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J. L. Handley, "Meadow Vale" Stud, Lockyer
O'Brien and Hickey, "Kildurham" Stud, Jandowae East
G. C. Traves, "Wynwood" Stud, Oakey
Westbrook Farm Home for Boys, Westbrook
H.M. State Farm, "Palen" Stud, Palen Creek
A. R. Ludwig and Sons, "Beau View" Stud, Beaudesert
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R. Postle, "Yarralla" Stud, Pittsworth
B. J. Jensen "Bremerside" Stud, Rosevale, *via* Rosewood
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S. T. Fowler, "Kenstan" Stud Pittsworth
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C. Wharton, "Central Burnett" Stud, Gayndah
S. Jensen, Rosevale, *via* Rosewood
V. V. Radel, Coalstoun Lakes
H. R. Stanton, Tansey, *via* Goomeri
L. Stewart, Mulgowie, *via* Laidley
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
O. J. Horton, "Manneum Brae" Stud, Manneum, Kingaroy.
B. F. Jensen, Rosevale
Dr. B. J. Butcher and A. J. Parnwell, 684 Logan road, Greenslopes, Brisbane

Tamworth.

D. F. L. Skerman, "Waverley" Stud, Kaimkillenbun
A. C. Fletcher, "Myola" Stud, Jimbour
Salvation Army Home for Boys, "Canaan" Stud, Riverview
Department of Agriculture and Stock, Regional Experiment Station, Kairi
E. C. Phillips, "Sunny View," M.S. 90, Kingaroy
F. N. Hales, Kerry road, Beaudesert
T. A. Stephen, "Withcott," Helidon
W. F. Kajewski, "Glenroy" Stud, Glencoe
A. Herbst, "Hillbanside" Stud, Bahr Scrub, *via* Beenleigh
F. Thomas, "Rosevale" Stud, M. S. 373, Beaudesert
H. J. Armstrong, "Alhambra," Crownthorpe, Murgon
R. H. Coller, Tallegalla, *via* Rosewood
A. J. Potter, "Woodlands," Inglewood
D. V. and P. V. Campbell, "Lawn Hill," Lamington
S. Kanowski, "Miecho" Stud, Pinelands
N. R. Potter, "Actonvale" Stud, Wellcamp

Wessex Saddleback.

W. S. Douglas, "Greylight" Stud, Goombungee
C. R. Smith, "Belton Park" Stud, Nara
D. T. Law, "Rossvill" Stud, Trouts road, Aspley
J. B. Dunlop, "Kurrawyn" Stud, Acacia road, Kuraby
R. A. Collings, "Rutholme" Stud, Waterford
M. Nielsen, "Cressbrook" Stud, Goomburra
G. J. Cooper, "Cedar Glen" Stud, Yarraman
"Wattledale Stud," 492 Beenleigh road, Sunnybank
Kruger and Sons, "Greyhurst," Goombungee
A. Scott, "Wanstead" Stud, Grantham

British Large Black.

H. W. Naumann, "Parkdale" Stud, Kalbar

Tuberculosis-Free Cattle Herds.

The studs listed below have fulfilled the conditions of the Department's Tuberculosis-free Herd Scheme to 31st January, 1957.

Breed.	Owner's Name and Address.
A.I.S.	M. E. & E. Scott, "Wattlebrae" A.I.S. Stud, Kingaroy
	F. B. Sullivan, "Fermanagh," Pittsworth
	D. Sullivan, "Bantry" Stud, Rossvale, *via* Pittsworth
	W. Henschell, "Yarranvale," Yarranlea
	Con. O'Sullivan, "Navillus" Stud, Greenmount
	H. V. Littleton, "Wongalea" Stud, Hillview, Crow's Nest
	J. Phillips and Sons, "Sunny View," Benair, *via* Kingaroy
	Sullivan Bros., "Valera" Stud, Pittsworth
	Reushle Bros., "Reubydale" Stud, Ravensbourne
	H. F. Marquardt, "Chelmer" Stud, Wondai
	A. C. and C. R. Marquardt, "Cedar Valley," Wondai
	A. H. Sokoll, "Sunny Crest" Stud, Wondai
	W. and A. G. Scott, "Welena" A.I.S. Stud, Blackbutt
	G. Sperling, "Kooravale" Stud, Kooralgin, *via* Cooyar
	C. J. Schloss, "Shady Glen," Rocky Creek, Yarraman
	W. H. Thompson, "Alfa Vale," Nanango
	S. R. Moore, Sunnyside, West Wooroolin
	H.M. State Farm, Numinbah
	D. G. Neale, "Grovely," Greenmount
	Edwards Bros., "Spring Valley" A.I.S. Stud, Kingaroy
	A. W. Wieland, "Milhaven" A.I.S. Stud, Milford, *via* Boonah
	W. D. Davis, "Wamba," Stud, Chinchilla
	Queensland Agricultural High School and College, Lawes
	C. K. Roche, Freestone, Warwick
	Mrs. K. Henry, Greenmount
	D. B. Green, "Deloraine" Stud, Durong, Proston
	E. Evans, Wootha, Maleny
	T. L. and L. M. J. Cox, "Seafield Farm," Wallumbilla
	J. Crookey, "Arolla" A.I.S. Stud, Fairview, Allora
	M. F. Power, "Barfield" Kapaldo
	A. H. Webster, "Millievale," Derrymore
	W. H. Sanderson, "Sunlit Farm," Mulgildie
	R. A. and N. K. Shelton, "Vuegon" A.I.S. Stud, Hivesville, via Murgon
	R. R. Radel & Sons, "Happy Valley," Coalstoun Lakes
Ayrshire	L. Holmes, "Benbecula," Yarranlea
	J. N. Scott, "Auchen Eden," Camp Mountain
	E. Mathie and Son, "Ainslie" Ayrshire Stud, Maleny
	C. E. R. Dudgeon, "Marionville" Ayrshire Stud, Landsborough
	G. F. H. Zerner, "Pineville," Pie Creek, Box 5, P.O., Gympie
	T. F. Dunn, Alanbank, Gleneagle
Friesian	C. H. Naumann, "Yarrabine" Stud, Yarraman
	D. J. Pender, "Camelot," Lytton road, Lindum
	S. E. G. Macdonald, "Freshfields," Marburg
Guernsey	C. D. Holmes, "Springview," Yarraman
	A. B. Fletcher, Cossart Vale, Boonah
	W. H. Doss, Degilbo, *via* Biggenden
	A. C. Swendson, Coolabunia, Box 26, Kingaroy
	C. Scott, "Coralgrae," Din Din Road, Nanango
	R. J. Wissemann, "Robnea," Headington Hill, Clifton
	G. L. Johnson, "Old Cannindah," Monto
	A. Ruge & Sons, Woowoonga, *via* Biggenden
	G. Miller, Armagh Guernsey Stud, Armagh, M. S. 428 Grantham
Jersey	Queensland Agricultural High School and College, Lawes
	J. S. McCarthy, "Glen Erin" Jersey Stud, Greenmount
	J. F. Lau, "Rosallen" Jersey Stud, Goombungee
	G. Harley, Hopewell, M.S. 189, Kingaroy
	Toowoomba Mental Hospital, Willowburn
	Farm Home for Boys, Westbrook
	F. L. Cox and Sons, "Rosel" Stud, Crawford, Kingaroy line
	P. J. L. Bygrave, "The Craigan Farm," Aspley
	R. J. Crawford, "Inverlaw" Jersey Stud, Inverlaw, Kingaroy
	P. H. F. Gregory, "Carlton," Rosevale, *via* Rosewood
	E. A. Matthews, "Yarradale," Yarraman
	A. L. Semgreen, "Tecoma," Coolabunia
	L. E. Meier, "Ardath" Stud, Boonah
	A. M. and L. J. Noone, "Winbirra" Stud, Mt. Esk Pocket, Esk
	W. S. Cenochie and Sons, "Brookland" Stud, Sherwood road, Sherwood
	Estate of J. A. Scott, "Kiaora," Manumbar road, Nanango
	F. W. Verrall, "Coleburn," Walloon
	C. Beckingham, Trouts road, Everton Park
	W. E. O. Meir and Son, "Kingsford" Stud, Alberton, *via* Yatala
	G. H. Ralph, "Ryecombe," Ravensbourne
	Mrs. I. L. M. Borchert, "Willowbank" Jersey Stud, Kingaroy
	W. and C. E. Tudor, "Boree" Jersey Stud, M.S. 498, Gayndah
	Weldon Bros., "Gleneden" Jersey Stud, Upper Yarraman
	D. R. Hutton, "Bellgarth," Cunningham, *via* Warwick
	J. W. Carpenter, Flagstone Creek, Helidon
	H. G. Johnson, "Windsor" Jersey Stud, Beaudesert
	W. S. Kirby, Tinana, Maryborough
	S. A. Cramb, "Trecarne Stud," Lockyer
	G. & V. Beattie, "Beauvern," Antigua, Maryborough
	J. A. & E. E. Smith, "Heatherlea" Jersey Stud, Chinchilla
	W. C. M. Birt, "Pine Hill" Jersey Stud, Gundiah
	T. Nock, Dallarnil
	P. Fowler & Sons, "Northlea," Coalstoun Lakes
	F. Porter, Conondale
	H. M. State Farm, Palen Creek
Poll Hereford	W. Maller, "Boreview," Pickanjinnie
	J. H. Anderson, "Inverary," Yandilla
	D. R. and M. E. Hutton, "Bellgarth," Cunningham, *via* Warwick
	E. W. G. McCamley, Eulogie Park, Dululu
	Wilson and McDouall, Calliope Station, Calliope

Safeguards for Producer and Consumer

By H. S. HUNTER, Director, Division of Marketing.

In addition to its efforts to improve the production practices and the technical "know how" of the man on the land, the Department of Agriculture and Stock provides marketing services and economic advice to aid him in getting the full value of his product and in the planning of his cropping programmes for succeeding seasons.

Marketing Aid.

Marketing services include the establishment of marketing boards for various products and assistance to them in the various decisions they are called upon to make from time to time. This particular form of assistance is provided on the principle of help to those who are prepared to help themselves.

The legislation under which the boards are established is in the form of enabling Acts. They are made to apply to a commodity only upon the request of the growers. The initiative must always come from the growers for the inauguration of a marketing scheme. Upon its coming into operation, administration of the scheme becomes the responsibility of a board composed of elected representatives of the growers, with the Director of Marketing, or his deputy, acting as a liaison with the Government and to some extent as an adviser, particularly to new boards and boards representing the smaller rural industries.

Some 36 years of experience in Queensland have shown that such grower-controlled marketing authorities can operate to the advantage of the growers and the community, provided the sound business policy is adopted of engaging the services of experienced and capable executive officers and provided the board and its marketing scheme receive the loyal support of all of the growers in the industry. The latter is a most essential requirement in the long-term interests of each and every grower and is well worth his earnest examination.

Boards are assisted where necessary by Treasury guarantees, and the interests of individual growers are protected by safeguards relating to voting at referendums, the conduct of elections, the provision that the proceeds of sales must be returned to the growers and by the annual auditing of the books and accounts of boards by officers of the Auditor-General's Department.

The Marketing Division, which is the nexus between the boards and the Department, also maintains contact with the Bureau of Agricultural Economics and the Marketing Division in the Commonwealth Department of Primary Industry.

Trends and Forecasts.

Reports published at regular intervals by the Marketing Division are of assistance not only to the primary producer, but also to trading and commercial institutions.

In addition to a section in the Department's Annual Report to Parliament, a report is submitted annually to the Minister which contains a wealth of information relating to the marketing schemes in operation; production trends are discussed each month in a report which is sought by bankers and traders; forecasts are made at appropriate

stages during the growing season of a number of crops, including the grains, potatoes and tobacco leaf; poultry and egg production is examined quarterly. Abstracts are compiled of overseas reports of grain prices and a special staff of reporters ascertains daily the Brisbane market prices for fruit, vegetables and dry produce of the farm.

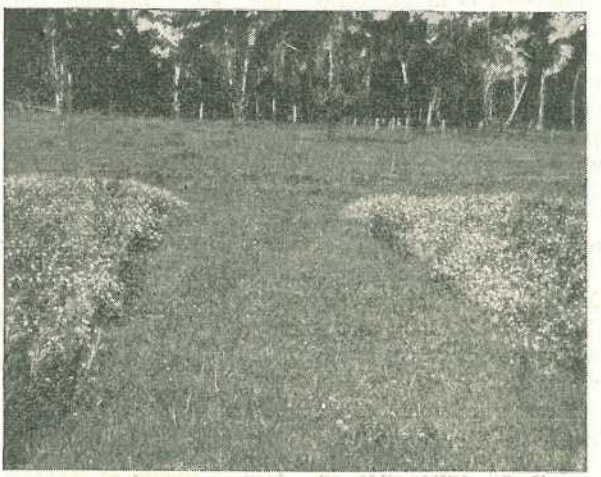
All this information, when available over a number of years, is subjected to statistical analysis and the resultant productivity and price trends are published for the information of persons interested.

Farm Economics.

The Division recently has embarked upon a number of economic surveys on farms with the object of compiling an accurate picture of the structure of the industry (as with pineapples), or to indicate the economic implications of a fundamental change in cropping practices where this is demanded by evidence of declining soil fertility (as in some of the grain crop areas). Economic information of this character has become more necessary for the guidance of farmers and agricultural field advisers under modern conditions of specialisation and the greater capital investment necessary for mechanisation of the farm.

Agricultural Standards.

The Division also, by standard enforcement, safeguards the interests of the consumer, including the rural producer in his role of purchaser of seeds, fertilizers, stock foods, veterinary medicines and pest destroyers. Fruit and vegetables offered for sale must be mature and free from disease. Seeds must be free from impurities and of proved viability. Seed certification schemes are operated for a number of commercial crops.



White Clover Responds to Superphosphate. The application of superphosphate to the plots on each side has greatly stimulated the white clover on this South Coast farm.

Field Turnips

By L. E. BRANDS, Adviser in Agriculture.

Turnips (*Brassica rapa*) were grown in the Mediterranean region nearly 4,000 years ago and have now spread from their original home in temperate Europe all over the world.

Many varieties have been developed in this time and types are now grown for both human and stock consumption. The cheapness of the seed and the ease with which turnips can be grown have made them an attractive rotation crop in European mixed farming systems.

Swede turnip (*Brassica campestris*), an allied species to the white turnip, can also be used either for human consumption or for stock feeding. It is most readily distinguished from the white turnip by its yellow or orange flesh and by its short stem or neck which surmounts the fleshy root.

Within both groups the varieties selected for table use are generally smaller and fine fleshed, while those selected for stock feeding are larger, coarser and higher yielding.

Use and Value.

Turnips supply succulent forage for winter feeding of stock. They are, therefore, comparable with silage and for best results should be fed in conjunction with legume hays or with grass hays and high-protein concentrates. They could also be grazed in conjunction with cereal crops such as oats and wheat.

While turnips are used principally for sheep, they are also relished by all other classes of farm livestock. They should be fed only to dry stock on the dairy farm, as turnip flavour taints milk. Turnips should be cut in pieces before being fed to cattle, as these animals are apt to attempt to swallow large portions of the roots and may choke.

This crop generally gives a much higher yield per acre than cereal crops. The total yield of food units per acre for turnips is at least 10 times that of cereal crops.

Used in conjunction with native grasses, they provide a suitable ration for all farm stock except breeding ewes; the latter require additional protein supplied in the form of young cereal crops, legume hays or green succulent pastures.

Sheep may be utilised for feeding off the crop without the labour of digging. When confined to limited areas, sheep will eat out the whole of the crop, both tops and roots. All that remains of the root is a thin shell which together with the animal manure helps to improve soil structure and fertility.

One of the great benefits of a crop such as this on the Darling Downs is that it makes an excellent rotation crop with cereals and assists a more diversified agriculture. When used as a grazing crop, it does not reduce the soil fertility to the same extent as a grain crop, and is doubly useful for this reason.

Varieties.

On the Darling Downs so far only one variety, the Mammoth Purple Top, is commonly grown. The seed is imported from Scotland. This variety is a heavy yielder and a normal crop will give 50 tons per acre.

Climate and Soil.

Turnips are most suited to cool climates with an abundance of sunshine throughout the growing season. After becoming well established they withstand long spells of dry weather. In a mature plant the primary roots

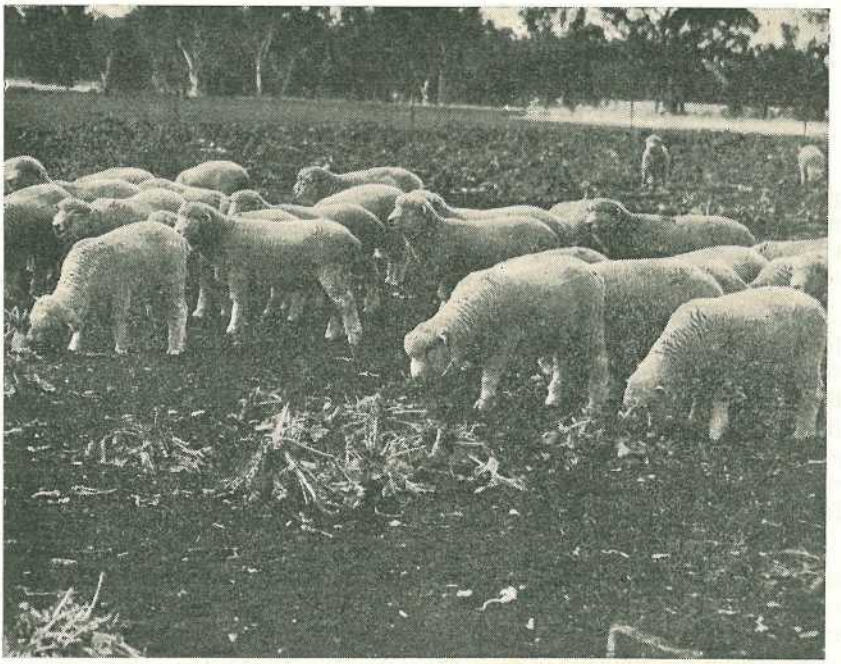


Plate 1.

Ram Lambs Grazing Field Turnips on a Darling Downs Farm. This picture, taken in July, 1953, shows an advanced stage of grazing; the foliage has all been eaten and only scattered roots remain.

may extend to a depth of 5 ft. or more and the fibrous surface roots may spread laterally for 2 ft. or more.

Turnips grow best in deep loamy soil that is well supplied with organic matter and plant food. Heavy clay soils are not desirable as the soil bakes, poor stands result, and the plants grow slowly. Shallow infertile soils are not suited to the production of turnips or other root crops, as the roots from such soils are not only small, but tough and stringy.

Soil Preparation.

The soil should be ploughed deeply and fallowed for some months. Prior to sowing, a light ploughing and harrowing is necessary to bring the surface soil to a fine tilth. A light rolling to compact the seedbed is recommended. Good seedbed preparation is advisable as it will reduce the likelihood of weed competition later.

Time to Sow.

The best time to sow is February-March, when subsoil moisture should be plentiful and regular rainfall can be expected. Autumn sowing also enables hot weather and the likelihood of aphis attack to be avoided. Moreover, the February-March sowings bring the crop to maturity at a time when graziers find it of best value. Under favourable conditions, turnips will mature within 100 days after sowing.

Sowing.

One pound of seed per acre planted at a depth of 1–2 in. will provide the best stand. A light rolling after sowing is recommended. If the planting rate of 1 lb. per acre is increased, lower yields may result due to severe moisture competition during growth.

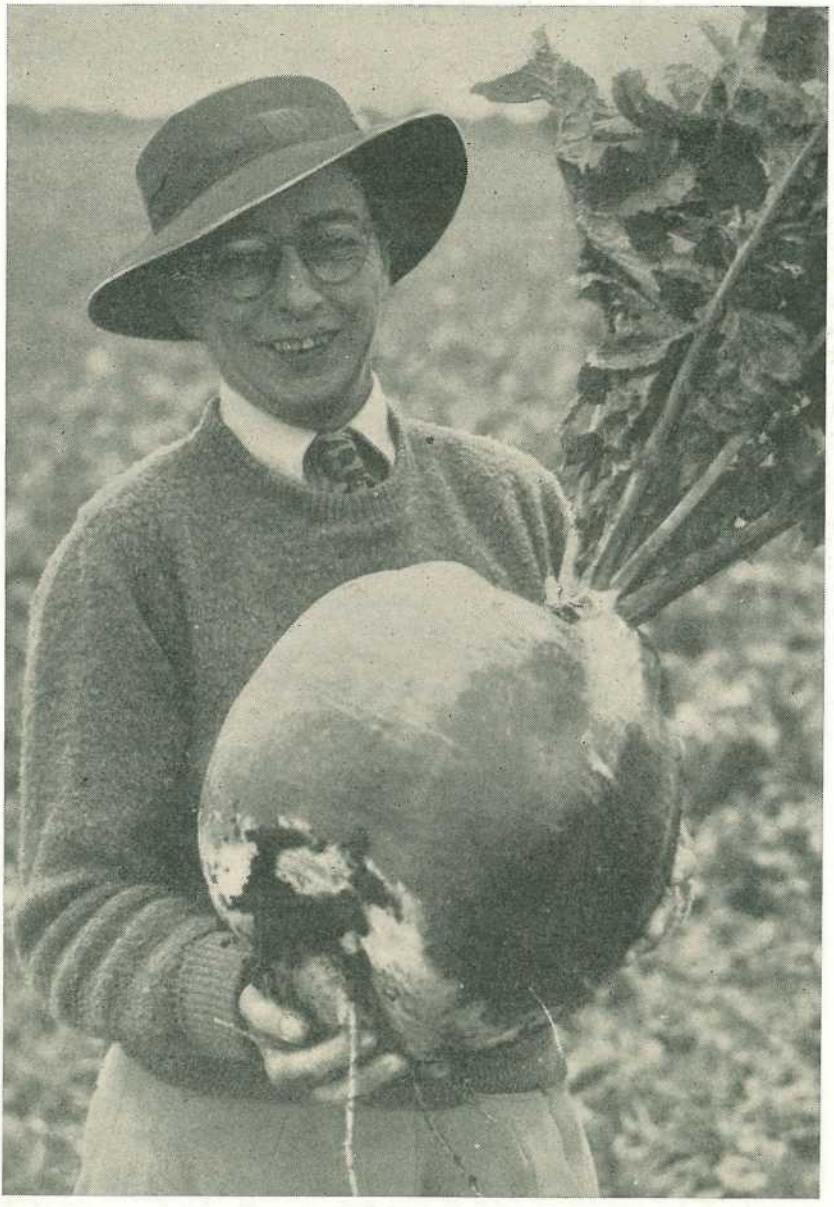


Plate 2.

A Sample of the Type of Field Turnip which can be Grown on the Darling Downs. This sample was typical of a crop grown by Mrs. I. M. Todd, "The Meadows," Dalby, for field grazing by sheep.

The seed can be sown through a combine in drills 14 in. apart. The combine set for 17 lb. of wheat per acre puts out about 1 lb. of turnip seed per acre when this seed is mixed with 14 lb. of a filler—for example, weevily wheat or sawdust. Should this low setting not be attainable on the machine, the quantities of the filler material have to be increased.

Growth of Crop.

Sown in March, the young plants develop to the grazing stage by early June. No inter-row cultivation is practised during that period. The sheep first feed on the tops and then on the regrowth of the leaves; finally they eat the roots.

Harvesting.

Field turnips are used solely for grazing. Controlled grazing by electric fences is recommended. As an example of the carrying capacity, the experience of a Brookstead farmer is given. Two hundred acres of heavy grey clay were sown to turnips in March. From early June they provided the principal feed for 2,500 sheep and lambs during the period between the end of the winter cereals and the commencement of grazing of the spring and summer crops, a period of approximately six months.

Pests and Diseases.

Turnips are not severely attacked by any diseases. Black rot (a bacterial disease) and black leg (a fungus disease) may cause stunted growth in the affected plants. Both are carried on the seed. White rust produces characteristic white or cream-coloured spots on the leaves.

Little can be done to control these diseases once they appear. Seed should be obtained where possible from a disease-free crop and a rotation of the land to crops unrelated to turnips should be practised.

Perhaps of more economic importance than the effects of the diseases mentioned are the losses incurred as the result of decay-producing organisms gaining entrance to the root through injuries caused by grazing. A soft, evil-smelling rot develops in injured roots, particularly during wet conditions. This trouble may be avoided to some extent by strip grazing and by keeping stock off the crop altogether during wet weather.

While a number of insect pests are capable of attacking field turnips, a winter crop is rarely seriously damaged by insects. Where insect attacks do occur, advice should be sought from the nearest office of the Department of Agriculture and Stock.

ADDITIONAL HERD RECORDING SERVICE.

From March onwards, each member of a herd recording group will be supplied with a record of the progressive total of milk and butterfat each cow in his herd has yielded since calving.

This information will allow the owner to see at a glance the length of time each cow has been milking and her production since calving. The figures will provide a valuable check on the effectiveness of the feeding methods in particular and of the general farm husbandry.

When the new service is in operation, Queensland dairy farmers will be receiving as comprehensive a herd recording service as those in any other State.

Wheat Varieties Recommended for Queensland—1957 Season

By Officers of the Agriculture Branch.

The wheat varietal picture in Queensland has changed greatly over the last 10 years, and is still changing to-day. As new and better varieties are developed by plant breeders in this and neighbouring States, they gradually supplant old favourites, and may in time replace them completely. Thus any list of varietal recommendations is likely to become out-of-date in a matter of a few years. The table presented here is intended for the 1957 season and will be revised from time to time in future.

The table of recommendations has been drawn up on the basis of 11 districts in which wheat is grown to some extent. Admittedly, in some of the districts listed, wheat is a very minor crop; however, even in districts such as these, Departmental advice is often sought on the most suitable variety or varieties to grow.

The recommendations have been provided by the Department's Agricultural Advisers in the respective districts. In most cases they are based upon the results of a series of carefully conducted yield trials in the various districts, backed up by farm experience with the varieties on a larger scale.

STEM RUST.

In most districts of south-east Queensland, resistance to stem rust is a most important varietal characteristic. True, there are many seasons in which rust is not at all serious. However, most Darling Downs farmers know that in a bad season stem rust can mean the difference between a 10-

WHEAT VARIETAL RECOMMENDATIONS.

District.	Quick-maturing.	Midseason.	Slow-maturing.
1. Darling Downs (Central and NW)	Spica, (Gabo, Seafoam, Puora)	Festival, (Charter)	Lawrence
2. Darling Downs (SE) ..	Spica, (Gabo, Seafoam)	Festival ..	Lawrence, (Celebration)
3. Maranoa	Spica, Gabo ..	Festival ..	Lawrence
4. Fassifern	Gabo, Puora ..	Kendee ..	Lawrence, Celebration
5. Brisbane Valley	Spica, Gabo, (Seafoam)	Festival, (Charter)	Lawrence
6. Lockyer Valley	Spica, Gabo ..		Lawrence, Celebration
7. South Burnett	Gabo, Spica ..	Charter, Festival	Lawrence
8. Central Burnett	Seafoam, Gabo, (Spica)	(Festival) ..	Lawrence, (Celebration)
9. Upper Burnett	Seafoam, Spica, Gabo	Festival	
10. Callide-Dawson—			
(*a*) Alluvials	Seafoam, Gabo, Spica, Pusa-4	Festival, Charter	
(*b*) Softwood Scrub ..	Gabo, Spica ..		Celebration
(*c*) Open Plains ..	Spica	Charter, Festival	
11. Central Highlands ..	Gabo, Spica ..	Festival ..	Celebration

bag crop and no grain at all. Even if such bad rust seasons occur only once in five years or so, the overall loss is still very serious unless rust-resistant varieties are regularly grown.

In the more northerly wheat districts (principally the Callide and Dawson Valleys and the Central Highlands), rust resistance is not of prime importance. In these districts, the spring weather is usually less humid than further south—and rust develops best in a humid atmosphere. Again, the wheats generally ripen so fast under these conditions that they can escape the effects of rust even if the disease is present.

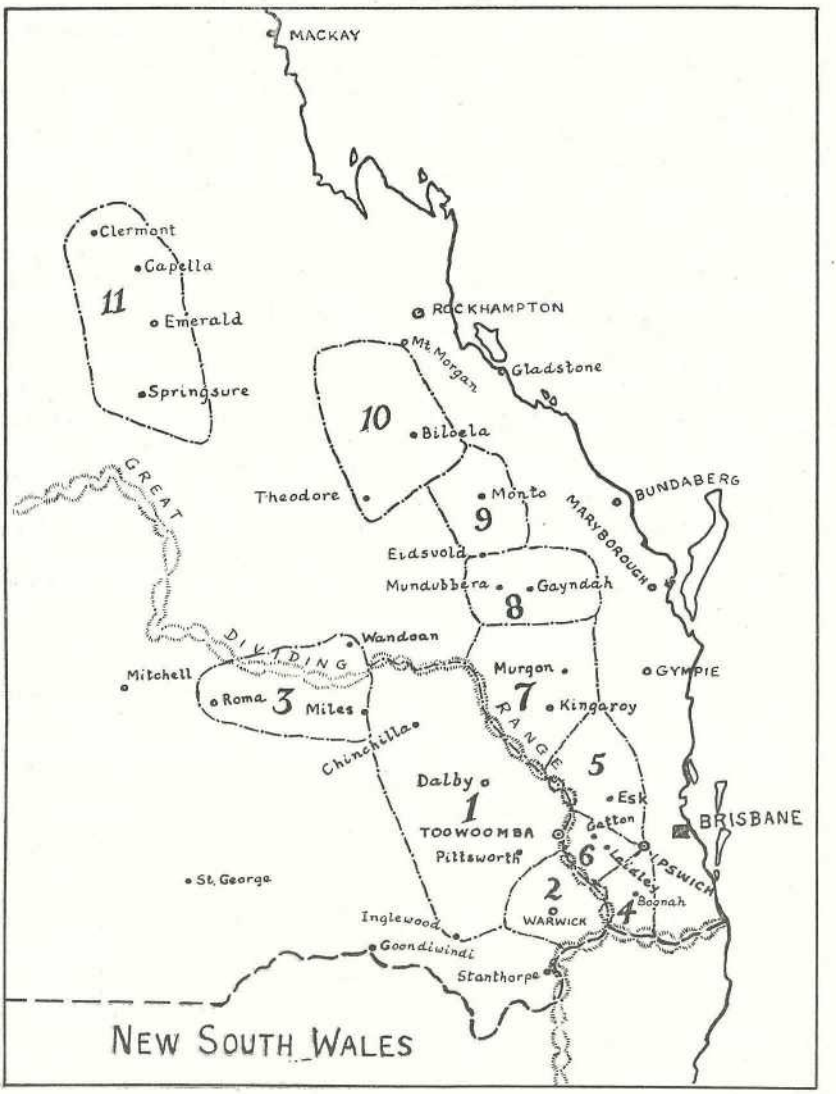


Plate 1.

Sketch Map of Portion of Queensland Outlining the Principal Areas in Which Wheat is Grown. The numbers identifying the areas correspond with those in the table. These areas are not intended to coincide with any official districts but represent approximate agricultural districts.

It was the rust resistance of such varieties as Gabo and Charter which gave them their big advantage over Puora. This last variety had been by far the most widely grown wheat in Queensland in the years immediately preceding 1949, but it soon lost ground to the rust-resistant varieties.

Changes in the prevailing strain of stem rust since 1949 have now resulted in some of the hitherto resistant varieties becoming quite susceptible. For example, in the 1955 season, even Celebration took stem rust quite severely—thus following in the footsteps of Yalta, Kendee, Gabo and Charter. At the present time the two popular varieties with the highest field resistance to stem rust are Spica and Lawrence, with Festival next.

QUALITY.

In years past, Queensland wheat-growers were not as a group greatly interested in wheat quality, because it was claimed that the premiums offered for quality were insufficient. Plant breeders, however, had kept this matter in mind, and as a result, farmers in this State have for the last 30 years had a range of varieties of very satisfactory quality to choose from.

At the present time, with greater competition existing in the world's grain markets, growers are quick to realise that quality is of prime importance. If Queensland's wheat industry is to expand beyond its previous peak, it must do so on the basis of high quality grain.

It is important to realise that the "strength" of a good bread wheat is dependent upon both the *quantity* and the *quality* of the proteins in the grain. The *quality* of the protein is mainly a varietal characteristic—for example, Spica and Gabo both possess very high protein quality for current bread-making requirements. The *quantity* of the protein in the grain is mainly dependent on the conditions under which the wheat is grown. Soil type, rainfall, soil management and farming systems can all play an important part in raising or lowering this protein percentage.

All the varieties listed in the accompanying table possess satisfactory protein quality. This does not mean that they all possess the *same* quality. They do in fact range from "very strong" varieties such as Festival and Charter to much softer varieties in the "medium-strong" class such as Lawrence and Seafoam. However, they do all possess very suitable qualities for bread-making when used in suitable blends.

The quantity of protein developed is largely in the farmer's hands. Most of our soils are not high in total nitrogen, even in their virgin state. Many of these soils cannot be expected to continue producing high-protein wheat under continuous cropping systems. It is only by maintaining soils at a satisfactory level of fertility—and this means the use of more varied farming systems—that Queensland can expect to remain a producer of relatively high protein wheat.

EXPLANATION OF TABLE.

In this table, the wheat varieties have been grouped approximately into three classes: quick-maturing, mid-season, and slow-maturing. The first and second groups comprise the main body of varieties suited for midseason or late planting. The slow-maturing group are better suited for early planting, coupled with feeding-off if so required.

In some instances varieties are given in brackets. This means generally that such varieties represent a second choice, being considered not quite so good as the other varieties listed for that district. In other cases, the bracketed varieties have not had sufficient testing to warrant a full recommendation, but have indicated some promise for the district in question.

The Potato Broad Mite

By G. H. S. HOOPER, Assistant Entomologist.

The potato broad mite (*Hemitarsonemus latus* (Banks)), which was of minor importance prior to 1955, has recently become a serious pest in south-eastern Queensland. Although it may be present in the spring crop, only the autumn crop is damaged appreciably. As well as attacking potatoes, this mite infests numerous weeds along headlands and creek banks.

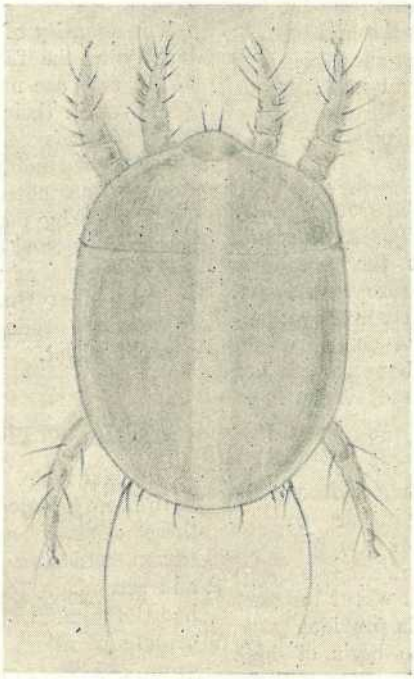


Plate 1.
Potato Broad Mite (Female X 250).

The mites are small, almost invisible to the naked eye, but can be seen with the aid of a lens. They are shiny and almost transparent. The female is larger than the male, globular in shape, with short legs, and incapable of quick movement. The male is more robust, has long legs, and moves actively over the plants, frequently carrying the female on its back.

Severely damaged plants are stiff and erect, and the leaf margins are curled downwards, with the undersurfaces of the leaves tinged brown. The newer leaves on these plants are more elongate, are dark green, and stand at a sharp angle from the main stem. Leaflets are pointed and much longer and narrower than those on undamaged plants. Infestations ultimately appear as dark-green patches in the field.

Tubers from severely affected plants often exhibit deep-seated splitting accompanied by numerous small protuberances.

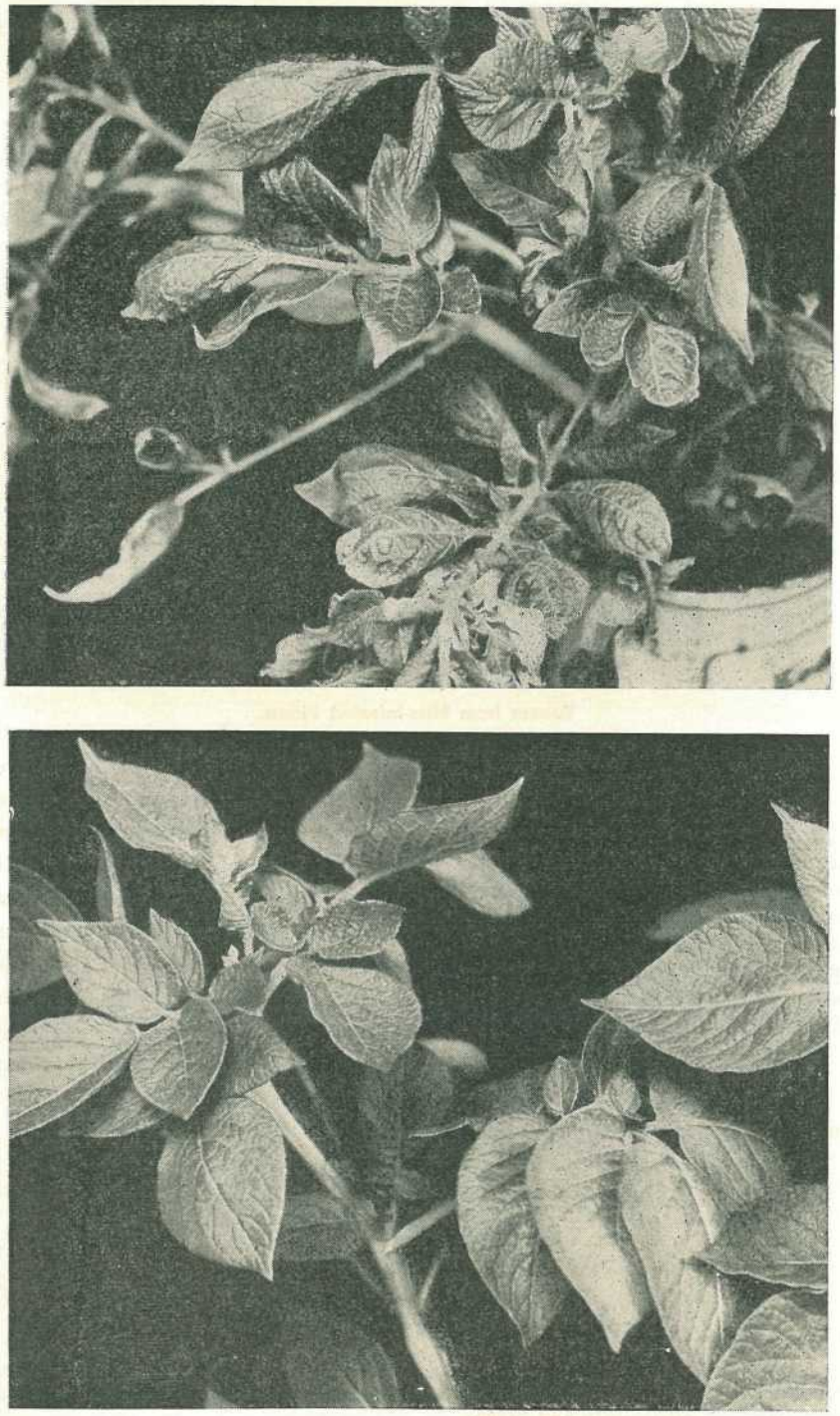


Plate 2.
Portion of an Infested Plant (top) and a Healthy Plant (bottom.)

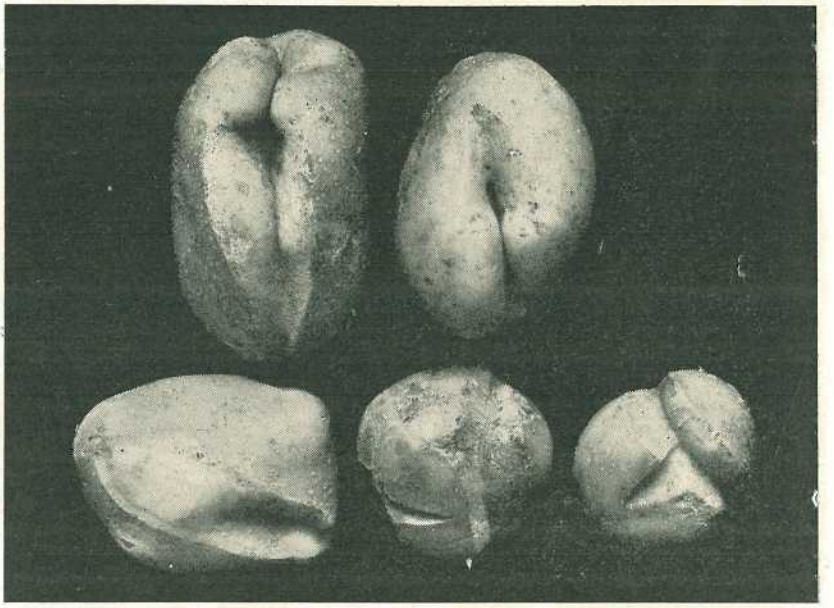


Plate 3.
Tubers from Mite-Infested Plants.

CONTROL.

Preventive Measures.

Routine spraying of autumn potato crops with DDT for other pests is seldom necessary, and should be avoided. Apparently this spraying has increased the pest status of the potato mite, which may cause some economic losses before suitable insecticides can be applied.

Insecticide Treatment.

Correctly timed spraying with lime sulphur, 1:80; spraying or dusting with sulphur according to label directions; or spraying with dieldrin at the rate of ½ lb. active ingredient per acre will control potato mite populations. As the mites are mainly on the under-surfaces, good plant coverage is essential. Treatment should be carried out at the first signs of plant damage; if delayed, the pest may become so well established that two sprayings, two to three weeks apart, will be required.

PLANT DISORDERS IN COLOUR.

Disorders of crop plants caused by a deficiency of one or other of the elements essential for plant health are illustrated in colour in a pamphlet issued by the Department of Agriculture and Stock.

The pamphlet is available free to Queensland farmers on application to the Department of Agriculture and Stock.

Harvesting Grass Seed

By J. G. J. STEVENS, Officer in Charge, Biloela Regional Experiment Station.

Aerial spraying of thousands of acres of brigalow scrub with hormones, added to a continually increasing area of virgin scrub being "rolled" or "pushed" by high-powered tractors, has created an enormous demand during the last couple of years for seed of improved pasture species for sowing to bring these areas into productive use.

There is also an ever-increasing realisation among owners of larger holdings of semi-open country in western districts that increased carrying capacity is possible, particularly through the use of buffel grass.

Cheap seed in large quantities is therefore the need in the three major species in demand—Rhodes grass, green panic and buffel grass.

Prices fluctuate, but generally speaking Rhodes grass can be bought at 4s. per lb. whilst good quality buffel and green panic are seldom procurable under 12s. 6d. per lb. The latter price makes planting of large areas an expensive project.

Up to the present, quite a lot of the grass seed on the market has been hand-harvested—hence the high price demanded—but it does seem from recent commercial and experimental work at the Biloela Regional Experiment Station that quicker and cheaper mechanical harvesting methods are possible.

Investigations into methods of grass seed harvesting have been in progress at Biloela since 1951 with the object of finding a cheap, quick and efficient method of harvesting a high-germinating sample of grass seed.

METHODS TESTED.

Flowering and maturation habits of the species were first studied and then the effects of various hand and mechanical methods of harvesting were investigated with regard to efficiency, yield and quality of seed.

The following comments are made on the various methods used to date.

Hand Harvesting.

Rhodes grass can be rubbed, green panic shaken, and buffel grass stripped into a receptacle carried by the person harvesting. High quality and high yield per acre can be obtained at high cost from a few acres.

Cutting the heads with a sickle and curing in heaps in the field for subsequent hand or stationary header threshing is a slightly faster method than stripping into a receptacle, but there is danger of weather damage during curing.

Cut with Reaper and Binder, Stook and Thresh.

High yield is possible and fair to good quality seed obtained due to maturation continuing in the stook. Provided stooks are small (no more than a man can load on to a waggon in one forkful) and tied at the top to keep rain out, weather damage is seldom serious in Rhodes grass, but it can be high in green panic.

Gauze Frame on Vehicle.

This method consists of a frame covered with wire gauze fitted to the front of a utility, truck or tractor. The frame is constructed a foot or two wider than the vehicle itself and extends 2 ft. or more above the radiator. There is a trough below (the curved portion of a heavy gauge galvanised iron stock watering trough is suitable), the bottom of which must be high enough to clear the ground and the height of the outer edge of which is about one-third of the total height of the crop.

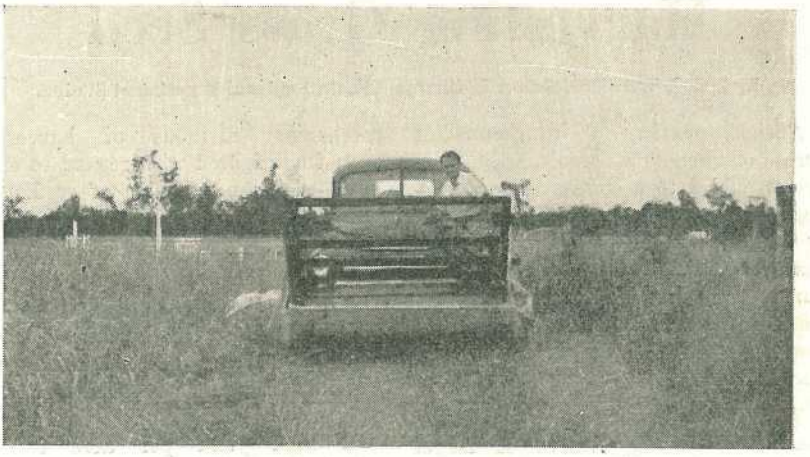


Plate 1.

Screen and Trough Mounted on a Truck for Harvesting Seed of Buffel Grass.

The vehicle is driven through the standing crop, with this home-made frame attached, at a speed of 10-15 m.p.h. The grass stalks are first hit by the lip of the trough, and the heads jerk back on to the screen momentarily, losing their ripe seed before being swept under the trough. The seed falls into the trough and is removed and bagged as necessary.

This harvesting method has distinct advantages and disadvantages which are briefly as follows:—

Advantages.

(1) Speed of operation. Many acres can be covered in a day—and speed is most important in grass seed harvesting.

Plate 2.

Truck with Screen and Trough Working in Buffel Grass.

Plate 3.

Buffel Grass Seed being Bagged from the Trough.

(2) Only ripe seed is dislodged from the heads; hence germination is high.

(3) Weather permitting, two or more harvestings of the same crop can be made as seed ripening progresses—this applies particularly in green panic.

Disadvantages.

(1) The driver of the vehicle is more or less "flying blind" and must know that there are no bad bumps, stumps or other obstructions in the paddock—or risk major damage to his vehicle.

(2) Most vehicle engines overheat quickly on this work.

(3) If a tractor is used it tends to become unmanageable at the speed required.

(4) No more than about 60 per cent. of the harvestable seed is actually collected—the remainder flies into the air and is lost.

This method has its uses, particularly in large areas and especially in buffel grass, which is handled better than either green panic or Rhodes grass.

Screen and Trough on Tractor: P.T.O. Reel.

A machine with a screen and trough on a tractor or jeep and reel driven from a power-take-off has been in mind for some time but has not yet been constructed.

The advantages envisaged over the screen described in (3) above are:—

(1) Slower ground speed, which would be compensated by additional threshing effect of the reel (somewhat like that used on a reaper and binder).

(2) Reduced loss of seed with maintenance of quality.

Standard Grain Header.

Most farmers own a header and its use for grass seed harvesting obviates the need for procuring other equipment. Work has been done with the All-crop (canvas conveyor front) type, by both straight-heading and pick-up threshing methods, and also with the conventional spiral-front type of header.

The outstanding features of grass seed harvesting with such machines may be summarised as follows:—

(1) If big acreages are to be covered speed is a major factor, for the seed is only available

in the head in a condition suitable for harvesting for a week —or perhaps a fortnight at the most. Wet or windy weather can cause the complete loss of a seed crop through shedding. Hence a 10 ft. or 12 ft. comb is a decided advantage over smaller machines.

(2) "Straight-headed" grass seed must be air-dried as soon as harvested. It is preferably laid out in the paddock on tarpaulins or home-made bag sheets immediately rather than bagged. If because of bad weather it is necessary to bring the seed in before it is properly dry, it should be spread out as thinly as possible and stirred frequently. Green panic requires much more careful attention in this regard than either buffel grass or Rhodes grass.

(3) Efficiency of straight heading can vary widely according to operator, machine and species.

Rhodes grass does not "flow" and is difficult to get into the grain box. Elevator blockages can waste a lot of time. It is also readily blown over the back of the riddle box and lost.

A good sample of *green panic* can be obtained with most headers, although the All-crop type generally produces the best results. However, in this species, although the seed is heavier, the riddles tend to "gum-up," seed separation becomes difficult and once again there are losses over the tailboard.

Until recently it was thought that *buffel grass* harvesting was not possible with a header, but this species has now been successfully harvested by this means at the Biloela Regional Experiment Station. The light-fluffy nature of this seed makes it most difficult to handle, but it has been found that by using a very low drum speed threshing of all ripe heads is completed without breaking up of green leaf, heads and stalks, all of which go over the straw walkers and are discarded.

No ripe seed is lost over the walkers; some gets through the riddles and is collected as a clean sample in the normal way, but the remainder is blown over the back of the riddle box (together with some trash) and the whole collected in an open wool pack trailed behind the machine on a sheet of galvanised iron used as a skid and so attached that no seed is lost.

The rough sample obtained in the wool pack is air-dried and then put through a hammer-mill running at only sufficient speed to break up the leaf and stems into a powder, which can later be sieved out.

Header-harvesting of Rhodes grass and green panic can often result in a loss of up to 50 per cent. of the potential yield; the cleaner the sample sought after, the greater the risk of loss "over the back." The trailing wool pack has now been used with these species as well as buffel grass, resulting in nearly 100 per cent. recovery of available seed and increase in acreage covered due to reduction of hold-ups due to blockages.

Pick-up Threshing with All-crop Header.

This involves mowing, drying in windrow or swathe and then putting through the header. It can produce a good yield of good quality seed provided mowing is done at the right time. Loss can be heavy if the weather turns adverse.

Stripper.

The old-fashioned long-discarded wheat stripper appears to be in a position to stage a "come-back" as a grass seed harvester. Its main advantages are as follows:—

(1) *Efficiency.*—Nothing is lost. The revolving beaters behind the comb thresh and deliver all

ripe seed (plus some green heads and trash) into its large box.

(2) *Simplicity.*—Working parts are few.

(3) *Speed of Operation.*—Although only 5–6 ft. in comb width, there is no waste time. Drawn by a low-powered tractor, it goes into a crop and can continue non-stop until the box is more or less full—2–3 hours.

(4) *Low Cost.*—Total purchase and reconditioning costs should not exceed £50 for an old machine. Old strippers are not numerous in Queensland, but almost every wheat grower in the older districts of New South Wales has a stripper, discarded with the advent of harvesters and headers.

YIELD.

Potential and actual harvested yields vary greatly according to crop and method. The yield range in the various species under discussion can be roughly set down as follows:—

	lb. per acre "per crop."
Green panic ..	50-150
Rhodes grass ..	100–200
Buffel grass ..	50–100

WHEN TO HARVEST.

Rhodes grass is ready for straight heading when it will "rub-out" easily in the hands (for reaper and binder and stooking it can be cut earlier) and buffel grass strips easily from the head when it is ripe, but green panic is more difficult to judge.

With this species it has been found that best results for both quantity and quality are obtained when:—

(1) Not less than 10 per cent. of the seed has ripened and shed.

(2) A good proportion of the remaining seed is yellow in appearance, is firm when squeezed and can be readily dislodged from the head.

Our early investigations showed that in this panicle-type head, seed ripening occurs progressively from the top of the head and tips of the lateral branches towards the bottom and centre of the head and covers a period of 10–14 days (sometimes even longer in the autumn).

GERMINATION OF SEED.

Viability of a particular seed sample can often be improved by recleaning, thereby removing more of the lighter infertile seed, and this method is often resorted to with Rhodes grass seed in order to reach the 30 per cent. germination test required for export quality seed.

Seed of many grass species also improves in viability with storage. Standards Branch officers have greatly assisted Regional Experiment Station staff in periodic testing of a large number of samples, particularly of green panic.

In this species germination tests above 10 per cent. can rarely be obtained when harvested, but screen-harvested seed which tested 9 per cent. in April, 1951, gave a test of 81 per cent. in October, 1952—after storage for 18 months.

Header- and stripper-harvested seed can be expected to test 3–5 per cent. immediately and ultimately rise to 50-60 per cent. if harvested correctly.

The potential test of a sample of green panic after storage appears to be related to the maturity of the seed at harvest and is roughly proportional to its initial test. As a general rule it can be expected that the test will double each three months for the first nine months, but harvesting when too immature can result in a sample which will never rise above 10 per cent.

Buffel grass reacts somewhat differently to green panic. When harvested it will frequently give negligible germination but generally rises to 30 per cent. within three months and to 60 per cent. in a further three months.

DRYING SEED AFTER HARVEST.

Grass seed threshed from stooks or windrows is usually dry enough to bag immediately for storage, but when any of the "straight-harvesting" methods are used immediate drying is essential.

Air-drying is the only method so far used at Biloela, but forced-draught hot-air methods may eventually prove worthwhile.

Buffel and Rhodes grasses do not require more than a day or two in the sun (or in shade if spread in a thin layer), but green panic requires special care. This seed will heat in a few hours if bagged straight from the harvester and requires constant attention for two or three days to avoid mould development. Special investigations have shown that viability is affected if temperatures above 100 deg. F. are allowed to develop.

SEED CLEANING.

Commercial firms use expensive machinery for cleaning grass seed, but the farmer needs to be able to bring his sample up to a reasonable standard for sale without much expense.

A large flat screen 9 ft. x 12 ft. has been made at Biloela for initial cleaning of grass seed samples. This screen is covered with ordinary mesh fly wire and is hung at an angle of approximately 45 deg. from the roof of a shed. It is given "shake" by attachment to a revolving shaft by off-centre bearings.

The rough trash can be quickly removed from green panic and Rhodes grass, the seed falling through the gauze. A smaller mesh screen is required to separate dust from the seed.

In the case of buffel grass, air blast was unsuccessfully tried to separate seed from trash, but subsequently it was found that by putting the rough air-dried sample through a hammer-mill at suitably reduced speed the desired amount of "hammering" could be obtained to break up miniature heads, stalk and leaves to fine particles without damaging the good seed. It then became possible to pass the material over the screen mentioned above, dust and small pieces of trash passing through and the hairy seed remaining on the screen, from which it can be bagged for storage.

SUMMARY.

Early work in seed harvesting at the Biloela Regional Experiment Station produced much valuable information but showed a wide variation in results as to both quality and quantity of seed recovered, all methods of harvesting leaving something to be desired.

In 1956 worthwhile advances appear to have been made in the following directions:—

(1) A header was successfully used to harvest buffel grass seed.

(2) The use of a trailing "bag" behind the standard header to catch seed blown "over the back" has greatly increased the value of such machines for harvesting Rhodes grass and green panic as well as buffel grass.

(3) The old-time wheat stripper emerges as the cheapest, probably the quickest, and all things considered, the best means yet tested of harvesting grass seed.

(4) A hammer-mill was found to be a satisfactory machine for changing a sample of buffel grass as harvested into one which could be run through a planting machine, this being a problem which had previously defied solution.

Hard Pan in Horticultural Soils

By D. DOWDLES, Horticulture Branch.

In any soil used for horticultural purposes, a compact impervious layer in the profile is undesirable. Such a layer is commonly known as hard pan and may be a natural characteristic of the soil or the result of faulty methods of land management. In either case, it impedes the movement of water and air through the soil and restricts root development in the cultivated crop.

TRUE HARD PAN.

True hard pan is a hard mineralised layer formed in some soils by the downward movement of iron, aluminium and manganese salts in solution and their deposition in bands within the profile. The zone of deposition is influenced by the intensity of the rainfall and the rate at which water percolates through the soil. Often the hard pan is comparatively thin and is under-laid by a subsoil with reasonable texture and permeability. Nevertheless, such a layer presents a barrier to root development, and, if undisturbed, is a hazard to the growing crop.

The hazard may not be serious in the case of shallow-rooted annual crops except perhaps in exceptionally wet seasons. Before deep-rooted plants and orchard trees can be grown successfully, however, it will be necessary to break or shatter the hard pan before planting; otherwise growth will be sub-normal.

Plate 1.

Soil Profile Showing True Hard Pan Formation at a Depth of 16 in.

Natural hard pan can be broken with the aid of explosives. In land which is to be planted with fruit trees, for example, a few strategically placed charges in the planting rows are usually sufficient to open up the soil and the benefits should last for many years. Explosives cannot be used in an established orchard and it is therefore essential that the presence or absence of hard pan in a prospective orchard area should be checked by exploratory tests with a soil auger before planting begins. The cores give a good indication of the profile.

INDUCED HARD PAN.

Any form of cultivation alters the soil type, and its characteristic structure in the virgin state is appreciably modified by the plough, disc harrow and other implements. All implements exert pressure on the soil and the degree of compaction varies directly with its texture and water-holding capacity when tillage operations are carried out. Clay loams and loams with a subsoil clay at shallow depths show a pronounced tendency to hard pan formation.

There are normally three stages of consistency in a clay loam: (*a*) dry; the soil is hard and, if implements are used, breaks up into clods and cannot be worked into the tilth required for sowing; (*b*) moist; the soil is friable and tillage operations present few problems; (*c*) wet; the soil is sticky and plastic and under some conditions the individual particles tend to run together. Implements should not be used when the soil is wet, for the aggregates or "crumbs" are then crushed and compacted. As a result, any tendency to hard pan formation is aggravated, particularly when, as all too frequently happens, the land is ploughed or cultivated to the same depth each year.

There appears to be no simple and rapid solution to the problem of induced hard pan. Many tillage operations must necessarily be fitted into a limited period and it is not always possible to time them all to suit the peculiarities of soil type, weather and

Plate 2.

Rotary Hoe in Operation. This implement should be used only when the soil moisture is adequate for efficient tillage.

the crop. It is therefore important to know when tillage operations can be performed with a minimum of injury to the soil. This is largely a matter of good judgment based on experience of a particular soil type.

In addition, however, it is necessary to apply supplementary measures which prevent hard pan formation, or if hard pan is already present, modify its harmful effect on crop production.

REMEDIES.

The correct approach to the problems associated with hard pan is to apply sound principles of land management.

The first step is to delay tillage operations after rain or irrigation until the soil is reasonably friable. If the soil comes off the plough or disc in a slick, shiny and cohesive slice, the land is too wet for cultivation. Tillage operations should then be put back a few days if this is practicable.

Although the merits and demerits of deep ploughing are debatable issues, there can be no doubt that continuous deep ploughing is undesirable in some types of soil. On clay loams in particular, this practice tends to induce the formation of a compacted layer commonly known as a plough sole. Perhaps the best practice is to vary the depth of ploughing when the land is being prepared for planting a crop. The depth of ploughing may range from 8 in. to 14 in. depending on the soil type and previous management.

Periodically, rippers or subsoilers—implements which cut and break through the subsoil—can be used to minimise hard pan formation and open up tight subsoils. In established orchards, the scope for such implements is limited but, when land is being prepared for vegetable or plantation crops, subsoiling is a useful

Plate 3.

Maize Cover Crop. Regular cover cropping is a safeguard against the formation of induced hard pan.

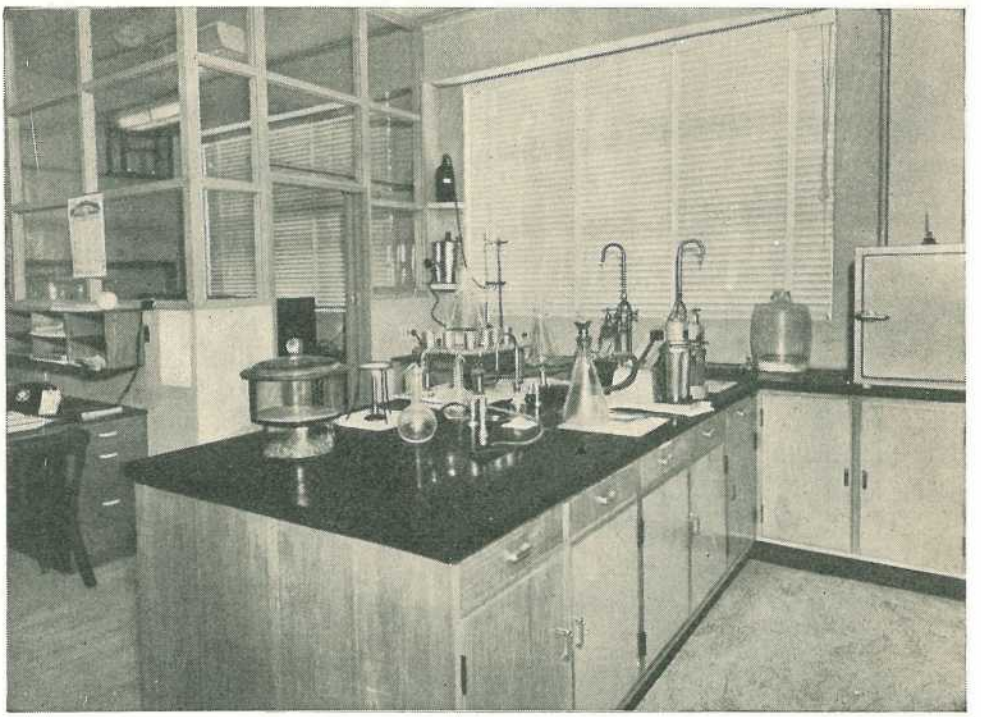
supplement to the regular use of the plough, cultivator or rotary tiller.

The rotary tiller has several advantages in land preparation for planting and in turning under cover crops. If used indiscriminately on excessively wet or over-dry soils, however, it is sometimes responsible for loss of structure and the formation of hard pan a few inches below the surface. Rippers are particularly valuable in preparing replant land for pineapples, a crop which is intolerant of poor drainage and waterlogging in the soil. The ripper is operated at right angles to the contour.

The movement of farm traffic on cultivated land should be reduced to a minimum when the soil is wet. Good access roads in a property are very useful under such conditions.

A deep tine fitted behind the tread of the tractor wheel helps to prevent compaction of the soil when the land is moist and showing signs of stickiness.

The addition of organic matter to the soil at frequent intervals is essential in horticultural areas for, among other things, soils containing large amounts of humus are less prone to compaction than those which contain only small amounts. Cover cropping should therefore be a standard practice.



The Department's New Dairy Laboratory at Hamilton for Research on Butter.

A Simple Method of Feeding Silage

By N. HOYER, Cattle Husbandry Branch.

Silage is a bulky feed, so easy methods of handling it when feeding-out are needed.

An Atherton district dairy-farmer, Mr. F. R. L. Wakefield, has devised a simple, labour-saving and time-saving method of feeding-out on his farm.

The silage is taken from the silo by means of a box or through a chute and put into troughs mounted on trolleys. These trolleys are run into the feeding yard on a permanent set of rails.

The wooden railway line runs from a trolley storage shed, past the silo, and into the feeding yard, as shown in Plate 1. This arrangement enables the trolleys to be moved with ease.

The trolleys can be connected together by means of a short length of chain. A chain is fixed to one trolley and attached to a hook on the next. By using this method, any number of trolleys can be hooked together and towed by a tractor.

The feeding yard is made long enough to enable the trolleys to be moved to a dry area in case of rain. This reduces mud to a minimum. Silage is usually fed, however, during dry weather.

The feeding yard needs to be on fairly level ground. It is an advantage if cows can obtain easy access from the feeding yard to the regular grazing paddocks. Where the feeding yard adjoins a main lane it may be possible for the cows to move from the feeding troughs to grazing at will. It will be appreciated that this system of feeding is employed best when cows are being allowed liberal quantities of silage.

CONSTRUCTION OF TROLLEYS.

The trolleys are of all-wood construction and are very strongly built. During construction all timber used should be painted with a non-poisonous, lead-free wood preservative.

Details of construction are shown in Plate 2. The following materials are required for one trolley.

Timbers.—Floor and sides of trough, 6 x 1, 7 boards 14 ft. 6 in. long. Ends of trough, 4 x 1, 4 boards 2 ft. 9 in. long. Spacers in trough, 3 x 1, 5 boards 2 ft. 9 in. long. Trough supports, 4 x 2, 14 pieces 15 in. long. Trough middle bearers, 4 x 2, 5 pieces 3 ft. 6 in. long. Trough end bearers, 4 x 3, 2 pieces 3 ft. 6 in. long. Buffers, 4 x 3, 4 pieces 6 in. long. Trough frame runners, 3 x 2, 2 pieces 15 ft. long. Main bearers, 6 x 2, 2 pieces 15 ft. long.

Total amount required—about 138 super feet.

Bolts.—4 x 6 in. x $\frac{3}{8}$ in. and 10 x 4$\frac{1}{2}$ in. x $\frac{3}{8}$ in.

Wheels and Axles.—Two pairs of cane trolley wheels and axles, costing about £5 for one pair and an axle.

CONSTRUCTION OF LINE.

The railway line may have to be altered to suit different soil types but the one used in this method is made of 3 x 3 hardwood rails and 4 x 3 hardwood sleepers, 3 ft. apart. The timber used for the construction of the line should be treated with a wood preservative, which should be free from lead and non-poisonous.

Scrap timber for rails and sleepers for 330 ft. of line cost £15–£20.

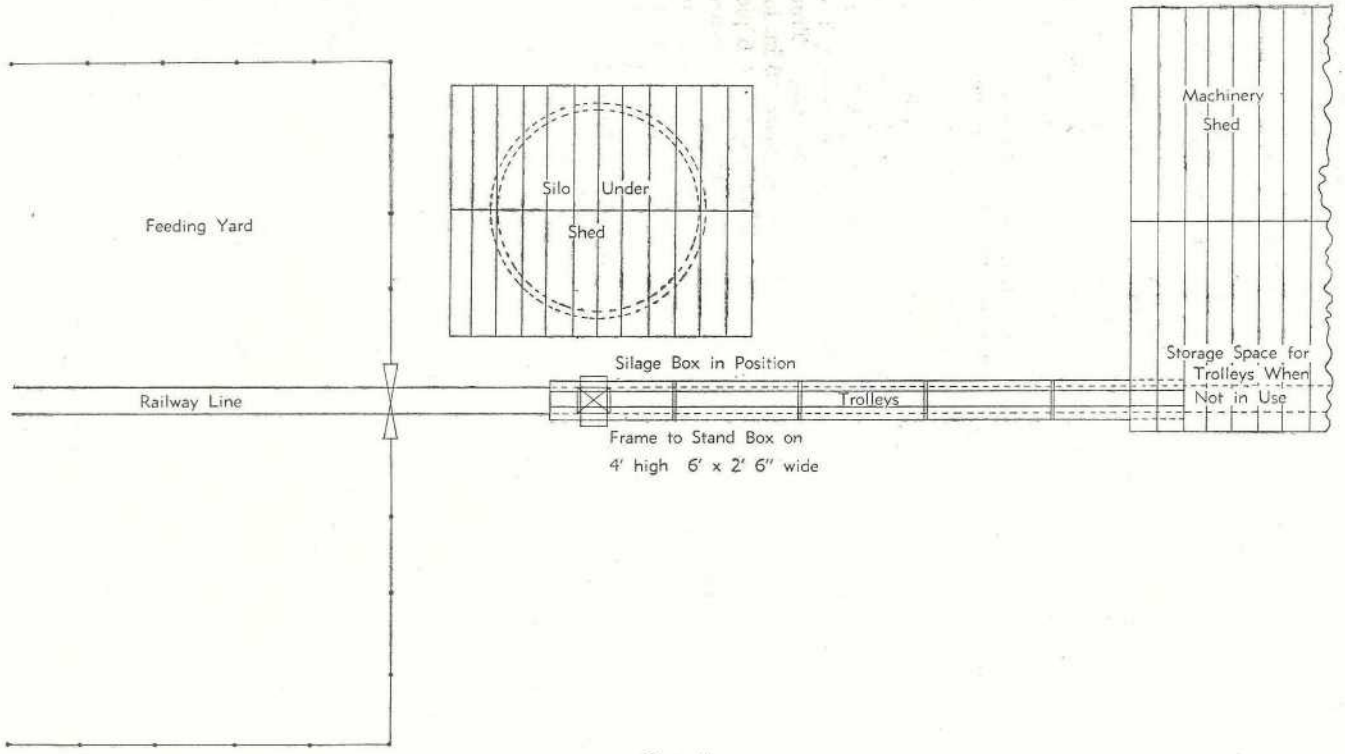


Plate 1.

Diagram Showing the Layout of the Trolley System in Relation to the Trolley Storage Shed, the Silo and the Feeding Yard.

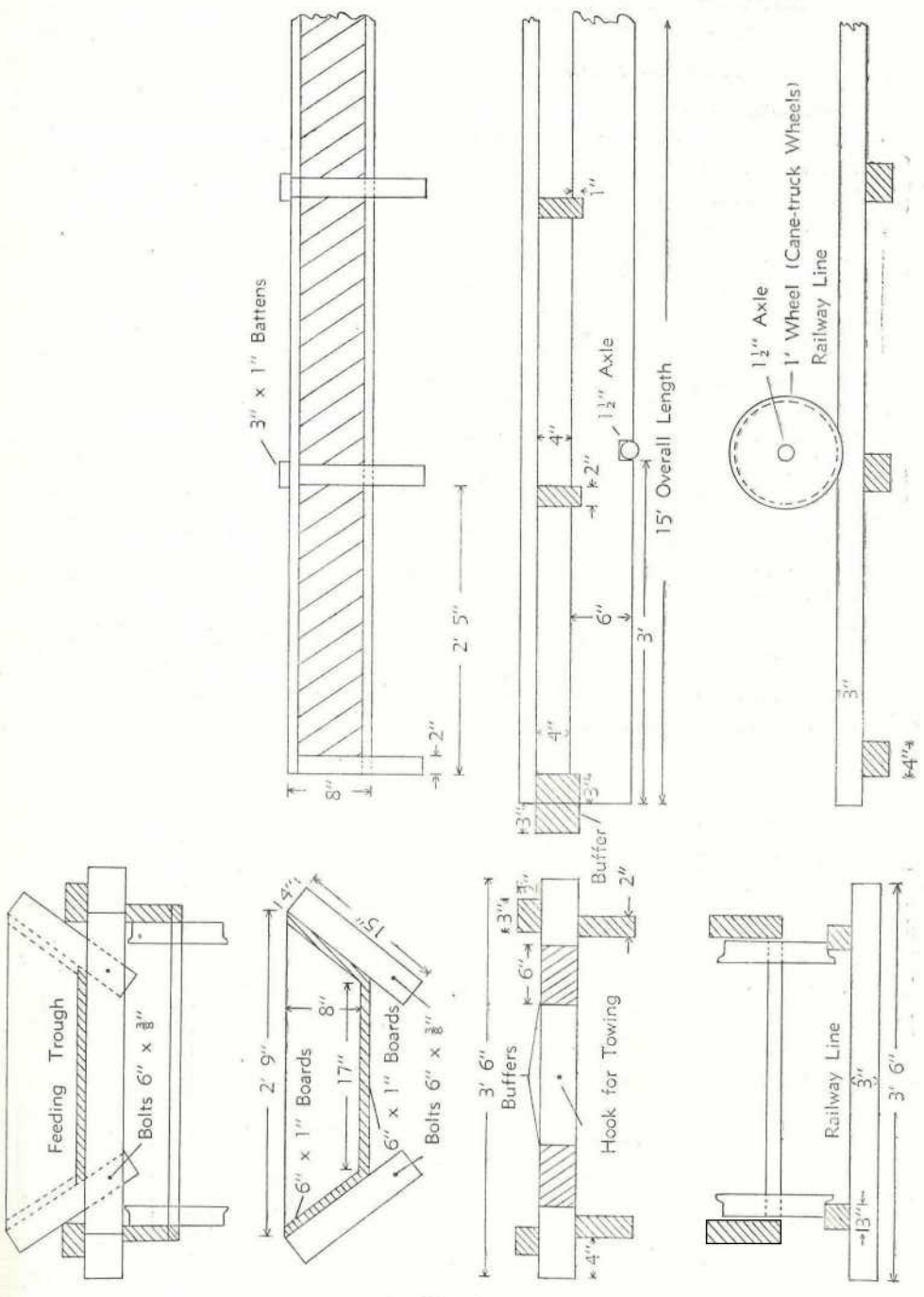


Plate 2.

Details of Construction of Trough and Trolley.

METHOD OF FILLING TROLLEYS.

From Pit Silo.

The silage is taken from a pit silo in a box or adapted drum. This container may have a hinged side or bottom. An alternative is to have the hitching points a little lower than centre. A chain and hook can be used to hold it upright when filled. Emptying is done by releasing the hook and guiding the mouth of the container into the trough. The trolleys can be moved along by hand when being filled. It is convenient if one day's supply can be hauled up in one operation, as this reduces the time taken.

The box can be lowered into the silo on pulleys attached to a derrick (Plate 3), which is suspended over the edge of the silo by a ½ in. wire rope attached to a tractor.

For safety it is advisable to back the tractor when lifting the box out of the silo. This method of working gives the operator full control over the box and also a clear view of what is happening at the top of the silo.

A wire rope is preferable to a hemp rope, as depreciation is negligible and the rope is much stronger, thus eliminating the danger of the full box falling back into the silo.

The box is rested on a platform above the trolleys and the silage raked out into them.

From Tower Silo.

A galvanised iron chute (Plate 4) can be designed to fit into the door of a tower silo and lead down over the trolleys. The silage can be thrown into the top of the chute from any position in the silo. Wastage is eliminated. Time and labour are saved. One man can fork out half a ton of silage by this method in a quarter of an hour.

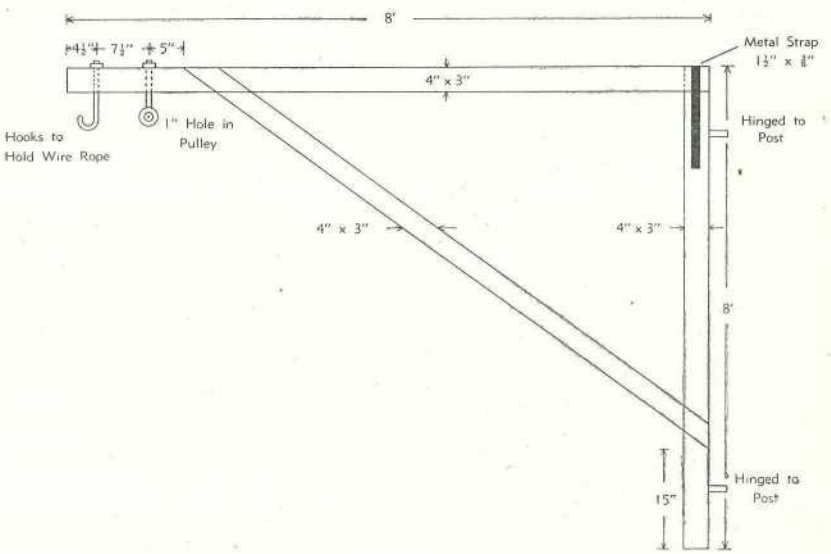
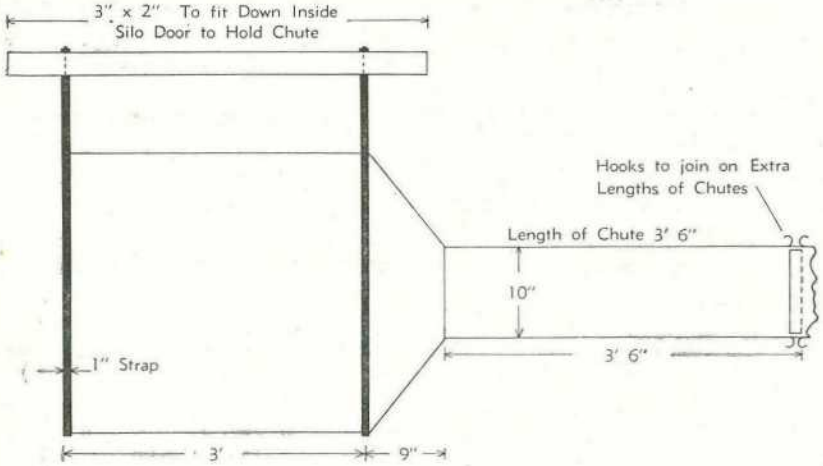


Plate 3.
Hoist for Raising Box or Drum from Pit Silo.



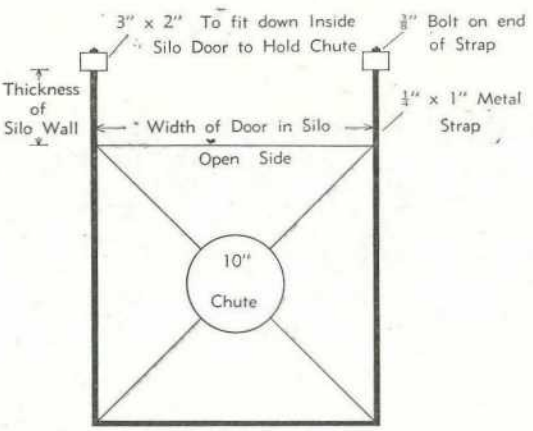


Plate 4.
Details of Chute for Emptying Tower Silo.

DETAILS OF FEEDING OUT.

Time and Labour.

This method of feeding is fast and simple, and with the use of electrical equipment the half-ton of silage necessary for 30 cows could be fed out in under 15 minutes. At present it takes 20 minutes for one man and a 10-year-old boy to feed half a ton of silage to 30 cows—that is, from time of moving the tractor into position until the cows are in feeding.

Number of Cows per Trough.

With horned Jersey cows it is found that five feed peacefully at each trough. That allows each cow 3 ft. of feeding space over the whole trough area. It is thought that with dehorned cattle, twice the number could be fed at the same trough space. Each cow would then have 1 ft. 6 in. of feeding space.

Quantities.

The trolleys can hold up to half a ton of silage. Sufficient silage is distributed over all the troughs to feed the herd. There should be enough trough space to accommodate all cows in the feeding yard at one time.

Wastage.

Very little silage is lost due to wastage. The only silage wasted is that which falls onto the ground. Battens of 3 x 1 nailed across the troughs on the flat at 2 ft. 5 in. intervals act as buffers which stop the cattle from swinging their heads from side to side and pushing the silage out of the trough.

Spillage is largely avoided if the silage does not reach higher than about 4 in. from the top of the trough.

STORAGE OF TROLLEYS.

The trolleys are of all-wood construction, and when not in use should be stored under cover for protection against the weather. In storage, one trolley is left intact and the others are stacked on top. Stacking can be done by lifting the troughs and frame off the wheels by means of a pulley attached to a beam in the roof of the shed. A rope is connected back to a tractor, the frame hoisted and a trolley pushed underneath. Five trolleys can be stacked comfortably in a 35 ft. x 8 ft. shed. To save space the wheels and axles can be stored in the top trolly trough.

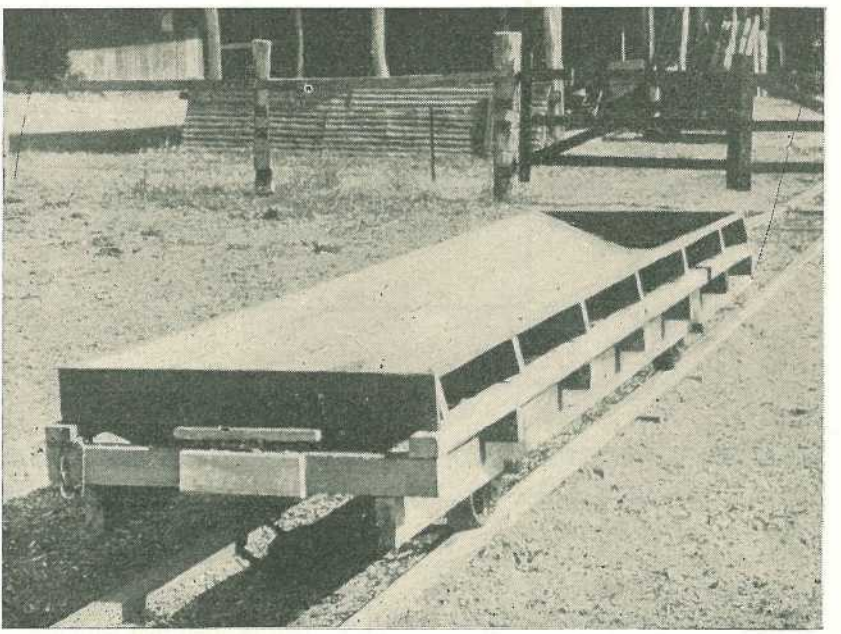


Plate 5.

End View of Trough and Trolley.

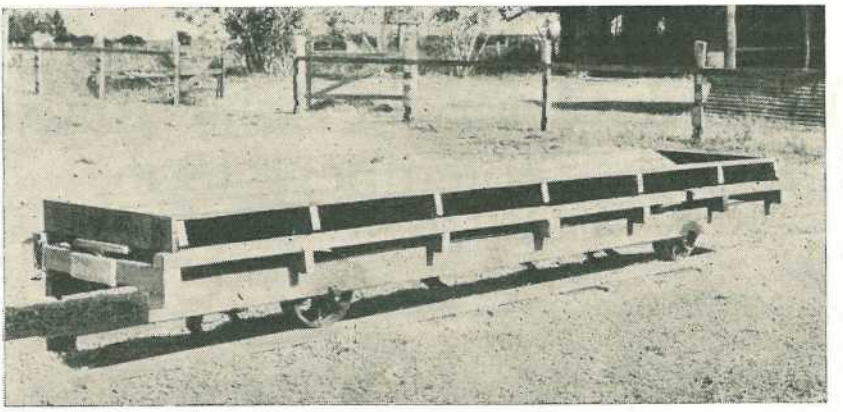


Plate 6.
Side View of Trough and Trolley.

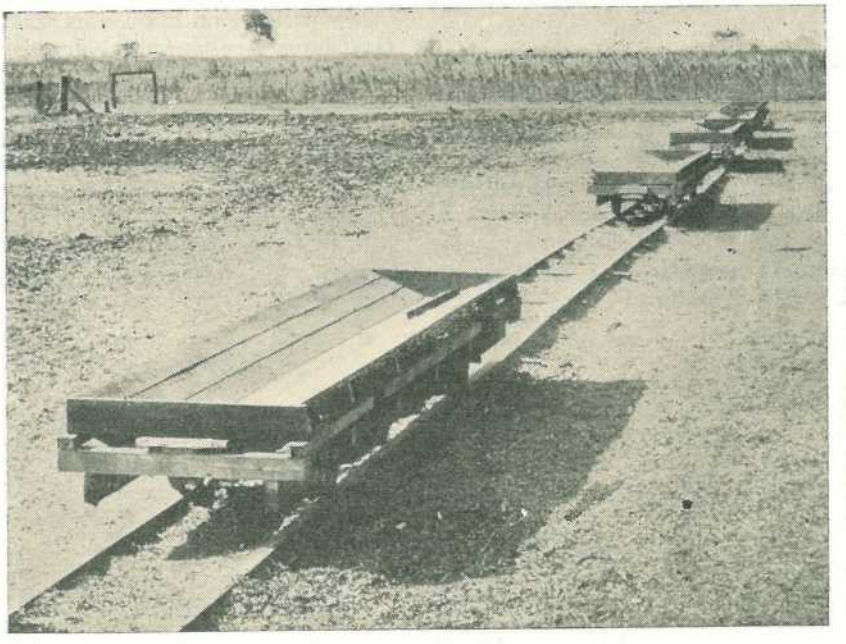


Plate 7.
Trolleys Spread Out Along Line in Feeding Yard.

Report on Group Herd Recording for the Year Ended 30th September, 1956.

By S. E. PEGG, Chief Adviser, Herd Recording.

The 12 months' period which ended on September 30, 1956, was a changeable one for dairying. Heavy and continuous rains were received from December until April. These rains caused severe flooding and serious erosion. They also prevented the preparation of land for winter fodder crops. From May until the end of the period dry weather prevailed. This adverse weather affected the production of dairy cattle in this State and to add to these setbacks a severe epidemic of ephemeral fever (three-day sickness) was also experienced. Despite these reverses, Group Herd Recording has continued to expand in this State.

During the period under review, there were 79 herd recording groups operating, of which 14 commenced in the last 12 months. During the year, 54,352 cows from 1,412 herds completed recorded lactations. Despite the setbacks mentioned the average production of butterfat was 155 lb., the highest ever attained. The total number of completed lactations and average productions for each year since 1948-49 are given in Table 1.

Right throughout the State, the interest shown by members of herd recording groups in improved pastures and pasture management has increased during the year. It is considered that this increased interest in pastures will be reflected in higher production in the future.

It must be stressed that unless dairymen are fortunate enough to have irrigation facilities, pastures do not provide sufficient nutriment for production during the periodical dry spells experienced in this State. During these periods it is necessary to supplement the pastures with conserved fodder if production is to be maintained.

Table 2 shows the number of cows, according to age groups, which completed lactation periods of 300 days or less, and their average production of milk and butterfat.

TABLE 1.

NUMBER OF COMPLETED LACTATIONS AND AVERAGE PRODUCTION PER COW.

Year.	Number of Herds.	Number of Lactations.	Average Production per cow.		
			Milk (lb.).	Test (%).	Butterfat (lb.).
1948–49 ..	507	17,216	3,289	4·3	144
1949–50 ..	715	22,392	3,523	4·3	152
1950–51 ..	814	26,798	3,312	4·4	146
1951–52* ..	818	23,123	2,657	4·2	112
1952–53 ..	1,073	34,304	3,467	4·3	150
1953–54 ..	1,202	41,378	3,143	4·3	134
1954–55 ..	1,266	45,734	3,486	4·3	150
1955–56 ..	1,412	54,352	3,563	4·3	155

* Drought year.

TABLE 2.

AVERAGE PRODUCTION IN AGE GROUPS OF COWS WHICH COMPLETED LACTATION PERIODS OF 300 DAYS OR LESS.

Age Groups.	Number of Cows.	Average Production per cow.		
		Milk (lb.).	Test (%).	Butterfat (lb.).
2-year-old	7,247	2,999	4·5	134
3-year-old	6,220	3,207	4·4	142
4-year-old	5,753	3,567	4·4	158
Mature	27,108	3,786	4·3	163
Unknown Ages	8,024	3,591	4·3	154
Total	54,352	3,563	4·3	155

The average length of lactation was 229 days, which was the longest average length of lactation since the inception of group herd recording in this State.

The average length of completed lactations each year since the 1948-49 year is given in Table 3.

TABLE 3.

AVERAGE LENGTH OF COMPLETED LACTATIONS.

Year.	Days.
1948–49	220
1949–50	223
1950–51	203
1951–52	209
1952–53	210
1953–54	211
1954–55	224
1955–56	229

In Table 4 the average length of lactation for each district for 1955-56 is given.

TABLE 4.

AVERAGE LENGTH OF LACTATION ACCORDING TO DISTRICT.

District.	Length of Lactation (Days).
Atherton Tableland ..	242
Mackay	225
Port Curtis	221
Dawson-Callide	225
Upper Burnett	228
Central Burnett	218
South Burnett	226
South-East Queensland ..	232
Eastern Downs	230
Western Downs	225

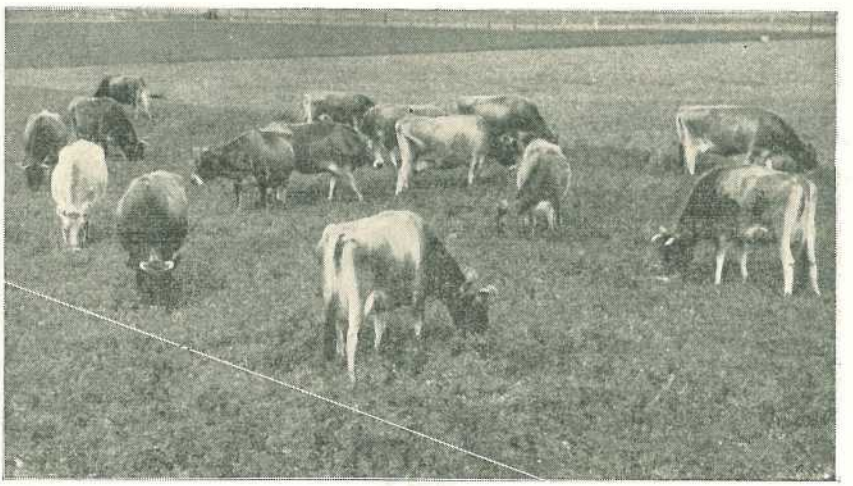


Plate 1.

Strip Grazing Ensures the Maximum Use of Fodder Crops or Pastures.

Once again, the longest average length of lactation was recorded in the Atherton Tableland area.

The short length of lactation is a very serious problem of dairy farming in Queensland. It is considered that cows should milk for 10 months and have a rest of two months before re-calving, after an interval of 12 months. The fact that the average length of lactation is approximately 7½ months means that 2½ months' production is lost. The economic loss is emphasised by the fact that during the year only 9,959 cows or 18.3 per cent. completed a lactation period of 300 days. The average production of these cows was 4,790 lb. milk and 211 lb. butterfat—that is, 56 lb. butterfat more than the average of all cows, 155 lb. The difference in production, equivalent to 68 lb. commercial butter, is worth at the present price approximately £12. This is the amount per cow which is lost owing to short lactation periods.

Table 5 shows the average production per cow in each of the herd recording groups. The groups are listed according to districts and the average production for each district is shown in the same table.

An interesting example of increased production is provided by the Pittsworth No. 1 Herd Recording Group. The average production over the past three years is set out below:

1953-54 .. 195 lb. butterfat.
1954-55 .. 231 lb. butterfat.
1955-56 .. 249 lb. butterfat.

The membership of this group has remained much the same during this period and it is evident that intelligent culling, allied with improved farm and herd management, has achieved results.

The number of cows in the various production ranges of butterfat is shown in Table 6.

TABLE 6.

NUMBER OF COWS IN VARIOUS PRODUCTION RANGES OF BUTTERFAT.

Ranges of Butterfat.	Number of Cows.	Percentage.
Under 100	10,973	20·2
100–149	16,355	30·1
150–199	14,708	27·1
200–249	7,682	14·1
250–299	3,005	5·5
300–349	1,086	2·0
350–399	374	·7
400–449	125	·2
450–499	33	·06
500 and over ..	11	·02

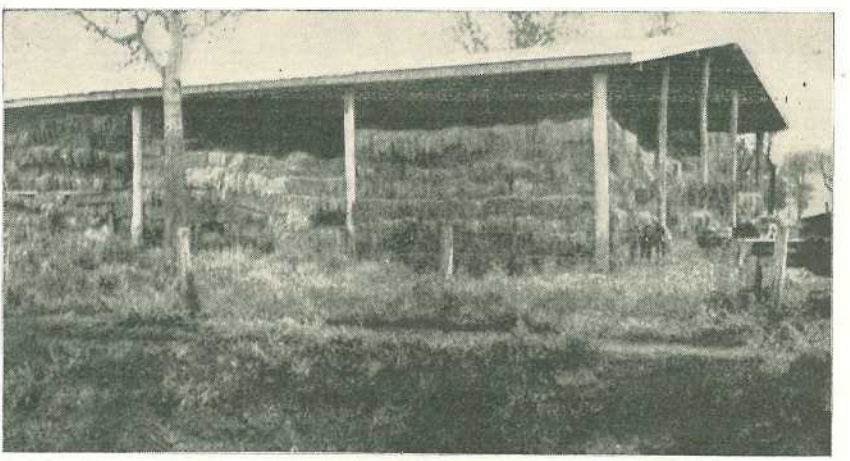


Plate 2.

A Standby for a Dry Season. A reserve of 12,000 bales of lucerne hay.

TABLE 5.

GROUP AND DISTRICT STATISTICS FOR 1955–56.

District/Group.	Herds.	Cows.	Average Length of Lactation.	Average Milk.	Average Test.	Average Butterfat. 1955–56.
			Days.	Lb.	%	Lb.
Atherton Tableland—						
Malanda No. 1	18	634	246	5,076	3·9	200
Malanda No. 2	20	540	241	4,039	4·0	161
Malanda No. 3	21	732	235	3,644	4·4	159
Malanda No. 4	21	399	243	3,670	4·1	151
Millaa Millaa	19	718	247	3,756	4·6	172
District	99	3,024	242	4,044	4·2	170
Mackay—						
Mackay No. 1	13	467	216	2,959	4·5	133
Mackay No. 2	14	534	213	2,333	4·6	107
District	27	1,001	225	2,625	4·6	120
Port Curtis—						
Mount Larcom No. 1 ..	20	900	210	2,579	4·7	120
Mount Larcom No. 2 ..	20	691	225	2,422	4·8	116
Raglan-Marmor	18	729	221	2,895	4·4	127
Rosedale	9	373	222	2,932	5·0	147
The Caves	16	657	235	3,510	4·8	169
Wallaville	18	673	216	2,682	4·5	122
District	101	4,023	221	2,811	4·7	131
Dawson-Callide—						
Biloela No. 1	18	1,039	230	3,250	4·5	145
Biloela No. 2	16	779	220	3,130	4·4	139
Wowan	16	743	222	2,996	4·5	134
District	50	2,561	225	3,139	4·5	140
Upper Burnett—						
Monto No. 1	18	915	231	4,031	4·0	160
Monto No. 2	21	1,005	225	3,269	4·4	144
Monto No. 3	14	573	225	3,357	4·3	143
District	53	2,492	228	3,570	4·2	149
Central Burnett—						
Biggenden	15	653	250	3,826	4·4	169
Mundubbera No. 1 ..	19	726	228	3,502	4·0	141
Mundubbera No. 2 ..	19	940	198	2,822	4·3	121
Mundubbera No. 3 ..	18	822	207	2,921	4·3	124
District	71	3,141	218	3,214	4·2	317
South Burnett—						
Durong	16	948	208	4,020	3·9	156
Goomeri	27	806	226	3,432	4·3	147
Kilkivan	17	497	218	3,000	4·4	131
Kingaroy No. 1	21	931	241	4,228	4·3	180
Kingaroy No. 2	21	671	230	4,634	3·9	180
Nanango No. 1	19	764	225	3,666	4·0	146
Nanango No. 2	19	756	224	4,120	4·1	169
Proston	22	872	233	3,563	4·5	162
Tansey	19	583	227	3,382	4·3	145
District	181	6,828	226	3,823	4·2	159
South-East Queensland—						
Beaudesert No. 1 ..	17	1,034	226	3,790	4·0	150
Beaudesert No. 2 ..	17	793	222	3,548	4·5	158
Beenleigh	21	511	235	3,265	3·9	126
Boonah	19	678	239	4,536	4·2	190
Brisbane No. 1	24	559	235	4,307	3·9	170
Brisbane No. 2	21	606	216	3,123	4·0	124

TABLE 5—*continued.*

District/Group.	Herds.	Cows.	Average Length of Lactation.	Average Milk.	Average Test.	Average Butterfat. 1955–56.
			Days.	Lb.	%	Lb.
Cedar Pocket	17	749	241	3,238	5·0	163
Coomera	17	883	242	3,801	4·2	1761
Cooroy No. 1	15	380	229	2,630	4·6	120
Cooroy No. 2	17	933	225	2,911	4·6	133
Esk No. 1	18	905	231	3,474	4·4	154
Esk No. 2	19	565	229	3,561	4·4	157
Esk No. 3	18	688	214	3,023	4·4	134
Gatton	20	505	218	3,834	4·2	160
Gympie No. 1	19	830	241	3,222	4·5	146
Gympie No. 2	17	817	234	2,988	4·8	142
Ipswich No. 1	17	410	240	3,903	4·1	161
Ipswich No. 2	16	285	228	3,709	4·3	158
Kenilworth	19	888	244	3,571	4·6	166
Kilcoy	21	959	222	2,746	4·6	127
Laidley	21	472	217	3,242	4·5	146
Landsborough-Caboolture	22	908	230	3,070	4·5	137
Maleny No. 1	17	526	247	3,081	4·7	145
Maleny No. 2	21	901	247	3,652	4·7	171
Mapleton-Kureelpa ..	25	722	251	3,010	4·6	137
Maryborough	19	796	228	2,927	4·6	134
Merrimac-Mudgeeraba ..	18	917	245	3,686	4·2	155
Miva-Theebine	18	1,059	238	2,985	4·9	145
Mount Tamborine ..	16	625	222	3,447	4·2	146
Mudgeeraba-Currumbin	19	887	231	3,029	4·3	130
Pomona	11	495	225	2,890	4·6	133
Wolvi	16	513	219	2,589	4·6	119
District	592	22,798	232	3,329	4·4	147
Eastern Downs—						
Allora	11	181	216	4,644	4·3	201
Crow's Nest	21	749	225	3,757	4·3	162
Goombungee	18	698	227	4,802	4·6	220
Oakey	18	863	229	4,634	4·3	197
Pittsworth No. 1 ..	22	580	241	5,872	4·2	249
Pittsworth No. 2 ..	4	138	230	4,864	4·5	217
Toowoomba No. 1 ..	22	814	235	5,256	4·4	229
Warwick No. 1	16	361	222	4,545	4·0	181
Warwick No. 2	10	170	225	4,902	4·4	214
District	142	4,554	230	4,795	4·3	207
Western Downs—						
Chinchilla No. 1	18	646	234	4,347	4·2	183
Chinchilla No. 2	16	695	227	4,541	4·4	200
Dalby	24	849	228	3,973	4·3	172
Jandowae	20	955	222	4,285	4·4	187
Miles	18	784	218	4,048	3·9	157
District	96	3,929	225	4,226	4·2	179

It is gratifying that the percentage of cows producing less than 100 lb. butterfat has decreased during the last few years, as follows:—

1953-54 ..	29.8 per cent.
1954-55 ..	22.5 per cent.
1955-56 .	20.2 per cent.

The number of cows producing 400 lb. butterfat or more has increased to 169 (0.28 per cent.) compared with 110 (0.24 per cent.) in 1954-55 and 26 (0.06 per cent.) in 1953-54.

Table 7 shows the number and percentage of herds in various production

ranges according to average production.

TABLE 7.

NUMBER AND PERCENTAGE OF HERDS IN VARIOUS PRODUCTION RANGES.

Butterfat Production Range (Lb.)	Number of Herds.	Percentage of Herds.
Under 100	181	12·8
100–149	571	40·4
150–199	432	30·6
200–249	164	11·6
250–299	49	3·5
Over 300	15	1·1

Here again a decrease is noted in the number of herds which averaged under 100 lb. butterfat. The percentage of herds dropped to 12.8 compared with 15.6 in 1954-55 and 24.0 in 1953-54. The percentage of herds over 200 lb. increased to 16.2 from 10.6 and 7.0 in the two previous years. Thus it can be seen that there is a steady increase in production of herds being recorded.

Highest Producing Herds.

The highest producing herds according to the number of cows which completed lactations are given in Table 8. Herds in which less than 10 cows completed lactations are not included.

The productions obtained by some farmers (Table 8) offer excellent examples of results which can be obtained by improved breeding methods and better farm practices. Herd recording supplies information to be used as a basis of breeding and farm planning, and which, when applied intelligently, must result in greater and cheaper production.

Plate 3.

Ample Watering Facilities Help to Increase Production.

TABLE 8.

HIGHEST PRODUCING HERDS.

Herd Owner.	Group.	Breed.	No. of Cows.	Average Production.			
				Milk (lb.).	Test (%).	Butterfat (lb.).	Length of Lactation (Days).
	10–20 Cows.						
R. S. and G. C. Postle ..	Pittsworth No. 2	Jersey	10	7,084	5·3	376	282
H. M. Waite	Laidley	Jersey	10	6,867	5·1	350	288
N. Sippel	Esk No. 2	Jersey	14	6,876	5·0	341	276
	21–50 Cows.						
H. Abel	Goombungee	Jersey	36	7,050	5·3	372	278
G. I. Holmes	Pittsworth No. 1	A.I.S.	31	8,937	4·1	370	280
K. and R. Laws	Malanda No. 1	A.I.S.	29	8,656	4·0	348	294
	51–100 Cows.						
A. E. Abel	Goombungee	Jersey	52	5,693	5·2	299	246
W. D. Davis	Chinchilla No. 1	A.I.S.	62	7,102	3·9	275	283
A. S. Peters	Goombungee	A.I.S.	60	5,735	4·8	274	224
	Over 100						
Haselwood Brothers ..	Jandowae	A.I.S.	165	5,434	4·0	220	236
R. James	Landsborough-Caboolture..	A.I.S.	120	4,807	3·8	182	247
K. Hooper	Wowan	Jersey	104	3,754	4·7	177	252

The Occurrence and Control of Worm Parasites of Sheep in Queensland

Prepared by Dr. G. R. MOULE, Director of Sheep Husbandry, in collaboration with officers of the C.S.I.R.O. McMaster Laboratory, and the Department of Agriculture and Stock and Woolgrowers in Queensland.

(*Continued from page 46 of the January issue.*)

Post-mortem Examination.

Select a sheep that is obviously affected, but not one about to die. A sheep that has died or is about to die is not a good subject, because most of the worms leave a dying animal. For a correct interpretation of a post-mortem examination you must know the normal location of the various worms, their appearance and whether the numbers found are serious. For example, 100 nodule worms is a serious infestation in a young sheep, whereas the same number of barber's pole worms or hair worms would be harmless.

Always consider how well the sheep were fed. The poorer the feed the fewer worms are necessary to cause trouble. Where graziers are not familiar with the anatomy of the sheep and the appearance of the worms, it is best to send the whole of the digestive tract, excepting the paunch but including the liver and lungs, to the laboratory. The material must be packed in 5 per cent. formalin in a sealed tin. Unless preserved, the worms disintegrate rapidly. Alternatively, seek the assistance of the nearest Sheep and Wool Adviser or Inspector of Stock, who will show you how to make a post-mortem examination.

Importance of Correct Diagnosis.

It is esential that you consider all the factors that might influence the condition of the sheep before arriving at a final diagnosis. Cases are known where sheep suffering from fluorosis, a disease in which the teeth wear unevenly at an early age, have exhibited symptoms similar to worm infestation. When conducting post-mortem examinations be careful to look at the condition of the back teeth.

TREATMENT BY DRENCHING.

Drenches are scarcer and more expensive than in the pre-war period. Control methods should aim at preventing outbreaks of parasitic diseases rather than curing them after losses have occurred. Reduction in the amount of handling and drenching of sheep must be an objective in all control measures.

Making the Best Use of Drenches.

Supplies of carbon tetrachloride, nicotine sulphate, phenothiazine and tetrachlorethylene, all short during the war period, are still insufficient and it is necessary to conserve these drugs and to consider their costs.

Phenothiazine.—Although the cost of phenothiazine is considerable, it is largely offset by the marked superiority of the drug. Phenothiazine should be used especially to prevent outbreaks due to the nodule worm and hair worm. It should not be used indiscriminately. The times to use phenothiazine are discussed later (Drenching at Strategic Periods, page 88).

Bluestone-Nicotine.—The bluestone-nicotine sulphate mixture has long

been used indiscriminately as a treatment for "worms." It is relatively expensive and nicotine is still scarce. It should, therefore, be reserved for treatment of young sheep, particularly weaners, suffering from hair worm. Do not use bluestone-nicotine mixture for treatment against barber's pole worm. It is no more effective than bluestone-arsenic mixture, which is much cheaper. Bluestone-nicotine mixture is not always highly efficient against hair worms in all sheep, but if it is used at strategic periods it gives a satisfactory measure of control. It is likely to fail in a bad outbreak. Under such circumstances, use phenothiazine, if not for the whole flock, at least for the "tail."

Carbon Tetrachloride.—This drug, which is essential for treatment against liver fluke, is commonly used for treatment against barber's pole worm, but in view of the unpredictable losses that sometimes follow its use and the cheapness of bluestone-arsenic mixtures which can replace it as a treatment for barber's pole worm, there is good reason to restrict its use.

Bluestone-Arsenic.—The bluestone-arsenic mixture is a cheap and effective treatment against barber's pole worm, and provided mixtures are properly made and the recommended dose rate is strictly followed, it is quite safe.

It is particularly useful for the control of barber's pole worm in grown sheep. For young sheep, bluestone alone may be used but the bluestone-arsenic mixtures are preferable.

Bluestone alone is not very effective against the barber's pole worm in grown sheep unless the usual dose rate is increased. Further, bluestone is not effective against immature worms. Bluestone-arsenic mixture is much more effective.

Drenches containing bluestone alone, bluestone-nicotine or bluestone-arsenic are effective against barber's pole worms in about 90 per cent. of sheep. They fail in the other 10 per cent. because they are swallowed into the paunch instead of the fourth stomach. Carbon tetrachloride and phenothiazine are effective against barber's pole worm when swallowed into the paunch, and may be used successfully to treat the sheep that fail to respond to bluestone mixtures. These drugs may be used as an alternating treatment, if not for the whole flock, for those sheep which fail to respond to other treatments (that is, for the "tail").

Tetrachlorethylene.—When this drug is given with, or immediately after, a dose of bluestone solution it is very effective against barber's pole worm. It is more effective than bluestone-nicotine against hair worm, and although it sometimes causes staggering or even temporary unconsciousness, the sheep soon recover if protected from injury by their fellows.

PREPARATION AND USE OF DRENCHES.

Phenothiazine.

Phenothiazine is marketed chiefly as a dispersible powder which mixes with water to form a suspension suitable for drenching. Ready prepared suspensions are also available.

Both automatic and non-automatic drenching syringes are commonly used for giving phenothiazine. Whatever type of instrument is used, a nozzle about six inches long is required so that the dose can be placed well back over the tongue, thereby avoiding slobbering, which leads to staining of the wool. Many syringes have a non-drip nozzle which is of considerable assistance in preventing staining of the wool.

A double bucket is useful when using a non-automatic syringe. One side of the bucket contains phenothiazine and the other side water, which is used to rinse the nozzle before a sheep is drenched. If the nozzle is not rinsed, phenothiazine suspension will drip and stain the wool. Fresh rinsing water should be used for each raceful of sheep.

Preparation of Phenothiazine Drench.—There are full directions for mixing on the containers of the various brands of phenothiazine on the market. Sometimes trouble may occur in mixing, especially with some imported lots of the powder. The following notes may assist in preventing staining.

The powder is usually packed in 1 lb. and 7 lb. containers. The simplest way is to take 1 lb. of powder and add water gradually, stirring thoroughly to produce a creamy suspension, then making the quantity of the mixture up to the required amount for the number of sheep to be dosed per pound. Finally, run the mixture through a fine sieve such as a double thickness of fly-wire.

As an example, suppose that weaners are to be dosed at 30 per pound. Take 1 lb. powder and add water, mixing thoroughly, so that eventually there is 30 fl. oz. (1½ pints) of mixture (that is, 30 doses at 1 fl. oz. each). Similarly, if a 7 lb. lot of powder is to be mixed, add water until the suspension measures 210 fl. oz. (10½ pints). Occasionally, when the required amount of water has been added the mixture is too thick for use with drenching syringes. Extra water must then be added until the mixture is sufficiently thinned for use. When this has been done the amount of mixture must be measured and the adjustments made so that the correct dose will be given to each sheep.

A measuring jug marked in fluid ounces and pints is of great assistance in making up phenothiazine, and indeed, all drenches.

Dose Rate.—In order to obtain high efficiency against the small intestinal or hair worm (known also as black scour worm), use 1 lb. phenothiazine powder for 20 grown sheep, 25 young sheep 8-12 months old, or 30-40 weaners 4-8 months old. It is particularly necessary to obtain a good kill of these worms in young sheep, and, it pays therefore, to dose only 30 weaners per pound of powder.

How to Drench with Phenothiazine.—One disadvantage in the use of phenothiazine is that it stains the wool. This is brought about in several ways, namely:—

(1) From dripping from the nozzle of the drenching syringe or pistol.

(2) By the soiled hands of the person drenching.

(3) By the soiled mouth of the drenched sheep being wiped on another sheep.

(4) By the phenothiazine passed in the urine.

Staining can be avoided by observing the following precautions:—

(1) Rinse the nozzle in water immediately after filling the syringe. The double container already mentioned provides water for this purpose as well as for periodical flushing of the instrument. The water container, of course, must be refilled with clean water periodically. Dripping can be almost eliminated by using a wiper attached to the container. A small roll of cloth or sacking attached to the rim of the water container can be used to remove the excess rinsing water from the outside of the nozzle. Another form of wiper consists of a piece of felt held between two pieces of sole rubber or leather. In the rubber or leather and in the felt, cut U-shaped notches, those in the felt being smaller than those in the rubber or leather. The wiper is rivetted to two pieces of tin or iron which form a sliding grip for attachment to the side of the drench container. This type of wiper can easily be removed and washed free of phenothiazine from time to time. It can be used instead of rinsing water, or in addition to it.

MIXTURES AND DOSES OF PHENOTHIAZINE FOR USE AGAINST HAIR WORM.

Dose.	Amount of Phenothiazine.	Add Water until Mixture Measures.
For Weaners, 4–8 months old, at 30 per lb.		
25 c.c.	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
30 c.c. (1 fl. oz.)	1 lb.	30 fl. oz. (1½ pints)
	7 lb.	210 fl. oz. (1 gall. 2½ pints)
For Young Sheep, 8–12 months old, at 25 per lb.		
30 c.c. (1 fl. oz.)	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
35 c.c. (2 x 17·5 c.c.)	1 lb.	29 fl. oz. (1½ pints)
	7 lb.	203 fl. oz. (1 gall. 2 pints)
40 c.c. (2 x 20 c.c.)	1 lb.	33 fl. oz. (1 pint 13 fl. oz.)
	7 lb.	231 fl. oz. (1 gall. 3½ pints)
For Grown Sheep, at 20 per lb.		
40 c.c. (2 x 20 c.c.)	1 lb.	26½ fl. oz. (1 pint 6 fl. oz.)
	7 lb.	185½ fl. oz. (1 gall. 1½ pints)
50 c.c. (2 x 25 c.c.)	1 lb.	33 fl. oz. (1 pint 13 fl. oz.)
	7 lb.	231 fl. oz. (1 gall. 3½ pints)
60 c.c. (2 x 30 c.c.)	1 lb.	40 fl. oz. (2 pints)
	7 lb.	280 fl. oz. (1 gall. 6 pints)

MIXTURES AND DOSES OF PHENOTHIAZINE FOR USE AGAINST NODULE WORM.

Dose.	Amount of Phenothiazine.	Add Water until Mixture Measures
For Weaners, 4–8 months old, at 40 per lb.		
20 c.c.	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
30 c.c. (1 fl. oz.)	1 lb.	40 fl. oz. (2 pints)
	7 lb.	280 fl. oz. (1 gall. 6 pints)
For Young Sheep, 8–12 months old, at 30 per lb.		
25 c.c.	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
30 c.c. (1 fl. oz.)	1 lb.	30 fl. oz. (1½ pints)
	7 lb.	210 fl. oz. (1 gall. 2½ pints)
For Grown Sheep, at 25 per lb.		
30 c.c. (1 fl. oz.)	1 lb.	25 fl. oz. (1¼ pints)
	7 lb.	175 fl. oz. (1 gall. ¾ pint)
40 c.c. (2 x 20 c.c.)	1 lb.	33 fl. oz. (1 pint 13 fl. oz.)
	7 lb.	231 fl. oz. (1 gall. 3½ pints)

(2) Use a non-drip nozzle or an oesophageal tube on your drenching syringe.

(3) Carry or hang near the race several pieces of cloth so that the hands can be wiped periodically.

(4) The race should be open behind the man drenching so that sheep can go into a roomy yard immediately. If they are left packed in the race or a small yard there will be a great deal of staining from mouths rubbing on the sides or rumps of other sheep.

(5) Do not hold sheep in yards more than an hour or so after drenching. It is unwise to muster, hold or drive them

during the three days after drenching. Urine staining is of little consequence if these precautions are taken.

When the automatic apparatus is used, there is practically no dripping from the nozzle, but the other precautions listed should be observed.

Many millions of sheep have been drenched with phenothiazine in various parts of the world without any ill-effects. However, in both New South Wales and Queensland, reports have been received that the drug has caused the death of the lambs when in-lamb ewes are treated within a fortnight of lambing. For this reason, it may be inadvisable to use this drug within a month before lambing.

Treatment of ewes before lambing is essential to reduce contamination of pastures with worm eggs and thereby protect the lambs. Two treatments, one at two months and the other not less than one month before lambing, are usually advisable.

The advice of Departmental officers should be sought before dosing young lambs with phenothiazine. Under some conditions young lambs may be sensitized to sunlight by phenothiazine and may suffer ill effects.

Bluestone.

Bluestone solutions can be readily prepared, the only precautions being to use exact, carefully weighed quantities, and glass, copper, wooden or earthenware containers. Old car battery containers are useful. Mixtures and dose rates are:—

(1) 2 per cent. solution—Dissolve 1 lb. bluestone in 5 gallons of water.

Doses—

Grown sheep—4 fl. oz. (specially increased dose).
Sheep 12-18 months—1½ fl. oz. (45 c.c.).
Sheep 8-12 months—1 fl. oz. (30 c.c.).
Sheep 4-8 months—¾ fl. oz. (25 c.c.).
Lambs under 4 months—½ fl. oz. (15 c.c.).

(2) 4 per cent. solution—Dissolve 1 lb. bluestone in 2½ gallons (or 2 lb. in 5 gallons).

Doses—

Grown sheep—2 fl. oz. (specially increased dose).
Sheep 12-18 months—¾ fl. oz. (25 c.c.).
Sheep 8-12 months—½ fl. oz. (15 c.c.).
For younger sheep use 2 per cent. solution.

Bluestone-Nicotine.

Many ready-for-use preparations of bluestone-nicotine are on the market. Mixtures are, however, readily and cheaply made. Use a 2 per cent. solution for younger sheep and a 4 per cent. solution for older sheep. A 2 per cent. solution is made by dissolving 1 lb. bluestone in 5 gallons of water and adding 16 fl. oz. nicotine sulphate.

If the weather is very hot or if the sheep are in very poor condition and have pale membranes or if they are close to lambing, reduce the amount of nicotine from 16 fl. oz. to 12 fl. oz. for the first dose, or until the sheep improve in health and/or the weather cools.

DOSE RATES. *Bluestone-Nicotine Drench.*

Age.	2 per cent. Solution.	4 per cent. Solution.
Grown sheep	2 fl. oz. (60 c.c.)	1 fl. oz. (30 c.c.)
Sheep 12–18 months	1½ fl. oz. (45 c.c.)	¾ fl. oz. (25 c.c.)
Sheep 8–12 months	1 fl. oz. (30 c.c.)	½ fl. oz. (15 c.c.)
Sheep 4–8 months	¾ fl. oz. (25 c.c.)	⅜ fl. oz. (12 c.c.)
Lambs under 4 months	½ fl. oz. (15 c.c.)	¼ fl. oz. (8 c.c.)

Bluestone-Arsenic Mixtures.

(1) *Bluestone-Arsenite of Soda.*

Dissolve ½ lb. bluestone in 1 gallon of water. Dissolve 2 oz. arsenite of soda containing 60-65 per cent. As_2O_3 in 1 gallon of water. Mix these solutions and a green, cloudy sediment forms. This is cleared by adding 1½ fl. oz. spirits of salts (commercial hydrochloric acid). Finally, make up to 3 gallons with water.

(2) *Bluestone-Arsenic Pentoxide.*

Dissolve ½ lb. bluestone and 1½ oz. arsenic pentoxide in 3 gallons water. There should be no sediment. Make sure that the pentoxide will dissolve in water.

Doses for both mixtures are:—

Grown sheep—1 fl. oz. (30 c.c.).
Sheep 12-18 months ¾ fl. oz. (25 c.c.).
Sheep 8-12 months ½ fl. oz. (15 c.c.).
Sheep 4-8 months ¼ fl. oz. (8 c.c.).
Lambs under 4 months ¼ fl. oz. (8 c.c.)

If bulkier doses are preferred—and they are desirable for sheep younger than 12 months—use the same amounts of arsenic preparations as above but double the amount of bluestone and double the amount of water. The dose rates will be double those given above.

When accurate scales for measuring small quantities are not available the following method can be used:—

(1) Make a stock solution of arsenic pentoxide by dissolving 1 lb. in 10 pints of water (or 1 lb. arsenite of soda (60-65 per cent. As_2O_3) in 8 pints).
(2) Dissolve ½ lb. bluestone in 1 gallon of water.
(3) Mix this bluestone solution with 1 pint of either of the arsenic solutions.
(4) Make up the mixture to 3 gallons with water.
(5) If arsenite of soda is used, add 1½ fl. oz. spirits of salts.
(6) Strain the mixture through a piece of cloth.

The doses recommended should not be increased. They are effective, and an increase is likely to kill the sheep. Remember that bluestone-arsenic mixtures are effective only against barber's pole worm and should be used, therefore, from the early spring to autumn. In winter, use bluestone-nicotine for young sheep. It is advisable to strain all drenches containing arsenic through a piece of cloth before use. This is in case there is any undissolved arsenic present.

Arsenical Poisoning.

If used according to the directions given, the mixtures containing arsenic should be perfectly safe for sheep. The dose rates must be strictly followed. Be sure that all of the arsenical preparation used dissolves completely. If there is any sediment strain off through a bag or cloth. If a sediment is noticed in the bottom of the container after using most of the drench, do not use the remaining solution. Mixtures should be stirred frequently during drenching. Sheep need not be starved before or after treatment.

If sheep show ill-effects after the use of drenches containing arsenic, use the following antidote: 1 to 2 teaspoonfuls of "hypo" (sodium thiosulphate, used in photography) dissolved in a half-cup of water. Swab the mouth, or drench with a few cubic centimetres of 5 per cent. bluestone, before giving the "hypo."

DRENCHING AT STRATEGIC PERIODS.

Strategic and Tactical Drenching.

Strategic drenching is preventive drenching and is based on knowledge of the seasonal occurrence of the more important worm parasites. This knowledge has been gained chiefly from detailed field trials carried out in Queensland by C.S.I.R.O. in conjunction with the Department of Agriculture and Stock and certain graziers.

Tactical drenching aims at preventing an increase in the number of worms sheep carry when climatic conditions are particularly favourable. The worms work by the weather, and drenching by the weather (tactical drenching) should forestall them. A fall of rain of 40-50 points or more with a few dull, humid days favours development and survival of the eggs and larvae of worm parasites on the ground. Sheep will begin to pick up larvae during the next few days. About three weeks later these larvae will have grown into mature worms, ready to begin to lay thereby adding more eggs to the pastures. Worms younger than about 15-18 days old are harder to kill with drenches than adult worms. Therefore, it is rather wasteful to drench before the worms are mature. Drenching about three weeks after dull rainy weather catches the worms at a susceptible age and kills them before they can lay eggs to contaminate the pasture.

Dryness, with heat or cold, destroys eggs and larvae on grass, so sheep are unlikely to pick them up during dry periods. However, sheep may carry over into a dry period worms they have picked up at some previous time. If dry weather lasts for a month or two and feed is becoming scarce it is advisable to drench. By removing the worms picked up before the dry spell, the sheep will be given a better chance to thrive under the dry conditions. In dry times sheep may overcrowd and overgraze small areas of green feed—for example, frontages, gullies, gilgais, etc. Many eggs and larvae may accumulate in these places. Whenever sheep are observed to be congregating in such situations it is advisable to drench them, whether there has been rain or not.

Barber's Pole Worm.

The barber's pole worm is a summer parasite picked up from spring through summer into early autumn. Its effects develop quickly. Outbreaks are closely related to rainfall. A fall of 40-50 points or more, accompanied by dull, humid weather, will be followed by increased infestation of sheep from the pastures. By treating sheep about three weeks after such a period the developing worms will be killed before they have begun to lay eggs to contaminate the pastures further.

If rains and dull weather persist over some weeks, treatment should be repeated at intervals of three weeks, until the weather becomes hot and dry or cold and dry. A final treatment should be given three weeks after a period of wet weather has ended. Unless this is done, sheep are likely to carry on a heavy infestation which may later cause trouble.

Nodule Worm.

This is a summer parasite and it depends on adequate rainfall during late spring through summer to early autumn. Larvae are picked up from pastures during the warmer months but develop slowly in the sheep and may not lead to severe ill-effects until the late autumn, winter, or even early spring months. Lack of food during winter increases the severity of the nodule worms' effects.

The three following rules are important in controlling nodule worm:—

(1) Treat all sheep, and particularly breeding ewes, late in August. This will reduce contamination of pastures for spring and will protect spring lambs.

(2) In North Queensland treat breeding ewes and young sheep in autumn or early winter. In southern Queensland treat all young sheep in autumn.

(3) Treat all sheep in winter (June-July) if infestations are severe.

Hair Worm.

The hair worm is a parasite of the cooler months and is picked up in autumn, winter and early spring. The ill effects it produces are usually seen

in winter and are made worse by shortages of feed. A wet autumn followed by a dry winter, and a wet winter followed by a dry or late spring, are likely to bring about severe outbreaks of black scours.

Treatment should be carried out as follows:—

(1) Treat breeding ewes two months and one month before lambing. This is particularly important if they lamb in autumn. It reduces the chances of lambs becoming heavily infested.

(2) Treat lambs at weaning time whether they are thriving or not. This applies particularly to spring lambs, which are weaned in autumn, when this parasite is prevalent.

(3) Treat young sheep (lambs, weaners, rising two-tooth) fairly regularly (every four or five weeks) from autumn until the spring feed comes away. The wetter the season the more often should treatment be repeated; but remember that a wet autumn followed by a dry winter is especially dangerous.

A Co-ordinated Programme.

The chart illustrating the seasonal rise and fall of the three important worm parasites (Plate 1) shows strategic times for drenching. These are not fixed for any particular date but should be carried out within a week or two of the period indicated on the chart. The timing of the late August drenching with phenothiazine is of greatest importance, for if delayed until the weather has warmed up its object may be defeated.

The drenching recommended on Plate 1 has a number of objects:—

(1) The summer drenching with bluestone-arsenic is planned to prevent the late summer rise of barber's pole worm infestation.

(2) Drenching with phenothiazine in autumn has several objects. It is a weaning-time treatment for spring lambs and a pre-lambing treatment for ewes to lamb in autumn. It reduces the number of nodule worms before the sheep enter the winter. It prevents a carry-over of barber's pole worm into the winter. It forestalls the autumn rise of hair worms.

(3) The mid-winter dose of phenothiazine is of greatest importance in districts where nodule worm and hair worm infestations are severe. It removes nodule worms which have emerged from nodules in the bowel wall since No. 2 treatment. It is a second attack on hair worms.

(4) Spring is probably the most important time of the year to give phenothiazine. It forestalls the spring rise of barber's pole worm. It removes nodule worms before they begin a new season's cycle of infestation. Cold and dryness hinder the development of eggs and larvae of nodule worm on the ground, with the result that during the winter little infestation is picked up by sheep. By the end of the winter most of the young nodule worms will have emerged from the nodules. This treatment late in August is the chief attack on these worms. It also prevents a carry-over of hair worm from the winter —a very important matter if the spring and early summer are dry and do not provide the flush of feed that normally helps to remove this species.

(5) The early summer drenching with bluestone-arsenic is a second attack against barber's pole worm planned to check the spring and early summer rise of infestation.

(TO BE CONTINUED.)

Lights for Layers

By B. W. MOFFATT, Assistant Adviser, Poultry Branch.

Each year, the poultry industry has to face the problem of disposal of surplus eggs produced in the spring. These eggs are usually sold to the United Kingdom at a price well below that obtained on the local market. They now bring very little, if any, return to the grower. A few months prior to this surplus, there are barely sufficient eggs produced to keep the market supplied. Thus, we find that egg prices rise in winter and fall in spring. The low spring price has no doubt been the downfall of many farmers who did not have the capital to tide them over this lean period—for this is also the period when most replacement stock are reared.

It is almost axiomatic that hens lay more eggs in spring than in late autumn and winter. If we could encourage birds to lay more eggs in winter and fewer in spring, we would lessen to some degree the number of eggs which we are forced to export. We would also ensure an increased supply of eggs on the home market when eggs are in short supply and when egg prices are normally higher. This is easier said than done, but the use of artificial lighting of poultry is proving to be a step in the right direction. You would have to be very optimistic to think that this is the final solution to the problem, but it does at least offer us a part solution.

Figure 1 is a graph of egg production which could be taken as that of a normal pullet flock under ordinary seasonal conditions. The fluctuations in production are clearly depicted. Production drops to a minimum in the autumn and winter, and then rises to a peak in September and October.

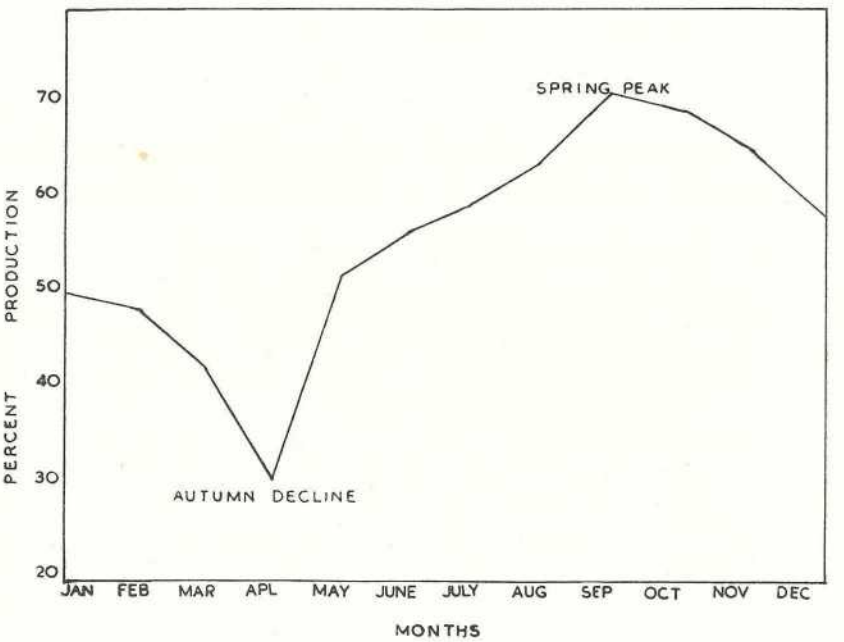


Fig. 1.

Graph Showing Normal Fluctuations in the Production of a Pullet Flock.

What Causes These Fluctuations?

If we compare the hen's egg production with the number of hours of daylight per day throughout the year, we find that as the number of hours of daylight decreases, so does the egg production. This is more than coincidence. Scientists have discovered that light does affect production.

This was once thought to be due to the extra number of hours of feeding time for the birds. It has since been proved to be due to the action of light on the retina of the eye which somehow stimulates the secretion of a hormone by a tiny but most important endocrine gland—the pituitary, which is situated at the base of the brain. The hormone secreted by the pituitary gland is carried by the bloodstream to the ovary. This hormone increases the production of ova and the finished product—eggs.

By studying Figure 2, which is a graph of the times of sunrise and sunset throughout the year, we see that on the shortest day of the year, there are less than 10½ hours of light compared with approximately 14 hours per day in summer. Here lies the answer to the question of seasonal fluctuations in production.

The Practical Application.

It may be inferred from the above that if we could increase the number of hours of light per day in the autumn and winter to approximately 14 hours as in the summer, we could lift our production of eggs in the winter to that of the summer. This cannot actually be realised in practice, as the extra light does not increase the overall production. It does, however, increase winter production with a corresponding decrease in the spring. The practical application of this discovery is therefore worth careful consideration.

How is it Done?

There are a number of ways of supplying this artificial light stimulus. If the object is to achieve a fairly constant period of light, lights can be

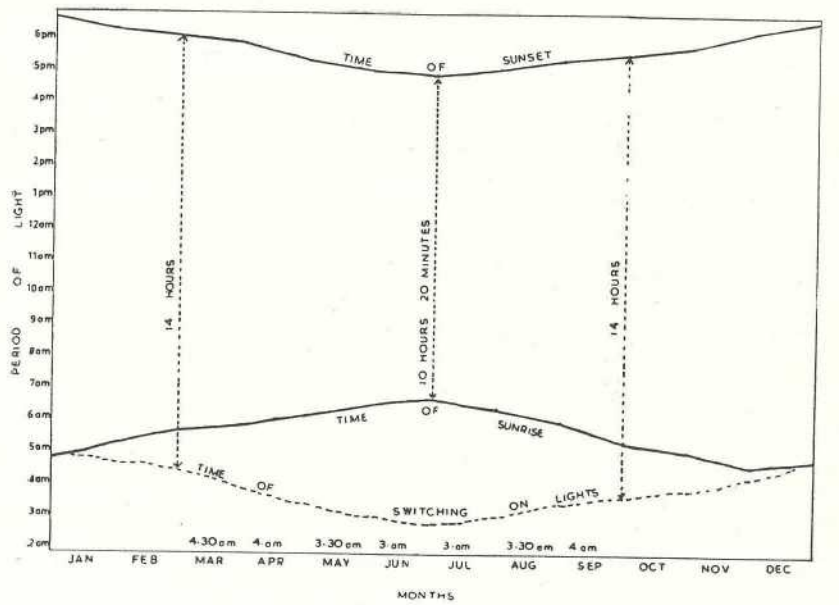


Fig. 2.

Times of Sunrise and Sunset at Brisbane.

switched on either in the early morning or just before dusk and adjusted to give a fairly constant 13 to 14 hour day with birds housed intensively or semi-intensively, for as soon as the lights come on they hop down from their perches to begin feeding. If "night" lighting is used, then there is the difficulty of getting the birds to perch when the lights go out. This can be overcome by using dimming devices, but these add to the cost of installation. Similar results can be obtained by "flash" lighting. Birds are subjected to a 20-second flash from 500-watt bulbs three times during the night. More expensive equipment is required for this method of lighting.

The electric light bulbs are placed to illuminate the feed and water troughs. An intensity of light of 1 watt to every 4 or 5 square feet should be allowed for best results.

A time clock switch is installed so that lights can be turned on and off automatically and regularly. Of the many types on the market, one is particularly suited to this work. This switch has a 30-hour reserve spring, automatically wound, which will keep the clock going in case of power failure. In this way, the clock will still be on time if the power has been off during the day. Other clocks without the reserve spring would be slow by the number of hours the power had been off and the lights would be late coming on. Regularity is most important in the artificial lighting of poultry, as an interruption to the programme of more than three days may cause the birds to moult.

When to Use Lights.

Experiments conducted so far indicate that most benefit can be obtained by using lights from March to September. By referring to Figure 2, it is a simple matter to determine at what time the lights should be switched on to provide 14 hours of light per day. The following times are generally applicable in Queensland.

	Switched on.	Switched off.
March ..	4.30 a.m.	Daylight
April ..	4.00 a.m.	Daylight
May ..	3.30 a.m.	Daylight
June ..	3.00 a.m.	Daylight
July ..	3.00 a.m.	Daylight
August ..	3.30 p.m.	Daylight
September ..	4.00 a.m. to 5.00 a.m.	Daylight

In March, the lights can be switched on at 4.30 a.m. without any preliminary "breaking in" period. However, when the lights are to be dispensed with, the period of lighting must be reduced gradually to avoid the possibility of a moult or slump in production. This is done by switching on the lights 20 minutes later each week during September until the time of switching on approaches daylight.

Which Birds to "Light."

The response to artificial lighting is most noticeable in birds where production would be at a low level in autumn and winter. Such birds are pullets hatched during the first half of the year and hens approaching their second year of lay. The response from birds hatched later than July is often not well marked. It seems that any bird that is likely to moult will give a response to the extra light.

It appears a feasible proposition to rear half of the pullet replacements in May and use lights on these birds. They could then be sold in the following September after 12 months' lay with good winter production, to make room for the next May-hatched pullets. The other half of the replacements would be reared in August or early September and should normally lay at a reasonable level throughout the following winter. By rearing in two batches, the rearing costs are spread out over a longer

period. Also, less brooder equipment is required to accommodate the smaller numbers.

What Winter Production Could We Anticipate?

To illustrate what results can be obtained by the use of artificial lighting in Queensland, a demonstration was conducted on a farm some 60 miles north of Brisbane, under the Commonwealth Extension Services Grant Fund. On this farm, a lighting system and time clock were installed so that 10 pens could be subjected to artificial lighting. A similar 10 pens without lights were made available to house control birds. Three hundred pullets and 300 hens were put under lights and their production records were compared with those of a similar batch of pullets and hens. The birds used as control were comparable with the test birds with regard to age and quality. The management and feeding of all pens were similar.

This test has now been conducted over two seasons and it is interesting to note that after the first season the farmer was so pleased with the results that he has now equipped more pens with lights.

Figure 3 is a graph of production on this farm, comparing the 300 pullets under lights with those not subjected to the artificial lighting. Both groups were hatched in May. It will be noticed that in early May, when production was lowest, the birds under lights gave an increase in production of 17 per cent. over the control birds. It can also be seen that the production in spring was lowest in the pens subjected to the artificial lighting.

Trials have also been carried out at the Poultry Section of the Rocklea Animal Husbandry Farm and similar results have been obtained.

The increase in production from hens subjected to artificial lighting is

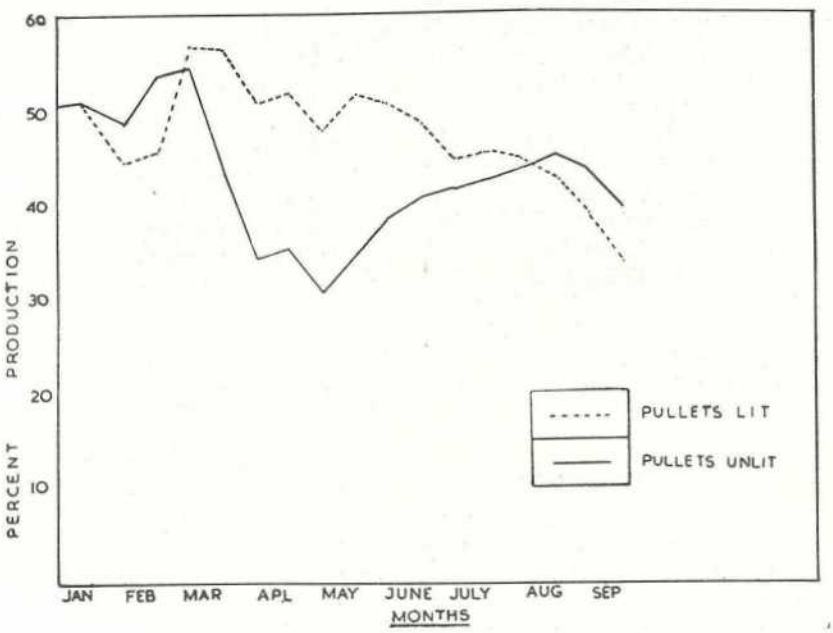


Fig. 3.

Effect of Artificial Lighting on Production on a Farm With 300 Pullets.

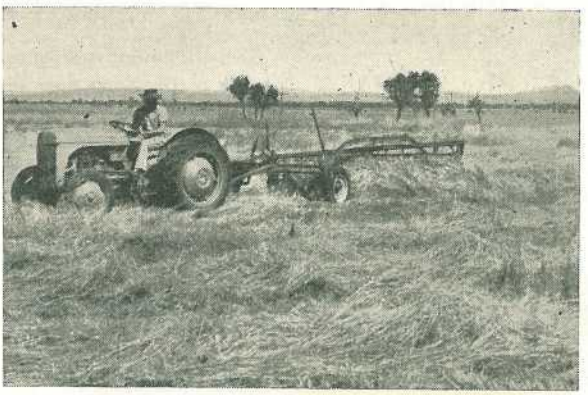
even more marked. Many farmers are now finding that hens are not a payable proposition because of increased mortality during the second year of lay, lower overall production and a greater intake of food per dozen eggs produced. If hens are to be kept, lights can increase the return per bird by the increase in winter eggs, although the egg shell quality of these eggs is inclined to fall in June or July.

Summary and General Recommendations.

As yet, only a few farmers are taking advantage of the effect of artificial lighting on winter production. Their numbers are steadily increasing and if sufficient farmers install lights the pattern of production showing a low winter and a high spring production can be changed to a more even production throughout the year.

This would be a big point in any sales campaign to increase the average consumption of eggs per person per year. Less fluctuation of price would also assist in this direction.

Overall profits can be increased by the use of artificial lighting on early hatched pullets or on hens between March and September. The intensity of light and the regularity of times of switching on are most important. The cost of installation of a lighting system and time switch is not great compared with the financial return to growers.



Raking Native Pasture Hay in Central Queensland.

Vaccinating Against Fowl Pox and Infectious Laryngo-Tracheitis with a Mixed Vaccine

By P. D. RANBY, Veterinary Officer.

Infectious laryngo-tracheitis (I.L.T.) was first diagnosed in Queensland fowls some four years ago although it had been known to occur in the southern States for a number of years previously.

Careful investigation has shown that the disease is not common in Queensland flocks and is generally associated with only moderate mortality. The very severe form with coughing of blood is rare.

As living virus is used to vaccinate against the disease, infection of non-protected fowls can occur as a result of vaccination. For this reason vaccination is only permitted on properties where a definite diagnosis of I.L.T. has been made. Unrestricted vaccination would spread the disease to poultry farms now free.

Only vaccines prepared from local strains of the virus are permitted to be used. This is because of the greater severity of the disease in southern States.

Where vaccination against fowl pox and I.L.T. are both necessary, a method of simultaneous application of the two viruses has been developed. This consists of mixing the two viruses and applying them to feather follicles.

DESCRIPTION OF THE DISEASES.

Infectious laryngo-tracheitis is one of the respiratory diseases of poultry, characterised by signs such as coughing, gaping of the mouth, throat rattles, nasal discharge and "bung eyes" (Plate 1). The virus typically

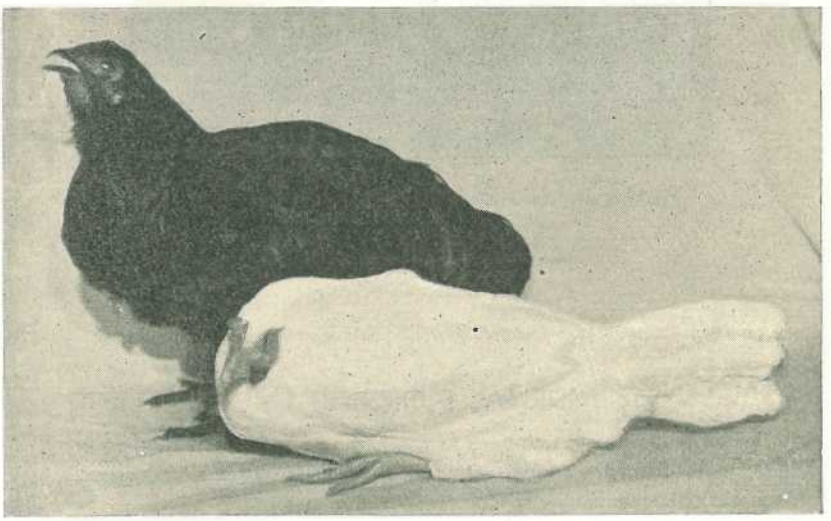


Plate 1.

Affected Fowls in an Outbreak of Infectious Laryngo-Tracheitis (I.L.T.) in Queensland. Note the characteristic gaping of the Australorp.

attacks the larynx and trachea, hence its name. A proportion of affected fowls dies from asphyxia caused by blockage of the larynx with a cheesy plug of dead tissue or by choking in their own blood-stained mucus.

The disease is transmitted by direct contact with either an actively infected fowl or a recovered fowl which remains a "carrier" of the virus. I.L.T. virus is a fragile one and will not live for more than a few days on the ground.

Fowl pox is characterised by wart-like growths on the comb and wattles (cutaneous form), and in a small proportion of affected birds by "cankers" of dead tissue in the mouth and throat (respiratory form). The cutaneous form is shown in Plate 2.

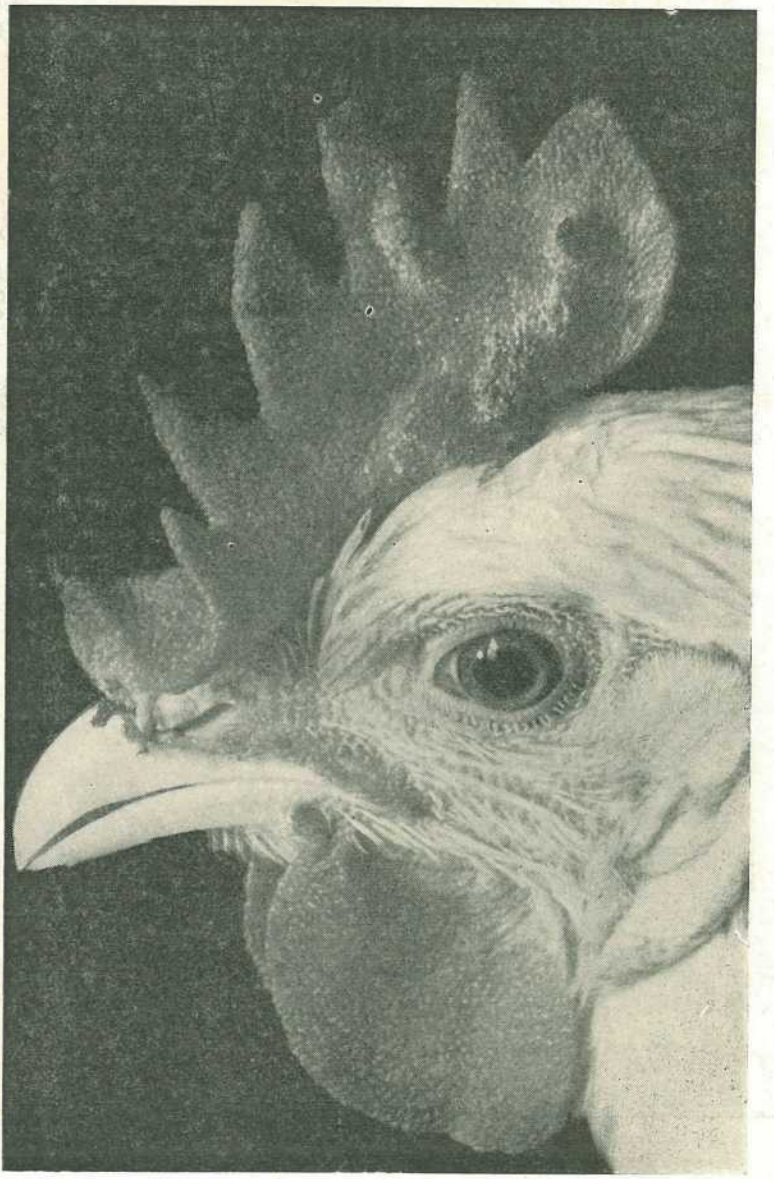


Plate 2.

A Case of Fowl Pox. Note the wart-like lesions on the comb.

Plate 3.

Team Vaccinating for I.L.T. The vaccinating stick is inserted into the cloaca (or vent) of the chick and rubbed against the lining to cause an abrasion. This facilitates penetration of the virus.

The virus causing fowl pox is transmitted mainly by mosquitoes and to a less extent by contact with the scales and scabs shed from the wart-like growths. In the latter case, the virus enters through scratches on the head or in the mouth. The virus is a fairly resistant one and can persist on the ground for a few months.

Vaccination against these two infectious diseases involves the use of living viruses.

USUAL METHODS OF VACCINATION.

The orthodox method of I.L.T. vaccination is by inoculating the vaccine into the cloaca, the cavity just within the vent, by means of a metal rod notched at one end to pick up vaccine (Plate 3) or by special swab sticks, one stick being used for each bird.

Two vaccine viruses are available for fowl pox—fowl pox virus, and pigeon pox virus.

Fowl pox vaccine is applied by either the stab method or the feather follicle method.

The stab method requires the use of a needle with two prongs on the end to pick up vaccine. A suitable vaccinating needle is made by cutting through the eye of an ordinary sewing needle to make two prongs, sharpening the prongs, and pushing the other end into a cork or rubber stopper. The skin is stabbed twice on the leg or less commonly (in Australia) on the wing web.

The feather follicle method requires the removal of feathers on the leg and the application of vaccine to the follicles by means of a short brush (Plate 4). This method is the more popular one in Queensland, although the stab method is quicker if a vaccinating team of three or four is used.

Pigeon pox vaccine is applied only by the follicle method described above.

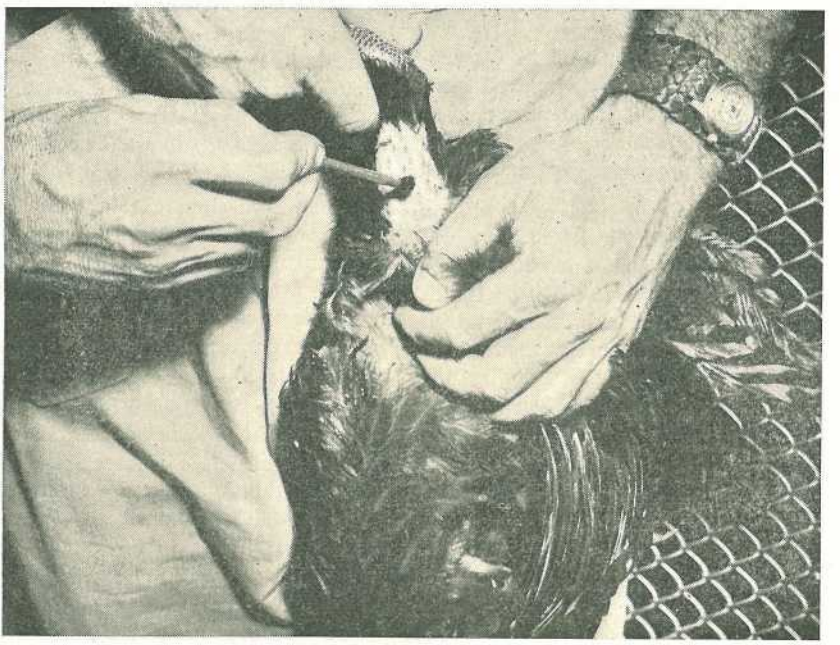


Plate 4.

Fowl Pox Vaccination by the Feather Follicle Method. Fowl pox or pigeon pox vaccine is applied by brush to about six feather follicles. This method of inoculating is now used for the mixed I.L.T. pox vaccine.

USE OF MIXED VACCINES.

In 1954, the writer obtained good "takes" or local reactions when I.L.T. vaccine was applied to the feather follicles of the leg instead of by the usual cloacal method. Since pigeon pox vaccine is applied to the feather follicles of the leg, it seemed possible that the two viruses, I.L.T. and pigeon pox, might still act when mixed together.

A trial commenced by the writer in December 1954, using young cockerels, showed that a mixed vaccine produced satisfactory "takes" and immunity to both viruses. Since then, the method has been used on a wider scale, and in 1955 about 40 per cent. of the I.L.T. vaccination done in the Brisbane area was with a mixed I.L.T. vaccine, mostly containing pigeon pox virus. Some vaccinated fowls from these groups have been tested later with the single viruses and found immune.

Preparation.

The I.L.T. vaccine used in Queensland is a "wet" vaccine prepared from egg-grown virus. The virus is a Queensland strain. A new dry vacine is being used experimentally.

The dried pigeon pox or fowl pox material is added directly to the wet I.L.T. vaccine, in the proportions of 300 doses of pox virus to 10 or 11 ml. of I.L.T. vaccine. The bottles of mixed virus vaccine are then returned to the vacuum flask used for keeping the I.L.T. vaccine at ice temperature. (I.L.T. virus is fragile and must be kept at a low temperature till just before use.)

For a given volume of vaccine, the number of doses by the follicle method compared with the cloacal method is in the ratio of 3:4.

Age to Vaccinate.

The minimum recommended age for I.L.T. vaccination is 6 weeks.

Fowl pox vaccine is preferably used between 6 and 12 weeks of age, and certainly not when pullets are close to the lay or are already in lay. At such times the systemic reaction which occurs 14 to 21 days following fowl pox vaccination will upset the birds unduly.

Pigeon pox vaccine may be used at any age, as it is a milder virus than fowl pox and is without danger.

If the vaccination can be left until birds are 9 weeks old the procedure is somewhat easier because of the presence on the leg of well-developed shaft feathers. However, the follicles of the hair-like feathers on younger birds are quite suitable for inoculating.

Applying the Vaccine.

A vaccinating team of at least three is required if any speed is to be maintained. These comprise a catcher, a holder and a vaccinator.

The holder grasps several birds by the right leg. An area of feathers is removed from the outside of the leg, just above the hock joint, as shown in Plates 4 and 5. If an insufficient area is exposed, the feathers are likely to become caught up in the brush.

The vaccinator carries a small column of vaccine in the vaccinating bottle, as required for I.L.T. vaccine. This ensures that quantities of fresh vaccine are added at frequent intervals from the vacuum flask.

The vaccine is applied to at least six follicles by means of a special brush made for the follicle method. After dipping the brush in vaccine it is a good idea to give it a light wipe inside the bottle, otherwise the vaccine will be used too liberally.

At no time should vaccine containing I.L.T. virus be left in the sun.

When to Use.

The mixed vaccine will be used where it is desired to vaccinate a flock for both I.L.T. and fowl pox at the same time.

I.L.T. vaccination in Queensland is performed by veterinary officers of the Department, following isolation of the virus at the laboratory. There is no restriction on use of fowl pox or pigeon pox vaccines.

The choice between fowl pox and pigeon pox vaccine depends on certain factors, which are briefly outlined below.

(1) Fowl pox vaccine produces a long-lasting immunity following vaccination, whereas pigeon pox vaccine (C.S.L.) gives a temporary immunity lasting 4–6 months. Hence, other things being equal, fowl pox vaccine is preferred.

(2) Fowl pox vaccine is preferably used between 6 and 12 weeks of age; if done over this age, some temporary upset is likely. However, older fowls may be done but not if they are within three weeks of lay or have started to lay. Pigeon pox vaccine should then be used.

(3) Fowl pox vaccine should not be used for unthrifty chickens. Pigeon pox and I.L.T. vaccine may be used. Queensland I.L.T. vaccine produces mild reactions and will not upset the chickens.

(4) Fowl pox vaccine should be used with caution if other respiratory diseases are present or if caecal coccidiosis is likely. Again, pigeon pox vaccine is safe.

(5) Our experience with pigeon pox vaccine is that it gives its best results in lowlying areas, where mosquitoes are prevalent. The reasons for this are not clear but it may be a consequence of what amounts to revaccination of the birds with fowl pox virus by mosquitoes.

Advantage.

The advantage of the mixed vaccine is that both viruses may be applied to the same site on the body by the same method; this saves catching the chickens twice. Attempting to do two methods of vaccination at the one catch is awkward and little quicker than catching the chickens twice.

One disadvantage of the method is that one cannot tell whether the "takes" obtained are to both viruses, but this can be overcome to some extent by inoculating three or four chickens on the opposite leg with pure I.L.T. vaccine before preparing the mixed vaccine. These are identified or isolated so that the "takes" can be read 7–10 days later (Plate 5). If the I.L.T. virus is potent, it will produce a "take" like that of pigeon pox —a papule or pustule without formation of crusts over the follicle.

Plate 5.

Pigeon Pox "Takes". A number of feather follicles have commenced to swell five days after vaccination with pigeon pox vaccine. A similar local reaction is produced by I.L.T. vaccine.

It is impracticable to check the pox vaccine in the same way, as it is in the powdered form when the vial is opened. However, our experience is that available fowl pox and pigeon pox vaccines are fairly reliable as regards potency. Fowl pox can be checked in the mixed vaccine "take" in that it produces crusting on the feather follicles soon after the pustules have developed. This is not produced by either I.L.T. or pigeon pox vaccine.

SUMMARY.

A new method of vaccinating against fowl pox and infectious laryngo-tracheitis of poultry has been developed. The method consists of the use of a mixed vaccine, containing the viruses of infectious laryngo-tracheitis (I.L.T.) and one of the bird pox viruses—either fowl pox or pigeon pox virus.

The mixed vaccine is prepared by adding the powdered bird pox virus directly into a "wet" I.L.T. vaccine.

Inoculation is by the feather follicle method, using a brush. Immunity is produced against each virus in the mixed vaccine. The method is quicker and simpler than the usual separate methods of vaccination.

WATCH PASPALUM IN IRRIGATED PASTURE!

Irrigated pastures of paspalum and white clover are looked at with mixed feelings by Queensland farmers. Some farmers prize these pastures, but others regard the paspalum component as a pest.

Mr. A. Nagle, Irrigationist, Department of Agriculture and Stock, points out that the chief disadvantage of this pasture mixture is that production is low in winter and early spring, when succulent forage is most needed. In midsummer, when pasture production of all kinds is high, the paspalum-white clover mixture gives its maximum yield.

If careful attention is given to summer management, however, paspalum-white clover pastures can provide valuable grazing for a long period of the year.

Paspalum runs to seed quickly during summer. It is then unpalatable, and selective grazing, with overgrazing of the clover, occurs. Unless the grass is mown to improve its palatability and to reduce its shading effect, the clover stand is reduced. Mowing encourages an upright growth of the paspalum, while continuous close grazing causes a low dense sward to develop. This tends to become sodbound, further reducing the clover stand.

During the peak of the summer growth, heavy grazing and several mowings are required to maintain a good balance between the clover and the grass in the pasture.

Winter production of paspalum-white clover pastures can be improved considerably by oversowing or sodseeding with 2 to 3 lb. per acre of H1 or Italian ryegrass during March or April. Reseeding may be required annually or every second year, but is inexpensive, as ryegrass seed costs only about 2s. a lb.

Ripping or tining to reduce the stand of paspalum and to allow the white clover to increase may be necessary periodically.

With attention to these management practices, particularly oversowing or sodseeding with ryegrass to step up winter production, irrigated pastures of paspalum-white clover will provide nutritious fodder over most of the year.

Ear Notching of Pigs

Prepared by Officers of the Pig Branch.

Before a litter is weaned, the young pigs should be given a permanent identification mark. Tattooing, tagging, and ear notching are common methods of identification, but of these the last-mentioned is undoubtedly the best and as nearly permanent as possible.

Notching has an advantage over tattooing in that it can be used on all breeds of pigs and if neatly done remains legible regardless of the pig's age. A pig's number also can be observed in the paddock without the necessity of yarding the animal and perhaps washing its ear.

Metal tags are not satisfactory, as they are often lost through pigs fighting or rubbing their ears against fences or other objects. With this method, also, the pig has to be yarded and the tags cleaned before the number can be read.

Until recently tattooing was the only method of ear marking officially recognised by the Australian Pig Society. Large White, Middle White and Tamworth pigs are still required by the Society to be tattooed for official identification.

It is not claimed that ear notching is the perfect system of identification, for it is realised that pigs may occasionally tear their ears through fighting, thus marring the notches; their ears also may be disfigured by excessively deep and careless notching.

However, these risks may be reduced to a minimum if the following points are observed.

(1). No marks should be placed from the middle to the base of the upper edge of the ear. The cartilage in this position is quite thick and it is necessary to cut deeply into it to ensure that the notches will not grow out as the pigs age. As a result there is always a danger of the ear drooping over in an unsightly manner—a very objectionable feature, especially in show stock.

(2). The value or number allotted to positions near the point of the ear

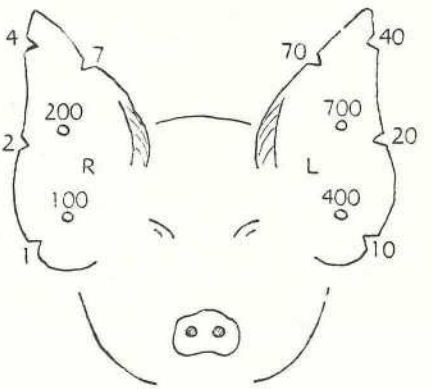


Plate 1.

The Key or Guide to the Ear-Marking System.

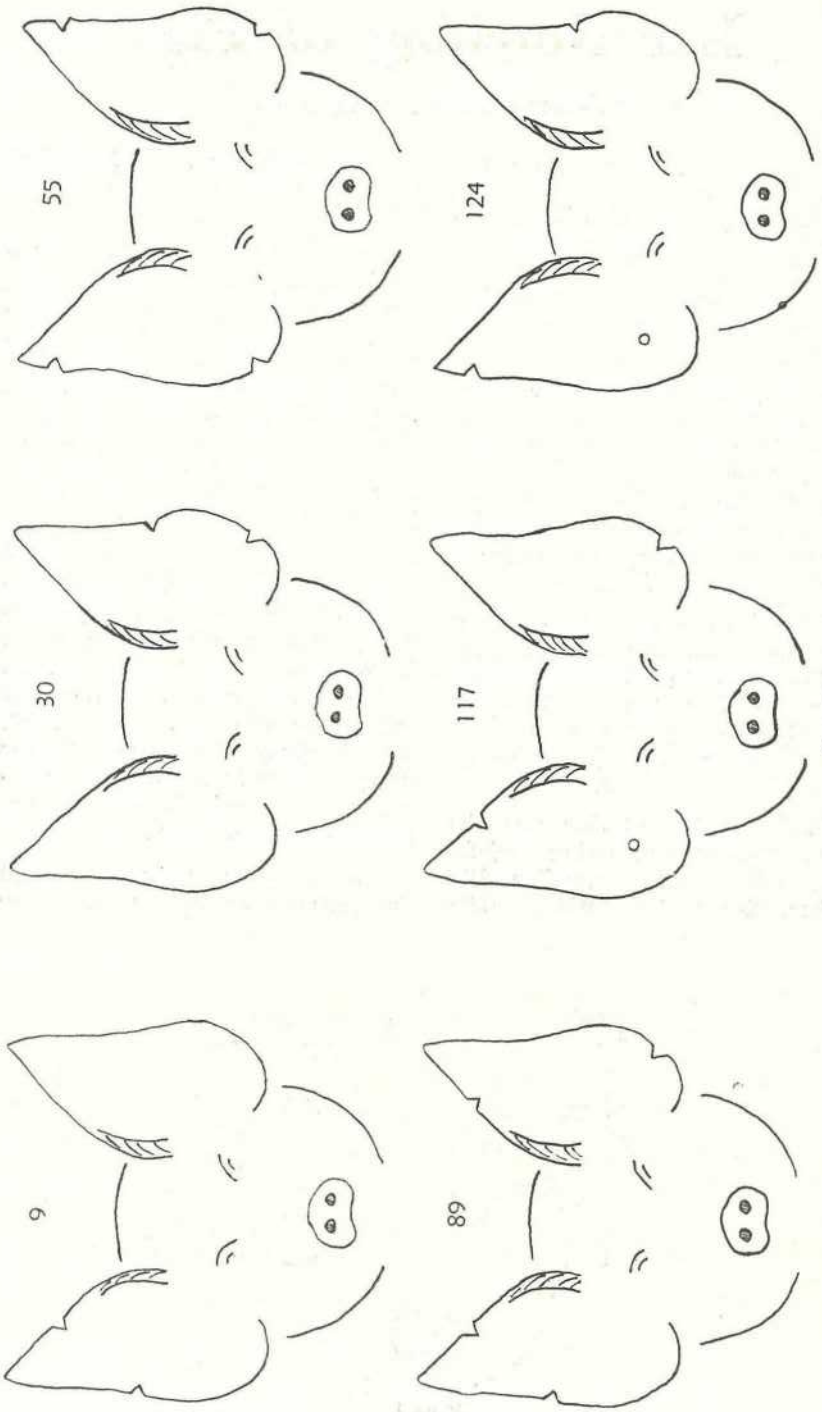


Plate 2.
Diagrams Showing How Various Numbers Would be Marked.

should be so designed that it is not necessary to take out more than one notch in this part of the ear for any number; otherwise the tip of the ear may droop.

(3). Round punch holes should not be used near the tip of the ear. In this position they are prone to cause tearing.

(4). Pieces removed from the ear should vary according to the size of the pig.

The ear notching system illustrated in Plate 1 has been designed to comply with the above limitations as far as possible. It is one example of many systems in which notches in particular positions of the ears represent numbers, thus enabling each pig or each litter to carry a different number.

A brief description of this system, which employs both ears for notching, is as follows:—

All unit numbers are placed on the right ear and the tens in the left or near ear. Confusion between the two may be avoided by remembering that the words unit and right each contain the letter "i" and the words ten and left the letter "e."

It will be noted that numbers 1, 2, 4 and 7 are recorded by a single notch, the value being determined by the relative position on the ear. The numbers 3, 5, 6, 8 and 9 represent a combination of the previous positions (for example, 2 and 1 to make 3; 4 and 1 to make 5; 4 and 2 to make 6; and so on). For these numbers it is therefore necessary to make two notches.

The tens are represented by notches in the left ear, the 10, 20, 40 and 70 positions corresponding to the 1, 2, 4 and 7 positions respectively in the right ear.

Any number up to 99 may thus be made by a combination of the above figures. If it is necessary to number beyond 99, round punch holes could be used as shown in the diagram, but in the average herd, where all pigs in the litter are given the same number, it is usually unnecessary to go beyond 99. By adopting the 1, 2, 4, 7 combination the number of cuts in the ear is reduced to a minimum.

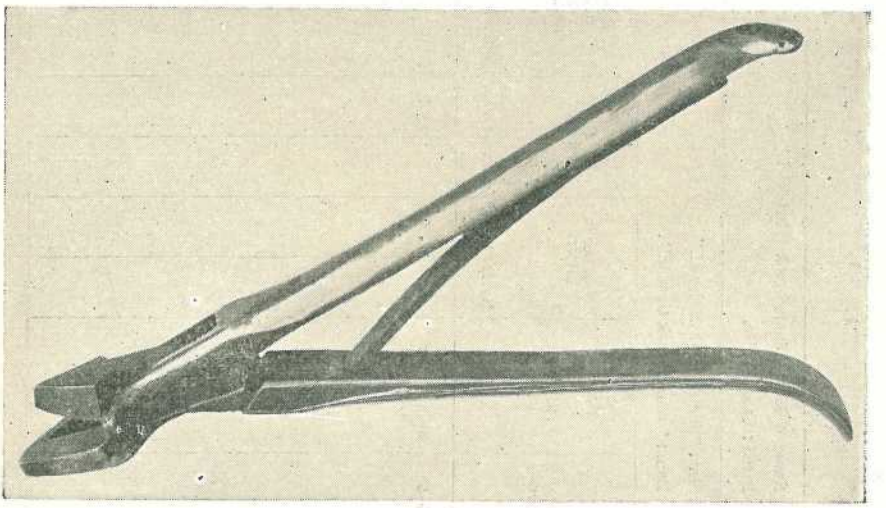


Plate 3.

Ear-marking Pliers With a Cutting Piece Shaped Like a V Upside Down.

SOW'S BREEDING RECORD.

Name of Sow : " Sunnybrook Pearl XVI." Date of Farrowing : 3–7–53.

Breed : Large White. Earmark No. 65.

Sire : " Sunnybrook Major II." Earmark : 32

Dam : " Sunnybrook Gem V." Earmark : 12

Litter Farrowed—	Sire of Litter.	Number in Litter.		Died at Birth.		Date of Deaths before Weaning.		Earmark and Date Weaned.		Disposal of Litter.												Remarks.
										Date of Deaths after Weaning.		Sold to Market.										
												Date.	Number.		Average Weight.	Price.		Gross Return.			Remarks.
		Boars.	Sows.	Boars.	Sows.	Boars.	Sows.			Boars.	Sows.		Boars.	Sows.								
															Lb.	*s.*	*d.*	£	*s.*	*d.*	
2–9–55	Sunnybrook Major	7	5	1	1	..	1	65		..	..	28–3–56	5	2	140	2	0	98	0	0	1 pig born dead
							3–10–55	29–10–55													
								Boars.	Sows.	..	..	10–4–56	1	1	136	2	0	27	4	0	1 pig overlain
								6	3												1 death — pneumonia
																					9 baconers marketed
																		125	4	0	

As the position of the notch on the ear determines the value, it is important that positions 1 and 10 be kept well towards the bottom of the ear and positions 4 and 40 well towards the tip of the ear to prevent confusion with the positions 2 and 20 in the middle of the ear. Likewise these latter positions should be as nearly as possible exactly midway along the ear; otherwise confusion may occur as between position 2 and either position 1 or 4, and as between position 20 and either position 10 or 40.

Pliers with a cutting piece shaped like a V upside down are recommended for ear marking, as notches of various sizes—according to the age of the pig—can be made simply by pushing the pliers varying distances on the ear. Small pigs up to weaner age should have only a comparatively small piece removed from the ear.

Careful recording of the earmark allotted to each animal or each litter of pigs (see specimen breeding record) is just as important as the marking itself, for one's memory should not be relied upon in these matters. Identification of pigs in this way is also of value in recording pedigree and performance.

FODDER CONSERVATION IN ACTION.

Loading Baled Lucerne Hay on a Central Queensland Property.

Buckraking Saccaline Fodder Sorghum in Central Queensland.