the level of protein in the mash increased. In this connection, it is of interest to note that the stock showed a decided preference for grain, even on the lowest protein ration.

A number of deaths in the 22.5 per cent. and 27.5 per cent. groups were reported to be due to ruptured livers. This might indicate some liver degeneration due to the continuous high protein intake.

Breed Production Experiment.

This experiment, a repetition of a trial carried out in 1953-54 to compare the various economic features of Australorps, White Leghorns and the cross between these two breeds using White Leghorn sires, also includes the cross between Australorp sires and White Leghorn hens.

The chicks were obtained from the Rocklea Animal Husbandry Research Farm and air-freighted to Kairi. By using artificial insemination, it was possible to use the pooled semen from groups of White Leghorn cockerels to produce White Leghorn and White Leghorn x Australorp crossbred chicks, using the same White Leghorn males. Australorps and Australorp x White Leghorn crossbreds were similarly produced by artificial insemination from the one small group of Australorp males.

The four groups have been in production for just over three months and the average hen-housed production per breed for this period is as follows:—Australorps, 28.7; Australorp x White Leghorn crossbreeds, 32.4; White Leghorn x Australorp crossbreds, 29.0; and White Leghorns, 21.5. The Australorp x White Leghorn crossbreds also have the highest average egg weight of all four breeds.

Artificial Lighting Experiment.

During the year under review, electric lights were installed in the front row of laying pens at the Poultry Section of the Rocklea Animal Husbandry Research Farm. Ten pens of birds are now under lights, and a similar number of pens in the second row with birds of the corresponding breed and age groups are being kept under similar conditions but without artificial morning lighting. Of the 10 groups in each row, there are four pens of second-year birds, the remaining pens being occupied by pullets hatched during August, 1955.

Lighting was commenced at the beginning of March and Fig. 2 shows the response in production which has been obtained in the second-year birds. It will be seen that the decline in production in the "lit" group has been only 10 per cent. over a period of almost five months, whereas production in the control pens of hens has declined by almost 40 per cent. The lights have not had so marked an influence on the August-hatched pullets. Production in the "lit" pens is about 10 per cent. higher than in the "unlit" groups.

This test will be continued for at least another four months to see how the production in the groups which are at present lit is affected when lights are switched off in springtime.

RANDOM SAMPLE PRODUCTION TRIAL.

The first random sample production trial in Queensland terminated at the Department's Rocklea Animal Husbandry Farm in December, 1955. The final point scores awarded on the basis of hatchability, rearability, egg production and livability ranged from 6,234 to 8,530.

The average hen-housed production for all groups entered was 173.6, whilst that of the winning group (Australorps) was 196.6 per bird for a 48-week period. Generally, the Australorps were superior to the White Leghorns, averaging 13 eggs more per bird. Egg size in the White Leghorn groups was generally better. This factor was taken into account when computing egg scores and resulted in the second place going to a group of White Leghorns even though the hen-housed average production in this White Leghorn group was less than that in two Australorp groups which were placed third and fourth.

The second random test commenced at Rocklea in September, 1955. The number of pens available for this work was increased from eight to nine. Six of the previous eight competitors re-entered.

Of the 479 pullet chickens placed in the brooders at day-old, 20 (less than 4 per cent.) died during the first 10 weeks of life. At 10 weeks of age, groups in excess of 45 were reduced by random selection to this number—a total of 396 to be reared to 18 weeks. During the final 8-week period, another 14 pullets (3.5 per cent.) died. These rearing results, though not as good as those for the 1954-55 test, are still better than those on most farms.

At 18 weeks of age, each group was reduced by random selection to 30 birds for the egg production section of the trial, which will conclude in January, 1957.

It is expected that work will begin shortly on the building of separate random sample testing facilities at Rocklea. The facilities will include a brooder house capable of holding 1,000 chickens and two rows of 15 pens each holding 20 birds. These buildings are being provided from Commonwealth Extension Services Grant Funds and are to be used for testing samples from the breeding flocks of farmers wishing to participate in the State Poultry Improvement Plan.

POULTRY STOCK SUPPLIERS.

During the year, 204 registrations as stock suppliers were made under "*The Poultry Industry Acts, 1946 to* 1950," compared with 206 last year. Altogether there were 19 cancellations and 17 new registrations. Of the 204 registrations, 149 are for the business of hatching chickens for sale, 43 for the business of supplying fowl eggs for hatching and 12 for the business of a poultry dealer.

PRODUCTION OF DAY-OLD CHICKENS.

The number of chickens sexed for the years 1952 to 1955 are as follows:—1952, 1,921,276; 1953, 2,699,857; 1954, 2,564,706; and 1955, 2,893,708.

The number of chickens sexed in Queensland in 1955 was 12.8 per cent. higher than for the previous year and almost 8 per cent. higher than in the record year of 1953. This figure does not represent the total number of chickens hatched in Queensland. It is estimated that in areas north of Bundaberg, where chick sexing is not carried out, 30 hatcheries would produce a quarter of a million chicks per year. In southern Queensland, most hatcheries also produce some chickens which are not sexed. In view of the fact that there are 119 hatcheries operating in this area, it would be a fair assumption to set the number of this class of day-old chickens at a quarter of a million per year. This would mean that the total estimated production of day-old chickens throughout Queensland from registered hatcheries for 1955-56 would be approximately 3,400,000.

This increase, particularly in the production of day-old pullets, would indicate an increase in the size and number of laying flocks in Queensland. It is considered that there has been no marked expansion in the industry during the year under review. Enquiries made of leading hatcherymen have revealed, however, an increased chick trade with New South Wales. One hatcheryman with an output of 178,000 sexed day-old chickens per year reported that he supplied 50,000 day-old chickens to farmers in New South Wales.

POULTRY MEAT PRODUCTION.

As will be seen from Table 5, the total number of poultry slaughtered in the Brisbane area shows a considerable increase (36 per cent.) on the previous year. The most noticeable increase is in the processing of cockerels, where the number is 53 per cent. higher.

There is considerable interest now in the production of the 8-9-week-old "petit poussin" (2-2¼ lb. liveweight chickens) and the 12-14-week-old class of chicken (a minimum of 3½ lb. liveweight). A number of commercial egg farmers are utilising their brooder and rearing accommodation when not in use for their own replacement chickens to produce one of these classes of poultry meat. Prices paid vary from 2s. 2d. per lb. liveweight for the 8-9-week-old chicken to 2s. 6d. for the 12-week-old or older class of cockerel.

TABLE 5.

SLAUGHTERING OF POULTRY—BRISBANE AREA.

—	Cockerels (Chickens).	Hens (Boilers).	Total Slaughtered.
1951–52 ..	574,886	637,372	1,307,095
1952–53 ..	206,101	328,315	613,844
1953–54 ..	240,049	311,444	604,725
1954–55 ..	206,418	346,417	512,438
1955–56 ..	316,991	381,561	698,552

Price for hen meat through the year ranged from 1s. 7d. to 1s. 10d. per lb. liveweight, which was 4d. per lb. better than the ruling rates for 1954-55.

DISEASE AND PEST CONTROL.

An examination of field officers' monthly reports shows that leucosis and intestinal coccidiosis were the most common diseases found in poultry flocks in Queensland during the year. However, the respiratory complex now ranks a very close third and one cannot help but be apprehensive at the widespread nature of the respiratory infections in our flocks.

Thirty cases of bluecomb were reported during the year, which is an increase of six on the previous year. However, the losses in laying pullets were not nearly as heavy as previously.

Pullorum Disease.

Altogether 223,302 fowls were bloodtested for 137 registered stock suppliers. A further 4,471 were tested for 11 farmers who wished to breed their own replacements.

It is pleasing to report that only 634 reactors were found in a total of 227,773 birds tested—an average of .002 per cent. Of the 137 flocks owned by stock suppliers, 57 were "clean" and a further 60 had less than .5 per cent. reactors.

Stickfast Flea.

Further outbreaks of stickfast flea occurred during the year at Lucinda Point (near Ingham), Beachmere and Charleville. The outbreak of Beachmere is viewed very seriously because of the proximity of the infestation to the large and important commercial poultry raising area around Caboolture.

A complete survey of the Beachmere area has been carried out and the flea has been found to exist on at least 16 properties in this small seaside resort. There is a "floating" population of holiday makers who bring dogs, cats and even fowls into and out of the area. Since the discovery of the flea at Beachmere in October, 1955, two drives have been made to treat all cats, dogs and fowls of the residents. There is reason to believe that the outbreak will be eradicated in time. It is of interest to record also that two doves shot with Ministerial approval on a heavily infested property were found to have a slight infestation.

In Townsville, the infestation is widespread, the flea now having been found on 83 properties in the residential area and on 20 properties in outer areas.

In order to facilitate the free movement of stock from farms known to be free of infestation in the Boonah and Normanby areas, an Order in Council dated November, 24, 1955, was promulgated rescinding a previous Order in Council declaring these districts an infected area under the Poultry Industry Acts. Steps were then taken to release from quarantine 57 farms which had been free from infection for a considerable time.

Three infected farms in the Tannymorel and seven in the Helidon areas, having been found free from stickfast flea for a period of 12 months or more, were also released from quarantine.

Poultry Advisory Board.

This board met on three occasions. The business dealt with included consideration of the programme of experimental work to be conducted by the Poultry Branch, the proposed Poultry Improvement Plan, and the estimates of the Poultry Branch, including the precept to be issued on marketing boards.

DIVISION OF DAIRYING: BRANCH REPORTS.

FIELD SERVICES BRANCH.

Mr. F. C. Coleman, Director of Field Services.

Summing up the conditions for the 12 months, it can be said that the year was one of abundant rains throughout all dairying districts. A short fairly dry period was experienced in November and December, but this had only slight effect on production. Prospects continue bright.

BUTTER PRODUCTION.

Production of butter for the year was 48,189 tons. This amount exceeds last year's total by 5 per cent.

The percentage of butter officially graded as choice quality was 38.21, compared with 36.79 in the previous year. The unsatisfactory percentages during the past three years (29.81, 36.79 and 38.21) reveal no inclination on the part of the industry to remedy a position which could, with determination, be effectively changed to reverse the amounts of choice and first grade butter now manufactured. It appears evident that despite the efforts of officers to improve quality, no worthwhile progress will be made in this respect whilst the price margins between the different grades remain small.

The usual winter weed defects again affected cream quality in several districts, whilst quality was seriously affected when the second epidemic of three-day sickness swept through Queensland herds during January and February. This was followed by several weeks of almost ceaseless rain and lack of sunshine, causing many roads to become untrafficable and seriously affecting cream deliveries to factories.

Officers have given attention to the quality of local butter, which generally has been satisfactory.

There have been numerous instances during the year of increased percentages of choice grade cream produced on those farms practising the new tower method of cooling cream. It is hoped that, in future, a more general use of such coolers will do much to improve the position so far as quality is concerned.

With one or two exceptions, the 51 butter factories remain in sound structural condition. Action has been initiated to ensure that any factory which requires repairs is improved to a satisfactory standard. A new type of pasteuriser unit was installed in one factory where degrading of butter has been experienced. In this case an immediate improvement in butter quality was achieved. This is the second pasteuriser of its type in Queensland.

The condition of equipment generally is sound. Approximately £192,835 has been spent on new equipment and renovations of buildings.

CHEESE PRODUCTION.

Production of cheese for the year was 7,580 tons, which was 341 tons less than the quantity manufactured in 1954-55. The distinct improvement in quality attained in 1954-55, when 84.28 per cent. of first quality cheese was manufactured, was not fully maintained in the past year, the percentage of first quality being 81.04. Had it not been for the abnormally wet weather and three-day sickness, quality might well have been better than in the previous year. Increasing numbers of cheese factory suppliers are installing coolers, and the Pittsworth Co-operative Dairy Association, on the suggestion of the Dairy Adviser, is prefabricating tower coolers for its suppliers.

There are now only 28 cheese factories operating, compared with 30 in 1954-55. The structural condition of these, with one exception, is considered sound. Steps have been taken to bring the sub-standard factory up to a satisfactory standard. Alterations and improvements are being undertaken by a number of Associations. New equipment to the value of £37,100 was installed during the period under review.

MARKET MILK PRODUCTION.

The amount of market milk consumed has continued to increase. In the Greater Brisbane area there has been an increase in consumption of almost one million gallons during the year, the annual gallonage consumed now being 17.2 millions.

Production was maintained at a high level in a year considered to be a good one for dairy purposes. Milk quality was satisfactory except for a short period when three-day sickness was prevalent and also when power failures during the electricity strike were experienced. Over the latter period, milk receivals by wholesale factories had to be reorganised. The number of raw milk producers for direct consumption further decreased, leaving only 52.

The general standard of dairy premises has improved and all raw milk producers for direct consumption have refrigeration facilities for cooling milk to a temperature lower than 50 deg. F. following production. The standard of dairy premises of milk producers delivering to milk chilling and treatment factories has also improved and in the Brisbane milk district 75 per cent. of these producers now have refrigerators installed.

A new milk factory has been completed in Brisbane and is almost ready for production. It will feature automatic crating and decrating of bottles. Structural improvements have been made in a number of milk pasteurisation plants. A number of new milk distributing depots are in course of construction following the zoning of milk distribution in the Brisbane area. These are of a good standard and are equipped with refrigeration plants.

Preparations are in hand for the erection of a modern milk factory at Rockhampton.

The school milk scheme has been extended in country areas where supplies of pasteurised milk are available. The price paid to producers of market milk in Brisbane remained the same as last year—3s. per gall. during the summer price period, equivalent to 7s. 8d. per lb. butterfat at the average fat content of 3.8 per cent., and 3s. 4d. per gall. during the winter price period, equivalent to 8s. 6d. per lb. butterfat.

FIELD ACTIVITIES.

Butter Factories.

Routine survey visits to all butter factories were continued and equipment and premises were examined strictly to ensure a hygienic standard of production. During these surveys officers assisted with the correction of flavour and texture defects which had caused degrading. As a consequence, texture defects have been fewer.

In order to assist factories to produce a higher quantity of true-to-grade butter, quarterly summaries of degrading results for the comparable quarter of the previous year were issued to all factories. This information, which has proved valuable to the Associations concerned, warns factory staffs of a possible recurrence of defects, thus enabling preventive measures to be adopted.

The amount of butter degraded during the year was reduced; this improvement is due to the installation of modern cream pasteurisation plants in those factories which previously had high percentages degraded.

In some factories using intensive systems of cream processing there has been a tendency to grade cream leniently. In an effort to correct this tendency, officers have emphasised the adverse influence this practice would have on the overall quality of cream in these areas.

In factory operations, in-place recirculation cleaning of certain items of factory equipment has been introduced with successful results.

Cheese Factories.

Officers have been active in carrying out regular and systematic surveys of cheese factories with the object of improving quality. Three small factories, however, are battling for survival and are producing a low-quality cheese. Unless the improved cheese marketing position can arrest this trend, the closure of these factories is imminent.

Generally speaking, there has been a response by factory managers to officers' recommendations to conduct regular methylene blue testing. However, there is still room for greater co-operation by a number of managers. The adverse cheese position at the beginning of the year was responsible for a small number of suppliers diverting their produce to butter factories. However, the cheese position has now improved and it appears that a re-diversion to cheese manufacture is taking place.

Dairy Premises and Equipment.

Hygiene.—Whilst figures show that there has been a further increase in the number of farmers possessing the full facilities in their dairy premises, it has not brought a corresponding improvement in quality. Something more is needed than the mere possession of essential equipment and that is the will to produce milk and cream of the very best quality. Some slight improvement, however, can be shown for the year, the number of dairy premises in which hygiene was considered unsatisfactory having been reduced by 4 per cent. The fact that twice the number of closure orders for uncleanliness were issued compared with the previous year no doubt contributed to this.

Structural Condition.—The number of new dairy premises erected in 1954-55 was 536, whilst 518 were renovated to a more satisfactory standard. The numbers for 1955-56 are 595 new premises and 547 renovations. Most of the new premises are of a very good standard and are usually attractively painted.

Dairymen are realising that greater comfort and a valuable saving of time result from well-planned premises and yards. The wet conditions which have been experienced during the last two years, and which created very unpleasant conditions in the yards, have induced many farmers to cement their holding yards and exits.

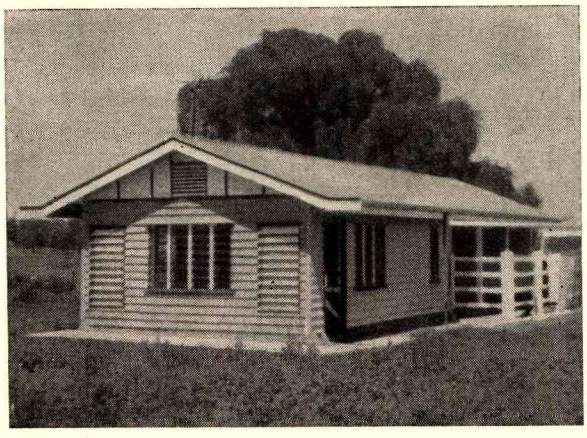


Plate 1.—A Good Type of Modern Milking Shed.

There was a noticeable change during the year in that prefabricated metal buildings are gaining in popularity; some very fine premises of this type have been erected. These buildings are in favour in those districts where timber is in short supply. They are also easy to erect and their price compares favourably with that of premises built of timber. There has been no noticeable development, so far, in the erection of elevated bails.

Hot Water Facilities.—Further progress has been made in the installation of hot water facilities, but approximately 15 per cent. of dairymen remain without fully satisfactory facilities. Many of these, however, comprise dairymen with five or six cows. There has been a considerable increase in electric hot water systems in the Brisbane, Gympie, Ipswich, Toowoomba and Kingaroy districts, where electrification has been extended.

Water Supply.—Since the Dairy Produce Acts were amended in 1955, making it necessary for dairymen to provide at least 2,000 gall. of water at the dairy premises, a move in the right direction has been made by many farmers.

Cooling of Milk and Cream.—The position regarding market milk and cheese milk suppliers is now reasonably satisfactory. Approximately 450 new farm refrigerators were installed during the year, 200 of these being in the Central and Darling Downs districts.

The tower cooler for cream offers good possibilities as an efficient cooler which is reasonably economical to construct. A number of these have been erected in the Warwick district and as a result the percentage of choice grade cream has been considerably increased. This type of cream cooler is being introduced on several C.D.I.E.G. farms this year. Should it prove to be efficient there is no doubt that the ensuing years will see increasing numbers of cream suppliers installing it. The worth of the tower cooler for milk has already been proved.

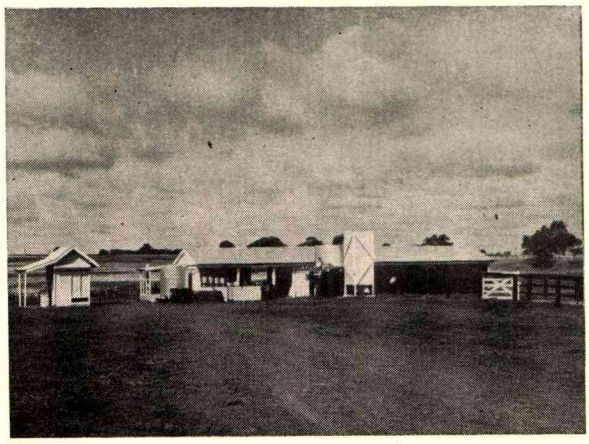


Plate 2.—A Water Cooling Tower for Milk on a Demonstration Farm.

Three specially imported American cream coolers were installed on demonstration farms and their economy and efficiency are being watched with interest.

Milking Machines.—Projects undertaken during the year included the setting up of the milking machine testing service and an investigation into the recirculation cleansing technique.

Ten sets of Ruakura air flow meters and vacuum recorders, costing £113 per set, were purchased by the Queensland Dairymen's Organisation and made available to Co-operative Dairy Associations. All sets issued have been operated solely by officers who received special training in their use by the Senior Adviser (Machinery). Reports show that of 155 milking machines tested only 16 were free of faults and needed no adjustment or repairs. Eight more sets are expected in the near future and will be issued to Co-operative Dairy Associations. This service has been very much appreciated by dairy-farmers.

The recirculation cleaning technique was carefully examined during the year by the Senior Adviser (Machinery) working in close collaboration with the Dairy Research Branch. A report on this is now being prepared.

The removal of milkstone from milking machines was also investigated; officers carried out a series of field trials using the daisy chain method of removal with phosphoric acid. Twenty-one trials out of 24 were successful. Hydrochloric acid treatment, however, offers quicker and more effective removal and this method is being investigated by the Dairy Research Branch.

Of a total of 20,042 dairy farmers, 17,375 (86 per cent.) are using milking machines.

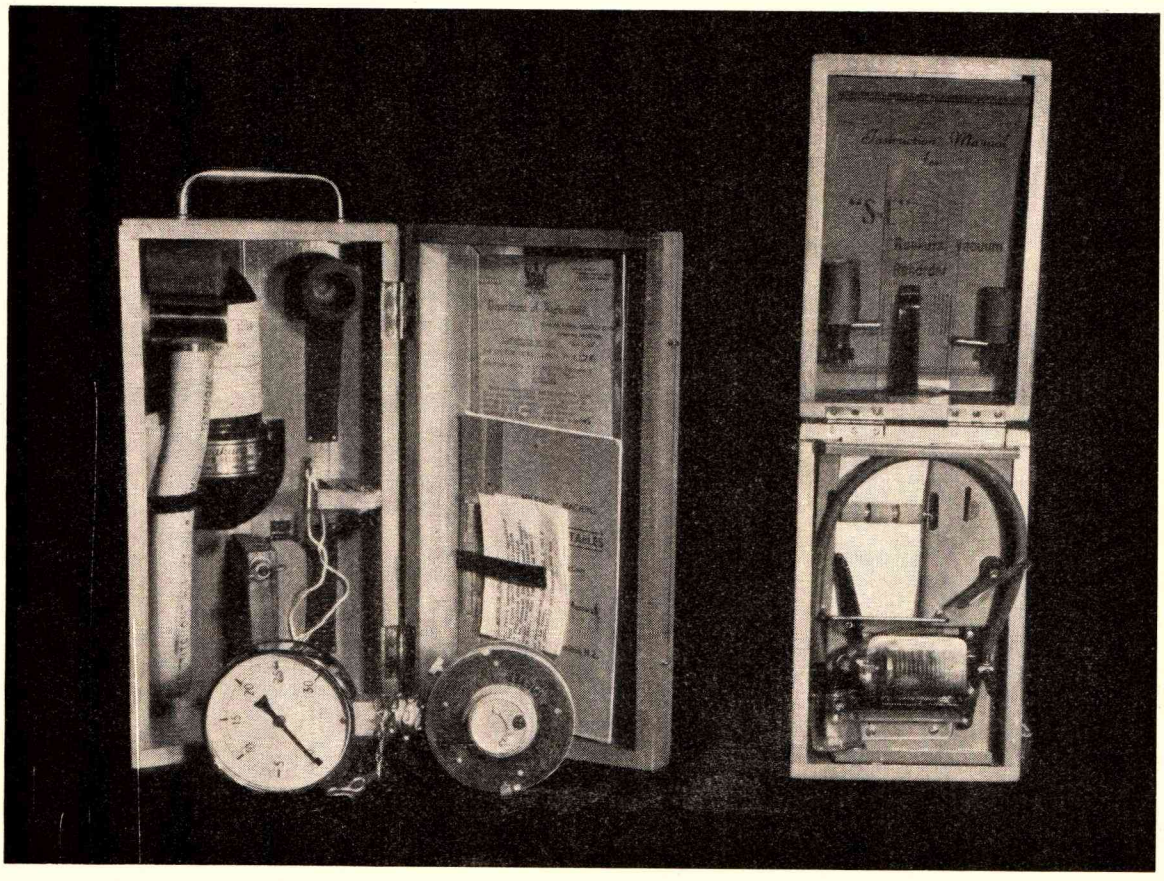


Plate 3.—Ruakura Air Flow Meter and Vacuum Recorder for Testing Milking Machine Efficiency.

FODDER CONSERVATION AND PASTURES.

During the course of their farm visits, officers constantly kept the necessity for fodder conservation before the dairy-farmer. More buck-rakes and forage harvesters are now in use. A great deal of pasture and lucerne could not be taken off during the long wet period and consequently was lost. A partial survey conducted by Branch officers revealed 5,356 farmers had conserved 143,370 tons of hay, 161 farmers had 13,119 tons of silage, and 2,985 had provided 15,165 tons of grain.

While these figures show that many of the States 20,000 dairy-farmers are conserving fodder, they also show that the quantities conserved are inadequate if the industry meets a drought of any length.

The interest and enthusiasm for improved pastures which have been stimulated during the last few years are in no way diminished and it can be said that the chief and most important topic at any gathering of dairy farmers is pastures. Whilst no accurate information is available, it is known that the area under improved pastures has increased very considerably and pasture improvement can be said to have become a snowballing movement. It is estimated that there are now 39,500 acres of improved pastures on 1,867 farms.

SEASONAL CALVING.

From herd recording data over the past eight years it has been ascertained that in many districts the average production of cows calving in the July-September period is approximately 30 lb. butterfat more than that of those calving in the first quarter of the year. Whilst it is not as yet possible to state what percentage of dairymen have adopted July-September calving, it is known that many have commenced recently and that others intend to do so. Seasonal calving is now practised by 40 per cent. of herd recording members. Factors hindering the adoption of seasonal calving are the lack of bull paddocks, ineffective boundary fences permitting entry of stray bulls, abortion and sterility problems, cost of fencing and difficulty of providing water at the bull paddock.

Whilst July-September is the best quarter of the year for calving in several districts, herd recording figures show that on the western Darling Downs, May to August are the best months for cows to calve.

It is believed that the dissemination of knowledge on seasonal calving by means of coloured slides, articles, radio, etc., will lead increasing numbers of dairymen to turn to the practice as one method of reducing their costs of production. Many dairy-farmers now practising it have testified, in newspapers and at meetings, to its advantages.

DEVELOPMENT OF EXTENSION WORK.

A little more than 12 months ago, stock was taken of the Division's extension services. It was realised then that although the total number of farm visits made each year (approximately 23,000) was creditable, it meant that the majority of the State's 20,000 dairymen were not visited frequently enough. Farm visits, which rank high among extension methods, had to be augmented by other methods. It was decided that technical information could best be imparted by officers to groups of dairymen at the monthly meetings of the Queensland Dairymen's Organisation branches, of which there are approximately 200. Other methods such as field days, organised tours, method demonstrations, radio talks and press releases could also be used.

Group Extension.

This new departure has proved successful, as in addition to farm visits officers have organised 444 illustrated talks, field days, method demonstrations, conducted tours, annual herd recording meetings, etc., and have attracted a total attendance of 16,321. This has made it possible to convey a great deal of technical information to dairy-farmers on a variety of interesting subjects.

Important though this aspect is, it is perhaps not so important as the close and understanding relationship which has developed between farmers and officers as a result. More dairy-farmers now realise that officers are desirous of assisting them and can be of real help. It is noted that many questions are asked during the informal periods at the conclusion of a night talk and during a field day, and it is at these times that the farmer and officer come to understand each other better. This desire for guidance has been very heartening to Departmental officers.

The illustrated talks to Q.D.O. branches have also had the effect of reviving the interest of members in their branches. The average attendance at the 232 Q.D.O. talks organised during the year was 31. In the great majority of the organised events valuable assistance has been readily given by officers of the Divisions of Plant Industry and Animal Industry. More than 10,000 circulars for distribution at such events have been prepared by the Division.

Illustrated Talks.

Sets of coloured transparencies were prepared as follows:—(1) Dairy hygiene, premises and equipment; (2) care and operation of the milking machine; and (3) herd production recording. A fourth set dealing with the cooling of milk and cream is now in course of preparation and sets dealing with a number of other subjects will be prepared each year. The presentation of these slides has met with success and the consensus of opinion among dairy-farmers is that they prefer slides to films. They are of special attraction, as coloured photos of local interest are taken by officers and added to those forwarded from Head Office. The illustrated talks have been favourably commented on by the Queensland Dairymen's Organisation.

Films.

Several film nights have been organised by officers at which films from the Divisional film library have been used together with some from the State Film Library. The Division now possesses two film projectors, one being at Head Office and the other at Toowoomba. Several officers are competent in the operation of the movie projector and others are learning.

Method Demonstrations.

Fifty method demonstrations were held; they included demonstrations by officers of the cleansing of milking machines, including the new recirculation method, the removal of milkstone, machine stripping of cows, checking foremilk for mastitis, cooling of dairy produce, cleansing rubberware, care and operation of milking machines, and use of the Ruakura air flow meter and vacuum recorder.

These small demonstrations carried out on the dairy premises of co-operating farmers and attended by groups of neighbouring farmers have been popular and have been responsible for the adoption of recommended practices by many dairymen. As a result, an added respect is being created for the officer who has demonstrated his practical ability. Wherever possible, the demonstrations have been carried out in modern milking sheds, where, in addition to the demonstrations, the advantages of modern premises and equipment have been pointed out.

It is expected that greater numbers of method demonstrations will be arranged during the coming year, particularly the cooling of cream, when the numerous C.D.I.E.G. demonstrations featuring cooling are in operation.

Conducted Tours.

Since the successful initial tour organised by the Division at Toowoomba in April, 1955, which was attended by 450 people, five others were organised and were attended by 1,100 people. The numbers attending and the interest displayed show that this form of field day is very popular with farmers and their families. Tours embrace inspections of the butter factory, improved dryland and irrigated pastures on demonstration farms, modern milking sheds, tower coolers, veterinary demonstrations, dairy research displays, strip grazing, fodder conservation, demonstrations of cleansing of milking machines, removal of milkstone, &c. Conducted tours call for a high degree of organising ability, and when successful, demonstrate a number of recommended practices to a large number of people in a short space of time.

Addresses to Junior Farmers.

The number of talks given to Junior Farmer Clubs was 94 compared with 38 in the previous year; 3,304 junior farmers attended these talks. Slides and films have been shown, field days attended, assistance rendered with Show exhibits and advice freely given. Officers are keen to help these Clubs, it being realised that assistance and encouragement given now will prove very fruitful and beneficial in carrying out effective extension work in future years; a good relationship formed with a future farmer at this stage, when he is receptive to advice and new ideas, will probably continue to exist in the future when he owns his own farm.

Journal, Press and Radio.

These effective extension media are growing in importance and are being increasingly used each year. The following submissions were prepared by officers:—11 articles for the *Queensland Agricultural Journal*, 6 A.B.C. Country Hour Talks, 14 radio tapes for country radio circulation, 16 Press releases and 11 news bulletin items.

District Conferences.

Following the successful innovation of district staff conferences in 1954-55, these were again held in the past year. The Director of Field Service attended conferences at Toowoomba, Warwick, Ipswich, Murgon and Maryborough. At each centre a 2-day meeting was arranged and attended by the Senior Dairy Adviser for the district and the officers under his supervision. Extension work for the year, plans for future extension work and problems connected with field and office duties generally were discussed.

Special Displays.

Two dairy displays were organised by the Division, one at Toowoomba and the other at Warwick. Each display featured dairy equipment, dairy produce and the methods by which high quality produce can be obtained. A very considerable amount of work and organisation was entailed in their presentation. It is estimated that approximately 11,000 saw the Toowoomba display, and approximately 5,500 attended at Warwick.

Photography.

Most officers are now proficient in the use of the camera and as a result the libraries of transparencies in their possession have been augmented. Coloured slides of local interest have contributed materially to the success of illustrated talks.

Dairy Extension Advisory Committees.

Three committees were created during the year. Their primary function is to work in co-operation with the Departmental extension services towards securing the adoption by farmers of recommended practices, particularly those proved by other farmers under similar conditions of soil and climate. These local committees are centred at Oakey, Gympie and Atherton. Their activities indicate that they are energetically attending to a very wide variety of requests from farmers in those districts.

Farm Demonstrations—Dairy Extension Grant.

Most demonstrations under the Grant are centred on improved pastures. Excessive rainfall during the December-March period interfered with the growth and management of many of the improved pastures in projects, while the sowing down of several new projects had to be deferred until next year.

As a result of C.D.I.E.G. demonstrations and the general extension programme, there has been a marked change in the attitude of farmers towards improved pastures. Interest in these projects has been well maintained and the area sown to improved pastures has shown a marked upward trend. The area sown on

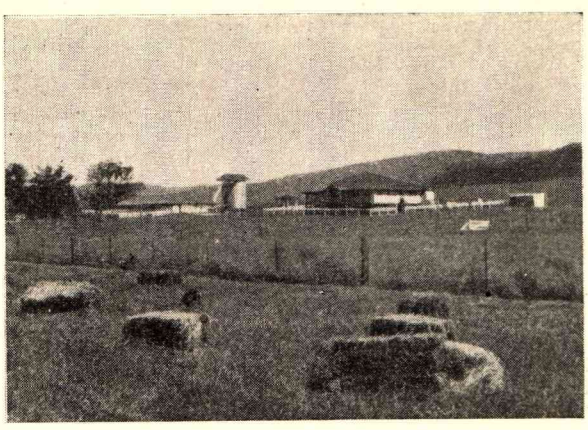


Plate 4.—A Commonwealth Dairy Industry Extension Grant Demonstration Farm.

demonstration farms to the end of June was 1,700 acres, comprising 230 acres under irrigation and 1,470 acres under rain-grown conditions. Pasture Improvement Committees have been set up in six districts and the members take an active interest in the work being carried out on demonstration farms.

Strip-grazing by the use of the electric fence is standard practice on most C.D.I.E.G. farms. Ninety co-operators have been supplied with electric fence units and the practice is being followed by numerous other farmers.

Plate 5.—Strip Grazing on a Demonstration Farm.

C.D.I.E.G. buckrakes were loaned to farmers to make wedge, bun and clamp silos.

At the end of June, 1955, there were 116 projects in operation. Seventeen of these were then terminated and during the year a further five withdrew from the Grant, while 34 new projects were initiated. This provided a total of 128 projects at the end of June, 1956. An analysis of the various demonstrations at the end of June, 1956, showed the following:—rain-grown improved pastures 92, irrigated pastures 23, strip-grazing of crops 6, fodder conservation 6, gully reclamation (soil conservation) 1.

During the year, 20 field days were held on C.D.I.E.G. farms with an average attendance of 100 persons. Wet weather caused the cancellation of some field days and reduced attendance at others.

The printing of an attractive dairy shed poster in five different colours, depicting the salient points to be observed in the production of high quality milk and cream and the care and operation of the milking machine, was completed during the year. The poster, which was financed from Grant funds, is expected to contribute materially to improved quality. It has been sent to Senior Dairy Advisers for distribution to the State's 20,000 dairy farmers.

A special exhibit was prepared for display at the Brisbane Royal National Exhibition in August, 1955. The theme of the exhibit was "fodder and water conservation in relation to increased production".

All co-operators under the Grant receive a copy of the bi-monthly "C.D.E.G. Newsletter." This small publication sets out the results achieved on various demonstration farms as well as items of topical interest.

HERD PRODUCTION RECORDING.

Pure-bred Dairy Stock.

In order to achieve uniformity throughout Australia, the rules governing the recording of pure-bred dairy stock were revised in 1955. The revised rules, which came into force on July 1, 1955, were designed to increase progressively the number of cows in herds under test until July 1, 1957, when the whole of the herd must be submitted. The productive ability of any herd can be evaluated only by the recording of the whole herd, instead of on the records of selected individual cows.

During the past year it was necessary for breeders to submit for recording all cows up to four years of age at the time of calving. The rules also provide for the length of lactation to be increased from 273 to 300 days and the age-production standards to be raised.

During the year, cows from 143 herds were recorded, compared with 134 herds in 1954-55. The number of cows which completed lactation periods is given in Table 1, together with the average production of such cows. The number of cows which completed a lactation period (1,913) is the greatest number ever recorded in one year.

TABLE 1.

AVERAGE PRODUCTION OF PURE-BRED COWS WHICH COMPLETED LACTATIONS, 1948–49 TO 1955–56.

Year.	No. of Cows.	Average Production		
		Milk.	Test.	Butterfat.
		Lb.	%	Lb.
1948–49 ..	1,064	6,783	4·8	323
1949–50 ..	1,064	6,608	4·7	310
1950–51 ..	1,153	5,917	4·6	271
1951–52 ..	885	5,571	4·6	259
1952–53 ..	984	6,247	4·6	290
1953–54 ..	1,375	5,860	4·6	271
1954–55 ..	1,359	6,021	4·8	288
1955–56 ..	1,913	6,304	4.6	292

Of the 1,913 cows which completed a lactation, the production of 966 (50.5 per cent.) was equivalent to or greater than the various age-production standards. This percentage of 50.5 is less than in the previous year, when 51.6 per cent. qualified. During the year 179 cows (8.5 per cent.) were withdrawn from recording for various reasons, compared with 155 (10.2 per cent.) in 1954-55. Details are given according to breed in Table 2.

TABLE 2.

RESULT OF PURE-BRED COWS RECORDED, ACCORDING TO BREED.

Breed.		Total.	Passed.	Failed.	Withdrawn.
A.I.S. ..	No.	766	437	270	59
	%	..	57·1	35·2	7·7
Ayrshire ..	No.	83	51	23	9
	%	..	61·5	27·7	10·8
Friesian ..	No.	24	8	14	2
	%	..	33·3	58·3	8·3
Guernsey ..	No.	76	27	28	21
	%	..	35·5	36·8	27·6
Jersey ..	No.	1,143	443	612	88
	%	..	38·8	53·5	7·7
Total ..	No.	2,092	966	947	179
	%	..	46·2	45·3	8·5

The average production, according to breed, of cows which completed lactation periods of 300 days or less is shown in Table 3.

TABLE 3.

AVERAGE PRODUCTION OF PURE-BRED COWS, ACCORDING TO BREED.

Breed.	No. of Cows.	Average Production.		
		Milk	Test.	Butterfat.
		Lb.	%	Lb.
A.I.S.	707	7,734	4·2	322
Ayrshire	74	7,960	4·3	343
Friesian	22	7,232	3·4	246
Guernsey	55	6,184	4·7	290
Jersey	1.055	5,216	5·2	272

The sixth annual report on pure-bred production recording was published and supplied to all interested dairymen as an aid to the selection of higher producing animals for breeding purposes.

Included in the report was the fourth supplementary list of cows which had qualified for entry into the Register of Merit. These are animals which have produced at a consistently high level over a number of years. The total number of cows which have qualified in each section is—

Elite Section 5. No increase during the year.

Lifetime Section 33. An increase of 7 during the year.

Intermediate Section 175. An increase of 37 during the year.

Goats.

Owing to the increased demand for goats' milk as a food for invalids and children, a production recording scheme was introduced to enable goat breeders to obtain stock of known production from which to breed for the improvement of production of their herds. So far only three herds have been recorded, from which 11 goats completed lactations with an average production of 680 lb. milk, and 24 lb. butterfat. The average butterfat content was 3.5 per cent. An increase in the number of herds to be recorded is expected in the ensuing year.

Group Herd Recording Scheme.

The demand for herd recording continues and during the year, 16 new herd recording groups were formed and two were closed. This brought the total number of groups to 79, including three small ones operating in conjunction with pure-bred recording groups. The number of herds being recorded is approximately 7 per cent. of the dairy herds in the State. Although progress has been satisfactory since group herd recording was introduced, this is a very small percentage when compared with England and Wales, where almost one-quarter of the country's dairy cows are included in the official scheme. In New Zealand also, 25 per cent. of dairy cows are recorded.

Revised rules to govern this scheme came into force on October 1, 1955. These rules bring the technique of herd recording in line with latest developments.

During the group herd recording year ended September 30, 1955, a total of 45,734 cows from 1,266 herds completed lactation periods. The average production of these cows was 348 gallons of milk and 150 lb. butterfat. This is an increase of 16 lb. butterfat compared with the previous year. This year 12.2 per cent. of the herds averaged over 200 lb. butterfat, compared with 7.0 per cent. the year before.

Members of herd recording groups are showing increasing interest in breeding, herd management and pasture improvement, and greater yields are expected in future years.

The staffing of groups with suitable herd recorders has been a problem. During the year 34 resignations were received.

Continuous Recording.—The Herd Recording Section has always advocated that the greatest benefit is obtained if a herd is recorded continuously. A survey of the herds recorded in the 1954-55 recording year shows the benefits derived from continuous recording.

The results are shown in the following table.

Number of Years Recorded.	Average Yield of Butterfat (lb.)
7	182
6	169
5	160
4	151
3	157
2	150
1	140
Average for 1954–55 ..	150

These results show that—

(*a*) Continuous recording results in greater production.

(*b*) The best herds are those that are recorded continuously.

Sire Surveying.—During the year 60 members of herd recording groups applied for surveys of their herd sires. The results show that 40 per cent. of the bulls used in these herds were lowering production. A much larger number of applications are coming to hand for the ensuing year, as farmers realise the value of this service.

Calf Identification.—This service has proved to be popular with herd recording farmers. During the year 9,470 heifer calves from 728 herds were tattooed. The identification of calves allows farmers to keep reliable herd records which will be useful when planning breeding programmes and for sire surveying.

Surveys.—One survey, commenced in the past year, is designed to obtain information concerning the prevalence, treatment, results of treatment, and effect of mastitis on production.

A survey of calf rearing practices and calf wastage was instituted in order to determine the various methods of calf rearing and the rate and causes of calf mortality. Collection of data was commenced during the year.

Information on the use of pure-bred bulls was gathered from members of herd recording groups and shows that 79 per cent. of these farmers use registered pure-bred bulls, of which 53.4 per cent. are from dams which have qualified by production for entry in the Advanced Register of the respective herd books. The herds which have been recorded longest contain the highest percentage of production-backed pure-bred bulls.

A preliminary survey of the effect of the period between calvings indicates that when a cow calves less than 12 months after the previous calving, the production of the subsequent lactation period is affected adversely. A longer period does not appear to be conducive to a greater production than that achieved by a 12-month period between calvings.

Preliminary results of a survey of the length of the dry period show that cows need a dry spell of at least eight weeks before calving, otherwise the yield in the subsequent lactation period is adversely affected. Dry periods of more than eight weeks appear to give little advantage.

The survey into advantages to be gained by seasonal calving has been continued. Increased production is obtained by calving cows in the optimum period, which varies slightly according to districts. A survey taken amongst members of herd recording groups shows that 40 per cent. of these farmers are practising seasonal calving.

Extension Work.—Sets of 51 slides have been prepared for use by field officers. These depict herd recording results, the results of various surveys and the manner in which the information may be applied to farm programmes. A commentary for use with the slides was also prepared. Extension work has been done by means of prepared articles, press statements, meetings, field days and farm visits.

Dairy Farm Competition.—A competition was conducted amongst members of herd recording groups for the period October 1, 1953, to September 30, 1955. The prize money was allocated from the Commonwealth Dairy Industry Extension Grant, and prizes were allotted according to the increase in production obtained during the last 12 months over that obtained during the first 12 months. Economy of production and methods used to obtain the increase were also taken into consideration. Sufficient entries were received from the members of 26 herd recording groups. Some farmers showed an increase of more than 40 per cent. over the previous year's production. The highest increase noted was 87 per cent. Field days will be held on the prize-winning farms so that successful methods can be demonstrated.

SUMMARY OF FIELD STATISTICS.

When considering the totals of farm visits shown in Table 4 it should be borne in mind that rain fell almost incessantly for several weeks in the February-March period and many roads became untrafficable. Nevertheless, despite the rain, officers continued to visit farms wherever the roads permitted travel. The weather, therefore, reduced the number of farm visits and the fact that officers are spending more time on each farm has also made some difference. More time at each farm has become necessary owing to the greater range of subjects for discussion with farmers.

TABLE 4.

SUMMARY OF FIELD STATISTICS, 1955–56.

Districts.	Farm Visits.	Factory Visits.			Suppliers Tests.	Factory Tests.
		Butter.	Cheese.	Milk.		
Brisbane	2,311	203	..	170	218	1,222
Brisbane (milk quality control)	1,419	4	8	330	304	11,166
Darling Downs (Toowoomba)	4,502	196	109	18	6,602	1,183
Rockhampton	2,531	187	..	33	491	2,258
Maryborough	2,523	247	22	106	515	2,712
Murgon	2,029	295	43	2	29	620
Gympie	2,358	274	28	89	769	573
Northern	1,410	91	..	92	233	7,989
Ipswich	2,735	238	..	61	398	3,137
Total	23,643	1,883	265	1,021	13,762	34,070

TABLE 5.

BRISBANE MILK BOARD SUPPLIERS AND FACTORY VISITS.

—	Farm Visits.	Factory Visits.
Milk Board Officers	2,232	1,147
Divisional Officers	3,052	706
	5,284	1,853

A total of 818 orders was issued, compared with 592 last year. These covered temporary closure of unsatisfactory dairy premises, the erection of new premises or renovation of old ones, the cleansing forthwith of premises where hygiene was poor, and cooling of milk or cream. There were four successful prosecutions.

DAIRY RESEARCH BRANCH.

Mr. L. E. Nichols, Director of Research.

In the year under review there has been an intensification of the assistance given by the Branch to the dairy industry. This has met with an increasing appreciation from within the industry of the benefits to be gained from the services of the Branch in relation to everyday practice, and in the solution of the many problems with which the industry is faced. The problems tackled have covered a wide range of chemical, bacteriological and technological aspects, and the work has assisted improvement of processing methods and quality of dairy produce.

A feature of the year's work was the number of investigations associated with farm production methods aimed at improving the quality of milk and cream. The laboratory quality control schemes for butter, cheese and market milk have encouraged factories to seek higher efficiency. Collaboration with officers of the Field Services Branch has continued in the implementation of these schemes.

The new dairy research laboratory at Hamilton was opened during the year. In addition to providing improved facilities for research work on butter quality problems, this laboratory will permit more routine chemical and bacteriological tests under the Butter Improvement Service to be made.

Wide interest has been displayed in overseas dairying developments as a result of 35 illustrated talks to various dairying organisations throughout the State. A number of practices observed in other countries by the Director of Research are being tried and encouragement given to their wider application. Already a number of Dairy Associations are appreciative of the value of overseas developments in relation to greater economy in production and factory processing, better milk utilisation and presentation of products for sale.

INVESTIGATIONS.

The majority of investigations have been designed with a view to assisting improvement in production and processing methods and aiding quality improvement, both chemically and bacteriologically.

Milk Composition and Feeding.

There is increasing evidence to support the belief that the composition of milk is influenced by the nutritive level of the rations fed to the cows and the kind of foodstuffs. The lack of green feed during the late winter and early spring months is thought to be the main cause of a marked decline in the fat and solids-not-fat percentages in milk supplied from the Brisbane milk district during the period of the year referred to. The trends of variation have been examined closely on three farms in the Beaudesert district. On the Darling Downs the decline in milk constituents appears to become more marked in January and February, when drier pastures are prevalent.

During the year under review, feeding trials have been done with the object of improving the solids-not-fat content of market milk. On one farm within the Brisbane milk district a 6-weeks trial in August-September, feeding freshly cut, high quality baled lucerne hay at the rate of 20 lb. per cow per day, resulted in only a slight rise in the solids-not-fat content of the milk, but a considerable improvement in overall production and in fat percentage, especially in the morning milk, was effected.

A trial was commenced in July on a second farm where a mineral supplement (sterilized bonemeal with a trace of potassium sulphate) was fed. No significant response in the solids-not-fat content of the milk was recorded for 2 months, but thereafter a consistent improvement in this milk constituent was obtained. The fat percentage in the morning milk of the fed animals was definitely improved. The fat percentage of the morning milk from the fed animals increased from 3 per cent. to 4.3 per cent. The solids-not-fat percentage rose from 7.6 per cent. to 9.1 per cent., whilst the controls remained comparatively constant.

Perhaps the most interesting feature associated with the mineral feeding trial, however, was the apparent lengthening of the lactation period (up to 2-3 months) of the cows receiving the supplement. This and other aspects are now receiving further consideration. Further confirmatory experimental work in conjunction with the Cattle Husbandry Branch is now under way, using identical twins, to assess the effect on milk composition of potassium in supplementary mineral feeding.

On two farms on the Darling Downs supplying milk to cheese factories, a summer pasture comprising lucerne, green panic and perennial prairie grass has been established. The object of this demonstration is to assess the value of the pasture mixture in improving milk composition for cheese manufacturing purposes during the summer months, when cheese yields normally decline. To date, results show a 5-10 per cent. increase in production and a rise of up to 0.3 per cent. in each of casein, total protein and solids-not-fat. Apart from securing 2-3 months' grazing, considerable quantities of baled lucerne hay have been conserved from the pasture. The results indicate the value of providing the cheaper perennial lucerne-grass pasture mixture for grazing during the summer months in preference to the more costly annual crops of sorghum and Sudan grass.

The beneficial effect of such a pasture on milk composition to date justifies extension of the practice. Accordingly, the work is being extended to include five farms. It has been estimated that for one Association treating 5,000 gall. of milk daily a rise of 0.3 per cent. in the casein percentage could result in an increased return of approximately £3,000 annually.

Solids-not-fat Content of Milk.

There is a growing appreciation of the value of the non-fat solids of milk in other dairying countries of the world and this appreciation is extending to Queensland. Contrary to past belief, it has been shown that the fat and solids-not-fat content of milk do not always vary proportionately. Often a high fat percentage accompanies a low solids-not-fat percentage. Feed capable of raising the fat percentage does not necessarily raise the solids-not-fat. In fact, at times there is a depressing effect.

Because of the prevalence of low solids-not-fat percentages in milk supplies irrespective of the fat content, the survey of the solids-not-fat content of milk has continued in three herds on the Darling Downs and three herds in the Brisbane-Beaudesert districts as well as on Regional Experiment Stations. Milk analyses have shown that the solids-not-fat percentage has a marked seasonal variation, the decline coinciding with a lack of green pasture. The extent of individual cow variations within the same herd has also been examined and found to vary widely, irrespective of the fat percentage.

It is thus increasingly evident that a rapid field test for the accurate determination of solids-not-fat in individual cow's milk, similar to the Babcock test used in herd recording, is necessary if a practical solution to the problem is to be achieved. The C.S.I.R.O. is undertaking the development of such a test, as the problem is one of importance to all States.

In survey work, three methods of determining solids-not-fat contents have been compared by the Branch, viz., lactometer, density hydrometer and drying. So far reasonably good agreement has been obtained

between the density hydrometer, the B.S.S. method and the A.O.A.C. drying method. However, occasionally discrepancies of up to 0.3 per cent. occur with individual cows; this justifies further examination of the methods, formulae and techniques.

Recombined or Reconstituted Milk.

Further trials were carried out with recombined or reconstituted milk and three batches were prepared during the year, mainly with a view to effecting refinements in processing and greater economy.

As a result of experience gained from the previous year's work, plans were drawn up in association with the Queensland Butter Marketing Board to help in the design of reconstituted milk plants for South-East Asia approved under the Colombo Plan; information on chemical and bacteriological standards of quality for the raw materials used was also provided.

During the year it was also found possible to reconstitute all constitutents on the same day without materially affecting flavour, provided the milk was held 24 hours before distribution. Previously, low temperature pre-heat skim-milk powder was held in solution overnight prior to reconstituting with butteroil.

A noticeable greyish-brown residue in earlier batches of reconstituted milk was reduced by efficient filtering, but not entirely eliminated. The residue is characteristic of milk following homogenisation, and clarification seems the most likely method of overcoming this peculiarity. The flavour of reconstituted milk appears to be improved by the addition of a trace of sodium chloride and further trials along these lines have been planned. The product, chemically and bacteriologically, compares favourably with normal milk and has distinct possibilities for use in western areas of the State and tropical countries where fresh milk is not readily available.

BUTTER.

pH and Keeping Quality.

Following a series of experiments conducted at Gatton College last year, a further series is now being carried out to ascertain what effect the serum pH has on the keeping quality of butter. In the initial trials 23 churnings of butter were made with three different pH ranges in each group—6.8-7.2, 7.3-7.6, and 7.7-8.2. The butters were examined fresh, after four weeks' storage and again after storage for six months. Neutralisation of the cream was effected with caustic soda. The results of these experiments suggested that more alkaline butters (that is, with a pH about 8.0) had superior keeping quality to those with a pH about 7.0. However, the practicability of the method was doubted and now a series of experiments has begun using normal factory neutralisers, sodium sesquicarbonate and sodium bicarbonate. Results to date indicate a similar, although more limited, trend than that obtained in the initial trials.

pH and Fat Losses and Bacterial Growth.

Overseas experience has shown that the higher the pH the higher the fat losses in the buttermilk. This aspect is also being examined at Gatton and results seem to be confirming overseas findings. It thus seems necessary to further examine a pH range giving sound economy with good keeping quality. Another aspect under investigation is the possibility of a high pH favouring bacterial development. Whilst there appear at present to be no significant differences in total plate counts of butter of the various pH ranges under trial, the predominance of any particular type of bacteria has yet to be assessed.

Cream Treatment Unit Trials.

This new method of cream pasteurisation has been introduced into Queensland by two factories. The principle of operation differs from the majority of cream processing methods in that the current of steam is passed in counterflow to the current of cream. This ensures favourable conditions for steam distillation of taints from cream.

Trials have been designed to determine the ability of this unit to process creams of varying quality. In all, 8 churnings of good choice, 11 churnings of fair choice, and 8 churnings of borderline quality choice cream have been prepared. With each quality, the degree of heat treatment has been varied between low, medium and high intensities. In all cases, the bacteriological results following heat treatment were satisfactory.

The fresh butter grading results are as follows:—

Quality.	Churns.	Treatment.	Degraded.	Average Score.
Good	1	Low	0	93·50
	5	Medium	1 (weed)	92·60
	2	High	0	93·00
Fair	4	Low	1 (weed)	92·75
	4	Medium	1 (weed)	93·00
	3	High	0	93·00
Poor	3	Low	1	92·66
	2	Medium	0	93·00
	3	High	0	93·00

The results can be considered satisfactory and indicate the benefits to be achieved by the more intensive treatment of the fair to borderline quality choice grade product. Twenty-one butters have also been examined after two months' storage and 12 after cold storage for six months. In all, butter flavour, texture, chemical composition and bacteriological quality have been satisfactory.

Butterfat loss estimations showed a range of 1.0 to 1.7 per cent. in 30 normal churnings. The average loss was 1.3 per cent. For the degree of intensity treatment this average figure is quite satisfactory. Steam consumption demands of the unit have varied from 1.9 to 3.3 lb. of steam per gallon of cream. An estimation of steam consumption in terms of wash steam has been made. It varied from 1.2 to 1.5 lb. per gall. for low intensity, 1.6 to 2.0 lb. per gall. for medium intensity and 2.1 to 2.6 lb. per gall. for high intensity of treatment. These consumption rates are satisfactory in relation to the type of cream being processed and the true-to-grade results which have been obtained on the resultant butters.

Churn Barrel Preservation.

Churn barrels made from locally produced timbers have shown a rapid deterioration due to fungal rots, and efforts are being made to lengthen their working life by applying suitable fungicides to the wood at the time of assembly.

In conjunction with the Forestry Department, two fungicide preparations are being tried—zinc naphthenate with a top coating of a plasticised resin; and a sodium salicylanilide salt with a top coating of an imported plastic. Both have been applied to all external surfaces, as well as the tongues and grooves, prior to erection. It was noted in the first barrel treated that fungal deterioration appeared to originate on the untreated tongues and grooves. These edges have been treated in the three churns now undergoing trial and better results are anticipated.

The investigation is necessarily a long-term project and observations will continue. North Queensland kauri pine is particularly susceptible to fungal rot, and whilst the matter of a suitable fungicide is receiving attention, it has been suggested that teak for churn-making be imported into this State.

CHEESE.

Cheese Packaging.

The field of packaging of rindless cheddar cheese has been explored with a view to making available to the industry information on the latest packaging methods and materials. This work was prompted by the need for eliminating the waste involved in producing cheese with inedible rind, as well as by the necessity to improve the appearance of cheese for retailing purposes. The application of the findings could assist in increasing the local sales of cheese.

By employing a multi-use press cloth in place of the normal cheese bandage, rindless cheese has been produced in both cylindrical and rectangular shapes, in sizes ranging from 1 lb. to 40 lb. Five distinct packaging materials have been under trial.

The most promising results have been obtained using a rapidly shrinkable plastic vinyl vinilidene chloride. Shrinkage losses with this material were considerably less than with normally waxed cheese. There was no evidence of rind flavour and this type of packaged

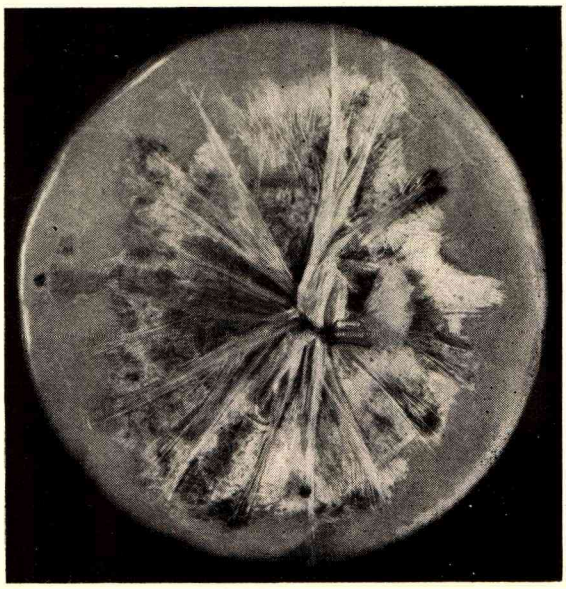


Plate 1.—A Poorly Packaged Cheese.

cheese proved resistant to infestation by cheese mites. Slight moulding occurred with some cheese, but modifications in clip closure and the reduction of seam stress in the covering agent appeared to reduce the incidence of mould growth (Plate 1). Exposure to high temperatures for short periods did not materially affect the packaged cheese or its appearance. The rate of flavour development was similar to that in waxed cheese, although the body appeared weaker after curing. The distension of some packages by an excessive rate of gas production was observed. However, it appears necessary to manufacture a cheese which while maturing evolves gas at no greater rate than the rate of diffusion of the gas through the packaging film. Already two large Cheese Associations are using the material in commercial practice.

A transparent rubber derivative tried showed a very high proportion of moulding within a week of wrapping the cheese. A wax-coated plastic wrapper gave better results than the rubber derivative, particularly if the wrapper was heat-sealed. A polythene film has also been used in bag form, some bags being vacuumised and clip sealed. Two different gauges of film were tried but in both instances mould growth developed extensively within 14 days. Observations on the use of laminated aluminium foil for wrapping cheese have been made, and although costly the method has proved satisfactory with heat-sealing.

Inhibitory Factors in Cheese-Milk.

"Slowness" in cheese manufacture is undesirable and adds to costs due to overtime worked by factory staffs. Apart from the effects of bacteriophage and antibiotics such as penicillin, inhibitory factors occur in cheese milk which can cause delayed working of the starter cultures.

A study of these factors has commenced which it is hoped will give a fuller explanation of the activities of some starter strains in relation to cheese milk. Some such factors are activated by rennet whilst others are inhibited. Others operate in the whey stage of cheese manufacture, but not in the curd state. Already some evidence is to hand which indicates the fallacy of conducting an activity test wholly in milk and using such results to predict the suitability of starters for cheese manufacture.

Shortened Process Cheesemaking.

Further work with the short process for cheddar cheesemaking has been carried out with a view to obtaining more information regarding the factors affecting the pH of this type of cheese. Earlier work had suggested that proper control of the pH attained by the cheese was difficult but essential for the consistent production of cheese of good quality.

A total of 10 vats of cheese was manufactured by the modified short process in trials of the effect of the amount of thermoduric starter used on the rate of acid development and the pH attained by the cheese. A number of vats of cheese were manufactured using 1 per cent. of *S. durans* starter. Working to the same time schedule but employing 2 per cent. of *S. durans* with the same amount of the normal starter, a further number of vats of cheese was manufactured. A pH test was performed on all cheese at 1 day, 5 days, 9 days and 14 days from the date of manufacture. The result showed that increasing the amount of *S. durans* used increased the rate of acidity development during manufacture and decreased the pH of the cheese. The use of a more active heat-resistant starter, TS2, was found to decrease the pH of the cheese even when similar running acidities were employed. Further manufacturing trials are to be carried out to ascertain how the most suitable pH for this type of cheese can be best attained with consistency.

Cheese Yield Investigations.

This study, having as its objective elucidation of the factors responsible for variations in the cheese-yielding capacity of the milk supplies, is of considerable economic importance to the cheese industry.

The following factors have been under observation:—

(1) Seasonal influence on cheese-milk composition.

(2) Influence of animal feeding on cheese-milk quality.

(*a*) Natural pasture (Category 1).

(*b*) Crop feeding (Category 2).

(3) Role of milk components in cheese-yielding capacity of milk.

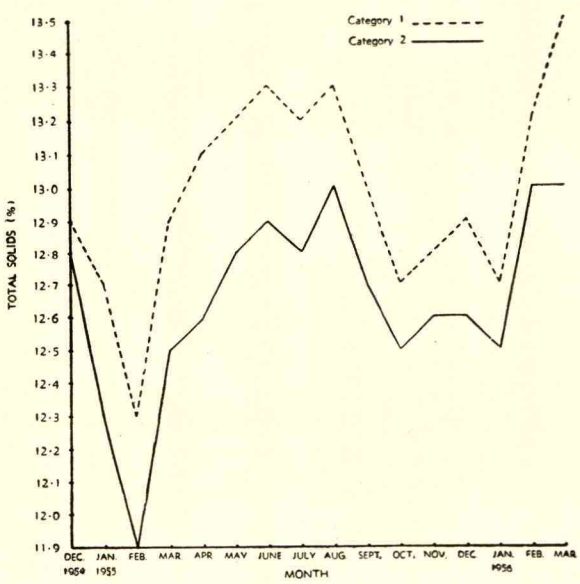


Fig. 1.—Total Solids Content of Cheese Milk from Cows on Natural Pasture (Category 1) and Crops (Category 2).

A total of 17 vats from each category has been examined. The seasonal pattern is now clear and it appears quite dissimilar from that shown by data published for other countries and even from that deduced from results for the rest of this State. The main points revealed are (1) the fat content does not show any definite pattern and is fairly constant; (2) the casein, solids-not-fat, total protein, total solids and yield of cheese follow a similar general trend, with large seasonal variations. Fig. 1 shows the trend for total solids. Previously research workers believed that the casein content generally followed the pattern of the fat content. However, evidence now indicates that the casein content is independent of the fat, as the following table shows:—

Fat.	No. of Results.	Average Casein.	Average Solids-not-fat.
%		%	%
3·6	1	2·76	9·20
3·8	8	2·56	8·76
3·9	7	2·56	8·84
4·0	9	2·60	8·88
4·1	5	2·47	8·84
4·2	3	2·63	8·90
4·6	1	2·67	8·96

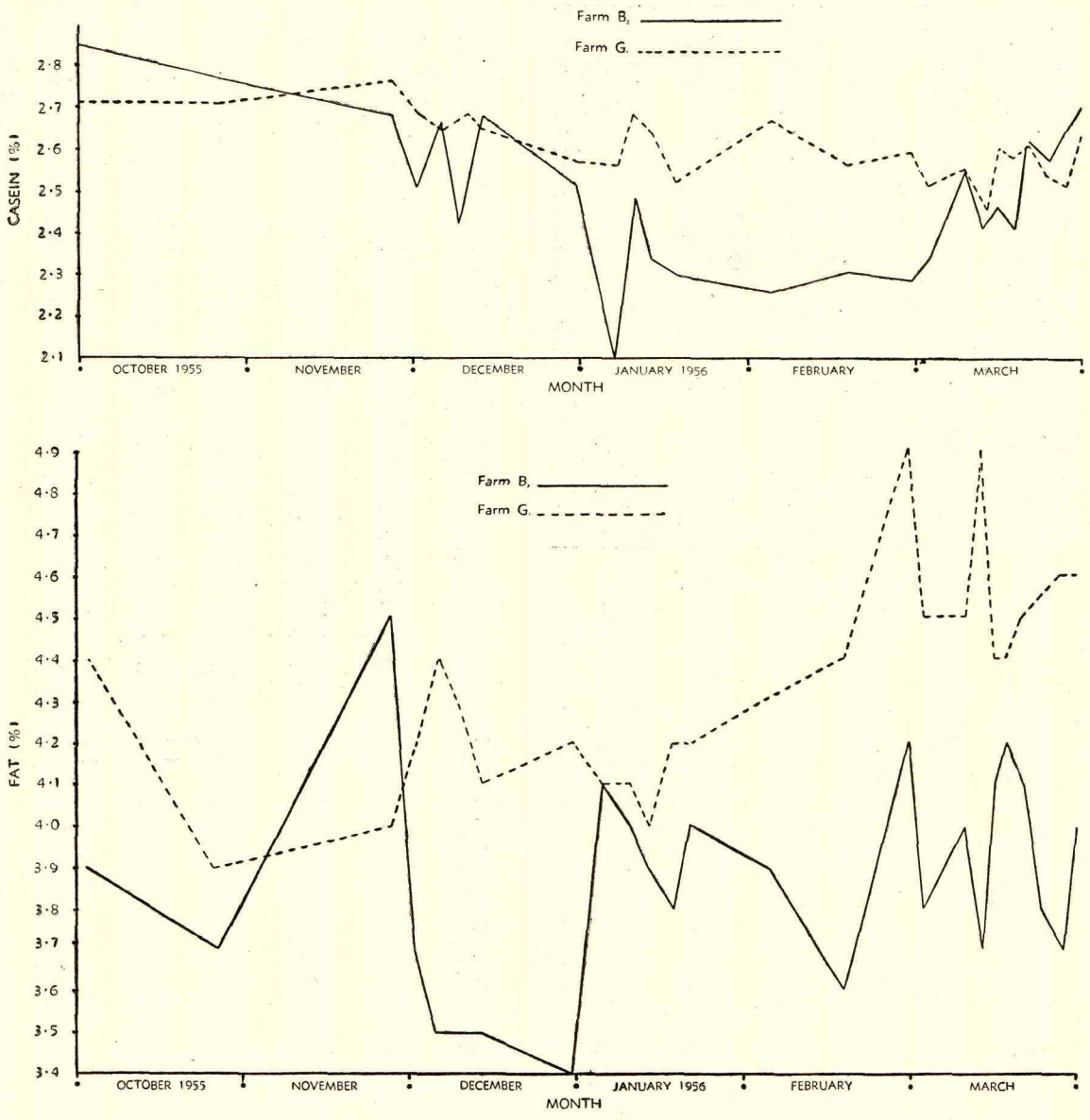


Fig. 2.—Graphs Showing Effect of Feed on Casein and Fat Contents of Cheese Milk. Farm G fed paspalum pasture; farm B sorghum and sudan grass crops.

The casein percentages are at their lowest in January and February, whilst the period of low yields extends from October to March inclusive. Yields in Category 1 with natural pasture were superior to those of Category 2 with crop feeding (sorghum, Sudan grass &c.). It was decided to select three farms from each category and try to correlate feeding practices with milk composition. Again a significant difference in the cheese-yielding capacities of the milks from farms in Category 1 and Category 2 was evident. The average differences were 0.4 per cent. fat and 0.23 per cent. casein.

Marked improvement in the cheese-yielding capacity of milk from cows was also shown when oats was fed as a winter feed, as compared with milks from cows fed on Sudan grass or sorghum as a summer feed. It would appear that Sudan grass and sorghum as summer feeds are inferior to oats as winter feed. There is evidence that paspalum pasture is superior to the summer fodders (Fig. 2), and, in fact it compares favourably with oats fed during the winter.

Evidence to date suggests that improved pasturage may improve the casein content. Consequently, improved pastures were laid down and the milk from cows fed thereon compared with that from a nearby control farm. Comparisons were also made with the milk before and after the improved pastures were fed. On two farms, a mixture of lucerne, green panic and perennial prairie grass was planted and a good pasture established. To date promising results have been obtained, but more evidence is necessary before assessing their value.

MARKET MILK.

Keeping Quality of Pasteurised Milk.

The value of good keeping quality in pasteurised milk needs no emphasis. However, there are a number of aspects of the keeping quality test for pasteurised milk which are worthy of investigation, particularly as it has now superseded the plate count for official standards in a number of overseas dairying countries. Difficulties in maintaining critical temperatures and the temperature effect have never been examined nor suitable apparatus designed for the conduct of the test, especially under tropical conditions. The effect of allowable variability in holding times and the effect of the bacterial flora have also to be examined, particularly in relation to Queensland conditions. The work may enable a more suitable keeping quality test to be derived for use in this State. For this reason, special equipment has been designed which will enable all aspects of the test to be thoroughly examined. The series of constant-temperature water-baths, accurately controlled and giving a gradation of temperatures, is to be used in this work.

Laboratory Quality Control.

The laboratory quality control of market milk has been continued in association with officers of the Field Services Branch. Samples of raw and pasteurised milk, vendors' raw milk, bulk tanker milk and market cream have been examined in connection with the work carried out by the Branch on behalf of the Brisbane Milk Board. A large number of milks, both farm and tanker, have also been received and tested for evidence of adulteration.

The microscopic examination of smears of low-quality raw milk has continued in the laboratory. In addition, the weekly examination of samples of market cream was introduced.

Raw milks from local suppliers and bulk milks from country depots have been tested regularly for methylene blue reduction times and butterfat content at the receiving depot.

Details of the samples examined in connection with the control of market milk and comparative figures for the preceding year are set out below:—

SUMMARY OF MILK AND TABLE CREAM EXAMINATIONS.

	Totals.	
	1954–55.	1955–56.
Bottled pasteurised milk—		
Plate counts	1,698	1,742
Coliform tests	2,863	3,169
Phosphatase tests—		
Number	1,567	1,551
Percentage negative	99·7	99·94
Fat tests—		
Number	1,654	1,831
Average fat percentage	3·86	3·90
Solids-not-fat—		
Number	1,280	1,463
Average percentage	8·63	8·58
Microscopic examinations	7,342	5,287
Raw milk at depots—		
Methylene blue tests—		
Number	263,627	361,559
Percentage below 4 hours	6·2	6·24
Fat tests—		
Number	83,618	103,924
Percentage below 3·3%	2·6	2·84
Bulk milks from country depots—		
Methylene blue tests	6,725	6,363
Fat tests	3,665	5,284
Bulk tanker samples tested in laboratory—		
Methylene blue tests	324	366
Fat tests	342	372
Raw milk producers' samples—		
Methylene blue tests	632	654
Fat tests	617	633
Bottled pasteurised cream—		
Plate counts	..	98
Coliform tests	..	108
Phosphatase tests—		
Number	..	113
Percentage negative	..	79·6
Fat tests—		
Number	..	115
Average fat percentage	..	37·4
Factory surveys	64	64
Total number of tests	375,954	494,632

Raw Milk Quality.—In the past year there has been a considerable increase in the number of methylene blue tests performed at processing depots and country receiving depots. The percentage of samples failing this test (6.2) is the same as for the previous year. It indicates that most of the raw milk supplied has been of good bacteriological quality. Microscopic examinations of low-quality milks have been made in the laboratory and the results of these tests, giving the probable causes of low quality and advice on remedial action, have been sent to the suppliers. The percentage of milks failing to reach the minimum legal standard of 3.3 per cent. fat was 2.8, compared with 2.6 per cent. in the previous year.

The monthly testing in the laboratory of samples of bulk milk supplies has been continued, 380 samples having been examined for methylene blue reduction time, fat, milk solids and freezing point.

The regular sampling and testing of milk from raw milk vendors has been continued. Of 654 samples examined, 8 per cent. had a methylene blue reduction time of less than 4 hours. This is less than in the previous year. Microscopic examinations of all milks of low quality have been made and the results included in the reports sent to the producers. Of these samples, 6 per cent. were below the 3.3 per cent. standard for fat.

There is increasing evidence to support the contention that the methylene blue test applied to raw milk is a reliable indicator of cooling efficiency on the farm and that the thermoduric plate count of raw milk is a further useful indication of contamination from dairy utensils. Consequently, more use is being made of both tests for the examination of milk for its suitability for the pasteurised milk trade. Milk samples examined for adulteration totalled 686. These samples were the result of screening following field tests, and as such the percentage positive to the freezing point test is necessarily high. When the samples were tested in the laboratory 21 per cent. showed evidence of added water. Appropriate action was taken by the Milk Board.

The following table shows the improvement in quality of raw milk supplies:—

Month.	Methylene Blue Tests. Percentage Milks failing 4 Hour Standard.	
	1942–44.	1955–56.
July	7·7	3·0
August	6·5	2·1
September	10·1	3·4
October	17·0	7·0
November	35·6	7·2
December	53·0	8·1
January	60·5	9·8
February	57·1	11·3
March	24·3	9·6
April	16·3	6·3
May	8·7	5·6
June	7·3	3·6
No. of tests	95,000	300,000

The improvement shown is enhanced by the fact that supplies have been continually expanding. This improvement has been due in no small measure to the milk quality improvement services provided by the Milk Board and the Department of Agriculture and Stock. Whilst there has been improvement in the quality of the milk produced there has also been improvement in the transport and handling of the milk, and more especially in the cooling of milk on the farms, particularly in farm refrigeration. Farm refrigeration is also aiding improvement in compositional quality because it enables the delivery of the night and morning supplies together.

Pasteurised Milk Quality.—The results of the phosphatase test show that a very high standard of pasteurisation efficiency has been maintained by all processing depots, only one sample of the 1,551 examined showing evidence of under-pasteurisation. During the year, the Aschaffenburg-Mullen method of phosphatase testing was introduced, thus considerably increasing the ease of conducting the test and giving greater reliability of results.

Many samples of pasteurised milk still show high plate counts, only a small proportion of samples having counts less than 100,000 per millilitre. The high counts are due to the presence of thermoduric organisms, which, however, do not adversely affect the keeping quality of the pasteurised milk. Approximately 6 per cent. of samples failed the keeping quality test, the storage used being 24 hours at 18-20 deg. C. Thermoduric counts are being made on milk from individual suppliers in order to locate those milks containing large numbers of thermoduric organisms.

Presumptive coliform tests have been performed on 10 ml. and 1 ml. of pasteurised milk samples, the 10 ml. test being used as an advisory test to warn the factories of traces of contamination in the bottled product. Of the samples tested, 11.6 per cent. showed coliforms present in 1 ml.

All pasteurised milk samples were examined for butterfat content, total solids and solids-not-fat. The average butterfat content was 3.90 per cent. The average solids-not-fat content was 8.55 per cent., which is slightly lower than the average for the previous year. The monthly average for solids-not-fat for samples from all factories was below 8.5 per cent. on three occasions—for the months of August and December, 1955, and April, 1956.

The testing of samples for the immigration authorities and defence forces on behalf of the Commonwealth Government has continued. During the year, 60 such samples were examined for plate count, *E. coli*, keeping quality, phosphatase, added water, butterfat and milk solids. A high standard of quality was evident from the results of these tests.

Cream Line.—There is a tendency to accept the cream line on bottled pasteurised milk as an indicator of milk quality and its richness. This method of examination can be misleading. The actual results of chemical and

bacteriological analyses show that the standard of milk quality generally is very satisfactory. Efficient and intensive methods of processing can affect the cream line, but are without effect on the fat content and nutritive value of the milk. Most authorities now object to cream plugging and favour homogenisation for uniformity of milk composition.

During the year, 64 surveys of milk pasteurising plants were made to check their efficiency and to locate sources of contamination.

Pasteurised Cream Quality.—A system of routine laboratory quality control has now been applied to cream marketed for the table trade. As there are as yet no standards for such control, it is hoped that the work done will furnish a basis for evolving such standards as well as showing the overall picture in respect of cream quality.

Samples of pasteurised cream were received each week since October from each of the Brisbane processing depots. These samples have been examined for plate count, coliforms, phosphatase and fat content.

The bacteriological results have indicated that there is need of improvement in market cream quality, as 20 per cent. of samples failed the phosphatase test. At present there seems to be no reason to doubt the reliability of the phosphatase test when applied to cream, provided the sample is examined within a reasonable time after processing. All samples were examined for coliforms in 1 ml. and 10 ml. of cream, and 77 per cent. of the samples had coliform organisms present in 1 ml. Plate counts of many samples were very high.

The fat percentage was above the legal minimum of 35 per cent., the average being 37.4 per cent.

Phosphatase Test for Milk.—Investigations into the use under Queensland conditions of the Aschaffenburg-Mullen phosphatase test for milk were concluded, and the results prepared for publication in the *Queensland Journal of Agricultural Science.*

Trials covering 12 months show that the new test is easier to perform, quicker, more convenient, and appears to be at least as sensitive as the Kay-Graham test. The method has also been provisionally approved for inclusion in the Food and Drug Regulations.

BUTTER IMPROVEMENT SERVICE.

Examination of butter samples under the Butter Improvement Service was continued during the year to provide information for control and advisory services.

Routine Control.

Chemical.—Routine moisture and salt determinations were carried out on 1,481 samples of butter, of which less than 1 per cent. were found to be over-moisture. The average chemical composition was moisture 15.58 per cent., salt 1.37 per cent., curd 0.88 per cent., and fat 82.17 per cent. A fairly good standard of composition control by most factories was shown. There is, however, room for improvement to achieve the ideal of 15.8 per cent. moisture. A total of 699 butters was examined for pH determinations and gave a mean pH of 7.65, differing little from the previous year. The trend to an alkaline butter for better keeping quality is indicated.

Bacteriological.—An average bacteriological quality index of 245 out of a possible 400 resulted from the bacteriological examination of 1,481 samples of butter. This represents a fair standard of hygiene in butter factories, but still leaves much room for improvement.

Microscopic Examination.—The standard of butter working, as judged by the microscopic examination of the butter, continues to be very good. This is important if bacteriological spoilage is to be reduced to a minimum. Of 1,481 samples, 77.3 per cent. were well worked.

Extraneous Matter.—Because of the importance attached to extraneous matter tests by overseas authorities, all routine butter samples are being subjected to such examination. So far 744 tests have been made, with the following results based on the Commonwealth official classification.

——	Clean.	Fairly Clean.	Dirty.	Very Dirty.
Number of tests	176	435	88	45
Percentage of total	23·7	58·5	11·8	6·0

To help factories overcome the presence of extraneous matter, a number of factory surveys were carried out to determine the most important sources. Results showed the main causes to be salt, water, coal dust, and dust accumulation on equipment. To overcome the problem of extraneous matter in dairy salt, there is need for improved packaging with an inner plastic liner in the salt bag.

Miscellaneous.

Variability in Butter Moisture Tests.—Because of variations between factory and official tests for moisture in butter, efforts have been made to standardise testing procedures and to check sampling methods and equipment used. Some differences have been due to faults in balances and weights and others due to delays in testing. The effect of condensation on samples during testing is also being examined.

Local Pat Butter.—Chemical and bacteriological examinations of pat butter for local consumption in Brisbane have been performed each week. Results show a generally satisfactory standard of chemical and bacteriological quality.

Unsalted Pat Butter.—Assistance has been given to the Butter Marketing Board in the development of an unsalted pat butter for export. Earlier consignments of this product did not appear to maintain their quality. However, modifications introduced involving a lower pH, a higher degree of working and an efficient wash water treatment are now giving pat butter with good keeping quality.

Fat in Buttermilk Powder.— The fat content of buttermilk powder continues to remain high, varying from 12 to 15 per cent. and indicating a high fat loss in buttermilk after churning. Considerable variation between batches occurs and seems to be associated with a widely variable fat content in the cream at churning.

Other investigations concluded or in progress include an examination of the accuracy of cream sampling for fat testing at butter factories; metallic taint in butter; fuel economy experiments using steam-metering equipment; and control of insect infestation of stored buttermilk powder.

CHEESE IMPROVEMENT SERVICE.

The Branch has continued to provide cheese starter cultures to all cheese factories in the State and a total of 790 cultures was distributed, mainly in the liquid form and occasionally as freeze-dried cultures. Where factories are situated at great distance from the laboratory, freeze-dried cultures are favoured.

There is an increasing tendency by factories to use mixed-strain starter cultures. Coincident with this tendency, starter contamination has increased and there has been a higher incidence of failures due to bacteriophage. Such a tendency is regrettable, because apart from the effect of contamination on starter and cheese quality it becomes increasingly difficult to combat vat failure due to phage. It also becomes virtually impossible to recommend a single-strain rotation to overcome failures where mixed strains have been previously used. This trend also indicates that some factories may be relaxing the care taken with starter propagation methods.

Of 23 cultures available for distribution, only four have been classified as slow acid producers. Some of the cultures have been shown to be not distinct in their phage relationships. These relationships have been taken into account, together with the rate of acid production and regularity of working, to develop the best possible rotation for use by cheese factories. Quarterly circulars are being prepared to keep cheesemakers and field staff alike up-to-date on all matters relating to cheese starters and bacteriophage.

An experimental cheese vat has been designed and made and this will allow small-scale experiments with fancy cheese. Cultures of *P. roquefortii* have been obtained and are being tested prior to use in the manufacture of a blue mould variety of cheese.

Other problems receiving attention include "cracked rinds" in cheese and a processed cheese emulsification problem.

FACTORY SURVEYS.

Laboratory officers made 139 visits to butter and cheese factories. The surveys were made in an effort to pinpoint the source of specific problems, such as quality defects, bacterial contamination, faults in manufacture, water treatments, presence of extraneous matter, starter propagation methods, and phage control.

MILK AND CREAM QUALITY IMPROVEMENT DEMONSTRATIONS.

From funds provided by the Commonwealth Dairy Industry Extension Grant, demonstrations have continued on selected farms with a view to aiding the improvement in quality of milk and cream.

Dairy Farm Detergent Demonstrations.

Contamination from dairy utensils is still the principal cause of most milk and cream defects. Consequently, demonstrations with improved types of dairy detergents, as aids to the more effective cleaning of dairy equipment, have been continued.

In addition to the eight detergent mixtures demonstrated in 1954-55 and the three demonstrated in the previous year, a further three methods were tried on 12 farms during the past year. The demonstrations were of (1) the alkali-acid technique using citric acid and a wetting agent with the alkali; (2) the alkali-acid technique using phosphoric acid and a wetting agent with the alkali; (3) the use of sodium metasilicate and a wetting agent for 6 days and of phosphoric acid once weekly as in methods 1 and 2.

Each method is being used with and without recirculation through milking machines. These methods are proving popular with farmers and their use is rapidly extending.

The technique in each method involves the use of alkali for 6 days and of the acid on the 7th day to facilitate removal of milkstone.

Method 3 has been developed with the object of overcoming the problem of hard water supplies, which are so prevalent in Queensland. Sodium metasilicate minimises precipitates with hard farm waters and so reduces the accumulation of milkstone on equipment.

Recirculation Cleaning.

This method (Plate 2) is being demonstrated on nine farms throughout Queensland and is proving useful for cleaning and sterilizing milking machines. When correctly used with the appropriate alkaline and acid cleaning compounds, it will permit the plant to be maintained in a satisfactory condition.

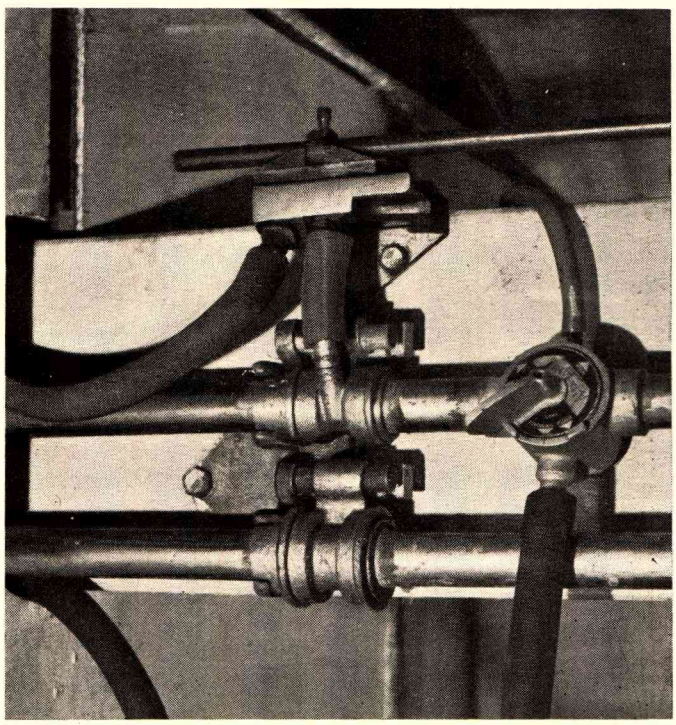


Plate 2.—A Recirculation Cleaning Device for Milking Machines.

The method allows best use to be made of a limited quantity of water because of a longer contact time between the equipment and detergents and chemical sterilants. For this reason, it has advantages over the standard rinsing method, quite apart from the convenience of the method.

The visual results are comparable with those obtained with the standard methods when they are supplemented where necessary with periodic acid treatment and brushing. The efficiency of the method was also confirmed bacteriologically.

It should be emphasised that whilst recirculation may provide a means of increasing the efficiency of cleaning and sterilizing equipment without dismantling, the method does not offer short-cuts in the basic principles to be applied.

Milkstone Removal.

Under Queensland conditions, where hard water supplies are prevalent, the normally practised phosphoric acid method of removing milkstone has proved unsatisfactory.

It has been demonstrated that phosphoric acid resistant deposits, as well as other deposits, can be easily softened by 5 minutes' recirculation of 9 oz. of concentrated hydrochloric acid in 2 gallons of water at 190 deg. F. This is followed immediately by 2 minutes' recirculation with 2 level tablespoons of sodium metasilicate per 2 gallons of water at not less than 190 deg. F. The plant is then brushed and rinsed with water at not less than 190 deg. F.

The method has helped to reduce the plate count of thermoduric bacteria on some farms supplying market milk.

Farm Cooling.

Equally as important as the effective cleaning of dairy equipment in the production of high quality dairy produce is the farm cooling of milk and cream. At present, five different arrangements of farm coolers are being tried on 30 farms with a view to determining the most economical yet efficient method. They include:—

(1.) A water-cooling tower which provides for the shock cooling of milk.

(2.) A smaller water-cooling tower which provides for shock cooling, with extension of the pit underneath for cool storage of cream.

(3.) A charcoal cooler for cream storage without precooling.

(4.) A combined water-cooling tower and charcoal cooler which allows for shock cooling and cool storage of cream in the charcoal cabinet. (Plate 3).
(5.) A water-cooling tower from which the water is diverted to a concrete trough in the dairy where the cream is stored.

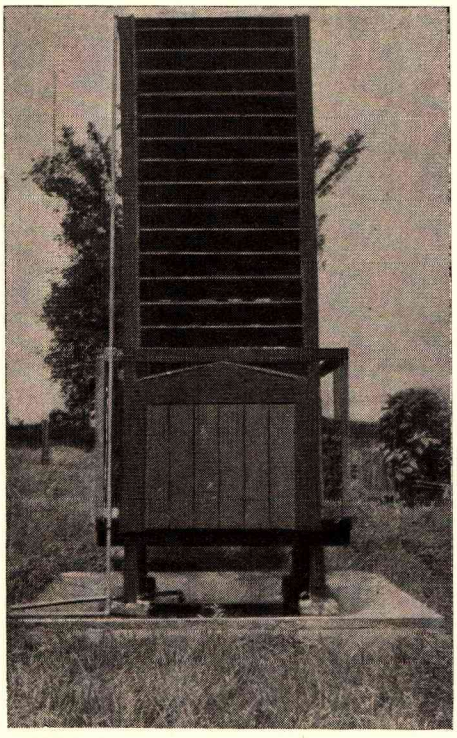


Plate 3.—A Combined Tower and Charcoal Cooler for Cooling Milk and Cream on the Farm.

All units are giving satisfactory results to date and have produced good quality milk and cream in districts where they are being demonstrated. Being cheap to construct and economical to operate, the coolers referred to are proving popular with farmers and their use is extending.

Farm Cream Refrigeration.

It is felt that under Queensland conditions farm refrigeration offers one of the best means of securing further improvement of butter quality. The Queensland Butter Marketing Board has marketed dairy farm refrigerators, but there is room for the development of a cheaper unit if farm refrigeration is to become more widespread. As an experiment, three small American in-the-tank refrigeration units were obtained through the Commonwealth Department of Primary Industry and established on three farms. These units, commonly known as "drop-in" units, are suitable for use with farm-built cooling tanks. Although this type of unit has yet to be thoroughly tried out under Queensland conditions, it is possible that the methods used may offer a cheaper and equally efficient type of refrigerator for use on dairy farms.

DAIRY FACTORY WATER SUPPLY.

Efficient operation of a dairy factory depends to a very large extent on the quality of the water supply. A survey of factory water supplies has shown that in many of them there is a great deal of suspended matter, hardness and bacteriological impurities. For cheaper operating costs and improved quality, these defects should be corrected.

During the year, 44 samples of water from dairy factories throughout the State were received and advice forwarded. Because of seasonal variability in the quality of water supplies, it has been recommended that the efficiency of any treatment applied be checked at least twice yearly.

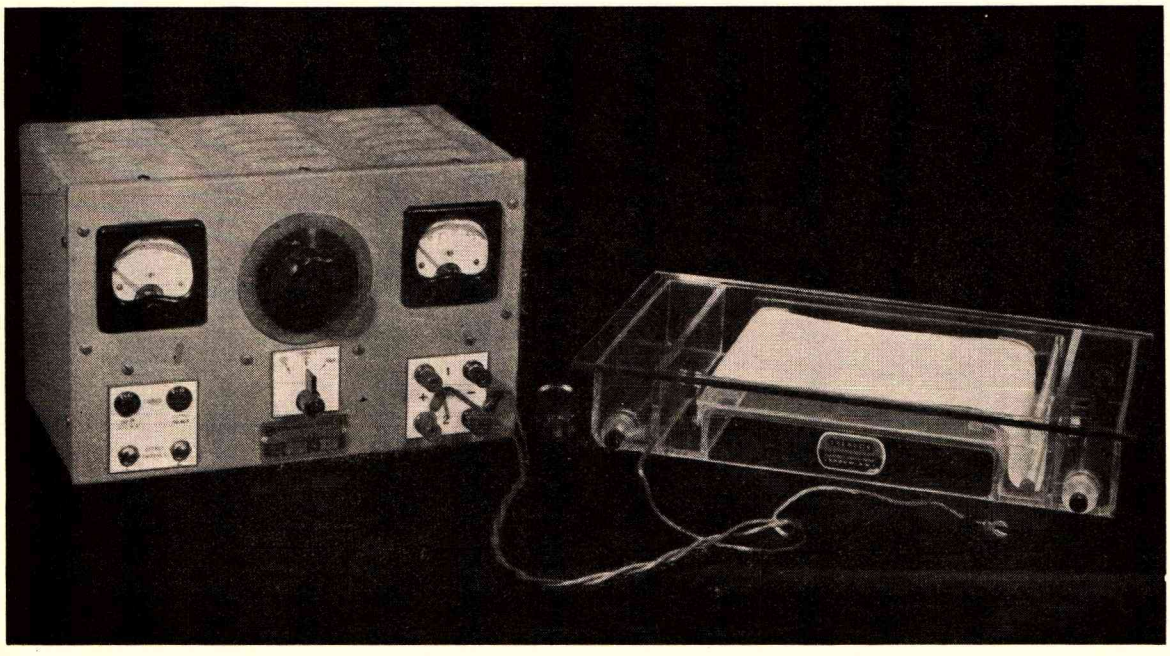


Plate 4.—Electrophoresis Equipment in Use for Studies of Proteins of Milk.

Orthotolidine colour standards have been forwarded to factories twice yearly to ensure efficient chlorination of butter wash waters. Investigations at one factory have revealed that water treatment, instead of being an extra factory charge, can result in considerable overall economy. The minimising of corrosion of equipment, pipelines and boilers, and the economy in fuel for steam-raising and detergents for factory cleaning are some of the factors that have resulted in a saving.

ANALYTICAL.

A total of 5,186 samples was submitted for general analysis. The samples included milk, cheese, butter, water, margarine, brines, salt, cream, detergents, powdered buttermilk and powdered skim-milk. The number of samples received was more than double that of the previous year.

In order to encourage the more effective utilisation of milk by-products, trials on the fortification of skim-milk powder with vitamin A on a commercial scale were commenced with the co-operation of a Dairy Association. Normally, skim-milk powder is deficient in this vitamin and fortification may aid increased consumption.

Chromatographic and electrophoretic methods (Plates 4 and 5) are being applied in the study of milk proteins and their possible effect on the flavour of dairy products.

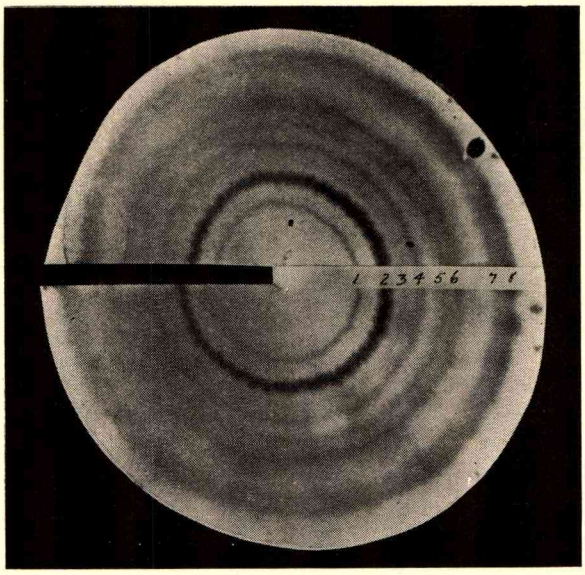


Plate 5.—Paper Chromatograms Showing a Number of Amino-acids in Cheddar Cheese.

An accurate, yet rapid field test for the estimation of fat losses in separated milk is needed and a comparison of several methods is receiving attention.

Almost 12,000 pieces of dairy glassware were tested for compliance with the requirements of the Dairy Produce Acts and 1,175 pieces (9.8 per cent.) were rejected for failing to meet the necessary standards. The standard of quality of dairy glassware showed some improvement in comparison with the previous year and it is hoped this standard can be maintained and even improved.

PUBLICATIONS, ETC.

Officers of the Branch have given 12 addresses to Q.D.O. and Dairy Factory Managers' conferences and eight radio broadcasts.

Thirteen papers were prepared for publication in the *Queensland Agricultural Journal, Queensland Journal of Agricultural Science* or *Journal of the Australian Society of Dairy Technology*.

STAFF.

The Senior Bacteriologist took up duties in Brisbane at the beginning of the year under review.

Two officers of the Branch sat for their M.Sc. qualifying examination, whilst another completed his thesis on an aspect of dairy research work and qualified for the degree of M.Agr.Sc. One officer of the Branch resigned during the year, to take up service in the industry.

DIVISION OF MARKETING: BRANCH REPORTS.

MARKETING BRANCH.

Mr. H. S. Hunter, Director of Marketing.

MARKETING.

The dominant features of Queensland's rural economy during the year have been the steadily narrowing gap between costs and prices in most industries, the emphasis placed on the development of industries such as tobacco, cotton and linseed which can effectively ease Australia's unfavourable balance of trade, and the difficulties which exist in our export industries because of competition and freight increases.

In contrast to the unsettled picture of the future which has marked the outlook of past years, it does seem that the market pattern of the immediate future will be along existing lines. There are still some uncertainties—for example, the current trade negotiations with the United Kingdom. Price fluctuation, too, is still with us, but this is frequently the result of seasonal effects on production in both importing and exporting countries. Again, surpluses in the United States are a definite danger.

There is now very much a buyer's market for most rural products and at best export prices appear to be settling down at a level which is generally low relative to production and marketing costs, with competition amongst exporters strong, if not always on price then on quality.

Lower incomes from exports in conjunction with rising internal costs have caused farmers to re-examine their farming patterns and in some cases to change to other crops where these are found to be more profitable. This tendency has developed alongside a clear need to increase exports and reduce imports in order to improve the balance of payments position.

The present tendency of farmers to change more readily from one crop to another in their search for more profit shows up particularly in grain areas, where there is a definite shift from wheat to barley, linseed and small grains, and even to cotton. In other districts the picture is not as clear because of the difficulty of finding alternative enterprises, though a need for greater diversification is now being manifest.

As regards the balance of payments position, there is an urgent need either to increase exports substantially or to reduce our dependence on imports, or preferably both. Whilst Queensland for 1954-55 (the last complete year for which figures are available) still showed a favourable balance on commodity trade (both interstate and overseas) of approximately £10 million, this represents a decline of more than £31 million on the previous year. Our direct overseas exports fell by more than £10 million over the same period.

For the last full year for which figures are available (1954-55), Australia had an unfavourable balance on commodity trade of more than £85 million, and when invisible items are added the total unfavourable balance on current account was over £258 million. This, in effect, means that nearly one-quarter of our total commitments on current account were not paid for by export income. Preliminary figures indicate that despite import restrictions and other measures designed to restrict overseas spending, there will again be a substantial unfavourable balance on current account for the year 1955-56.

Fig. 1 graphically illustrates the trading position of Queensland and of Australia as a whole, and clearly shows our dependence on rural industry with respect to our export earnings.

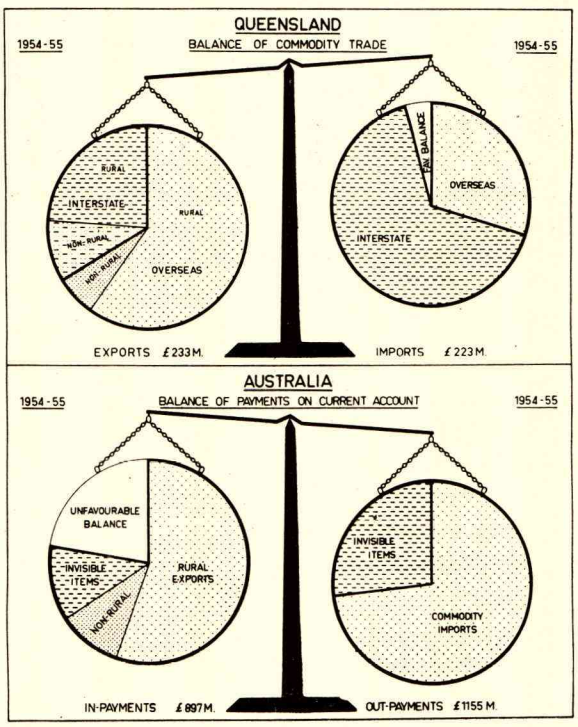


Fig. 1.—Queensland Balance of Trade and Australian Balance of Payments.

With this heavy dependence on rural industries in the export sphere, it is natural that all sections of the community are looking to these industries to provide the major contribution towards improving our export position. Broadly, our rural industries may be classified into two groups according to their relation to the balance of trade. On the one hand we have the export industries such as wool, meat, dairying, sugar, wheat, fruit, &c., whilst on the other we have the import-saving industries such as tobacco, cotton and linseed.

The problem with regard to the export industries is to increase overseas exports. This is not always synonymous with increasing production; for example, Australia has a large surplus of wheat but is finding it difficult to sell. Selling on world markets is not merely a matter of price; price reductions often result only in similar reductions by other exporters, and in many cases do not greatly affect demand. All aspects of export merchandising must receive attention, and matters of quality, presentation of uniform samples, maintenance of high standards of purity, control of insect damage, &c., must receive as much attention as production, production costs and price. In some of these fields progress is necessarily slow. However, there are many ways in which immediate improvement can be effected. Substantial progress was made along these lines during the year with respect to wheat and barley exports, and details are given later in this report.

Chief among the import-saving industries in the rural field are tobacco, cotton and the vegetable oil crops such as linseed. It is with respect to these particularly that attention is focussed on Queensland, this being the

State where most expansion in these crops is likely to occur. The value of Australian imports of tobacco, linseed, linseed oil and raw cotton and cotton yarn is at present of the order of £27 million annually, and if the value of cotton manufactures such as piece goods is added the import value rises to more than £70 million a year, or about 8 per cent. of our total commodity imports. Substantial savings of foreign currencies, including dollars, could thus be achieved by expansion of production of these crops.

The problems associated with the expansion of these industries are different in many respects from those encountered by the export industries, and such matters as tariff protection and market stability assume major importance. These industries are as yet comparatively small and it is essential that their development be along sound lines; this can only be achieved by careful attention to both cultural and economic aspects. The main stimulus to expansion must come from profitability. Protracted and difficult negotiations with Governments and buyers have been a marked feature of these industries in recent months.

Commodity marketing boards concerned with these industries or with export industries have therefore been faced with a strenuous year, made even more difficult because of bank credit restriction, itself due to the unfavourable trade position. This credit restriction plus rising internal costs is having an adverse effect on the operations of marketing organisations. Credit to finance advance payments to growers becomes all the more important when returns from sales are lower and slower to come to hand. Consequently, some boards have been seriously embarrassed during the year because of lack of funds to meet advances to growers and initial operating costs for the season.

More detailed comment on the position of individual industries is given in the following sections.

EXPORT COMMODITIES.

Pastoral.

The downward trend in export prices for meat and wool which was evident in 1954-55 has been continued. Although wool production in Australia in 1955-56 amounted to 1,398.6 million lb. (greasy equivalent) in comparison with 1,288 million lb. in 1954-55, and the quantity of wool exported has also increased by 119.4 million lb. (greasy equivalent), realisations were £15.2 million less. Average prices for the season were 13 per cent. lower than in 1954-55, and apart from a recovery at the end-of-season sales were relatively stable. Stable and lower prices should help meet competition from other fibres, and with a continuation of high levels of income and employment a strong demand for wool should continue for the immediate future.

The increased share of the British farmer in the United Kingdom beef market has made itself felt on prices of exports from Australia. United Kingdom home production of beef and veal in 1955 was 63 per cent. of total consumption requirements, rising from 47 per cent. in 1938. This gain in the British farmer's share in the beef market is almost as great as his gain in the pig meats market, which over the same period increased from 74 per cent. to 91 per cent. of requirements of fresh pork, and from 36 per cent. to 46 per cent. of bacon and ham consumption.

The Fifteen Year Agreement has given a measure of security to the Australian beef industry which it did not enjoy pre-war, but increased self-sufficiency and the preference of the United Kingdom consumer for home-killed meat have narrowed the market for imported meat. Competition from the Argentine and New Zealand can therefore only be met by an increased emphasis on chilled meat and an improved quality and presentation of frozen meat.

Although the volume of exports of beef and veal to the United Kingdom (and to other markets) has increased, values have been lower than in 1954-55. It seems certain that last year's experience will be repeated and that deficiency payments making good the amount by which actual realisations fall short of the guarantees under the United Kingdom Agreement will have to be paid.

Dairy and Farmyard Products.

The United Kingdom market for dairy products has now completely reverted to free trading conditions. The long-term contract expired on June 30, 1955. All Ministry of Food stocks have been cleared and pre-war competitive marketing under the individual brands of exporting countries now prevails. Initially, Australian butter met a good demand and prices rose to as high as 400s. per cwt. Since Christmas, however, in the face of heavier supplies and increased competition from other countries and from margarine, prices for Australian choice butter had by May fallen to as low as 287s. per cwt. Prices have subsequently recovered and prospects have improved. Cheese prices after weakening during 1954-55 have since increased and firmed following the disposal of Government-held stocks, a fall in United Kingdom production, and a fall in exports from Australia and other countries.

Reflecting good seasonal conditions, the quantity of butter exported from Australia increased in comparison with 1954-55. Under the Dairy Industry Act, 1952, producers of butter and cheese are guaranteed by the Commonwealth Government a minimum return on total sales within the Commonwealth and up to 20 per cent. of this quantity exported. Hence, notwithstanding the fall in average overseas prices, aggregate returns to dairy-farmers have increased.

Diversion from cheese manufacture has also contributed to the increased butter production. In Australia as a whole, cheese production in 1955-56 decreased by 14 per cent. in comparison with 1954-55. Despite the closure of two factories in September and October, 1955, in addition to the three closed earlier in that year, a good season enabled production in Queensland to be maintained close to last year's level.

The outlook for dairy products is still influenced by stocks accumulated on the North American continent under the stimulus of the price support programme, although stocks have been reduced from the higher levels of 12 months ago.

Fig. 2 shows in respect of wool, beef and veal and butter the increasing competition which the livestock industries are experiencing on the export market.

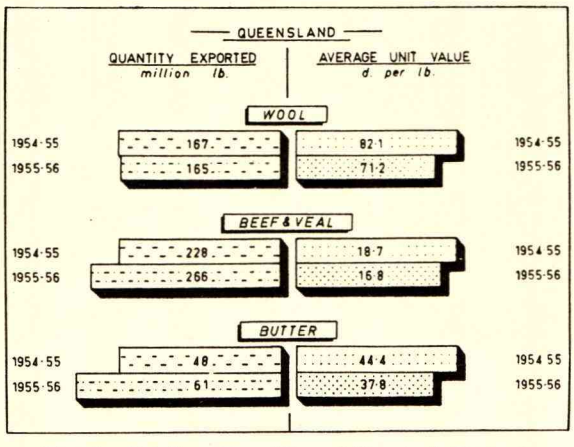


Fig. 2.—Relative Quantities of Livestock Products Exported and Unit Export Values.

Fortunately for Australian exporters, decreased quantities of eggs were imported into the United Kingdom during 1955-56 from other countries such as Eire and the Netherlands. The diversion of Australian cargoes to Western Germany also assisted in maintaining a firm demand in the United Kingdom at average prices returning the Australian Egg Board 4s. 0.559d. per dozen eggs, in comparison with 3s. 3.48d. per dozen in the previous year. Queensland shipments of shell eggs for the 1955 season to the United Kingdom amounted to 18,834 cases, of which 4,330 cases (23 per cent.) were diverted to Western Germany; 3,493 cases were exported to the Far East.

Sugar.

Under the Commonwealth Sugar Agreement, which has now been extended to 1963, Australia enjoys a guaranteed but strictly limited market. Of our guaranteed minimum annual quota of 600,000 tons, 314,000 tons is sold at an annually negotiated price. The balance is sold at free market price (plus preference). The negotiated price for the 1956 season sugar is the same

as for the 1955 crop—£40 15s. sterling c.i.f. per ton. Increased production and stocks both inside and outside the British Commonwealth effectively prevent any major increase in exports of sugar to help overcome our balance of payments problem.

Fruit.

Queensland exports of fruit, which are practically confined to canned pineapple, totalled during 1954-55 about 10 per cent. of the Australian total, or approximately £3 million. Despite increasing competition on the Canadian market, which now takes only about 10 per cent. of our exports, the total value of exports for 1955-56 is expected to be about the same for approximately the same quantity. The United Kingdom continues to be the main outlet for our canned pineapple, taking about 80 per cent. of the export pack.

Grains.

The international grain market now appears to have emerged from a period of uncertainty and has more or less settled down into a strong buyer's market. The sharing of the available markets amongst leading exporters is the subject of intense competition on all grounds except direct price cutting, and United States disposal policies have been causing Australia some concern, as has also the heavy subsidisation of French wheat exports.

The general level of trade in grain is somewhat lower than might have been expected a few years ago, particularly in the case of wheat, where it has suffered as a result of the efforts of many importing countries to achieve at least a measure of self-sufficiency. There seems as yet no inclination on the part of high-cost producers among the importing countries to reduce production and to rely more upon lower cost imports. Indeed, it would be unwise, in the present context of recurring foreign exchange problems, internal employment situations and security considerations, to predict any immediate scaling down of production by traditional importing countries.

The grain picture as far as Australia is concerned is far from encouraging. Although still able to produce grain more cheaply than most other countries, Australian grain farmers are finding export more difficult and less profitable. This is reflected in the likely drastic cuts in wheat acreage predicted for this year. Farmers' costs and internal marketing charges continue to increase, whilst high shipping freights are providing a most effective barrier to the profitable sale of Australian grain abroad, particularly on the traditional United Kingdom-Continent markets. Some idea of the extent of this barrier can be gauged from Fig. 3, showing the proportion of c.i.f. United Kingdom-Continent prices absorbed by shipping freights and marketing costs during the past four years.

It is obvious from the chart that the balance remaining after export costs have been met has decreased substantially, and since this balance represents all that is available to meet costs incurred in Australia and to provide a profit margin for farmers, it is evident that there is an urgent need to keep internal costs as low as possible if we are to maintain a reasonably high level of export income.

With the increasingly competitive nature of international markets for rural products, more and more attention is being directed towards quality, and the need for maintaining high standards for export grain is becoming more generally recognised by both commercial and farming interests. Higher quality means not only higher prices but also better clearances.

Substantial progress was made in the wheat and barley industries in this respect during the past year, and Queensland wheat is now selling at a premium on overseas markets, whilst our barley is being freely accepted as of malting quality whereas until a year or so ago all export sales were made as "feed".

During the 12 months ended June 30, some 5½ million bushels of Queensland wheat was exported as grain and a further 1 million bushels in the form of flour.

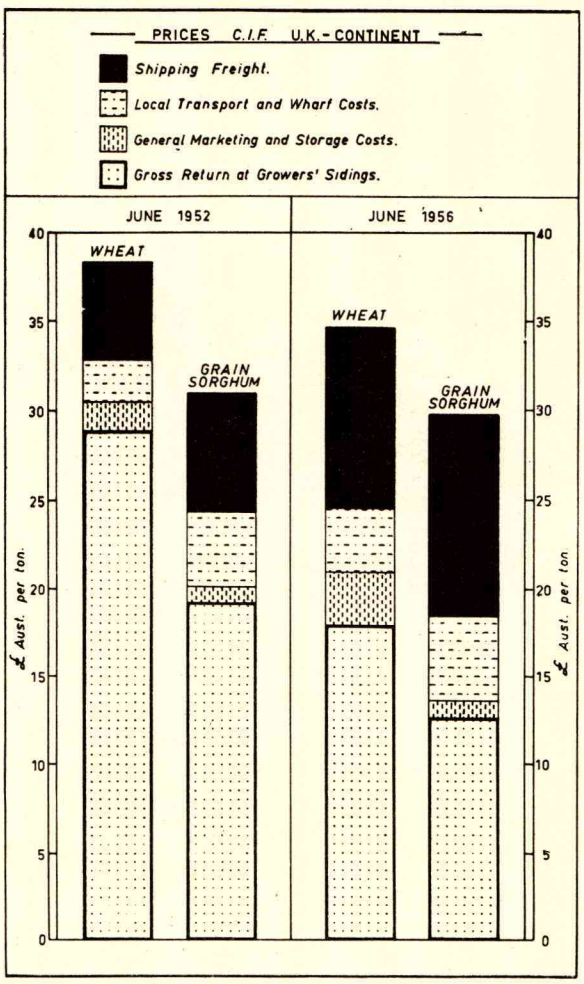


Fig. 3.—Dissection of United Kingdom-Continent Prices for Wheat and Grain Sorghum.

Mainly because of the high freight charges to the United Kingdom and the Continent, practically the whole of the export surplus of over 2 million bushels from the 1955-56 barley crop has been sold to Japan at prices which compare more than favourably with world market rates, and Japanese buyers have already expressed interest in the 1956-57 crop, which is still being planted.

Following lengthy negotiations, a new International Wheat Agreement has now been written to replace the current Agreement, which expires with the 1955-56 season. Under the new Agreement, which will continue until 1958-59, maximum and minimum prices based on Northern Manitoba No. 1 wheat have been reduced to C$2.00 and C$1.50 respectively—that is, 5 cents below the level of the present Agreement. The total quantity under the new Agreement will not be definitely known until all participant countries have ratified. However, it is expected to be only about 300 million bushels, or less than one-third of the total world wheat trade. Australia's quota is expected to be about 30 million bushels.

The small percentage of trade covered, plus the fact that the United Kingdom (the largest importer) is again not a party to the Agreement, makes it difficult to visualise the Agreement as a major stabiliser and future stability is likely to depend, as it has in recent

times, upon the willingness and ability of the major exporters to hold stocks. Perhaps the most promising feature is that all major exporters are now members, and this should facilitate exporter co-operation.

The Grain Sorghum Marketing Board in its first few months of operation has encountered great difficulty in selling on the export market. Demand from the United Kingdom and the Continent is weak. The same situation applied last year but a strong demand from Japan cleared all available stocks from Queensland at profitable prices in excess of £19 per ton, f.o.b. basis. Up to the end of June, Japan was buying grain sorghum only on a specification which could not be met under the Queensland system of marketing. The United States and Argentina were supplying at as low as £16 10s. per ton f.o.b. Brisbane parity, which was considerably lower than the Brisbane local price.

There has been a decided swing in recent years in Queensland grain-growing areas towards canary seed, white French millet and panicum. Up to the present there is a steady overseas demand for these bird seeds, and, unlike the larger grains, there has been no apparent decline in price levels over the last 12 months. Contrasted with wheat, barley, grain sorghum and maize, these seeds, particularly canary seed, have a high export value relative to weight, and are less affected by rising shipping and rail freights.

IMPORT-SAVING COMMODITIES.

Oilseeds.

The import-saving vegetable oil industries are not without problems. Among these, linseed and the dual-purpose crops, peanuts and cotton, deserve special mention, as Australian imports of their oils cost up to £2 million a year.

The linseed growing industry is largely competitive with the winter grains as far as land use is concerned, and there is now a noticeable tendency for some farmers to change from wheat to linseed. Under the stimulus of a fixed price of £70 per ton offered by the Linseed Crushers' Association for the last four years (including the current crop), acreages have doubled in each of these years.

In the peanut industry, which serves the dual purpose of providing edible nuts and oil, rising costs and falling prices have so reduced profitability that an application is being made to the Tariff Board for increased protection on both nuts and oil. Without such protection the industry is unlikely to expand.

The cotton growing industry, although it provides oil as a by-product, is more concerned with the production of fibre, and heavy mechanisation is an essential prerequisite to its expansion. Growers generally seem unprepared to risk the increased investment for the specialised machinery required without some long-term guarantee of a stable and profitable price. Although the 1955 planting of 20,000 acres was the largest since 1943, the 1956 planting was lower. This was in part due to an unfavourable season, but there is little doubt that the main handicap to expansion was economic uncertainty. The Cotton Bounty Act of 1955 extended the period of guaranteed price only to the end of 1958 and the guarantee itself was not a definite figure but was variable by Regulation between 9½d. and 14d. per lb. Although it has since been announced that the guaranteed return (for all grades above strict good ordinary) will be held at the maximum of 14d. per lb. until the end of 1958, the industry is seeking a longer guarantee term and a higher price.

Tobacco Leaf.

Perhaps the greatest scope for rapid development of import-saving industries is with tobacco. Imports of this commodity alone are of the order of £17 million a year, and unless Australian production is increased the figure will undoubtedly rise. Queensland offers the best prospects and irrigation facilities already provided or in course of construction should ensure safe and fairly rapid development provided the economic incentive to growers is there.

A tobacco research organisation which has been set up with funds provided by growers, manufacturers and the Commonwealth Government, in conjunction with technical and advisory services by the Department of Agriculture and Stock, should ensure sound development in the cultural sphere. However, the major problem confronting the industry remains the need for a stable price at a level which will offer an incentive towards expansion. Although much effort has been spent in endeavours to secure this objective, it has not yet been attained. There can be no doubt that stability depends on firm agreement between The Tobacco Leaf Marketing Board and the manufacturers with the full participation of the Commonwealth Government. Some progress has been made in this field and agreement has been reached on grading and grade schedules, but there is as yet no agreement on price.

Intense competition among manufacturers, although resulting in a record average price of 162.38d. per lb. for the 1955 sales, greatly reduced the effectiveness of the smaller manufacturers by the end of the 1955 auction series and the 1956 sales began with very little auction competition. The result was a substantial reduction in clearances and lower prices. The Tobacco Leaf Marketing Board stopped the sales pending negotiations. A number of conferences and discussions failed to reach agreement on minimum prices. However, in the meantime the blending percentages were increased to 17½ per cent. for tobacco and 21 per cent. for cigarettes to operate from July 1, 1957, whilst it was announced that imports will be reduced substantially. Following these changes, the 1956 auction series was recommenced in May. At the same time, endeavours to reach agreement on firm minimum prices acceptable to all parties are continuing, together with discussions on the future of the auction system of marketing, which is no longer appropriate where the number of buyers is so small and the market is dominated by one big manufacturer.

In addition to the foregoing review of marketing developments during the year 1955-56, a detailed description of the activities of the various commodity marketing boards operating in Queensland will, as in previous years be given in the Annual Report by the Director of Marketing to the Honourable the Secretary for Agriculture and Stock, as required by *The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1955.

AGRICULTURAL ECONOMICS.

The work of the Marketing Branch in economics and statistics has been steadily developed over the last decade. Soon after the reorganisation of the Department and the creation of a Division of Marketing just over 10 years ago, a market price reporting service and a crop reporting service were instituted.

The major requirement at that time and during the subsequent period of rapid post-war agricultural expansion was current statistics. Farmers and those dependent on the rural industries for their livelihood wanted readily available and timely information on prices and crop prospects. Markets during the first half at least of this period presented no problems. They were assured and profitable.

Whilst costs of production were rising in common with price levels generally throughout the Commonwealth, returns were increasing to a greater extent than costs. Under these conditions efficiency does not loom large as a problem and in any case surplus income can be availed of to develop mechanisation and introduce new techniques. The economic emphasis in times like these is on distribution rather than production. Foremost among the type of information needed to assist in the making of distribution decisions are market price reports and crop reports and forecasts.

Over the last few years, prices of farm commodities have tended to fall, and at the same time costs on the farm have continued to rise. This constriction of farmers' markets has brought about a gradual shift in emphasis from distribution to production. Efficiency and cost reduction now assume a considerably enhanced significance.

Economic Research.

As the problems of modern commerce increase in complexity, so also is there an increase in the degree of precision and refinement of the economic data needed for their solution.

These requirements fall into two broad patterns—

(*a*) Industry data to guide industry leaders and to assist in making representations to various authorities.

(*b*) Farm data to assist individual farmers in their planning.

The last 10 years have seen a huge increase in capital investment needed because of the greater diversity and number of machines necessary on the modern farm. Inflated land values also pose a special problem for persons who have acquired farms in recent years. Every increase in capitalisation increases the proportion of total costs over which the farmer has no control, raises the minimum level of gross income necessary for the farm to pay its way, and reduces resource mobility and hence the range of rational alternative production patterns. Successful farming in these circumstances requires a very much higher degree of business ability than before the war.

This changed situation has had a definite impact on the work of the Marketing Branch and research projects at both industry and farm levels were carried out during the year.

Cotton Survey.

Officers of the Marketing Branch assisted the Commonwealth Bureau of Agricultural Economics in the planning and execution of a survey designed to investigate the structure of the cotton industry and to assist in assessing the industry's prospects.

It was decided that the Bureau of Agricultural Economics would make a series of case studies of cotton farmers, and that the Marketing Branch would be responsible for the collection and tabulation of data designed to present a synoptic picture of the structure of the cotton industry as it fits into the general agricultural and animal husbandry pattern of the cotton growing areas.

The Marketing Branch's contribution involved field work in January 1956 in the Gladstone, Monto, Mundubbera, Biloela, Wowan, Theodore and Toowoomba areas, interviewing butter factory managers, railway station-masters and others, and tabulating the statistical information obtained into a unified picture which describes the structure of the cotton industry and cotton farms generally with a completeness that would be impossible to approach with any other technique. It is felt that any consideration of the problems of the cotton industry in Queensland will proceed more confidently in the light of the results of this survey and analysis than could have been possible previously.

Atherton Maize Survey.

In April another field survey, this time at the farm level, was made in the Atherton district. Soil erosion has been causing increasing concern to maize farmers in this area over recent years, and particularly serious damage which occured early in 1956 following heavy rains brought a certain urgency to the problem of remedial measures.

About a quarter of the farmers in this area, confronted by the evidence of declining fertility and loss of soil through erosion, have changed or are in the process of changing from the predominant pattern of continuous row-crop cultivation to a system of mixed farming.

The Marketing Branch was given the task of examining the situation on some of these farms to ascertain the economic effects of such a change. Information was obtained about a number of the farms by means of personal interview with a prepared questionnaire. Each farmer made available to the survey team copies of his taxation returns for the previous three years. Information was also obtained from a number of other persons and institutions, including marketing organisations, dairy industry and shire officials, and field officers of the production Divisions of this Department.

The report of this survey was presented in two parts, the first outlining the economic considerations involved in the change, and the second containing a budgetary analysis, setting out comparisons between a hypothetical farm making a change to mixed farming and one which retains its existing pattern of crop growing.

Plans for Development.

Further farm economic surveys are projected. The pineapple industry, through the Council of Agriculture, has asked that a study be made of the economics of pineapple production, and an investigation into certain aspects of dairy production is visualised. An examination into the economic significance of weeds in Queensland has also been requested.

Preliminary statistical work designed to establish the structure of the pineapple industry as a prerequisite to further analysis was commenced in June. This was being done in collaboration with the Council of Agriculture and the Committee of Direction of Fruit Marketing.

Even at this early developmental stage of farm survey work in this State, the principle of co-operation with industry organisations wherever possible has been established. This should ensure that the selected projects are designed to provide answers to questions which primary producers themselves are asking. Acceptance of this principle should result in the gap between economic research and extension in this State being kept to the minimum.

The practical manner in which contributions by industry organisations and the Marketing Branch can best be integrated in an economic research project can only be determined by experience. Much, of course, would depend on the structure of the industry concerned. For example, the design and plan of the pineapple project and also the final processing might be the responsibility of the Marketing Branch, while the industry organisation might do much of the actual field work and statistical tabulation under technical advice from the Marketing Branch.

Farm survey and management research in Australia is of comparatively recent origin and workers in this field are still developing a theoretical framework and methodology suitable for Australian conditions. As there is very little in the way of precedents or general theory, much of the work being done now in the Marketing Branch is of a pioneering and experimental nature. Overseas, particularly American, literature is being closely studied and techniques which have been developed in the United States and Canada (such as, for example, linear programming and activity analysis) are being examined with a view to their adaptation to Queensland conditions.

In the circumstances, progress is bound to be slow at first, particularly in view of the restrictions imposed by staff limitations, but it is felt that by participation in work of this nature the Division will be making an increasingly important contribution towards solving agricultural problems in this State.

Crop Reports and Forecasts.

The Crop Reporting and Forecasting Service issued reports throughout the year in respect of wheat, barley, maize, grain sorghum, potatoes, tobacco leaf, peanuts and the poultry industry, and developmental work has been done with the object of expanding the service to include small grains. These grains, which include canary seed, white French millet and panicum, are assuming increasing importance in Queensland's overseas trade, and the decision to include them in the Crop Reporting Service was taken after persistent requests from farming and trade circles.

An investigation is also being made into the practicability of extending the scope of the quarterly Report on Poultry Industry to include regular statistical information relative to the cockerel-rearing industry.

Report on Production Trends.

The Report on Production Trends is now in its eleventh year of publication and its distribution list has continued to expand under pressure of popular demand. This report includes summarised versions of the most recent Crop Reports and Forecasts, as well as current information supplied by the Divisions of Animal Industry, Plant Industry, and Dairying, the Commonwealth Meteorological Bureau, the Bureau of Sugar Experiment Stations, Marketing Boards and cold storage firms.

Market Price Reports.

There is an increasing interest in the publications of the Market Price Reporting Service. The Daily Official Market Quotations includes in addition to price quotations a commentary on quantities, qualities and demand for all varieties of fruit, vegetables and farm produce, and enables growers, traders and consumers to be in daily touch with the state of the markets by means of radio, press and postal services.

The Weekly Market Report is concerned with the broader aspect of supply and disposal, and gives an overall picture of the weekly trading together with criticism and comment designed to be of value to the supplier. This periodical receives wide publicity in the country press and growers' journals.

Productivity Trends.

With the narrowing of margins between costs and prices for rural produce there has come an increasing need for information on productivity changes, and statistical analysis of data relating to the various industries provides the best method of ascertaining changes in efficiency. During the year mathematical trend analyses of this kind have been carried out with respect to the crop and livestock industries of the State.

Price Analyses.

Preliminary work in the study of movements in prices of some fruit and vegetable crops has been carried out and it is hoped that publication of further analyses will be possible early in the coming year.

Grain Abstracts.

To assist in keeping growers and their representatives on grain marketing boards informed of developments in the international grain market, the Marketing Branch this year commenced the periodical issue of digests of relevant published material. These are circulated to interested bodies.

GENERAL.

The Plywood and Veneer Marketing Boards.

The operation of The Plywood and Veneer Marketing Board and The Northern Plywood and Veneer Marketing Board was not extended and both were allowed to expire by effluxion of time on May 2, 1956.

These boards were set up originally (one in 1934 and the other in 1935) to organise the marketing of plywood produced in Queensland south and north of the Tropic of Capricorn respectively. They were established at a time when economic conditions were such that some stabilising influence was considered necessary in the industry These conditions no longer exist, and as the industry is now organised throughout Australia on a voluntary basis no adverse effects will accrue.

A liquidator has been appointed to wind up the affairs of the boards.

Barley.

Close attention has been given to the barley industry during the year. The tremendous growth which has occurred in the Queensland barley industry—from about half a million to over 3 million bushels in the last four years—is causing many problems associated with handling, storage and finance. The present accent on quality and the need for efficient handling have made it necessary for The Barley Marketing Board to undertake a programme of storage construction. The programme was begun with the erection of a bag storage type shed at Mywybilla and the securing of a site at Dalby. Further storages are envisaged and consideration is being given to methods of financing the necessary building programme.

Wheat Bulk Handling.

The State Wheat Board's bulk handling conversion programme is stil progressing and during the year a contract was let for the erection of a bulk terminal at Pinkenba. This terminal when completed will have a total storage capacity of 1,300,000 bushels.

Work on the erection of country bulk handling facilities is continuing and it is expected that by the commencement of the 1956 harvest country facilities with a combined storage capacity of 2,600,000 bushels will be available at 11 centres.

During the absence of the Chairman overseas for part of the year, the Director of Marketing was appointed Acting Chairman of the Board.

Cotton and Tobacco Industries.

During the year the Division's staff have actively participated in the efforts these industries are making to establish a sound marketing structure. This has required considerable industry discussion and attendance at a number of conferences called to deal with the various problems involved. Some progress was made in the settlement of immediate difficulties, but there is a very urgent need to get both these industries on a footing of long-term stability. Farmers who have to make production decisions need to have confidence in the future, particularly as substantial capital investments are called for in successful cotton and tobacco production.

The outcome of negotiations which are still being conducted by these industries with manufacturers and the Commonwealth Government will be of vital importance to the economy of this State. A strong case was prepared supporting the extension beyond 1958 of the period during which prices will be guaranteed to cotton growers as already provided by the Cotton Bounty Act of 1955. An increase in the guaranteed price above 14d. per lb. seed cotton is also sought. As with tobacco, another feature of importance is the control of imports and the difficulties which arise from the building up of competing supplies within Australia. The Assistant Director of Marketing (Mr. C. H. Defries) continued to represent the Department on the Tobacco Advisory Committee, which comprises representatives of Governments, growers and manufacturers.

Unsold stocks of cordage and bedding grades made necessary a Government guarantee of £60,000 for The Cotton Marketing Board to enable it to make first payments to growers for the 1956 season.

Potatoes.

Proposals are still being mooted for a non-marketing organisation which would be charged with the task of arranging the collection of funds for research into agronomic and storage problems and create a focus of discussion on matters affecting the industry. Abnormally high prices and the consequent extraordinary cost of seed, which has now risen to over £100 per ton, are seriously disrupting the industry, which is now being drawn into a most extreme form of glut and scarcity pattern. Some discussion took place during the year in regard to the Commonwealth-wide marketing scheme but no agreement was reached.

The Grain Sorghum Marketing Board.

This Board was set up on March 8, 1956, following a ballot in which 65.12 per cent. of the votes cast favoured the proposal. The harvesting of the 1956 crop had commenced when the Board began its operations and this, together with vigorous opposition from an influential section of the merchants, has seriously hampered the Board in its efforts to achieve an orderly marketing scheme. The situation has necessitated close and detailed attention to many legal matters concerned with the policing of the Board's powers as well as the normal intricacies of building up an efficiently functioning organisation. Credit stringency has also created difficulties and a Government guarantee was arranged to release the Board from the disadvantages suffered by a new body with no assets in regard to its initial organisation and the setting up of a staff. The Board has received considerable help from the Council of Agriculture and The Egg Marketing Board.

STANDARDS BRANCH.

Mr. F. B. Coleman, Standards Officer.

During the year 322 sellers of agricultural requirements were visited, inspections covering the coastal area and near inland districts from the New South Wales border to Rockhampton and as far west as Dalby. It was not possible, because of staff difficulties and pressure of other work, to make the usual visit to the northern areas of the State.

Further progress has been made in the matter of seed cleaning. A new specific gravity machine of Australian manufacture made its appearance in Queensland during the year and has augmented the supply of this necessary type of equipment. The Darling Downs area now has five of the State's seven gravity machines. New screen-type cleaners have also been installed to meet increased seed-cleaning requirements.

At the 1955 Brisbane Exhibition, in association with the Plant Breeding Staff of the Queensland Agricultural High School and College, the Branch staged an exhibit illustrating the production and value of hybrid maize seed.

A list of registered veterinary medicines was published by the Branch and two articles on seed processing in Queensland were contributed to the *Queensland Agricultural Journal.*

SEEDS.

Table 1 sets out details of seed samples examined at the Brisbane Seed Testing Station.

It is interesting to observe that while the number of samples taken by Inspectors has not altered to any great degree, 6,623 samples were received from sellers as against 4,643 in the previous year. This appears to indicate that sellers are becoming more appreciative of the need to submit samples for examination before buying the seed and offering same for sale.

TABLE 1.

SUMMARY OF SEED SAMPLES EXAMINED.

Samples Received from	1954–55.	1955–56.
Inspectors of Branch	3,547	3,440
Seed Certification Officers ..	236	220
Sellers	4,643	6,623
Buyers	176	149
Government Departments ..	1,123	813
Experimental test samples ..	851	190
Total samples examined ..	10,576	11,435
Inspectors' samples which failed to comply	671	554

Table 2 indicates that 239 bags of farm seeds were required to be cleaned under supervision of an Inspector because of the presence of objectionable impurities such as prohibited seed, excessive weed seeds and inert

TABLE 2.

ACTION TAKEN ON UNSATISFACTORY SEEDS.

—	1954–55.	1955–56.
Farm seeds cleaned under the supervision of an inspector—	303 bags	239 bags
Destroyed or otherwise rendered unsuitable as seed—		
(i.) Farm seeds	120 bags	148 bags
(ii.) Vegetable seeds ..	4,873 lb.	2,205 lb.
(iii.) Packeted seeds ..	7 pkts.	10,521 pkts.
Processed for stock food—		
(i.) Farm seed	564 bags	60 bags
(ii.) Vegetable seeds ..	3,960 lb.	1,811 lb.

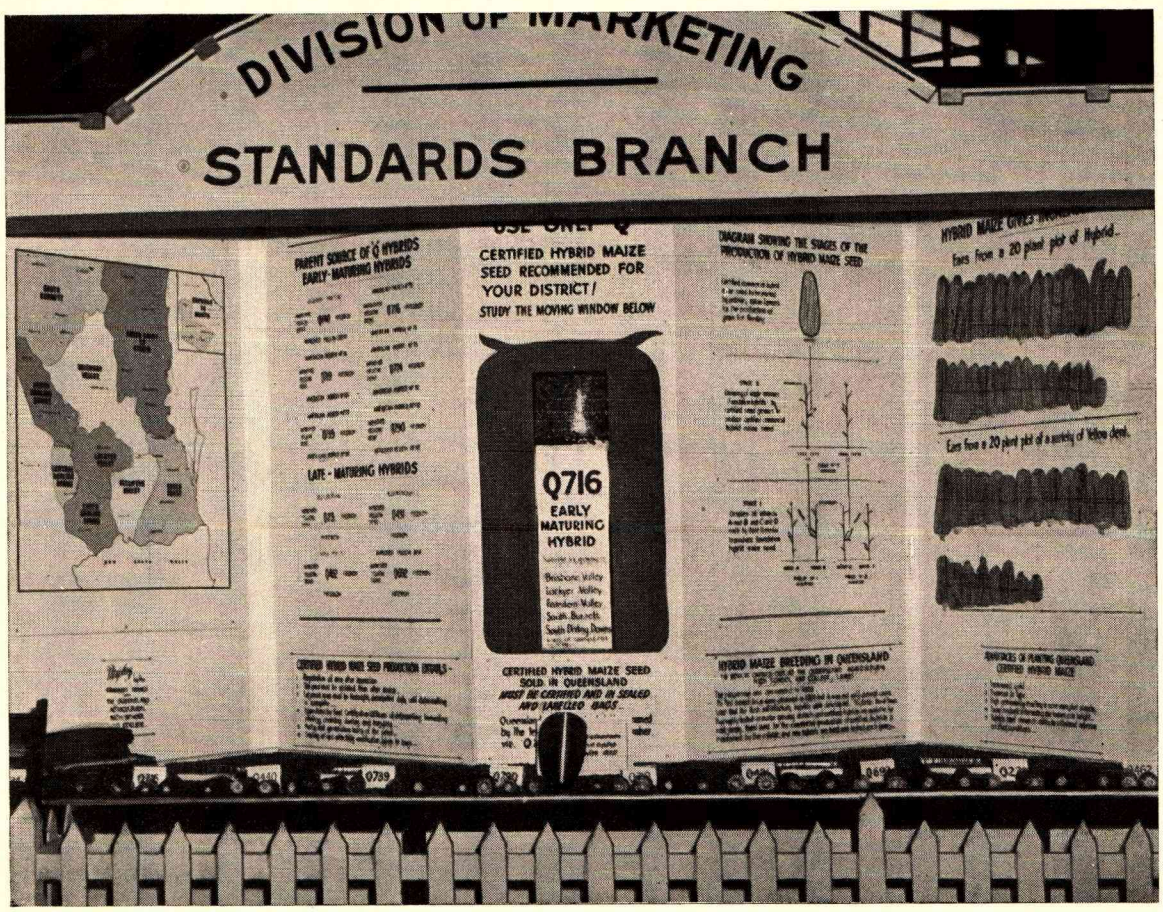


Plate 1.—Hybrid Maize Exhibit at the Brisbane Exhibition, 1955.

matter. It is interesting to note the quantity of seed destroyed or rendered unsuitable as seed. Included in this are 10,521 packets of vegetable seed prepared for home gardeners and almost one ton of vegetable seed in larger units. It is known also that firms packeting seeds have destroyed large numbers of packets as a result of Branch activities. The amount of 1,811 lb. of vegetable seed converted for feeding to stock also represents a substantial removal from the seed market.

CERTIFIED SEED.

Table 3 sets out the amounts of certified seed produced since 1953, together with the amounts rejected because of low germinability or the presence of prohibited seeds or excessive inert matter.

TABLE 3.
PRODUCTION OF CERTIFIED SEED.

Crop.	1953.		1954.		1955.	
	Certified.	Refused.	Certified.	Refused.	Certified.	Refused.
	Bus.	Bus.	Bus.	Bus.	Bus.	Bus.
Hybrid Maize ..	7,901	985	8,153	1,248	3,336½	381
Grain Sorghum	5,091	4,662	14,831	..	12,403	4,287¾
Sweet Sorghum ..	57	18	134	..	448½	301
Sudan Grass ..	..	..	123	230	71⅜	814
French Bean ..	312	326	14	5	135½	11½
Cowpea ..	431	..	..	..	..	..
Tomato	75 lb.	33 lb.	61½ lb.	..	107½ lb.	8¾ lb.

For the current season, 2,120 bus. of hybrid maize seed has been certified to date. Last season the amount certified was below average, due partly to a reduction in the acreage planted and partly to adverse climatic conditions. Because of the small amount certified, all carryover seed from the previous season was sold.

Certified sorghum seed production for 1955 was satisfactory but the demand for such seed is increasing. This is apparent from the relatively small amount of certified seed at present being carried over in seed stores. Low germinability and the presence of prohibited weed seeds caused the rejection of 4,287 bus. of seed intended for certification. The need for complete elimination of prohibited weed seeds is being emphasised.

A total of 135½ bus. of bean seed was certified for 1956 sowing. Probably the yield for the current season will be less because of the incidence of disease and excessively wet conditions.

The production of certified Q1 tomato seed has ceased due to the standard of the commercial crops of this variety having been improved. A token stock of seed is being kept in cold storage for checking against commercial crops if necessary. The variety Q5 has been included in the certification scheme.

MATERIAL OTHER THAN SEEDS.

TABLE 4.
SUMMARY OF ACTION ON MATERIALS OTHER THAN SEEDS.

—	1954–55	1955–56.
Samples received from—		
Inspectors	380	224
Buyers	10	14
Seized (bags)	13	38
Destroyed (bags or bales)	110	13

Of the 212 samples of material other than seeds obtained by Inspectors, 7 samples of fertilizer and/or lime and 23 stock food samples failed to comply either with the prescribed standards or with their manufacturers' guarantees. Such deficiences were taken up with the manufacturers and action taken to avoid a repetition. It was found necessary to destroy 13 bags of a magnesian lime because of its failure to comply with the standard and it was not possible to improve it by any treatment. A total of 25 bags of laying mash seized for non-compliance with the manufacturer's guarantee was subsequently released after the manufacturer re-labelled the bags on a reduced guarantee which still complied with the prescribed standard.

REGISTRATION.

The number of applications for the registration, re-registration or further registration of agricultural requirements rose from 2,291 to 2,421.

The Agricultural Requirements Board reported on the efficacy of 599 preparations, of which 490 were pest destroyers and 109 veterinary medicines. Two pest destroyers were refused registration.

During the year, 1,319 agricultural requirements were registered or re-registered.

A 3-year registration period for stock food, fertilizer and lime preparations began in January, 1956 and all such preparations have been reviewed. The re-registration of those preparations which comply with the regulations has been effected.

Supplies of raw materials for the manufacture of prepared stock foods are readily available and formulations are now more stable than they have been for a number of years.

A substantial increase in the number of preparations based on dieldrin and aldrin that are being offered for sale indicates the popularity of these chemicals in the pastoral industry. Diazinon, an organic phosphate for cattle tick control, was recently introduced to Queensland.

TABLE 5.
FERTILIZER PRICES.

Name.	1938.	1955.	1956.
	February.	March.	May.
	£ s. d.	£ s. d.	£ s. d.
Nitrate of Soda (16%) ..	13 0 0	37 10 0 (*a*)	40 0 0 (*a*)
Ammonium sulphate (20·5%)	12 0 0	37 10 0 (*a*)	39 5 0 (*a*)
Superphosphate (22%)—			
Jute Bags	5 6 6	11 16 0 (*b*)	11 13 6 (*b*)
Paper Bags	..	11 0 6 (*b*)	10 18 0 (*b*)
Granulated Superphosphate			
Jute Bags	..	12 6 0 (*b*)	12 3 6 (*b*)
Paper	..	11 10 6 (*b*)	11 8 0 (*b*)
Blood and Bone (5/15) ..	7 10 0	25 4 0 (*c*)	25 4 0 (*c*)
Potash—			
Muriate (60%)	..	33 0 0 (*c*)	33 16 0 (*c*)
Sulphate (48%) ..	15 10 0	40 5 0 (*c*)	41 1 0 (*c*)

(*a*) Less 7s. 6d. for cash. (*b*) Less 5s. for cash. (*c*) Net.

LIMES.

There are 30 limes registered in Queensland, including burnt lime, hydrated lime, magnesian lime, processed lime, pulverised limestone, slaked lime and earthy lime.

SEED IMPORTS AND EXPORTS.

Table 6 sets out details of seeds examined at the port of Brisbane for the purpose of the Quarantine Act and/or Commerce (Trade Descriptions) Act.

TABLE 6.
SEEDS EXAMINED.

Kind of Seed.	1954–55.	1955–56.
Imports—		
Farm Seeds—		
Beans (sacks)	3,394	2,705
Grass (sacks)	20	45
Legumes (sacks)	20	95
Miscellaneous (sacks) ..	82	193
Vegetable—		
Miscellaneous (lb.) ..	1,069	2,258
Parcel post (parcels) ..	219	147
Peas (sacks)	286	310
Exports—		
Grasses—		
Paspalum (sacks)	3,363	2,119
Rhodes (sacks)	83	84
Miscellaneous (sacks) ..	41	48
Legumes (sacks)	10	..
Miscellaneous (sacks) ..	1	..

GRAIN AND STOCK FOOD EXPORTS.

Reports were issued on 1,476 samples of grains submitted by shippers or agents in connection with which a Government certificate of quality was required either by the Government of the importing country or by the terms of the buyers' contract. These samples represented a total of 47,956 tons of grain, including maize, wheat, sorghum, barley, ryecorn, white French millet, *Setaria italica,* Japanese millet, canary seed and sunflower. Of the samples of grain examined, 97 were found to contain seeds of *Datura,* a poisonous weed prohibited in Queensland when contained in either seeds or grain; this involved 2,529 tons of grain. Eighteen samples of mill offals representing 2,751 tons were examined. The figures given do not include considerable quantities known to be exported but for which Government certificates of quality were not required.

FRUIT AND VEGETABLES INSPECTION.

From May 14, 1956, the Standards Branch has been responsible for the administration of *The Fruit and Vegetables Act of* 1947. A horticulturist and 10 fruit and vegetable Inspectors were seconded to the Branch from the Horticulture Branch on that date.

CLERICAL AND GENERAL DIVISION.

Clerical and General: Mr. H. Barnes, Special Administration Officer.

Extension Consultant Service: Mr. G. R. Moule, Extension Co-ordinator.

Mr. H. Barnes

The services of the administrative Assistant Under Secretary (Mr. W. T. Gettons) were made available to the Queensland Meat Industry Board again during the year. The report on clerical and general activities has therefore been prepared by the Special Administration Officer, who has carried out the duties of his Departmental position.

STAFF.

The number of persons in the employ of the Department increased by 62 and at June 30 numbered 1,136. The total includes staff employed on extension work for which financial assistance is given by the Commonwealth Government but is exclusive of approximately 120 seasonal workers occupied on sugar-cane testing duties at various sugar mills.

The clerical staff numbers 211, comprising 85 males and 126 females as follows:—

——	Brisbane.	Country.	Total.
Clerks	78	1	79
Clerk-Typists	70	51	121
Male Assistants	7	—	7
Female Assistants ..	3	1	4
Total	158	53	211

Fifty-nine new appointees, comprising 17 clerks, 39 clerk-typists and three female assistants took up duties, but resignations accounted for a loss of 35 officers, whilst one clerk and one clerk-typist were transferred to other Departments, four took up duties with the technical staff and one was dismissed. Country offices in 35 towns now have the assistance of clerk-typists to relieve extension officers of much routine clerical work and enable them to spend the maximum time in the field.

ACCOMMODATION.

With the continuous growth of the Department the provision of office and storage space has become a very real problem. There is a pressing need for more accommodation. At Head Office the space available in the present building is quite inadequate to properly house the present staff, let alone provide for expansion.

Storage space for materials and equipment is also at a premium. Much valuable equipment has had to be housed under an old shed at the rear of the main building, where it is subject to deterioration under damp conditions.

Improved conditions have been effected recently in a number of country centres and are being sought in others. New and more spacious accommodation has been occupied at Maryborough; additional offices have been secured in the Government buildings in Townsville, Rockhampton, Innisfail, Wandoan and Wallangarra; extensions have been made to buildings occupied at Caboolture and Pittsworth; better accommodation has been provided in the new Court Houses at Ingham and Goondiwindi; some of the staff at Ayr have been transferred to the Regional Experiment Station to relieve congestion; better private premises have been leased at Cooroy. More accommodation is needed and is being sought in places such as Toowoomba, Kingaroy, Bundaberg, Cairns, Emerald, Dalby, Malanda, Oakey and Gympie.

ACCOUNTS.

Payments for the year, from all funds, were £2,093,704, compared with £1,862,230 for the preceding 12 months. Receipts totalled £1,105,837 and £1,057,780 for the respective years.

The expansion of the Department's field and technical services is reflected in the greater volume of work passing through the Accounts Section. In four years the number of vouchers paid annually has risen by more than 10,600 and in 1955-56 numbered 32,789. The number of cheques issued yearly also increased by more than 10,000, being 47,310 for the 12 months under review. Payments made in connection with the following projects indicate to some extent how additional work has been allotted to the Section during recent years.

——	1952–53.	1955–56.
	£	£
Grade Herd Recording Scheme	44,554	73,117
Tuberculin Testing Scheme	60,183	100,482
Commonwealth Extension Services Grant ..	17,391	38,733
Commonwealth Dairy Industry Extension Grant	70,206	65,399

The accommodation for the Accounts Branch is totally inadequate but it is not practicable to afford the Branch more space within the present building. The use of punch-card machines would ease accommodation difficulties and would go a long way towards solving the problem of clerical staff shortage in this and other sections of the Department.

RECORDS.

A large volume of correspondence was again handled by the Records Branch. A total of 87,901 inward letters was received, but this figure does not include the numerous returns, forms, applications, etc. which come to hand weekly and monthly. Additionally, more than 11,000 intramural and 53,922 outward letters were completed, making a grand total of 152,840. The introduction of an additional registration box has ensured that there is a minimum of delay in recording and distributing correspondence to the various Branches for attention.

COMMERCIAL AND DESPATCH.

The output of work in this Section continues to increase and is particularly noticeable in the number of orders placed for materials and equipment. The current policy of the State Stores Board of placing as many items as possible under contract is very satisfactory, enabling as it does many orders to be placed direct by the Department with the supplier, obviating delays in delivery of and payment for goods. The following table shows how the number of orders issued has increased during five years and the manner in which the orders have been placed.

Year.	Orders on State Stores.	Orders Placed Direct.	Total Orders Issued.
1951–52	3,163	2,539	5,702
1952–53	3,175	2,960	6,135
1953–54	3,772	4,556	8,328
1954–55	3,781	5,190	8,971
1955–56	3,008	6,302	9,310

A new form of requisition for materials has been introduced and is proving most satisfactory. All details of the action taken by the Commercial Clerk to secure the particular materials required are recorded on the new requisitions and duplicates are returned to the sections or officers concerned so that they are fully advised.

There is a keen demand for copies of Volume III of the Queensland Agricultural and Pastoral Handbook describing and illustrating the pests and diseases of plants in the State. Only 924 copies remain in stock out of 5,000 printed in 1952.

All outward letters for each of the 17 large country offices are now posted daily in one outer cover. This has been largely responsible for the saving of more than £200 in the yearly postage account. In 1954-55 this amounted to £5,884 and in 1955-56 it was only £5,652.

TRANSPORT.

The provision of transport for new officers continues to be a difficulty. Thirty-two new vehicles have been purchased to replace 26 condemned Q.G. machines and six private cars formerly used on a mileage basis but which became no longer available for Departmental use. Four other new vehicles were purchased—one from the Commonwealth Extension Services Grant, two from the Commonwealth Dairy Industry Extension Grant, and one for the Artificial Insemination centre at Atherton. The effective strength of the Department's fleet of vehicles is 254. Additionally 249 officers have permission to use privately owned cars for official purposes at approved mileage rates.

EXTENSION CONSULTANT SERVICE.

Funds for an extension consultant service were again made available by the Commonwealth Government under the Extension Services Grant. The need for such a service to consolidate the Department's extension activities was emphasized by shortage of staff on the one hand and a growing public demand for information on the other.

The work of the extension consultant service throughout the year has been recorded under three headings, corresponding to its aims.

These aims have been stated as:—

(*a*) To assist in the co-ordination of extension activities through the Department;

(*b*) To train staff in extension methods;

(*c*) To serve as consultant to the Divisions and Branches in programme planning and all extension activities.

Co-ordination of Extension Activities.

Early in the year a summary of all extension activities within the Department was completed. It dealt with programmes at Departmental, Divisional and Branch level, and detailed not merely extension objectives but also the channels and aids by which these objectives were to be reached, the availability of men and the sources of finance.

The summary revealed that approximately 400 officers were actively engaged in extension work. For about one-third of this number it represented a full-time occupation. The remaining two-thirds gave only part of their time to extension. Their efforts were supporting a total of 84 programmes, distributed throughout the Divisions and Branches of the Department.

The purpose of the summary was to enable officers to relate their individual effort to the overall work of the Department. In addition, it was hoped it would aid in maintaining a balanced programme in extension, and assist in establishing liaison between field officers charged with implementing the various aspects of the work outlined. Since liaison seemed of special significance in connection with the Department's overall programme in fodder conservation, the summary included mention of the contribution being made by all sections.

Throughout the year the service has assisted in correlating activities associated with the programme of fodder conservation, and has encouraged the adoption within the Divisions and Branches of certain basic steps in programme building.

Among the main contributions made by the service in support of the fodder conservation programme has been the assimiliation of suggestions made by several hundred field officers, and the incorporation of such advice in the form of a proposed programme. The work entailed the careful scrutiny of questionnaire forms, situation analyses, and presentations under the title "The Case for Fodder Conservation." Some means of classification had to be arrived at, so that opinions expressed could be viewed in the light of local conditions. An agronomist had been transferred to the headquarters of Agriculture Branch to assist in the correlation of fodder conservation activities, and his services were enlisted in the work of interpreting answers and drawing up a tentative programme. A summary of the answers received, together with the proposed programme, has been circulated to field officers for their comment. Once their replies have been received it is hoped to finalize a programme.

As a result of contacts established between the service and the Division of Marketing, it is hoped that material on the economic problems associated with fodder conservation may be compiled shortly.

Training Staff.

As previously, the service conducted a school in extension methods for Departmental officers. Its aim was to provide up-to-date knowledge of extension techniques applicable to Australian conditions.

For the first time the school was run on a voluntary basis. Applications were called and 120 requests for admission were received. The questionnaire-type forms used by applicants were graded according to the apparent value of the school to each applicant, and with these gradings as a guide the Divisions then made a final selection of candidates.

Twenty-four Departmental officers were chosen to attend. Five Wool Scholars were present under the Commonwealth Sheep and Wool Extension Services Scholarship plan, and overseas visitors from Cyprus and Libya—who happened to be in Queensland under the auspices of F.A.O.—were also given the benefit of the school.

Essentially the school was conducted along the same lines as in previous years. Every encouragement was given to officers to look upon the school as their own.

The curriculum comprised lectures on the aims, problems and philosophy of extension; on human relations and the psychology of rural people; on educational method and rural leaders; on extension overseas and methods of programme planning; and on the place of extension in relation to rural people and the general public. For the first time lectures on public speaking were introduced. These were delivered by an officer of the service who had undertaken a course of study in the subject.

Individual officers were made responsible for presenting one each of a total of 27 channels and aids used by extension, such as radio, exhibits, tours and meetings. All officers were then called upon to submit written assignments on these topics.

Tuition in the use of extension aids—such as projectors and tape recorders—was included in the programme, and specialized subjects were covered by a series of guest speakers, all of standing in their professions.

To enable officers to gain experience in chairmanship they were elected in turn to preside over sessions of the school. The value of this practice was enhanced by the fact that discussion periods were a regular feature of the course.

In the light of experience gained at previous schools, the time table was adjusted to obviate the need for night work on assignments. The evening sessions were devoted to lectures on human relations, to the presentation of extension methods, and to the showing of films for instructional purposes.

Role-playing was used as an adjunct to both lectures on human relations and public speaking. To assist officers in grasping the fundamentals in programme planning, an exercise in strategy was devised: the stages in planning were represented on separate cards, and officers were requested to arrange the cards in a satisfactory sequence.

By means of questionnaire forms presented to officers at the beginning and end of the school, and from a study of the written assignments, an attempt was made to evaluate the success of the school.

The results showed conclusively that officers had clarified their thoughts on the subject of extension. The standard of work was high, and it was heartening to note the influence of pre-school training upon certain officers. This training had been received from senior officers who, not content with having themselves attended a school, had taken effective action to pass on the knowledge acquired.

A measure of the work accomplished in the three weeks' duration of the school may be had from the fact that it was the equivalent of a year's study at a university in a single subject. This is assuming a subject embracing two hours of lectures and an hour of practical work each week for the period of the academic year.

An overall study of assignments, questionnaires, and the trend of feeling during discussion reveals certain points, some of which may be worthy of mention.

One of the requests most frequently received was for a better knowledge of agricultural economics. In addition, officers made suggestions to the effect that perhaps extension teaching could more effectively reach banking and other interests having indirect control of rural development.

The latter suggestions were of special interest in that they demonstrated the contribution a school of this kind can make toward the spread of production aims. Not only are officers made aware of the role they can play in the transmission of high-level policy; they are in addition tutored in the methods whereby such policy can be absorbed by the rural population, and can emerge again as the inspiration of its leaders.

The need to think in terms of the farm family was another point referred to. The family's overall prosperity was the concern of extension. There was the point to remember, also, that the producer often received ideas indirectly, by way of his wife and children.

Consultant Activities.

Throughout the year the service has given assistance to the Divisions and Branches in the preparation and presentation of extension material. Suggestions have been made for the improvement of written matter, and advice has been given on the employment of extension techniques. A list has been compiled of film and movie equipment held within the Department, its ownership, its type, its availability and its possible use. Much time has been devoted to the handling of requests for the loan of films, both those held within the Department and those available from outside sources, notably the Commonwealth Department of Commerce and Agriculture and C.S.I.R.O. Lists of films available from these sources have been circulated at regular intervals, and the necessary loan arrangements made.

Following discussions between the Department and the A.B.C. on the subject of rural broadcasting, the service obtained the opinions of the Divisions and Branches upon a number of proposals as to how rural broadcasting could be improved. Submissions were then collated, and a summary distributed representing the full range of thought.

An evaluation of the exhibits in the Departmental Court at the Royal National Show was made by a member of the service, and a report circulated listing the possible reasons for the public's response to the individual items.

An officer of the service attended the Junior Farmers' Organization Conference in Mackay as representative of the Department, and reported favourably on the part this Organization can play in transmitting ideas to and from rural people. He found warm appreciation of the support given by the Department of Agriculture and Stock in obtaining a film unit for the Organisation through Commonwealth Extension Services Grant Funds.

Publications.

The circulation of the Department's monthly advisory publication for farmers, the *"Queensland Agricultural Journal,"* was maintained during the year at a figure exceeding 15,000 copies per month. While the circulation has increased to a considerable extent in the last few years, it is capable of further expansion, as there are over 40,000 rural holdings in the State.

Efforts are being made to improve the presentation of the journal to ensure, as far as is practicable, that the recipients will peruse its contents and study the articles applicable to their particular pursuits. Colour has been introduced to the cover and the setting out of the contents changed.

All Branches concerned with production and marketing of primary products contributed regularly to provide a journal of wide interest.

Over 100 of the articles appearing during the year were reprinted and issued as advisory leaflets or pamphlets, the total number of copies printed being nearly 200,000. Of these articles, 48 originated in the Division of Plant Industry, 32 in the Division of Animal Industry, 17 in the Division of Dairying and 5 in the Division of Marketing. These new publications brought the total number of titles of free leaflets and pamphlets to over 600.

The *"Queensland Journal of Agricultural Science,"* the Department's quarterly scientific publication, continues to have a wide geographical distribution and new exchanges for scientific literature of other institutions were arranged during the year. Of the 22 scientific papers published during the year, the Division of Plant Industry contributed 12, the Division of Animal Industry 8 and the Division of Dairying 2.

The Queensland Agricultural and Pastoral Handbook Series, comprising volumes on farm crops and pastures, horticulture, and insect pests and diseases of plants, has been in heavy demand. Only one volume was available during the year, but progress was made in preparing revisions of the other two volumes. That dealing with horticulture is expected to be printed in the next financial year.

Brochures on various aspects of fodder conservation were submitted for publication during the year under the Commonwealth Extension Services Grant, and a special publication dealing with the main weeds of Queensland went to press.

Press and radio continue to make wide use of the Department's weekly News Bulletin, which carries items of topical interest to primary producers. The bulletin is sent to some 90 newspapers and radio stations. Practically every country newspaper regularly uses items from this source, and this coverage must make the bulletin an effective extension medium.

News on the current operations of the Department has also been kept flowing through press and radio.

Broadcasting.

The programme of regular broadcasts of agricultural talks through numerous country stations, initiated in 1954, was continued successfully during the past year. Two taped talks were supplied each week to 10 country stations. This represents material for over 1,000 broadcasts. As most of the stations concerned use the tapes on regular sessions for country listeners, the service must assuredly have considerable value in extension.

The service is provided as a co-operative one in the interests of primary producers, no time being bought and no fee being asked by the Department.

These taped talks, circulated by the Information Branch, are additional to the numerous talks provided directly to the A.B.C. and commercial stations by various Branches.

Library.

The Central Library continues to receive and circulate a large amount of material. Periodicals are now circulated to more than 200 separate addresses, and are perused by considerably more than that number of officers. Numerous loans of books and periodicals have been made to officers throughout the State.

The staff position has been improved sufficiently to permit the restoration of services which had to be discontinued because of shortage of staff.

Photography.

Nearly 700 jobs, many of them involving scores of enlargements, were completed in the Photographic Section during the year. The appointment of an additional officer enabled an increased volume of work to be undertaken, including more extensive field photography than it was possible to do previously. The Section's equipment has also been improved to expedite the put-through of enlargements.

In addition to still photography, the Section rendered some assistance to Branches undertaking cinematography.

Exhibits.

The Department's court at the Brisbane Royal National Show in 1955 was supervised by the Acting Special Administration Officer of Central Administration. The display was again very colourful and instructive and was seen by many thousands of people.

Various Branches participated in exhibits at country shows and prepared floats for commemorative processions.

A. H. TUCKER, Government Printer, Brisbane.