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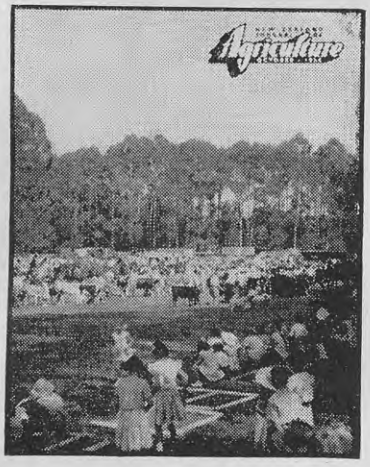
This Month's Cover



Another agricultural and pastoral show season is under way in New Zealand and fixtures will be held in many centres from now until the late autumn. This month's cover, which has been reproduced from a colour photograph by D. R. Brenchley, is of the 1953 Taumarunui and District A. and P. show at Taumarunui. Much of the farm land around Taumarunui is typical of the North Island hill country which was surface sown after the bush had been felled and burnt. Even today there are extensive areas of native timbers in the district and sawmilling is an important industry.

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SUBSCRIPTION RATES

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Renaissance of Surface-sown Grassland

By P. W. SMALLFIELD, Director, Extension Division, Department of Agriculture, Wellington

BORN as it were amid the more primitive aids to farming—the fire stick and the axe—the surface-sown grasslands are now being offered renaissance by the aeroplane through aerial topdressing. Established on steep hills on a seed-bed formed of the ashes of a forest fire, the pastures have long been subject to a declining level of production through falling soil fertility, erosion, overgrazing, and invasion of secondary growth. Contemplation of recent advances in the science and practice of hill country farming gives confidence to the view that a new era of increased production has opened for hill country farming.

NO very exact records appear to exist detailing when the practice began of sowing pastures on the ashes

Above—A bush burn. At left—A new burn. After sowing the next job was to bridge streams, clear fencelines, erect fences, and undertake such other clearing as would enable sheep and cattle to graze over the whole sown area. Photographs from the Alexander Turnbull Library photograph collection.

of a bush burn. It is probable, however, that the early settlers borrowed the idea from the Maoris, whose habit of primitive agriculture was to plant their food crops on the ashes of a bush or scrub clearing, and records of early Auckland settlement indicate that wheat was grown in this way in the early 1840s. Hursthouse writing in 1861 indicates that the practice of establishing surface-sown pastures in the ashes of a bush burn had been well systematised at that time. He describes the procedures of under-scrubbing, felling, and burning and enumerates seeds mixtures. He states that the common mixture used was about a bushel of perennial ryegrass with 3lb. of red clover and 3lb. of white clover, but he considered a wider variety of grasses should be used, including sheep's fescue, meadow fescue, cocksfoot, and *Poa pratensis*. The guides he gave in 1861 really summarise the practices followed by pastoralists who during the last three decades of the 19th and the first decade of the present century converted about 10 million acres of bush-clad hills into pastoral land.

The eagerness of the pioneers in converting bush land to grass and consequent problems of land erosion and deterioration are often deplored, but they had little choice. The very existence of early North Island settlers depended on the course they followed. Little if any other class of land was available in the North Island on which economic farming was possible, and any general conversion of scrub land to grass had to await the advent of fertilisers and mechanised farming.

Clearing and Burning

As burning of bush land was usually timed to occur in late December or January (when conditions were generally suitable for the establishment of rape and turnips) and 2 months were allowed for the drying out of the last felled areas, the work of clearing was begun in June with one man employed for every 30 to 35 acres. The first job was to under-scrub the area thoroughly by cutting all low growth to a height of not more than 6in. above the ground and this work was completed before felling started. Generally all trees up to 3ft. in diameter were felled, but larger trees were left standing. Costs of clearing were recorded in 1861 as £2 per acre and were about the same in 1914 at the end of the bush burn era.

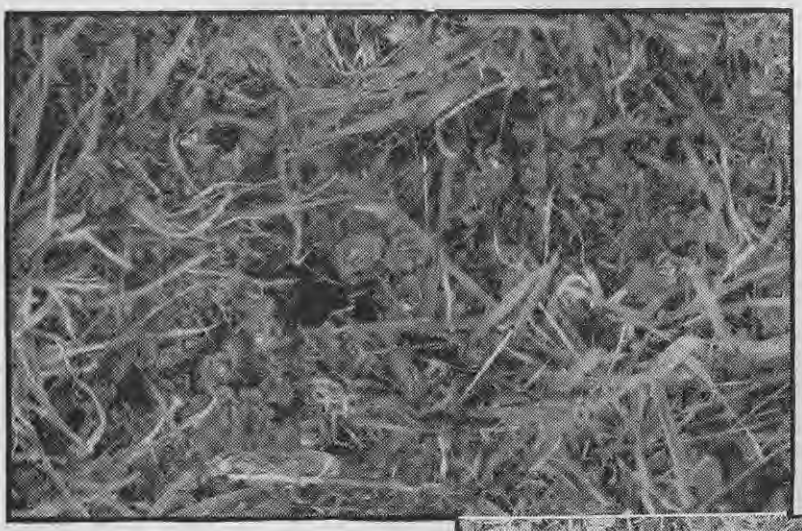
Fires were usually started at midday on a warm, sunny day with a moderate wind. A clean burn was the aim and failure to secure this was often the cause of early reversion, for stock could not work through areas too thickly carpeted with unburnt debris. As soon as the burnt area had cooled sufficiently seeding was proceeded with, but some preliminary clearing of tracks through the burnt area was usually necessary to allow the seed-laden packhorses to distribute their loads at strategic points for hand sowing. After sowing the next job was to bridge streams, clear fencelines, erect fences, and undertake such other clearing as would enable sheep and cattle to graze over the whole of the sown area.

To the inexperienced the task of converting heavily timbered bush country, thickly carpeted with undergrowth, into sheep farms might have appeared practically impossible, but actually the procedure was not at all difficult. Once an assured market for meat was obtained after the introduction of refrigeration the process of bush-burn sowing was pushed ahead rapidly until all suitable available land was grassed.

Seeds Mixtures

Most bush-burn pastures were established with a seeds mixture consisting mainly of perennial ryegrass, cocksfoot, and red and white clovers. Rape and/or turnips were invariably sown with the grass seed mixture and sowing was timed to secure heavy rape and turnip crops for winter feeding rather than the best possible pasture establishment.

Surface-sown hill country. Over the major area of surface-sown land pastures have stabilised as danthonia and browntop swards with a carrying capacity of slightly less than a ewe to the acre. The introduction of clovers and their stimulation by phosphatic topdressing are the first step in raising soil fertility and increasing production.



Above—*Lotus major*. In high-rainfall areas *Lotus major* is a particularly valuable legume for pasture improvement. It will thrive under soil fertility conditions too low for white and subterranean clovers, will compete with secondary growth, and will survive fire. At right—White clover. The major area of surface-sown land will carry white clover. For oversowing to succeed the clover seeds must fall on the soil when conditions are favourable for germination and growth. Pastures should be prepared for oversowing by hard grazing before topdressing with seed and fertiliser, and generally autumn sowings are the most successful. Below—Subterranean clover. On drier country subterranean clover is most suitable for sowing, but generally a mixture of white and subterranean clovers is sown, usually 2lb. of white and 1lb. of subterranean. If the clovers are sown separately, the usual seeding is 2lb. of white and 3lb. of subterranean.

"The Settler's Handbook of New Zealand" (1902) sets out the grass mixtures recommended for surface sowing in the various land districts at rates varying from 20lb. to 30lb. per acre. The mixture generally recommended was on the following lines:—

	lb. per acre
Cocksfoot	5
Perennial ryegrass	10
Italian ryegrass	3
Crested dogstail	1
Meadow foxtail	2
Timothy	2
White clover	1
Cowgrass	1
	25
Rape	2
Total per acre	27

On land not of the best quality farmers were advised to increase the cocksfoot, decrease the perennial ryegrass, omit foxtail and timothy, and add 1lb. of chewings fescue, ½lb. of danthonia, 1lb. to 2lb. of *Poa pratensis*, ½lb. of *Lotus corniculatus*, and 1lb. of *Lotus major*. A good deal of attention was given to surface-sown grass seed mixtures from 1910 to 1920. A. H. Cockayne stressed the importance of the inclusion of crested dogstail and danthonia in surface-sown mixtures, drew attention to the use of browntop and *Lotus major*, and emphasised the folly of sowing anything but the best seed and the fact that poor land required a much more expensive seed mixture than good land.

Despite authoritative recognition for the inclusion of low-fertility-demanding grasses in bush-burn mixtures the average settler continued to sow mainly ryegrass, cocksfoot, and clovers with rape and turnips. Much of the ryegrass seed used was false perennial, which rapidly disappeared, and quite large areas were sown with cheap bush-burn mixtures consisting largely of worthless seed. In the lower- and moderate-rainfall areas the unobtrusive invasion of danthonia

saved the pastures, but in the high-rainfall areas secondary growth quickly invaded unsatisfactory pastures.

Deterioration

Concern over the problem of pasture deterioration on surface-sown hill country has expressed itself in various ways at various times. At first the problem was one of falling carrying capacity, but as long as land was cheap and abundant the problem was not of much concern to the public. When, however, in the early part of the present century development of pastoral farms pressed on to the highly elevated and heavy-rainfall areas and unsuccessful burns were obtained, opinion gradually conceded that there were areas where forests should be reserved.

In the early 1920s the incidence of deterioration over large areas in the western central district of the North Island culminated in the passing of the Deteriorated Land Act 1925, which allowed rent remissions on Crown leaseholds based on the performance by lessees of remedial work in clearing secondary growth and pasture improvement. The benefits of the Act were, however, suspended during the depression of the 1930s.

More recently interest has been focused on the problem of slip and sheet erosion on hill country and consequent effect on rivers and low-lying land. The whole problem of hill country deterioration naturally centres round remedial measures which can be economically adopted. No great progress was made while pastoralists were limited by what they could do by hand. The first measures were hand cutting and resowing of second growth and hand topdressing, but it was not until the early 1920s that topdressing of hill country by hand became recognised as a useful practice. Much knowledge was gained from work of this nature, but economic conditions precluded any major advancement.

Recently, however, the light aeroplane has introduced a new era in hill country improvement, allowing for the oversowing and topdressing of hill country on a grand scale. Improved pasture production and livestock carrying capacity through the introduction of clovers and stimulation of growth by phosphatic fertilisers will reverse the long process of deterioration. Work to clear second growth and check erosion which was often not feasible under conditions of declining fertility will undoubtedly be worth while under conditions of increasing productivity.

Danthonia-browntop Pastures

Over the major area of surface-sown land the pastures have stabilised as danthonia and browntop swards with a carrying capacity of slightly less than a ewe per acre. Where topdressing has not been practised and the natural soil fertility is low, clovers are mainly represented by annual species, but where soil fertility is higher some of the more productive grass and clover species have survived and perennial ryegrass, crested dogstail, cocksfoot, and white clover make important additions to the sward. The introduction of clovers and their stimulation by phosphatic topdressing are the first steps in raising soil fertility and increasing production.

Above—Manuka blight. Manuka in the past was dealt with by pulling or where the plants had escaped beyond this control by cutting, burning, and resowing. The spread of manuka blight has changed the outlook on control measures and over large areas resowing by aeroplane after burning of the dry sticks of scrub and rough grass appears the most feasible method of reconditioning the land. Below—Hard fern is difficult to suppress in high-rainfall areas. Hard winter grazing of pastures has helped the spread of hard fern and on many areas land has alternated between pasture, hard fern, and bracken fern.

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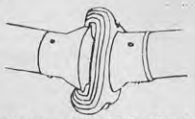

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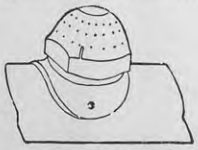

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In high-rainfall areas *Lotus major* is a particularly valuable legume for pasture improvement. It will thrive under soil fertility conditions too low for white and subterranean clovers, will compete with secondary growth, and will survive fire. The seed is expensive and for oversowing ½lb. per acre with 2lb. of white clover is usually sufficient. Good results have been obtained with patch sowing on selected sites by hand, and where *Lotus major* has been introduced in this way over a period of years it has ultimately become a dominant plant in the sward.

The major area of surface-sown land will carry white clover, but on drier country subterranean clover is more suitable. Generally a mixture of the two clovers is sown, 2lb. of white and 1lb. of subterranean per acre. If the two clovers are sown separately, the usual seeding is 2lb. of white and 3lb. of subterranean clover. For oversowing to succeed the clover seeds must fall on the soil when conditions are suitable for germination. Pastures should be prepared for oversowing by hard grazing before topdressing with seed and fertiliser, and generally autumn sowings are the most successful. In most districts autumn sowings may be continued in May. Phosphatic fertilisers are usually required to stimulate clover establishment and growth and 2cwt. of superphosphate per acre is usually applied at sowing.

The fertiliser, lime, and minor-element applications necessary to raise fertility naturally vary on different soil types, and among the minor elements molybdenum has recently achieved prominence in helping to promote a vigorous clover growth on considerable areas of hill country. A great deal of further investigation is required to determine the major- and minor-element deficiencies on various soil and land classes of hill country, but recent work with molybdenum indicates that minor elements may play an important part in raising fertility on certain classes of land, and the use of molybdenum has certainly improved the efficiency of phosphatic fertilisers and obviated the need for heavy applications of lime on considerable areas of hill country.

Discing hill country. In recent years remarkable progress has been made in rejuvenating moderately steep areas of surface-sown hill country by discing, resowing, and topdressing.

Second Growth

The incidence of second growth has varied on different classes of land and at various phases of pasture deterioration. With poor burns and poor initial establishment rapid reversion to natural growth occurred, but current problems lie rather with second-growth phases of old-established pastures where on poorer areas manuka and tauhinu have invaded the pastures and on higher-rainfall areas hard fern and bracken fern control is a perennial problem.

[*National Publicity*

Aerial topdressing, by which during the year ended 31 March 1954 more than 200,000 tons of phosphatic fertilisers were dropped on nearly 2 million acres, undoubtedly ushers in an era of expanding production on hill country grassland.

Manuka in the past was dealt with by pulling or when the plants had escaped beyond this control by cutting, burning, and resowing. The spread of manuka blight has changed the outlook on control measures and over large areas resowing by aeroplane after burning of the dry sticks of scrub and rough grass appears the most feasible method of reconditioning the land.

In general bracken fern has been controlled by stock, but hard fern has been difficult to suppress in high-rainfall areas. Hard winter grazing of pastures has helped the spread of hard fern and in many areas land has alternated between pasture, hard fern, and bracken fern. Hard fern invasion has led to a drop in stock carrying capacity, which has been followed by bracken fern, which has shaded out the hard fern. The induced bracken fern has been burnt, resown, and controlled by stock with the cycle of hard fern invasion repeated. Recent work with spraying with 2,4,5-T in gorse control on hill country illustrates the possibility of extensive control of undesirable vegetation by weedicides.

Discing Hill Country

In recent years remarkable progress has been made in the rejuvenation of moderately steep areas of surface-sown hill country through discing, resowing, and topdressing. The tracklaying tractor and the giant discs have enabled many thousands of acres of hill country to be treated as plough-able land, to be broken up, sown in winter fodder crops, and then resown to grass. The practice has allowed the establishment of new pastures of productive grasses and clovers and given full returns from topdressing. Up to the present the introduction of grasses on an established browntop and danthonia sward has been very disappointing and the problem is one on which intensive research is urgently required.

Full returns from topdressing will not be obtained until perennial ryegrass, cocksfoot, crested dogstail, and other high-producing grasses of ploughed grassland are introduced to hill country swards. Some seed-bed preparation appears essential for their introduction and at the moment this is possible only on areas which can be disced with the tracklaying tractor.

Future Developments

Aerial topdressing, by which 203,110 tons of phosphatic fertilisers were spread on 1,929,499 acres during the year ended 31 March 1954, undoubtedly ushers in an era of expanding production on hill country grassland. Topdressing and oversowing must be done systematically. A property should be divided into sections and a start made by oversowing and topdressing one section so that livestock management may be conditioned to allow for the establishment of the oversown clovers. In the following year a further section should be oversown and topdressed and the section previously oversown again topdressed. Provision must also be made then for an appropriate increase in livestock numbers to exploit the increased pasture production. Subsequently the remaining sections of the property should be similarly treated and livestock numbers appropriately increased.

The development of improved pastures will undoubtedly demand changes in pasture and livestock management, and as pastures of high production have a more marked variation between winter and early summer production than do low-producing pastures, the problem of winter supplementary feeding will become more acute in future, particularly if more emphasis is placed on cattle production on hill country. So far the problem of winter keep on many farms under the process of pasture improvement has often been met by the production of fodder crops on discable country before it is sown in improved pasture. In future it may be necessary as steeper country is developed by aerial oversowing and topdressing to keep discable areas under a long-term pasture-fodder crop rotation if the best use is to be made of the improvement of steeper land.

The improvement of pasture swards on hill country is likely to be the only practical method of lessening soil erosion on hill country. Much detailed investigation is required to secure data on the need and form for further protective works and even if these are necessary, they are unlikely to prove feasible except under an era of rising productivity on hill country. Pasture improvement through aerial topdressing and oversowing is the paramount immediate need of surface-sown hill country grasslands.

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Radio Broadcasts to Farmers

RADIO broadcasts to farmers will be given during November as follows:—

1YA Auckland, 7 p.m.

3 November—"Summer Pasture Management", by H. Woodyear-Smith, Auckland.

10 November—"Current Work in the Apiary", by E. Smellie, Apiary Instructor, Department of Agriculture, Auckland.

17 November—"The Growing of Autumn and Winter Vegetables", by B. P. Coleman, Horticultural Instructor, Department of Agriculture, Auckland.

24 November—Y.F.C. talk, by Franklin district committee of Federation of Young Farmers' Clubs.

1XH Hamilton, 12.33 p.m.

4 November—"Blue Belly in Pigs", by D. W. Caldwell, Veterinarian, Department of Agriculture, Hamilton.

11 November—"Aspects of Haymaking", by H. M. Bull, Instructor in Agriculture, Department of Agriculture, Hamilton.

25 November—"Culling of Poultry", by W. L. Jourdain, Poultry Instructor, Department of Agriculture, Hamilton.

1YZ Rotorua, 7.15 p.m.

11 November—"Spring Work in the Orchard", by H. A. Prew, Horticultural Instructor, Department of Agriculture, Tauranga.

25 November—"Meat Inspection", by C. N. C. Blair, Meat Inspector, Department of Agriculture, Rotorua.

2YZ Napier, 7.10 p.m.

9 November—"Fodder Conservation", by S. H. Henry, Instructor in Agriculture, Department of Agriculture, Hastings.

23 November—"Import Restrictions", by J. G. Niccol, Livestock Instructor, Department of Agriculture, Hastings.

2XA Wanganui, 8 p.m.

18 November—"The Feeding of Pigs during Summer Months", by C. M. Bailey, Supervisor, Taranaki District Pig Council.

25 November—"Japanese Millet for Summer Greenfeed", by A. K. Booth, Instructor in Agriculture, Department of Agriculture, Wanganui.

3YA Christchurch

8 November (12.20 p.m.)—"Growing Tomatoes in Small Houses", by M. Porter, Horticultural Instructor, Department of Agriculture, Christchurch.

11 November (7.15 p.m.)—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Fields Instructor, Department of Agriculture, Rangiora.

4YZ Invercargill, 7 p.m.

2 November—"Turnips and Swedes", by L. T. Reid, Fields Instructor, Department of Agriculture, Gore. "Town Milk Production", by G. Hicks, Dairy Instructor, Department of Agriculture, Invercargill.

9 November—"Turnips and Swedes", by L. T. Reid. "Pasture Mixtures", by W. Faithful, Fields Instructor, Department of Agriculture, Invercargill.

16 November—"Why Bees Swarm", by S. Line, Apiary Instructor, Department of Agriculture, Invercargill. "Pasture Establishment", by W. Faithful.

23 November—"Grain Growing", by T. Sewell, Instructor in Agriculture, Department of Agriculture, Gore. "Pasture Management", by W. Faithful, Fields Instructor, Department of Agriculture, Invercargill.

30 November—"Grain Growing", by T. Sewell. "Lamb Drafts", by J. P. Anderson, Veterinarian, Department of Agriculture, Invercargill.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8.5 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

1YA Auckland, Tuesdays at 12.35 p.m., Wednesdays at 7 p.m., Thursdays at 12.33 p.m., Saturdays at 6 p.m. (Auckland stock market report).

1YD Auckland, Thursdays at 7.30 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawkes Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawkes Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Thursdays at 12.33 p.m.

4YA Dunedin, Mondays at 12.33 p.m., Wednesdays at 7 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 7 p.m.

Development of Swamp-land in Waituna District, Southland

By W. FAITHFUL, Fields Instructor, Department of Agriculture, Invercargill

APPROXIMATELY 3000 acres of swamp-land is being developed by the Department of Lands and Survey in the Waituna district, Southland. Included in this development block is some of the most difficult land to improve, consisting of part of a very extensive area of swamp, known as the Seaward Moss, estimated at about 80,000 acres. This swamp area can be broadly divided into 3 main classes of land: First, a very wet, spongy peaty complex about 4ft. deep resting on a marine gravel, the cover being dominantly moss and manuka. Next is a raw peat up to 15ft. deep which is confined generally to the watersheds and is carrying manuka up to 14ft. high. (These two types constitute the major part of the Seaward Moss area.) The third type is of only limited area and comprises a very wet clay soil growing red tussock, flax, moss, and some manuka.

THE 3000 acres at Waituna has been taken over to investigate the possibilities of more extensive development of this type of country. Isolated blocks of land throughout Seaward Moss have been and are still being developed by individuals, but these blocks are more or less confined to the wet clay land types and to the margins of the peat complex soils. The method of development employed has been the excavating of main drains and such other drains as may be necessary before any cultivation work could be attempted.

As soon as the area has dried out sufficiently to carry the tractor the land is swamp ploughed, and after being left to weather during winter is worked in the following spring and sown in ridged turnips. The turnips are grazed off during winter and a second turnip crop may be grown, depending on the state of the block. The following year a permanent grass seed mixture is sown. Alternatively, oats and grass may be sown in the second year and the resultant pasture left down for 2 years. This temporary pasture is then ploughed, a crop of turnips taken, and then the area is sown out in permanent pasture.

HEADING PHOTOGRAPH: A swamp plough being used on some of the wet clay land which has been drained; this land is similar to some of the 3000-acre block at present being developed.

Free Bulletins on Farm Management

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During the development the land is given 1 ton of lime each year until 3 tons per acre has been applied, and the pasture paddocks are topdressed with 2½cwt. of phosphatic fertiliser and ½ ton of carbonate of lime per acre per annum. The development of this land has been assisted very materially by preliminary drainage work carried out by the Southland Catchment Board.

Some of the developed country is of high carrying capacity. An area adjoining the Waituna Development Block, which was capable of carrying only a few cows on 1100 acres in 1932, is now carrying 800 ewes, 300 dry sheep, and 60 cattle. Development began in 1937, but the major development has been done during the past 6 years (since the Catchment Board drainage was completed) and there are now 250 acres of sown pasture and a further 100 acres in the course of development this year.

The grassing of the Department of Lands and Survey area will be along the lines successfully employed in the development of peat swamp in the North Island, with modifications being made as they are required to meet local conditions. After excavation of the initial main drains mole drainage is being done with a specially made mole plough to deal with this swampy land, parts of which are full of timber and roots. Surface cultivation with a heavy rotary hoe and a heavy roller is then undertaken and a pasture mixture sown without any preliminary turnip crops being grown; an experimental sowing has already been made on about 55 acres.

Rearing Chickens on the Colony System

Notes for the Household Poultry Keeper

THE value of portable colony houses for rearing chickens is still not fully realised by commercial and household poultry keepers. There is no doubt that if the system were better understood, it would be far more extensively adopted. In this article H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings, discusses the merits of this form of rearing chickens.

A colony house which is suitable for the housing of growing pullets. This type of house is portable, adaptable to weather conditions, and cheap and simple to construct.

ADMITTEDLY not all small poultry keepers have the space available nor keep the numbers of chickens to justify building a colony house. For most urban dwellers a few hens in a corner of the garden are all that can be managed, but for many country people a colony house set up in a sheltered paddock is most convenient and economical. The colony system is far more economical in regard to accommodation, labour, and food than is any other form of rearing chickens. After leaving the brooders chickens reared on this system thrive much better than those enclosed in small, bare yards. In such yards the ground gradually becomes tainted, resulting in the chickens bearing an unthrifty appearance in the form of pale legs, loose feathering, and general loss of appetite. Once a growing chicken of 8 to 10 weeks receives a setback it is liable to become a victim of duodenal coccidiosis or roundworms. To lay the foundation of future profits it is not only necessary to supply chickens with liberal quantities of good food, but they must also have suitable conditions and environment.

The Colony House

Portability, adaptability to weather conditions, low cost, and simple construction are the features of the summer colony house illustrated. It is 8ft. 6in. long by 7ft. wide with a height of 5ft. to the apex and walls 2ft. 6in. high.

A shelter of these dimensions with six perches is suitable for approximately 100 10-week-old chickens, but this number should be reduced to 50 when the birds are 4 months old. The centre perches of 3in. x 2in. timber are carried through the ends, providing handles for moving the shelter short distances. The roofing for these shelters can consist of flat iron, asbestos, or tarred roofing material, the two first named being preferred. Asbestos is brittle and where cattle have access to the colony paddock flat iron would probably be preferable. The wire floor is both a valuable disease control measure and a labour saver, since there will be no accumulation of droppings to endanger the health of the birds. It has been found that 1½in. square mesh netting is very suitable for this purpose.

Location

The colony house should be placed in an open paddock with the side of the roof facing the prevailing wind. With shelters of this type crowding or tail picking is reduced, and the availability of ample fresh air provides ideal conditions for vigorous growth. Mash hoppers and troughs should be gradually moved away from the shelter to induce the chickens afield during the day.

The transferring of chickens from the brooders to the colony house should be done late in the afternoon. After feeding they should be placed in the colony house, the door closed, and the chickens left to settle down. The following day the chickens can be fed and let out, but it is advisable to build a temporary run around the colony house for the first 3 days, after which the chickens will go in at night without any trouble. Most commercial establishments transfer the chickens from the brooder shed to the colony house at from 5 to 6 weeks of age after the chickens have been hardened off. To do this the heat should be turned off at the end of the fourth week and the chickens allowed to remain in the shed for 3 or 4 days before being transferred to the colony house. This greatly reduces the risk of chilling, particularly early in the season.

Deworming

Chickens reared on range are still prone to roundworms and the usual precautions should be taken to safeguard young stock. Carbon tetrachloride is available in capsules and should be given at 12 weeks and again just before the birds are transferred to the laying houses. There is also a worm powder drug available which can be fed in the mash, and this may be found more convenient to use than carbon tetrachloride.

If chickens are dewormed at the ages mentioned, they will not be subjected to any setback and the likelihood of any other disease such as intestinal coccidiosis gaining a hold will be almost eliminated.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during August 1954, with comparative figures for the same month of 1953, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery	Tons Whey	Total	Percentage inc. or dec.
August 1954	9,276	117	9,393	—
August 1953	9,428	118	9,546	—
Increase or decrease ..	—152	—1	—153	—1.603

Butter in store at 31 August 1954 was 4,690 tons

CHEESE

Period	White	Tons Coloured	Total	Percentage inc. or dec.
August 1954	2,043	—	2,043	—
August 1953	1,650	7	1,657	—
Increase or decrease ..	+393	—7	+386	+23.295

Cheese in store at 31 August 1954 was 2,311 tons

If these figures are converted into butterfat equivalent, there is an increase of 0.202 per cent. in butterfat graded for August as compared with August the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

Porker and Baconer Competitions in 1954

PIG carcass competitions have been conducted during the year along the same lines as in previous years. There is ample evidence that those keen producers who have interested themselves in the competitions open to them have developed the art of pig husbandry to a high degree. Outstanding performance by members of Young Farmers' Clubs and the improved efficiency shown in the baconer growth-rate class were two of the features. This review of the season's competitions is by A. Longwill, Superintendent, Pig Industry, Department of Agriculture, Wellington.

WITH a return to a buyers' market for pig meats in the United Kingdom, which is virtually the only securely established outlet for production surplus to local requirements, the necessity for close attention to quality is obvious. Light porkers (in the 60-80lb. range) are enjoying a good market with little serious competition. Heavier porkers and baconers, particularly the latter, are meeting competition from the world's best; hence, if profitable trade is to be maintained, a high-quality article must be put on the market at the appropriate time and in attractive parcels.

Premiums for quality are already becoming evident and, if present trends continue, it will soon pay handsomely to concentrate on the desired weight range and quality. Competitions serve as a reminder of the underlying fundamentals in the production of high-quality carcasses. These are:—

1. Selection of breeding stock for carcass characters.
2. Intelligent feeding of the pigs at all stages.
3. Finishing at weights suitable to the market and the type of pig.

Selection of Breeding Stock

In the absence of any testing scheme which might enable breeders to select accurately their best animals for improvement of the breed makeshift methods have to be employed. Some use can be made of the fact that certain strains of purebred stock are capable under good management of scoring well in carcass competitions. Provided a high enough standard is set, selection under these conditions should not lead one far astray. For example, where only carcass score is known a high standard should be set, say 80 per cent. of possible points. Even so, of course, there is a risk of selecting slow growers or inefficient feed converters in this way. Where carcass score and rate of growth or other productive efficiency data are available the selection is made more reliable. For example, where growth-rate and carcass quality together are included in the points assessment as in competitions dealt with in this article a standard of 70 per cent. of possible points would give a reasonable chance of selecting efficient stock.

The results of these competitions have stimulated interest in the selection of breeding stock of the strains which have shown up to advantage. Purebred pigs, particularly of the Large White breed, have repeatedly taken a prominent place, and among the crossbreds Large White x Berkshire has predominated.

As a result in the last 10 years the Large White breed has advanced in popularity from the fourth pure breed, with 14 per cent. of total registrations in 1944, to second breed, with 32 per cent. of total registrations of all purebreds in 1953. The Berkshire, still New Zealand's most popular breed, has advanced from 39 per cent. to 45 per cent. of all registrations. The two breeds have advanced at the expense of all the other breeds represented in the 1944 Herd Book of the New Zealand Pig Breeders' Association. Tamworths have declined from second position, with 27 per cent., to third, with only 16 per cent., Large Blacks have declined from third position to fourth (19 per cent. to 6 per cent.), and Duroc Jerseys (1 per cent.) have disappeared from the Herd Book.

Undoubtedly much of the change-over has been merely on a breed-selection basis and though up to the present it may have been effected soundly, it would certainly be in the industry's interests to have more accurate testing carried out to assist selection in all breeds from the present stage onward. A start in this direction has been made in the testing at Ruakura of the purebred animals selected for the national breeding scheme, which is aimed principally at supplying more efficient breeding sows to the industry as quickly as possible.

This testing must be expanded quickly to cover all purebred animals and registration must be made contingent finally on a satisfactory standard of performance under testing station conditions. From the present testing capacity of something less than 50 sows and 10 boars a

HEADING PHOTOGRAPH: An exhibit at the competition field day at Westfield freezing works, Auckland, showing the system of judging and the difference in quality of prime, unfinished, and overfat pigs.

Competitors, other farmers, and meat trade representatives discuss prize-winning carcasses.

year the capacity must be increased to enable 1000 sows and 200 boars to be maintained constantly under test.

Feeding for Carcass Quality

As has been stressed on numerous occasions in the "Journal" achievement of standards of quality to reach commercial requirements depends chiefly on the treatment of the pigs, particularly on intelligent feeding. The intermediate type of pig kept on most farms can be ruined by inept feeding and management, especially by over-feeding, taking it to too heavy a weight, and making it grossly over-fat as a baconer. On the other hand average-type pigs even can be made to conform with commercial grading standards if they are well managed.

The factors in management necessary to achieve the desired results are connected mainly with efficient feeding. The daily ration should be balanced and adjusted to obtain a predetermined rate of growth. The aim is rapid growth up to porker weight (130lb. liveweight or 90lb. carcass) followed by a period of feeding adjusted to achieve a regular, controlled gain which, depending on the type of pig, ensures the correct finish. The earlier-maturing type of pig must be subjected to restricted feeding at an earlier stage than must the later-maturing, bacon-type pig and its rate of gain more rigidly controlled than the latter's. In either case properly applied restriction of feed improves economy of conversion of feed into meat.

The art of applying these principles is studied by competitors in carcass competitions, and those who, starting with sound breeding stock, have successfully practised the art of feeding are always prominent in the competitions. They know the importance of all the carcass characters which are assessed in the judging, including the carcass weight appropriate to the class. Where teams of 4 pigs are required competitors also devote some pains to ensure uniformity not only in conformation but in weight.

TABLE 1—MAXIMUM POINTS ALLOCATED TO EACH CARCASS CHARACTER

	Maximum points	
	Porkers	Baconers
Direct measurement:		
Length	20	20
Shoulder fat ..	10	10
Loin fat	15	20
Balance of side ..	5	5
Eye Judgment:		
Hams	15	15
Fore-end	10	10
Loin development ..	10	10
Belly thickness ..	5	5
Marketing points ..	10	5
Total	100	100
Deductions made if weights not within this range	66-85lb.	136-155lb.

Basis of Carcass Judging

Fifty per cent. of points for porkers and 55 per cent. for baconers are allocated on measurements, and tables relating body length and backfat to carcass weight, and depth of side to length, are used to determine the points scored. The remainder of the points covering conformation characters and marketing points are assessed by experienced judges on eye appraisal. Full details of the system of judging are given in New Zealand Department of Agriculture Bulletin No. 243 "N.Z. Baconer and Porker Carcass Judging Standards".

Table 1 shows details of the break-up of points allotted to various characters in both porkers and baconers.

Farm Performance

Since the results obtained in carcass quality are so dependent on management, more interest centres in classes in which some data on farm performance, at least rate of growth, are included with carcass points in making the final assessment. Good performance in these classes means not only good management but stock which are above average in efficiency. Hence the results of these classes are published in some detail. Readers who are interested may get in touch with some of the successful entrants, secure breeding stock, information on feeding, or both, and emulate the example of the prizewinners.

Canterbury Recorded Class

The Canterbury District Pig Council has always included in its annual baconer competition a section for pigs from litters which have been weighed at 3 weeks and 8 weeks; these weights are recorded under conditions recognised by the council for purposes of the competition. Table 2 gives details of the 9 entries in this section in the 1954 competition. The place winners in the main carcass competition are also shown.

Messrs. J. H. Pitman, Rotomanu, and F. D. Higgins and Son, Wakefield, contested the honours as they did in the previous year. On this occasion the advantage gained by the former in farm performance points, particularly in weight gain from weaning, gave him victory despite a lower carcass score. It appears probable that even better over-all results could have been obtained by the winning pig had its rate of gain been reduced in the finishing stages and a week or fortnight more taken in reaching killing weight. On the other hand the pig placed second would have benefited by being grown more rapidly in the first month or two after weaning.

North Island Competition

The Tomoana competition, which receives entries from all over the North Island, caters by means of a growth-rate section for those who can properly substantiate the date of birth of their entries so that growth-rate points can be included with carcass points in making the final assessment.

Teams consist of 4 pigs and besides 100 carcass points for each pig 10 points are allocated for uniformity of weight and 10 for conformation, making a total for the team of 420 points. To these is added a possible of 100 points for growth-rate, making the possible for this section 520 points.

TABLE 2—POINTS SCORED BY ENTRIES IN RECORDED CLASS IN CANTERBURY DISTRICT PIG COUNCIL BACONER COMPETITION, 1954

Entrant	Number weaned	Points	Litter weight 8 weeks	Points	Liveweight gain per day	Points	Total farm points	Carcass points	Grand total	Place
			lb.		lb.					
Possible points ..	10 +	10	400 +	20	.75 +	20	50	100	150	
J. H. Pitman ..	11	10	443	20	.92	20	50	73	123	1
F. D. Higgins and Son	12	10	430	20	.63	12	42	80	122	2
J. H. Pitman ..	11	10	443	20	.91	20	50	69	119	3
F. D. Higgins and Son	12	10	430	20	.63	12	42	70	112	
Hodgkinson and Win	8	8	332	13	.88	20	41	69	110	
P. D. Cook ..	8	8	236	0	.79	20	28	64	92	
W. Jacobs	8	8	352	15	.70	18	41	51	92	
W. Jacobs	8	8	352	15	.75	20	43	45	88	
P. D. Cook ..	8	8	236	0	.69	15	23	57	80	

Placed Entries in the Carcass-quality Section

E. C. and E. H. Wadsworth, Takaka, 85 points, E. L. Duffield, Belfast, 84; R. Newton, Brookside, 82.

There was a welcome increase in the number of entries in the class this year, particulars of which are shown in Table 3.

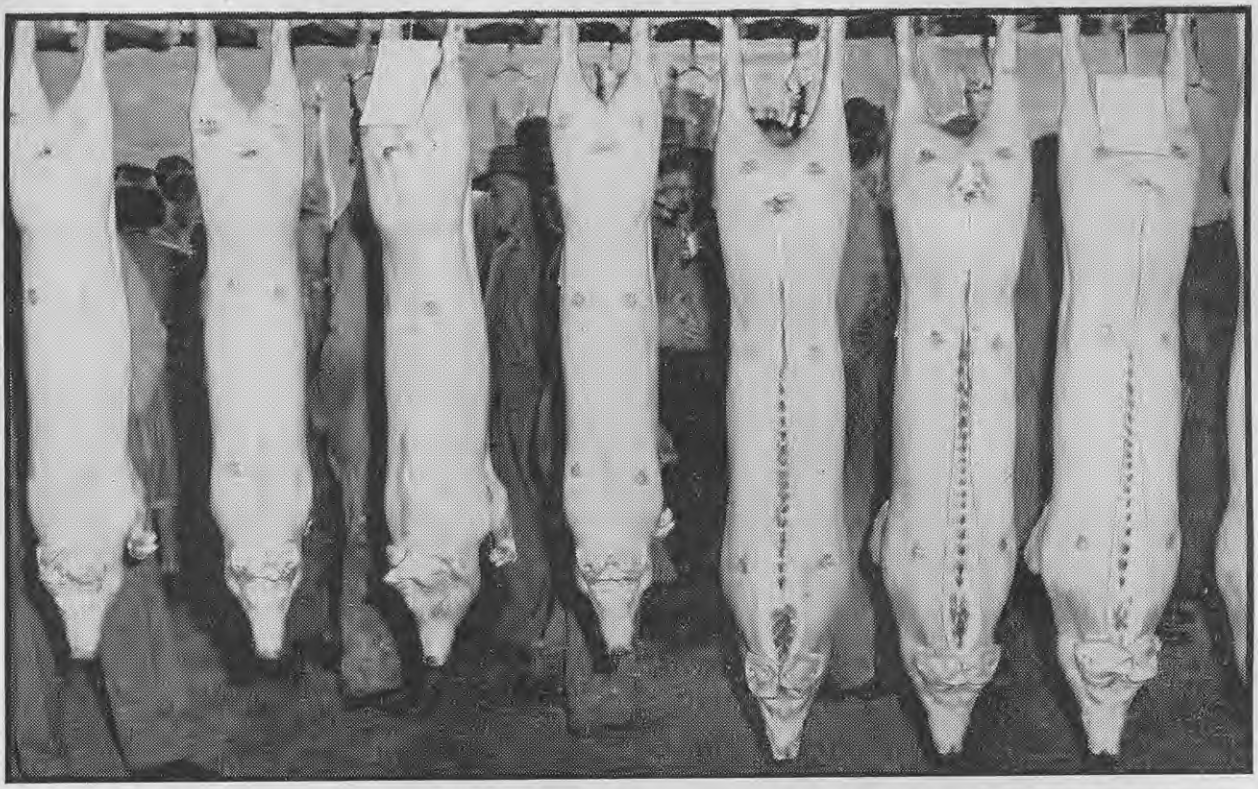
Though porkers have been responsible for the increase, there has been evidence of improved performance in the baconer teams, 52 per cent. of them being eligible for inclusion in the published tables (see Table 5) this year as against 27 per cent. last year.

Table 4 gives details of the 38 porker teams qualifying for publication as having scored 70 per cent. of possible points.

TABLE 3—NORTH ISLAND GROWTH-RATE SECTION, 1954

Works	Porkers	Baconers	Total	Total teams in competition
Tomoana	23	14	37	165
Patea	15	4	19	221
Westfield	26	5	31	693
Totals	64	23	87	1,079
No. of teams scoring 70 per cent. of total points ..	38	12	50	—
Per cent. of teams in section	59	52	57	—

At the North Island competition field day the author discusses carcass quality and the means of achieving the desired results.

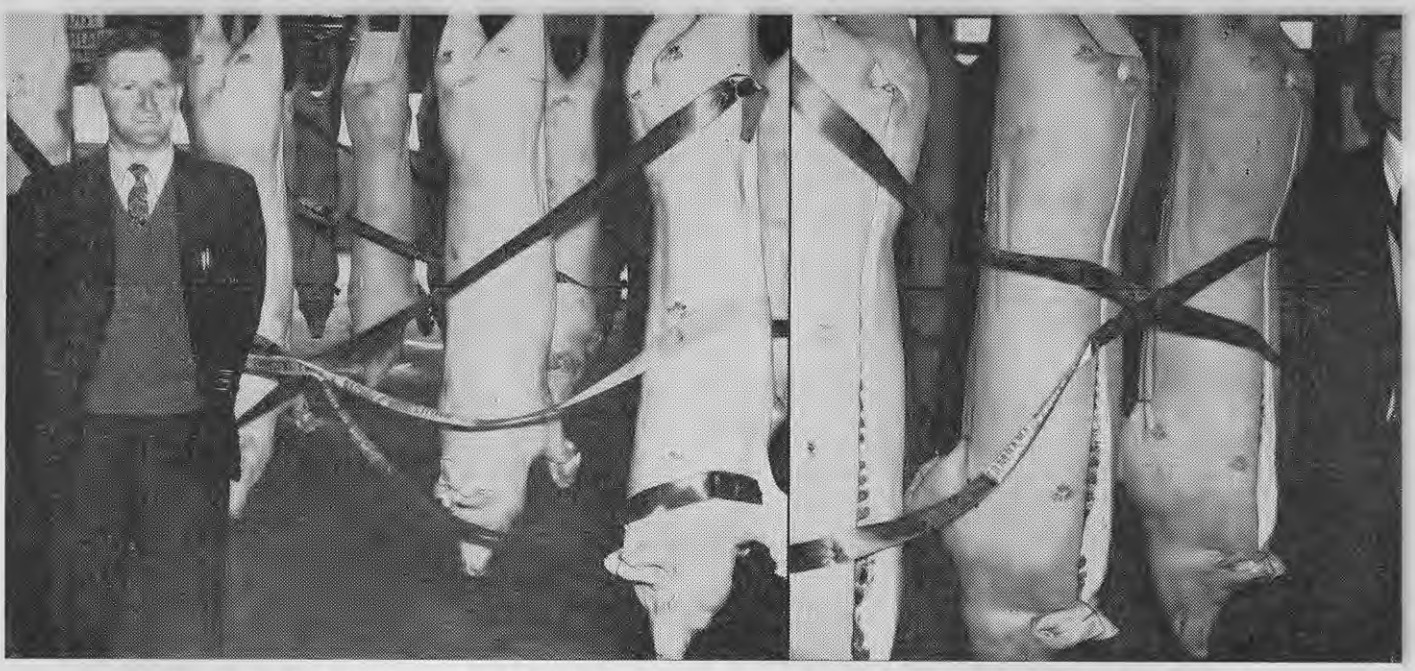


Ruakura Animal Research Station non-competitive teams which scored 353 points for porkers and 333 points for baconers. The entries had the highest points for porkers and for combined teams.

TABLE 4—TEAMS SCORING 70 PER CENT. OR MORE OF TOTAL POINTS IN GROWTH-RATE SECTION, 1954: PORKERS

Name and address	Breeding of pigs	Date of birth	Average deadweight lb.	Age at slaughter days	Standard age for weight days	Points for		
						Growth-rate (100)	Carcass (420)	Total (520)
F. R. Holt, Te Kauwhata ..	B. x L.W.	21/11/53	78	114	119	100	333	433
R. E. Mutton, Te Puke	Ped. L.W.	28/12/53	82	105	123	100	327	427
T. W. Sewell, Patutahi	L.W. x (B. x T.)	19/8/53	74	105	115	100	327	427
A. E. Wood, Whakatane ..	Ped. L.W.	27/11/53	79	130	120	78	349	427
Mrs. E. Bent, Otorohanga ..	L.W. x (B. x D.)	12/12/53	73	109	114	100	323	423
M. E. Bull, Patutahi	L.W.	9/1/54	76	130	117	73	340	413
A. N. Furze, Inglewood	L.W. x	24/1/54	79	102	120	100	311	411
R. J. Bent, Otorohanga	L.W. x T.	23/10/53	73½	110	115	99	312	411
B. M. Sewell, Patutahi	L.W. x (B. x T.)	19/8/53	70	112	111	97	314	411
J. F. Bremner, Pahiatua ..	L.W.	20/11/53	89½	137	131	91	318	409
Mrs. H. K. Furze, Inglewood ..	L.W. x B.	24/1/54	68½	108	110	100	308	408
H. J. Tozer, Otorohanga ..	L.W. x B.	14/7/53	91	134	132	98	310	408
D. G. Sullivan, Waipukurau ..	T. x B.	10/1/54	84	135	125	83	322	405
J. F. Bremner, Pahiatua ..	L.W.	23/3/54	77½	132	119	72	330	402
I. Billington, Hukanui	L.W. x T.	18/1/54	75	94	116	100	302	402
T. W. Sewell, Patutahi	B. x (T. x B.)	22/7/53	84½	126	126	95	306	401
H. E. C. Billington, Hukanui ..	L.W. x T.	25/1/54	79½	108	121	100	300	400
H. J. Billington, Hukanui ..	L.W. x T.	25/1/54	85	115	126	100	299	399
R. Kovaliski, Gisborne	L.W.	9/1/54	77	137	118	60	339	399
Fowell Bros., Howick	B. x L.W.	13/10/53	79	141	120	56	340	396
*J. W. Latham, Stratford ..	T. x B.	20/12/53	79	128	120	87	306	393
*W. Williamson, Hawera	B. x L.W.	10/1/54	66	116	107	79	310	389
W. J. Atkins, Patutahi	L.W. x (B. x T.)	2/8/53	81	129	122	87	301	388
A. N. Furze, Inglewood	L.W. x	24/1/54	71	123	112	75	312	387
E. Russell, Waiuku	L.W.	13/10/53	80	125	121	92	293	385
H. M. Winters, Tauranga ..	Ped. L.W.	24/11/53	67	99	108	100	285	385
H. A. and A. D. Aiken, Waverley	L.W. x B.	22/11/53	73	129	114	68	316	384
H. J. Billington, Hukanui ..	L.W. x T.	18/1/54	80½	108	122	100	281	381
T. H. Jackson, Inglewood ..	L.W. x B.	12/12/53	84	145	125	61	319	380
L. A. Ritchie, Manutuke ..	T. x B.	12/1/54	76	134	117	63	317	380
H. Shreuder, Otorohanga ..	L.W. x B.	9/12/53	69	118	110	80	298	378
C. Wilson, Stratford	T. x L.W.	19/1/54	68½	115	110	87	281	368
F. D. Davies, Tuakau	B. x L.W.	23/11/53	69	133	110	47	320	367
Mrs. H. K. Furze, Inglewood ..	B. x L.W.	1/2/54	67	122	108	66	301	367
Marra and Hoskins, Waipukurau	T. x B.	10/1/54	76	135	117	62	303	365
Marra and Hoskins, Waipukurau	T. x B.	10/1/54	83	135	124	77	288	365
B. Shreuder, Otorohanga ..	L.W. x B.	19/1/54	77½	113	119	100	264	364
*A. L. Skilton, Wanganui ..	L.W. x B.	4/1/54	77	142	118	48	314	362

* Whey feeder. (Latitude has been allowed the last-mentioned entry because of its good carcass score and the recognised slower growth-rate on whey feeding.)



Left—Mr. A. E. Wood, Whakatane with his porker team, which secured first prize, with 349 points, in the North Island competition.
Right—Mr. N. A. Fraser, Kawakawa, who won the combined teams prize in the North Island competition.

It is remarkable that in these merit teams the majority are crossbred pigs receiving half of their hereditary make-up from the Large White breed.

In only one case out of the 17 teams which scored full points for growth-rate was this achieved by a purebred litter. This was the pedigree L.W. litter entered by Mr. H. M. Winters in the porker class.

Rapid growth paid in the production of porkers, the major place winners in this class all having days to spare on the standard of growth-rate laid down. However, the pedigree Large White team entered by Mr. A. E. Wood had a comfortable margin on carcass points and only required to have been grown slightly more rapidly to have taken first place in this class as well as in the champion porker class.

Baconer Growth-rate

It was very gratifying to find that two of the first three teams in the baconer growth-rate section had been grown fully up to the standard of growth-rate expected and that the first of these, a team entered by Mr. T. W. Sewell, Patutahi, was placed second in the open baconer carcass championship, won by a pedigree L.W. team

TABLE 6—TEAMS SCORING 80 PER CENT. OR MORE OF POSSIBLE POINTS (CARCASS ONLY) OR 75 PER CENT. OR MORE FOR COMBINED TEAMS

Entrant	Breeding	Points
PORKERS		
Ruakura Animal Research Station	L.W. x (B. x L.W.)	353
A. E. Wood, Whakatane	Ped. L.W.	349
H. E. Johnston and Co., Whangarei	Ped. L.W.	348
H. E. Johnston and Co., Whangarei	Ped. L.W.	347
M. E. Bull, Patutahi	L.W.	340
Fowell Bros., Howick	B. x L.W.	340
Fowell Bros., Howick	B. x L.W.	339
H. Eriksen, Dannevirke	L.W.	339
J. G. Johnston, Patumahoe	B. x L.W.	339
W. Costar, Kaiaua	L.W. x B.	338
W. E. Chick, Paeroa	Devon x	337
N. A. Fraser, Kawakawa	Ped. L.W.	337
BACONERS		
G. W. Hickey and Sons, Waiuku	Ped. L.W.	353
T. W. Sewell, Patutahi	L.W. x (T. x B.)	342
B. M. Sewell, Patutahi	L.W. x (T. x B.)	339
N. A. Fraser, Kawakawa	Ped. L.W.	339
B. Waterland, Inglewood	L.W. x B.	337
COMBINED		
Ruakura Animal Research Station	L.W. x (B. x L.W.)	686
N. A. Fraser, Kawakawa	L.W.	676
Fowell Bros., Howick	B. x L.W.	673
T. W. Sewell, Patutahi	L.W. x (T. x B.)	669
R. E. Mutton, Te Puke	L.W.	661
A. N. Furze, Inglewood	L.W. x	632

TABLE 5—TEAMS SCORING 70 PER CENT. OR MORE OF TOTAL POINTS IN GROWTH-RATE SECTION, 1954: BACONERS

Name and address	Breeding of pigs	Date of birth	Average deadweight lb.	Age at slaughter days	Standard age for weight days	Points for		
						Growth-rate (100)	Carcass (420)	Total (520)
T. W. Sewell, Patutahi	L.W. x (B. x T.)	3/6/53	146	182	187	100	342	442
B. M. Sewell, Patutahi	L.W. x (B. x T.)	27/5/53	140	196	181	80	339	419
T. Hancock, Eketahuna	L.W. x L.B.	27/9/53	142½	172	184	100	315	415
Fowell Bros., Howick	B. x L.W.	20/5/53	142	204	183	69	333	402
A. N. Furze, Inglewood	L.W. x B.	28/8/53	140	195	181	79	320	399
T. W. Sewell, Patutahi	L.W. x (B. x L.W.)	13/5/53	151½	196	192	92	306	398
I. Billington, Hukanui	L.W. x T.	14/8/53	154	195	194	98	300	398
J. F. Bremner, Pahiatua	L.W.	18/8/53	150½	196	191	92	300	392
Fowell Bros., Howick	B. x L.W.	11/7/53	143	179	184	100	284	384
H. M. Winters, Tauranga	Ped. L.W.	28/8/53	138	155	179	100	280	380
K. W. Jackson, Inglewood	L.W. x B.	25/10/53	146	171	187	100	274	374
Mrs. C. S. Grenside, Hastings	B.	1/9/53	135½	195	177	73	294	367

entered by Messrs. G. W. Hickey and Sons with 353 points. This gives strong support to the contention that growth-rate and carcass quality can be combined in baconer production, if there is a good foundation and an appreciation of the shape of growth curve which must be followed. Rapid early growth while lean meat is developing, to allow maximum development of lean, followed by some restriction of feed to keep the growth-rate in the region of 10lb. liveweight gain per week from 130lb. onward is the aim. Provided a good start is achieved, it is possible to reach the standard of growth-rate laid down. Restriction of feed not only produces a leaner carcass but promotes economy of food conversion.

The writer spoke at each of the field days held in conjunction with the North Island competition, stressing the points to observe in feeding and management and the need to apply the lessons learnt in view of the return to a buyers' market for New Zealand pig meats. As more competitors pay attention to the details of management advocated it is expected that an increasing proportion of the entries will top the 400 points standard.

Carcass Championships

Table 6 sets out the entries which scored 80 per cent. or more of the possible points for carcass only (including uniformity). A slight increase is shown in the proportion of the total entries in the competition which reached this standard.

A change has been made in Table 6 in publishing the combined teams (baconer and porker teams entered by the same owner) that score 75 per cent. or better of the aggregate. This lowering of the standard by 5 per cent. of the possible points has enabled six entrants to qualify with combined teams this year compared with two last year.

Conclusion

Over the past 20 years pig carcass competitions have played a useful part in promoting interest in improvement of pigs and their management. A stage is being reached when properly organised breed improvement work must be established to take care of the stock improvement aspect. As progress is made in this direction it can and undoubtedly will be accompanied by parallel improvement in feeding practice.

All photographs by Sparrow.

Radio Broadcasts

RADIO broadcasts to farmers will be given from Station 2ZA Palmerston North at 12.33 p.m. as follows:—

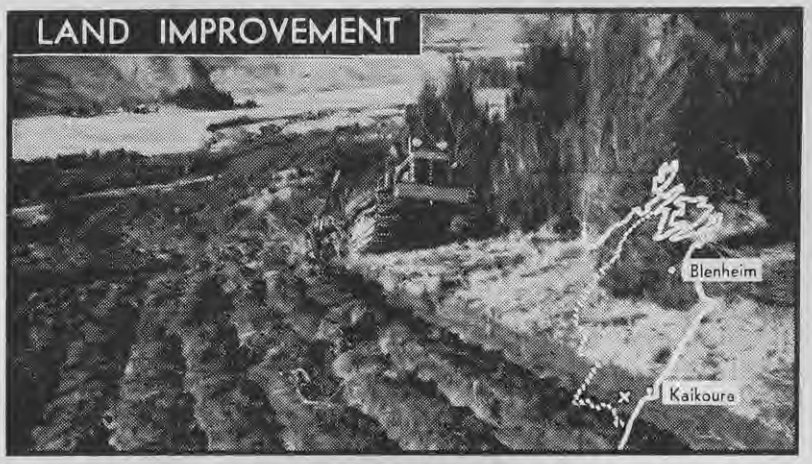
1 November—"Care of Sheep", by D. R. Thomson, Livestock Instructor, Department of Agriculture, Palmerston North.

8 November—"Elimination of Summer Feed Shortages by Irrigation", by J. O. Brasell, Farm Machinery Instructor, Department of Agriculture, Palmerston North.

15 November—"Care of Milk and Cream on the Farm", by L. P. Cotter, Farm Dairy Instructor, Department of Agriculture, Pahiatua.

22 November—"Disease Control in Horticultural Crops", by C. L. Napier, Horticultural Instructor, Department of Agriculture, Palmerston North.

29 November—Y.F.C. session, by I. G. Tabor.



Breaking in Marlborough Hill Country

IN southern Marlborough there are areas of scrub-covered hill country which are capable of development, and in this article J. P. Beggs, Instructor in Agriculture, Department of Agriculture, Blenheim, describes the methods adopted by a farmer on the inland road from Kaikoura to Waiau to handle this type of country.

ON the property of Mr. L. H. H. Weaver there are 90 acres of scrub-covered hill country which vary from steep to moderately easy country. The latter portion is confined to the undulating tops and comprises approximately one-third of the block. From these undulating tops the country slopes toward deep gullies on all sides.

Before 1900 the block was ploughed, but since then scrub growth has been dealt with by periodic cutting or burning. When the recent breaking-in programme was begun much of the area was covered with manuka scrub and fern of varying density and size, the height of the scrub ranging up to 20ft. Pasture cover consisted almost entirely of browntop.

Ploughing

Ploughing was begun in the winter of 1952. To facilitate this the dense patches of fern were burnt off. Small scrub was ploughed in, but large bushes had to be removed before the passage of the plough. This was done by pulling them out with a tracklaying tractor and wire rope and pushing them over into the gullies.

To carry out the work as speedily as possible three types of plough were used. On the relatively easy and clean country on the tops a 3-furrow plough was used, and small scrub was handled satisfactorily with a double-furrow swamp plough. A large section of the block, however, could be worked satisfactorily only with a single-furrow "brush-breaker" plough. This work was much slower.

The ploughing of the 90 acres, together with the pulling of the large scrub, occupied 339 man hours.

Subsequent Cultivation

After it had been ploughed the area was left in the furrow for a time and subsequent cultivation then took the form of discing and levelling. Tandem discs were used and 6 cuts were made, with harrows behind the discs in the later stages.

Levelling was carried out very effectively with a jarrah beam 1ft. square and 30ft. long drawn behind the tracklaying tractor. This also helped to consolidate the seed-bed in preparation for liming and sowing.

Liming and Drilling

As the soil on this developed country is naturally sour, the owner always applies lime if it is practicable. Mr. Weaver used a unit consisting of a tracklaying tractor and trailer with lime sower attached, with which 2 men applied lime at 1 ton per acre.

Seed was then broadcast through a grain drill and harrowed in, the mixture being 30lb. of perennial ryegrass (Certified Mother seed), 2lb. of cocksfoot, 2½lb. of white clover (Certified Mother seed), and 1½lb. of Montgomery red clover. Drilling was done in blocks from January to March. The first block was sown with rape and the later ones were sown with a cover of oats.

The time spent on the paddock after ploughing and until the seed was all sown was 471 man hours.

Benefits Derived

Though considerable time and effort were spent in this undertaking, the farmer has been well rewarded for his industry. In place of an unsightly, scrub-covered hill he has now an additional block of good grazing country. The previous carrying capacity was 1 ewe to 3 acres, but Mr. Weaver now estimates that he will be able to carry 2½ ewes to the acre, more than a sevenfold increase.

Besides other areas of similar country in southern Marlborough there are areas in many parts of the Marlborough Land District which could be developed by these methods.

HEADING PHOTOGRAPH: Clearing scrub on Mr. Weaver's farm, the location of which is indicated by the cross on the map.

Dairy Farming as a Business

"SUCCESS in farming is not gauged by production alone. In any business an increased turnover may cost more than it is worth and so be unprofitable. Likewise in farming the main object is not merely to increase production, but to do so as economically as possible," R. T. du Faur, Farm Adviser, Franklin Farm Improvement Club (Inc.), said in an address to this year's Ruakura Farmers' Conference. His paper, an adaptation of which follows, emphasised the vital importance of the study of finance in relation to farm practices and showed how management defects or weaknesses can be pinpointed by analysis of returns, expenditure, and farm capital.

THE farmer has little or no control over the prices he receives for his produce, but he has a larger measure of control over what it costs him to produce his butterfat, lambs, wool, etc.

The efficiency of a farmer is reflected accurately in his costs of production; the most efficient dairy farmer is the one who can produce butterfat at the lowest cost per pound.

Costs and prices have risen markedly within the last 8 to 10 years, and in view of the spectacular rises in wool prices within recent years, farmers have perhaps become somewhat complacent concerning net returns. High profits have been made with relatively little effort involved in planning farm programmes.

Farm Costs

Though less spectacular, the rise in farm costs has been steady, with the result that the margin for profit has been narrowed, particularly now that overseas markets show signs of hardening. The counter to this trend, either now or in the future, lies in raising the efficiency of farm management.

In other words, **net** income must be increased without a proportionate increase in costs.

First, consider working expenditure as revealed by the profit and loss account a farmer receives from his accountant once a year. Does this convey much to him? Is he spending too much on manure or contract work? What is his major expenditure item? What are his shed expenses per cow?

At the left are shown the working expenses for two farms, A and B. The items under the various headings are exactly the same; that is, the heading shed expenses includes items such as rubbers, brooms, caustic soda, herd testing, veterinary expenses, electric power for the shed, and repairs to the milking plant.

The figures quoted are for the season 1952-53; the farms are on factory supply and all the farms are owner-managed.

Repairs and maintenance and seed and manure are A's highest items; and tractor, truck, and car expenses and repairs and maintenance are B's highest items.

As the figures are presented in the table their significance or importance cannot be gauged. These items must be related to the medium of earning; that is, as a taxi driver works out his costs per mile, a doctor per patient, a builder per square foot, a farmer should have his figures analysed in relation to stock carried and per acre.

Further, each item should also be worked out as a percentage of the total expenditure to give some idea of the proportion spent on various items; for example, is 10 per cent. of the farm expenditure on manure or is the figure 30 per cent?

In Table 2 the working expenses per cow of farms A and B are compared.

TABLE 1—WORKING EXPENDITURE FOR TWO FARMS

	Farm A £	Farm B £
Wages	—	—
Casual/contract labour	34	45
Stock bought	36	112
Repairs and maintenance	133	214
Shed expenses	52	142
Tractor, truck, and car expenses	85	233
Seed and manure	116	150
Fodder	71	90
Overhead	107	161
Freight	21	18
General	13	14
Total	668	1,179

TABLE 2—WORKING EXPENDITURE PER COW FOR TWO FARMS

	Farm A		Farm B	
	Total £	Per cow £ s. d.	Total £	Per cow £ s. d.
Wages	—	—	—	—
Casual/contract labour	34	1 0 7	45	1 2 6
Stock bought	36	1 1 10	112	2 16 0
Repairs and maintenance	133	4 0 7	214	5 7 0
Shed expenses	52	1 11 6	142	3 11 0
Tractor, truck, and car expenses	85	2 11 6	233	5 16 6
Seed and manure	116	3 10 4	150	3 15 0
Fodder	71	2 3 0	90	2 5 0
Overhead	107	3 4 10	161	4 0 6
Freight	21	12 9	18	9 0
General	13	7 11	14	7 0
Total	668	20 4 10	1,179	29 9 6

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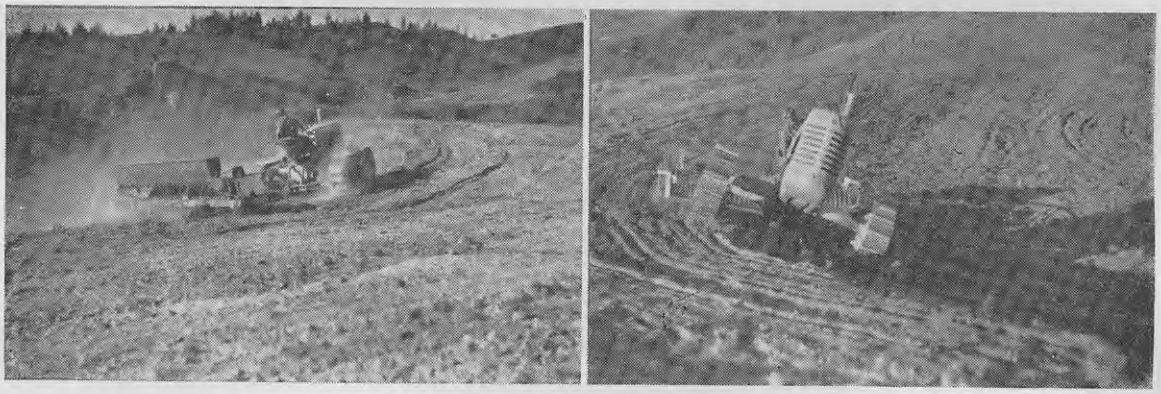

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For shed expenses B spent twice as much per cow as did A. The farms described throughout this article had an average shed expenditure of approximately 30s. per cow. B's shed expenditure is obviously too high, and an analysis showed that he was spending too much on proprietary veterinary medicines; for example, he bought 2 gallons of an advertised concoction at £8 per gallon because he heard it was good for bloat; he used a teacupful! One side of his milk room was full of shelves of medicine. This excess expenditure amounted to 30s. per cow or £60 per year; he did not realise this until his expenditure per cow was compared with that of other farms. He spent more per cow on shed expenses than the average farmer per cow on manure.

For manure and seed the average expenditure per cow of the farms analysed in this article is £3 10s., but on some farms this expenditure varies from £1 10s. to £11.

Though it is not intended in this article to analyse these figures in detail, it is important that the method and significance of analysing farm accounts should be appreciated. Table 3 gives expenditure per cow for three items on five farms.

The total amount spent on permanent labour, casual and contract labour, and fodder purchased should not exceed approximately £4 to £5 per cow, unless the farm is in the process of extensive development.

The table stresses the importance of utilising labour to the best advantage so that if permanent labour is employed, farming activities should be so planned that expenditure on casual and contract labour and fodder purchased is reduced to a minimum.

To this end alone it pays a farmer to increase the area cut for silage and reduce the area cut for hay, as the latter is nearly always baled by a contractor—sometimes, indeed, the whole operation of making hay is handled by contract and is expensive.

Similarly it often pays a farmer, particularly in the course of pasture renewal, to grow a winter feed crop which can be grown and utilised with his own labour force; this also will reduce his hay area. The stacking of loose hay is of course a different proposition.

Table 3 shows that farms D and E, employing labour, have a minimum expenditure on casual and contract labour and fodder, and that farms A, B, and C, without permanent labour, have to rely on casual and contract labour and the purchase of hay and other fodder.

Farm B, however, spent £3 2s. per cow on cultivation, haymaking, and other work and has now approached the stage of development justifying not only the purchase of a tractor but also the economic employment of a youth. The expenditure for contract labour on this farm is higher than the tractor expenses and cost of fodder purchased on other farms.

Other items of expenditure can be similarly analysed.

TABLE 3—EXPENDITURE PER COW ON FIVE FARMS

	Farm A	Farm B	Farm C	Farm D	Farm E
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Permanent labour ..	—	—	—	3 16 8	2 19 2
Casual/contract labour ..	1 2 6	3 2 0	1 0 7	4 1	2 9
Fodder	2 5 0	2 10 11	2 3 0	2 8	3 3
Total	3 7 6	5 12 11	3 3 7	4 3 5	3 5 2

Farm Profits

The influence of the cost factor on net returns is shown in Table 4.

TABLE 4—NET PROFIT PER COW ON TWO FARMS

	Farm A	Farm B	Difference
	£ s.	£ s.	£ s.
Gross revenue per cow	61 18	58 10	3 8
Expenditure per cow	26 2	42 6	16 4
Net profit per cow	35 16	16 4	19 12

Farm A was managed at a cost of £26 2s. per cow, interest and depreciation included, and it cost farm B £42 6s. or £16 4s. more per cow. There is approximately £3 difference only in gross income, but the difference in expenditure emphasises the importance of the reduction in costs or the raising of farming efficiency.

Farm A has a net profit of £35 16s. per cow, but farm B has only £16 4s., a difference of £19 12s. Farm B would

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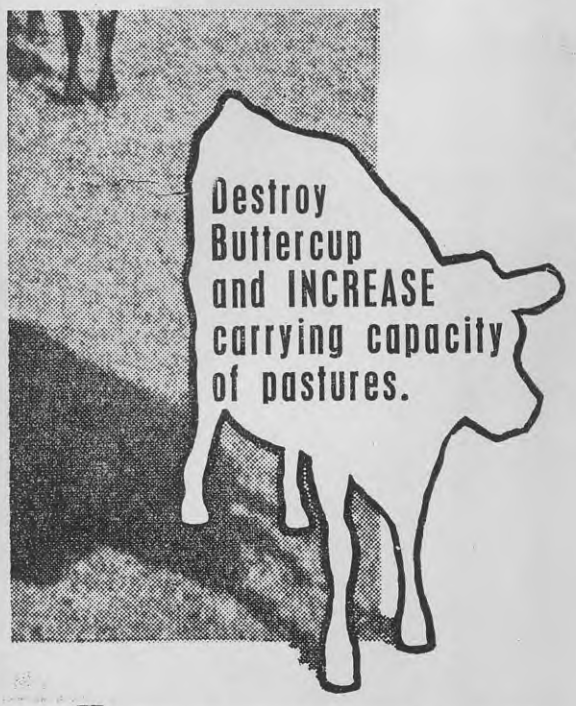

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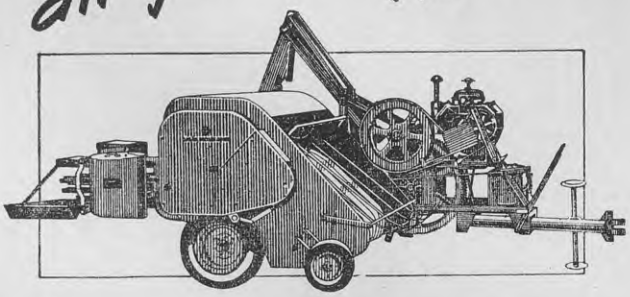

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TABLE 5—ANALYSIS OF INTEREST SURPLUS ON THREE FARMS

Farm capital	Farm A	Farm B	Farm C
	£	£	£
Stock	2,547	2,734	1,101
Plant and machinery	3,584	1,371	971
Land and improvements	5,842	6,537	2,995
	11,973	10,642	5,067
Farm capital per cow	147.8	122.3	126.6
Gross farm income	4,109	4,356	2,341
£ per acre	35.7	24.5	39.0
£ per cow	50.7	50.0	58.5
Farm expenses	1,938	2,292	1,692
£ per acre	16.8	12.9	28.2
£ per cow	23.9	26.4	42.3
Net income			
£ per acre	18.9	11.6	10.8
£ per cow	26.8	23.6	16.2
Owner's surplus	2,171	2,064	649

need to get approximately 33 per cent. more for its produce to have the same net profit as farm A.

Table 5 is an analysis of the profits of three farms in relation to the capital worth of the farms.

The first step is to calculate the total capital worth of the farm; that is, the total value of the stock, plant, land, and buildings. This amount is then worked out per cow. The values taken are:—

1. Reasonable market value for stock and plant, or sometimes for the latter the purchase price less normal depreciation.
2. The latest Government valuation, based on fair market value, of land and buildings.

On the farms in Table 5 there is a variation from £122 to £148 of capital per cow.

The gross farm income is then worked out per acre and per cow, and from this calculation it can be seen that farm A has normal returns per acre and per cow, C has a normal return per acre and a high return per cow, and B has a normal return per cow and a low return per acre. Thus farm B is not well developed.

Farm expenditure and net profit are shown similarly and it becomes apparent that:—

1. Farm C's expenditure per cow and per acre is far in excess of that of farms A and B. The per cow expenditure is £19 higher than A's and £16 higher than B's and the per acre figure is £12 higher than A's. C's net profit is consequently low.

2. A's and B's expenditures are normal per cow, and B, with lower carrying capacity, has low per acre expenditure.

3. A's and B's net incomes per cow are normal, but C, due to high expenditure (income is above normal), has low net profit per cow and per acre.

4. B's net income is low per acre. Further development is warranted.

The sum left after deduction of expenditure from income is called net profit, or, more correctly, owner's surplus; this figure is analysed still further in the following table:—

TABLE 6—PURE PROFIT ON THREE FARMS

	Farm A	Farm B	Farm C
	£	£	£
Owner's surplus ..	2,171	2,064	649
Less 5 per cent. return on capital	599	532	253
Less wages/ management ..	800	800	800
Pure profit	772	732	—404

Each farmer is entitled to a return on his money as an investor and this return is assessed at 5 per cent. on the capital worth of his farm, and £800 has been allowed for wages or management. These two items are then deducted from the owner's surplus to show the pure profit, the final index of farming efficiency

The allocation of £800 as wages or management is arbitrary, but it probably represents a fair average sum for living expenses with provision of a free house, milk, etc. Formulas can be used to determine managerial reward due on amount of capital involved, but these have been avoided to prevent confusion in the analysis.

From this calculation it can be seen that C, with a pure profit of minus £404, is living on capital or has a low standard of living. A and B have profits of over £700.

The significance of this pure profit is shown in Table 7.

TABLE 7—ANALYSIS OF PURE PROFIT ON THREE FARMS

	Farm A	Farm B	Farm C
	£	£	£
Pure profit (total) .	772	732	—404
Pure profit per acre	6.6	4.6	—6.7
Pure profit per cow	9.5	7.4	—10.1
Pure profit per cent. of capital ..	6.4	6.3	—8.0

As can be seen farmer C is completely in the red. B has a good return on capital, though his per acre and per cow assessments are lower than those of A. This is partly due to the lower value of B's farm, as it is not fully developed and has a lower carrying capacity.

It is interesting to compare C's analysis with what it should be; that is, with one which would indicate a reduction in his excessive expenditure, as shown in Table 8.

TABLE 8—ACTUAL AND DESIRABLE REVENUE AND EXPENDITURE OF FARM C

	Actual	Desirable
	£	£
Gross revenue per cow	58.5	58.5
Farm expenses per cow	42.3	28.0
Net income	16.2	30.5
Gross revenue per acre	39.0	39.0
Farm expenses per acre	28.2	18.6
Net income	10.8	20.4
Owner's surplus ..	649	1,224
Pure profit	—404	+171
Pure profit per cent. of capital ..	—8.0	+3.6

To farm economically and with a margin of safety C should manage his property at a reduced expenditure and should also develop his farm to carry five more cows; both of these recommendations are possible on this farm.

Considerations when Buying a Farm

When a farm is being purchased the price should be considered carefully on a per cow basis rather than on an acreage basis, as the returns will be limited by the number of cows carried. For example, a farm of 100 acres carrying 50 cows at a capitalisation of £175 per cow as a going concern is economically worth approximately £8750 or £87 10s. per acre; but if the farm is developed to a carrying capacity of 80 cows, it is worth £14,000 or £140 per acre. There is much land being sold today at £50 to £80 per acre above its economic worth. There are, of course, other factors to consider, such as the state of buildings and fences and locality.

To emphasise the full value of analysing accounts, analyses have

If permanent labour is employed, farming activities should be so planned that expenditure on casual and contract labour and fodder purchased is reduced to a minimum. To this end alone it pays a farmer to increase the area cut for silage and reduce that cut for hay, as hay is nearly always baled by a contractor; sometimes, indeed, the whole operation of making hay is done by contract and is expensive.

TABLE 9—COW EQUIVALENTS COMPARED ON TWO FARMS
(as at 1 July)

	Farm A cow equivalents		Farm B cow equivalents
60 cows and heifers ..	= 60	66 cows and heifers ..	= 66
12 yearlings	= 6	No replacements reared	
2 bulls	= 1	2 bulls	= 1
Total	67	Total	67

been worked out in terms of amounts "per cow", but to obtain a better comparison **between** farms it is wiser to assess the accounts in terms of "per cow equivalent". This is necessary because some farmers rear all their replacements, some buy in, and others partially adopt both practices. The farmer who buys in his replacements close to calving should be milking a larger number of cows than is the farmer rearing all his replacements, but it does not follow that his net return is higher.

Method of Assessing Stock

For farm accounting the date of ending of the financial year is important and should be changed to suit the type of farming. For factory supply dairy farms and for sheep farms 31 May or 30 June are the best dates, as they "tie in" with the climatic year and the mid-winter months are the lowest income months. For town supply the usual date of 31 March is quite satisfactory, as the winter period is one of high returns and the type of farming is not correlated to the seasonal fluctuations of pasture growth to the same extent as factory supply farming

An exception in sheep farming is the farmer who caters for the production of winter beef for the butchers' markets; 31 March would suit him better.

Thus a farmer on factory supply should assess his accounts in relation to the stock on hand at 1 June or 1 July, as his income will be obtained from this number of stock for the coming year. His cows and heifers in calf are all treated as per cow equivalents and the remaining stock, usually yearlings, bulls, and perhaps dry cows, are converted to per cow equivalents at the ratio of 2:1 (2 yearlings equal 1 cow). At this time of the year, on a feed-consumed basis, 3 yearlings would equal 1 in-calf cow, but by the end of spring, when they are more developed, a ratio of 2:1 would be correct and by the end of the year the ratio would be nearer 1:1, so that a fair average over the year would be 2:1.

Table 9 shows the difference between two farms of similar area with one buying in replacements and the other rearing.

The analysis system outlined for dairying can be applied similarly to sheep farming, the stock carried being converted to ewe equivalents and the information assessed either per ewe equivalent or per 100 ewe equivalents.

It is not satisfactory to assess the accounts in relation to per sheep or per ewe carried, as one farmer may rear all his ewe replacements and have a balanced flock, another may buy in 2-tooth or 4- to 5-year ewes, and yet another may run wethers on harder country or carry a higher proportion of cattle. Thus all stock carried have to be converted to a common basis so that farms are comparable and also to measure the individual farm's progress or development.

The following conversion scale is used for this:—

	Ewe equivalents
1 ewe	= 1
3 dry sheep (includes rams, hoggets, and wethers)	= 2
1 beef cow	= 4
1 dairy cow	= 6
Other cattle beast	= 3
1 horse	= 5

Procedure in Farm Improvement Club

Farmers in the Franklin Farm Improvement Club are having their accounts analysed, and a list has been drawn up showing all the items that are included under various headings so that farmers and their accountants can use the same headings and the information can be set out along the lines suggested at very little extra cost. After all, it is a foolish business man who does not know if his business is being conducted economically.

Conditions under which farming is usually conducted are partly responsible for the lack of interest by farmers in financial analysis, as the farmer is a busy man with little time to spend on bookkeeping. However, it is probable that the main reasons for this lack of interest are:—

1. The farmer has not been shown the value of financial analysis, and

2. Farm accountants have been fulfilling only half of their obligations.

Farm accountants should do more than merely balance figures; they should be able to draw up the farmer's expenses and returns along the lines suggested in this article and point out his general management weaknesses. The farmer should then be able to consult efficient extension officers so that these weaknesses can be eradicated.

Because farming is becoming more intensive, and particularly because of the hardening trend in New Zealand's overseas markets, farmers must have the guidance of reliable figures and correct analysis to avoid much wasted effort and expense.

Just as it pays to herd test, so does it pay to farm test, and the only effective test of the farm management is that provided by the farm figures.

By a study of such factors as financial returns, grazing records, and butterfat and gallonage records the value of farm management practices on a number of farms can be readily assessed. This is the procedure followed in the Franklin Farm Improvement Club.

Heading photograph by National Publicity.

A. G. Alexander Memorial Appeal

THE increased attendances at the Annual Farmers' Conference Week at the Ruakura Animal Research Station have shown the need for better accommodation for this and other farmers' gatherings in the Waikato. After this year's conference a fully representative committee under the chairmanship of Mr. D. J. Carter was asked to go into the matter.

IT was decided that a hall should be built and that it should become an Agricultural Hall of Fame dedicated to the memory of agriculturists who have made outstanding contributions to the progress of farming. In particular, it was agreed that the hall should be dedicated initially to the late Mr. A. G. Alexander, of Morrinsville, and that it should be known as the A. G. Alexander Memorial Hall.

The late Mr. A. G. Alexander.

Mr. Alexander, who died early in May, was an outstanding leader of the farming community. He had been a member of the New Zealand Dairy Board, a director of the National Dairy Association, Dominion Chairman of the Dairy Section of Federated Farmers, a member of the National Pig Industry Council, Chairman of the Morrinsville Co-operative Dairy Company, and a member of the National Artificial Breeding Committee. On all these and many other organisations he gave conspicuous service. In 1953 he went to London as one of the negotiators for both dairy and meat prices. He was keenly interested in agricultural research, and, like thousands of his fellow farmers throughout New Zealand, he fully appreciated the practical help that farmers gain from the Ruakura Animal Research Station.

It is estimated that a suitable hall can be built for £30,000. The Government has expressed its wholehearted approval of the project and has undertaken to meet half the estimated cost of £30,000 provided the farming community and the general public subscribe the other half. The committee has launched an appeal for subscriptions, which may be sent to the Provincial Secretaries of Federated Farmers of Auckland, Waikato, Bay of Plenty, and Taranaki, the Executive Officer, Ruakura Animal Research Station, or the Honorary Secretary of the Appeal Committee, Mr. J. R. Turnbull, P.O. Box 447, Hamilton.

Destruction of Wild Colonies of Bees

PROMPT destruction of bees that lodge in buildings or other unsuitable situations is recommended in this article by S. Line, Apiary Instructor, Department of Agriculture, Invercargill, which describes the means of dealing with wild swarms. Such colonies if allowed to become established may be very difficult to deal with and are always a potential danger to commercial beekeepers because of the risk of serious bee disease spreading from them to nearby apiaries.

AN experienced beekeeper realises that proper hive manipulation during spring will prevent bees from leaving a hive. He spends as much time as is practicable in providing for a hive increasing in size—giving some attention to the queen—and so eliminating the causes which tempt bees to swarm.

Attention should be given to wild colonies of bees wherever they settle. If a farmer or householder is not prepared to eliminate the bees, he should report their presence to someone capable of dealing with them. Where there is no beekeeper handy to deal with a swarm an inexperienced person may be tempted to manoeuvre the swarm into a makeshift hive such as under an apple case, and to leave it there indefinitely.

However, it is illegal to retain bees in any makeshift accommodation or box where the comb has to be cut away to remove it. Movable frames are essential for the easy inspection of comb for any diseases and for other adjustments.

Wall opened up. The old comb is examined for disease before the bees are destroyed.

When this farm building was opened up the bees were found to be diseased.

It would be impossible to keep foulbrood disease to a minimum if hives could not be quickly and periodically examined. If a beekeeper starts to find foul-brood in his hives which is difficult to account for, a special effort should be made to inquire about the possibility of wild hives in the surrounding district. The longer bees are left in a building or shed, the more widely distributed the comb becomes, and if it is in the wall of a house, a much bigger section of the building may have to be opened up than would have been necessary if the swarm had been attended to at an early stage. If only to save a section of wall or to avoid discoloured wallpaper, the job should be done early.

Removing Bees from Buildings

Once a swarm becomes firmly established in a building the first step is to locate the centre of activity behind the boarding. In a house bees usually prefer to establish themselves under the top plate of a wall and gradually to build the comb downward in the cavity between the studs. From the outside appearance there may be some uncertainty as to where to start opening the wall, but if the wild hive has been in the building for a few weeks only, a board about 2ft. down from the eave should be eased outward far enough for a fumigant to be injected.

For an older-established hive it will be more practicable to use a breast-drill and a keyhole saw to cut out a

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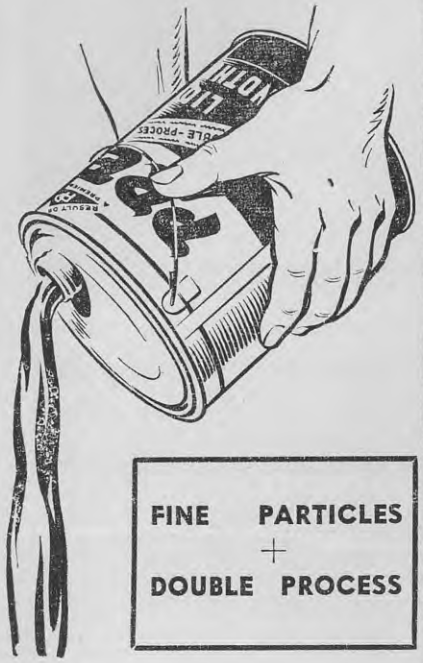

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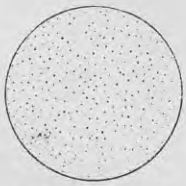

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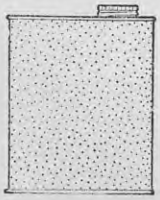

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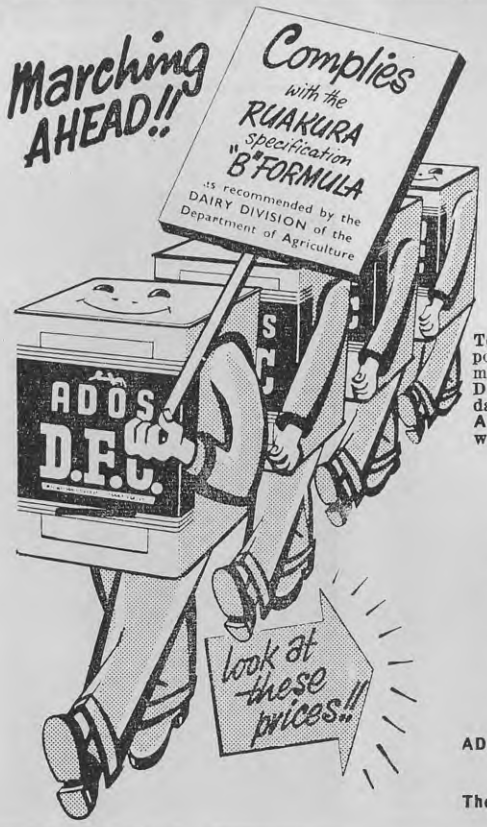

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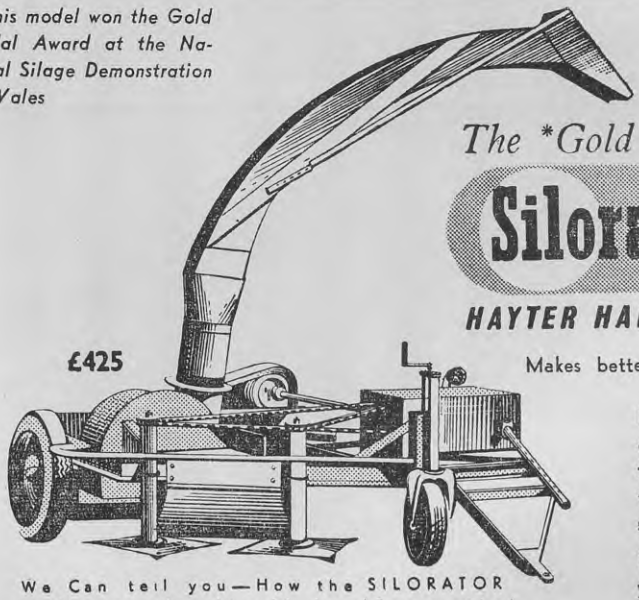

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section of weatherboarding between two studs. Saw cuts should not be made straight through the timber, but at an angle of 30 to 45 degrees so that when the boards are nailed back they will fit neatly and the general appearance of the building will not be spoilt. It is natural for bees to become aggressive while sawing is in progress, and a bee smoker should be available for subduing them.

Where a wild hive has been established for some considerable time it is better not to kill the bees until the comb has been examined for signs of foul-brood. If this should be present, the bees should be driven to another section of the wall by careful smoking and the comb should then be removed. The cutting away of diseased comb should be done so that no honey is spilt and the wax should be placed in a bucket or a box lined with paper. After all the comb is removed the bees may be allowed to return to clean up any honey or wet surface before they are destroyed, perhaps the next day. Any honey and wax should be burnt in a pit; otherwise the spores of foul-brood could be spread by robbers and infection taken to apiaries. Where honey has to be burnt, solid sticks or branches are necessary over the fire to prevent the honey from smothering the flames.

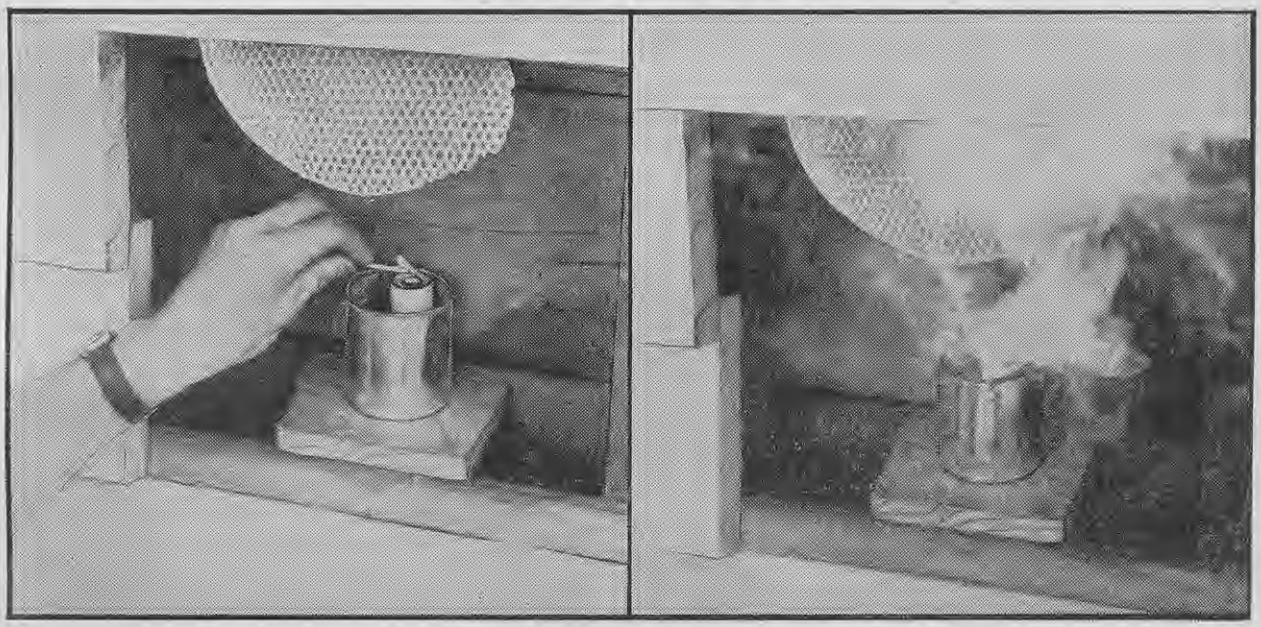
Fumigation of Bees

When a wall is opened up and the brood nest appears free of disease the bees may be gassed immediately. A gassed area should be left and no work done there until the odour has disappeared, especially if work has to be done in a confined space. Many beekeepers are familiar with the use of cyanide in powder form for the destruction of diseased bees in the open, but as this chemical can be dangerous or fatal to human life, it should be used only when the operator has had personal instruction in its use and in its dangers.

New comb (left) and old comb (right) in a farm building. The clean, diagonal cut through the weatherboards will simplify replacement of them neatly. Wild bee comb in a wooden building is usually found attached to the top plate and built down between studs.

An old method of exterminating bees which can be successful if there are not many vents or exits through which the vapour can escape is that of burning sulphur. This should not be burnt on a shovel, where it is exposed to the air, for the flames will consume most of the smoke and nullify its effect. It should be placed in a smoker on old sacking where it can smoulder but not flame. A small cup of powdered sulphur (¼lb.) can exterminate a colony of bees in 5 to 10 minutes if the fumes can be confined to the infested area. This method can be dangerous to the operator if he cannot get plenty of fresh air.

Bees may also be killed with quick-acting smoke bombs containing D.D.T. and lindane, which can be obtained from plant nurserymen, hardware stores, and carpet suppliers. A match is applied to the bomb, which gives



[Elmwood

Left—Lighting a smoke bomb of D.D.T.-lindane in a tin on a temporary shelf within a wall where bees are to be destroyed. Right—Dense smoke from the bomb is capable of killing bees and insect life in 2500 cub. ft. of air space.

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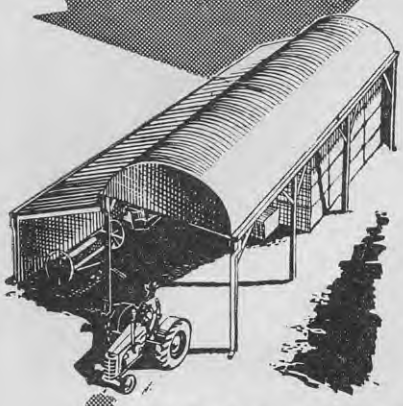

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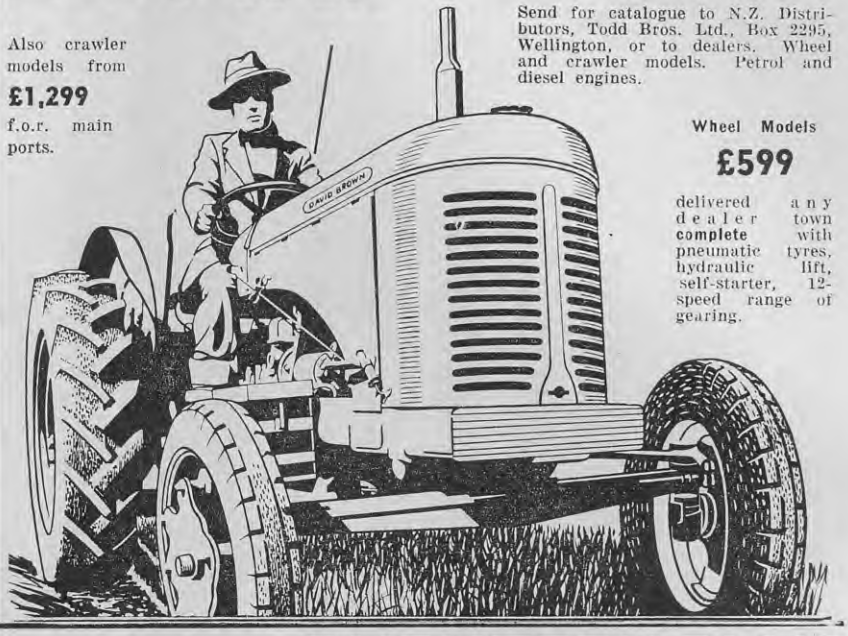

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off a cloud of smoke that will kill a large variety of insects, and bees within 2 minutes. The size of bomb suitable for bees resembles a 2in. cylindrical torch battery cell.

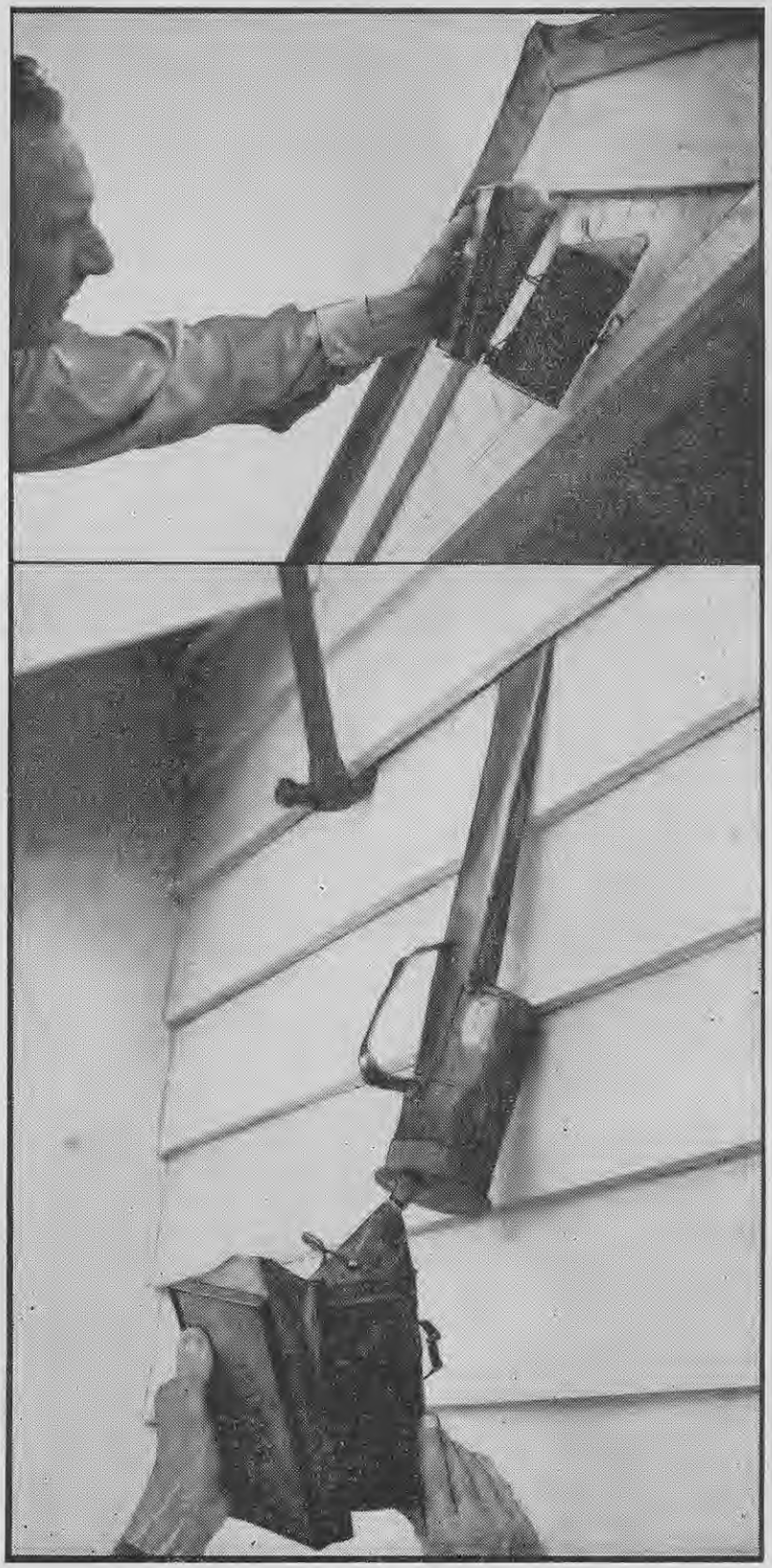
Before being lit the smoke bomb should be placed in a 2lb. treacle or honey tin and stood on a temporary shelf within the wall. The tin is safer with a press-on lid which has been perforated with about a dozen small nail holes to let out the smoke. The smoke bomb is said not to give off flame, but as spider webs, which are common in wall cavities, are inflammable, use of a nail-punctured lid as recommended is a worthwhile precaution. Boards that have been removed should be made to fit temporarily in place to confine the fumes. The smoke is not harmful to animals or humans.

Experiments with a relatively new preparation called "Gammexane 25" (used as a smoke) have been successful for quickly eliminating bees and preparing the way for the removal of wax combs and honey from buildings. This fumigant has a lasting effect. There have been instances where a swarm has occupied quarters previously inhabited by bees destroyed with the fumigant; the later swarm has been seen to dwindle away and die out entirely by contact with the residue from the smoke.

After honey comb is cleared from interior walls (especially where "Gammexane 25" is not used) the walls should be painted with a strong disinfectant; otherwise swarms are likely to be attracted to the spot later by the aroma of the wax remaining.

Crevices on the outside walls where bees have gained access can be blocked by plugging them with untreated wool (easily collected in the country from barbed-wire fences) or some spongy, woolly material. This can be poked into a joint with a knife and remains in place because of its springiness. In some structures, such as churches and buildings with hollow brick and concrete walls, or in ornamental gables the opening up of the affected area to reach bees established there is often impracticable. Where timber has to be dealt with a ¾in. hole may be bored (a cork will fit this hole afterward) and a fumigant injected with sufficient pressure to permeate the many passages and divisions between sections of comb.

As this work will often have to be done from a ladder, the equipment needs to be simple. It is quite convenient to work with a bee smoker in which, before mounting the ladder, the operator places 2 dessertspoons of "Gammexane 25" powder on smoking sacking within the cylinder. The smoker is immediately placed against the hole in the timber and the bellows are moved gently. The smoke will penetrate the bee comb and the bees will be dead in from 1 to 2 minutes.



Upper left—"Gammexane 25" smoke injected through a hole bored in a gable of complicated design. Lower left—Using "Gammexane 25" in a smoke gun where the chemical has been placed on smouldering sacking. The bellows of the bee smoker are moved gently to give slight pressure to the smoke.

[*Lower photo by Elmwood*

Destroying a colony of wild bees in a tree trunk by using a pump screwed on to a container holding a cyanide fumigant.

With a smoker using "Gammexane 25" best results will be obtained only if smouldering sacking or embers are arranged carefully, as the fire in the smoker can race and partly spoil the effect. If the hole in the wall is right beside the operator, one layer of fresh sacking should be laid over the embers, the "Gammexane 25" placed on this, a small tuft of half-dried grass laid over the powder, and the spout then fitted on. The fresh sacking allows enough time for applying the spout to the hole and the grass prevents the fire from racing and consuming the smoke. If the smoker has to be taken up a ladder, it is best when charging the smoker on the ground to put two layers of sacking over the embers.

As the smoker may become tainted with the fumes of the chemical, it is advisable to use equipment that is no longer required for normal use.

Bees in Trees and Poles

If a swarm is in a hole in a tree, an investigation should be made to decide on the best method of exterminating the bees. Where bees are beyond reach in the trunk and cutting down or burning of the tree is undesirable or impracticable, bees may be suffocated by passing into the hole some insecticide powder, cyanide gas, or "Gammexane 25" smoke from a smoker. One advantage of smoke is that it reveals any other holes that bees could use in the same trunk. The hole should be blocked with a clay plug or, if small and circular, by a tapered wooden plug.

In some country districts electric power poles made of concrete and having a hollow core have become the home of bees. Sub-stations are equipped with cyanide pumps and the local electricity supply authority should be informed if bees remain established in these poles for long.

Bees in Chimneys

Bees in a chimney are almost always established within 3ft. or 4ft. of the top and when in that position are usually difficult to dislodge cleanly. Methods may have to be varied according to the type of chimney and for that reason it is advisable to have them cleared by a qualified beekeeper or, if there is not one handy, to ask the Apiary Instructor for the district for advice on how to proceed.

Bees in any place other than movable-framed hives are a potential danger to the beekeeping industry. The average householder is well aware that to interfere in the domain of bees is to invite them to show fight, but the longer they are left the more difficult they are to shift. Wild bees become a nuisance and a menace to beekeeping generally. If they are discovered and cannot be dealt with, the nearest competent beekeeper or the local office of the Department of Agriculture should be notified. The Apiary Instructor for the district will then be able to advise on solving the problem.

Meteorological Records for August

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	52.2	+ 1.2	67.8	31.3	6.79	15	— 0.04	1.37	14	142.5
Auckland	160	52.4	+ 0.2	64.2	36.0	4.37	20	— 0.05	0.92	14	109.8
Tauranga	10	50.3	+ 0.6	65.5	27.1	3.72	14	— 1.03	1.60	14	147.9
Ruakura	131	48.4	+ 0.6	62.0	22.1	4.61	16	+ 0.52	1.12	14	125.5
Rotorua	975	46.9	+ 0.9	60.7	25.6	5.38	16	+ 0.48	2.25	14	133.4
Gisborne	12	49.8	+ 0.6	67.4	28.6	3.92	10	+ 0.06	1.18	6	151.9
New Plymouth ..	160	49.4	— 0.2	60.0	33.0	8.38	14	+ 2.63	1.80	14	147.6
Karioi	2125	42.0	+ 0.0	59.0	17.6	5.71	19	+ 1.50	1.33	26	
Napier	5	50.2	+ 1.1	67.9	32.4	2.87	13	— 0.06	1.05	1	146.7
Wanganui	72	48.8	— 0.3	64.3	30.8	4.15	14	+ 1.20	1.57	26	127.2
Palmerston North .	110	47.8	+ 0.1	64.5	24.2	4.35	21	+ 0.60	1.62	26	112.4
Waingawa	340	46.4	+ 0.5	63.0	25.0	3.98	21	— 0.20	2.10	14	137.9
Wellington	415	47.2	— 0.4	57.7	37.2	6.24	21	+ 1.59	1.53	14	104.3
Nelson airfield ..	5	44.6	— 0.2	60.3	25.3	5.06	9	+ 1.92	1.92	14	161.7
Blenheim	12	46.4	+ 0.1	62.4	27.2	4.48	9	+ 2.15	3.01	14	177.4
Hokitika	15	44.8	+ 0.1	59.4	27.0	8.47	15	— 0.57	1.31	30	160.2
Hanmer	1270	40.2	— 1.2	63.5	20.6	7.62	16	+ 4.04	2.38	15	124.3
Christchurch ..	22	44.6	+ 0.3	69.3	25.4	2.68	14	+ 0.63	0.98	15	134.4
Ashburton	323	43.8	+ 0.1	66.2	22.2	3.89	9	+ 1.57	1.34	15	150.7
Timaru	56	43.7	— 0.1	66.3	24.3	3.34	9	+ 1.88	1.24	14	155.6
Alexandra	520	40.6	— 0.8	61.1	20.4	0.75	10	+ 0.12	0.23	11	161.7
Taieri	80	43.1	— 0.6	65.2	22.7	2.78	13	+ 1.04	0.78	15	137.7
Invercargill airfield	0	42.7	— 0.3	60.2	23.7	3.14	18	+ 0.20	0.67	19	152.3

"Copper Deficiency in Cattle and Sheep"

Department of Agriculture Bulletin No. 238, "Copper Deficiency in Cattle and Sheep", by I. J. Cunningham, Superintendent of the Department of Agriculture's Animal Research Station, Wallaceville, describes the symptoms of the deficiency in affected stock on peat and other soils and methods of relieving the condition. A straightforward lack of copper and a copper deficiency accompanied by poisoning due to excess of molybdenum in the grass have been recognised on peat soils. Symptoms vary from retarded growth and general unthriftiness to severe, debilitating scouring, especially in winter and spring. Suitable licks and methods of topdressing to alleviate the deficiency are described.

Root Crops in the Home Garden

BY thoughtful planning of crop rotations and successions the home gardener can avoid having cabbages, cauliflowers, and the like maturing in excessive quantities at one time, with shortages at other seasons. Spreading of planting and hence of maturity dates will help with crops of this nature. Root crops on the other hand can be harvested over a long period by use of the ground as the storage medium. In the first part of this article the growing of root crops is discussed by B. P. Coleman, Horticultural Instructor, Department of Agriculture, Auckland. The section on routine work for November is by W. G. Crawford, Horticultural Instructor, Department of Agriculture, Oamaru.

ROOT crops play a valuable part in the garden programme and because they are easy to grow and are practically constantly available, they may be planted in considerable quantity. The aim should be to have root vegetables of some kind all the year round.

Soils and Manures

Most root crops grow best in deep, friable, well-drained soils high in humus content but not acid. Fresh organic material not fully decomposed is a disadvantage, because it tends to encourage forking of the roots. Rich soils or those which have been heavily manured for a previous crop very often produce good root crops without the addition of more fertiliser. Nevertheless, provided that the land is reasonably well drained and can be deeply and thoroughly cultivated, roots can be grown quite satisfactorily in a wide range of soil types.

Where it seems necessary to use fertilisers, and many soils will need them, the following balanced base mixture may be used at from 2oz. to 4oz. per square yard: 9 parts by weight of superphosphate, 10 parts of bonedust, and 1 part of sulphate (or muriate) of potash. Suitable ready-mixed garden fertilisers are also available from seedsmen.

Lime may be used at from 2oz. to 8oz. per square yard according to the nature of the soil. A light dusting of nitrate of soda after the rows have been thinned may also be desirable.

Cultivation and Care of Crops

Land should be thoroughly and deeply cultivated for all root vegetables, especially crops such as long-rooted carrots and parsnips, and the surface soil should be worked to a fine tilth for the seed.

If fertilisers or lime are used, they may be broadcast and worked into the soil or applied along the rows, provided they do not come into direct contact with seeds or plants.

Drills ½in. deep are suitable in normal circumstances for the seed of most root vegetables, but seed may be sown a little deeper if the soil is dry. If the surface soil is inclined to harden or cake, it is an advantage to sow a few radish or turnip seeds with those of carrots or parsnips, as the first two germinate quickly and produce strong seedlings which break the soil surface for the weaker carrots or parsnips. The early germinating seedlings also serve as markers until the seedlings of the main crop become established, when the markers should be pulled out.

Thinning should be done before the seedlings are more than about 2in. high. Final spacings will vary from about 2in. apart for radishes and small carrot varieties to about

[*Sparrow*

Thinning carrots. Early thinning of root crops gives the roots the best chance to develop good size and shape.

6in. apart for large parsnips or swedes. Early thinning gives the roots the best chance to develop good size and shape.

Weeding between the plants is best done by hand, but between the rows the work can be done more quickly with a hoe. It is particularly important to keep weeds suppressed until the vegetable seedlings are very strongly established, but it is always easier to keep weeds under control by fairly frequent attention while they are small. Shallow cultivation will keep weeds down and deep working is undesirable because it is likely to injure the vegetable roots.

Selective weedicides are available for larger gardens and save a great deal of work, but they are not generally worth while for small plots. Some are unsuitable for use within 6 to 8 weeks of harvesting, because they may cause tainting of the vegetables.

Carrots

Carrots are the most popular and important of the root crops. The following varieties are recommended:—

Long types: These are suitable for deep, easily worked soils. Varieties: James Intermediate and Morses Bunching.

Medium types: These are the most suitable for average soil and climate. Varieties: Chantenay and Manchester Table.

Short types: These produce smaller crops but mature quickly and are thus suitable for early or very late sowing. Varieties: Early Scarlet Horn, French Forcing, and Oxheart (usually sold as Guerande).

Carrots prefer a limed soil that is well drained but not subject to serious drying out. In most districts seed should be sown from September to January, but earlier and later sowings may be made where the climate is mild.

Main diseases and pests: Carrot rust fly, aphides, leaf spot, and eelworm (see page 351 for control measures).

Parsnips

Parsnips are a valuable vegetable for winter harvesting, and in fact their flavour is improved after light frosts. If the ground is reasonably well drained, parsnips left where they have grown will remain sound for many weeks after reaching maturity and consequently do not require special storage facilities.

The variety Hollow Crown is probably the best to plant in most home gardens.

Parsnips have a long growing season and are usually grown from seed sown about November or December. They mature in autumn and winter. They do best in deep soils.

Main diseases and pests: Rust fly, aphides, leaf spot, and eelworm (see page 351 for control measures).

Beetroot

Beetroot may be grown quickly and easily, and successional sowings from early spring to late autumn are desirable.

Recommended varieties are Detroit Red, Early Wonder, and Obelisk. The last is a longer rooted type.

Beetroot grow well in almost all soil types, but need a well-limed soil.

Though beetroot are usually grown from seed, seedlings are not difficult to transplant if set out in moist soil. Beetroot are of the best quality when harvested before reaching full size.

Main diseases and pests: Leaf spot and leaf rust (see page 351 for control measures).

Turnips

The principal value of turnips is their rapid growth and early maturity, especially for spring sowings for the months when other vegetables are scarce.

Recommended varieties are White Stone, Early White Milan, Milan Purple Top, and the slower growing Golden Ball.

Turnips must be grown quickly without check and should be harvested before reaching full size. They are not satisfactory in hot weather, because they must have an even and adequate supply of moisture to keep them growing quickly.

Main diseases and pests: White butterfly and diamond backed moth caterpillars and aphides (see page 351 for control measures).

Swedes

The best quality swedes are those harvested in late autumn and winter after temperatures have fallen.

The varieties recommended are the medium sized Laing's Garden and Superlative.

Swedes prefer a well-limed soil. Seed should be sown from November to early February for late crops. Earlier sowings mature when ample supplies of more popular vegetables are ready and in any case lack the quality of late-harvested swedes.

Main diseases and pests: As for turnips, but also boron deficiency.

Radishes

Radishes, which are popular for salads, are at their best in spring, but may be grown all through the warm weather.

There are many varieties, of which the following are good: French Breakfast, White Icicle, and Long Scarlet.

A variety of a larger type is Chinese Winter.

Radishes must be grown quickly and without check and must be harvested as soon as they are large enough, as quality deteriorates quickly. They prefer rich, moist soil, but will do quite well in many types of soil if it is well prepared. They are more difficult to grow in hot weather.

Salsify

Salsify (or oyster plant) is one of the less commonly grown roots. Its season is much the same as that of the parsnip, though the roots may be dug and used before they are fully mature. Though a biennial, the plant is grown from seed and treated as an annual. The soil for this crop must be well drained.

If any roots are left over after winter, boxes or pots may be placed over the crowns to blanch the flowering shoots, which may then be used like asparagus.

Black Salsify

The flavour of black salsify is sweeter than that of salsify and it is preferred by some, but it has the disadvantage that the root must be soaked before cooking to remove a bitter taste. The plants may be grown for a second season to increase the size of the roots. The leaves may be used in salads. Cultural treatment is the same as for salsify.

Horse Radish

Horse radish is used as a condiment, but is comparatively seldom grown in home gardens. If not kept under control, it can become a troublesome weed. Horse radish is propagated by division of crowns or by root cuttings. The best cuttings are about ¼in. in diameter, 2in. to 8in. long, and taken from either tips or crowns of roots. Intermediate cuttings are less satisfactory.

Cuttings should be planted almost horizontally after side roots have been removed. The best time for planting is August. The plants may be kept for two or three seasons, but to keep this vegetable under control it is best to treat it as an annual.

Spanish Oyster Plant

The Spanish oyster plant (or golden thistle) has a prickly leaf, which is some disadvantage, and a flavour between parsnips and salsify. The edible roots are lighter in colour and larger than those of salsify and the yield is double that of the latter, which to some extent compensates for the prickly leaves.

This plant may be grown from seed sown in spring or by division of crowns. Soil and culture are as for salsify.

Diseases and Pests

The table below gives the quantities of the various specifics for controlling common pests and diseases of root crops.

[*R. W. Orr*

Salsify or oyster plant.

Work for November

With the better weather likely from now on, plant growth will no doubt be more rapid, but the same conditions favour the rapid development of insect pests and diseases. Control measures are linked very definitely with good gardening practices, because though spraying is in itself most necessary, attention to garden sanitation is also important. All crop remnants should be collected as soon as possible after the edible portion is harvested and either composted or dug into the soil. Long grass or weedy patches in the vicinity of the garden should be cleaned up, as many injurious insects thrive in this cover. Only good quality seed and strong, stocky, healthy plants should be used. A system of crop rotation should be adopted as far as possible.

Weak, sickly plants are much more susceptible to attacks of diseases and pests than are healthy ones. To keep plants healthy they should be supplied with as much plant nutrient as required and in the correct proportions for proper development. If this is possible, the plant will make vigorous growth and will be better able to withstand or offset disease and insect attacks throughout the season. However, regardless of what precautions are taken pests and diseases are apt to be troublesome at certain times of the year. Growing crops should be examined periodically and control measures applied immediately insect pests or diseases appear. They can become serious in a short time if allowed to go unchecked, and for this reason gardeners should have on hand sufficient spray materials to meet any emergency.

Cultivation

The hoe should be kept going between growing crops. Small weeds are easily killed, but large weeds are more difficult to control. Surface cultivation for weed control is all that is necessary. Deep cultivation close to crops injures feeding roots that are near the surface. The main object of

CONTROL MEASURES FOR DISEASES AND PESTS OF ROOT CROPS

Disease or pest	Specific	Quantity
Aphides	Nicotine sulphate	7 teaspoonfuls to 4 gallons of water
	or H.E.T.P.	4 teaspoonfuls to 4 gallons of water
	or T.E.P.P.	2 teaspoonfuls to 4 gallons of water
	(If nicotine sulphate is used, soft soap should be added; soap should not be used with the other spray materials mentioned)	
Carrot leaf spot Parsnip leaf spot Beetroot leaf spot	Bordeaux mixture or Certified copper compound	4oz. of copper sulphate and 5oz. of hydrated lime to 4 gallons of water 3oz. to 4 gallons of water
Beetroot leaf rust	Lime sulphur plus colloidal sulphur	3¾ fl. oz. plus 1½ fl. oz. to 4 gallons of water
Caterpillars of white butterfly and diamond-backed moth	D.D.T. dusting powder	Dust on to plants
	or D.D.T. 50 per cent. wettable powder	½oz. to 4 gallons of water
Carrot rust fly	No effective control measures known, but dusting seed with lindane before sowing may give partial protection	
Eelworm	No control except by soil sterilisation with D.D. or chloropicrin, which is not always practicable and on which advice should be sought if necessary from the nearest office of the Horticulture Division of the Department of Agriculture	
Boron deficiency	Borax	Apply 1oz. to each 10 sq. yds. of garden before sowing or planting. One application should be effective for several years

To control several pests, combinations of these spray materials may be used, but it is better to use nicotine sulphate rather than H.E.T.P. or T.E.P.P. in combination with Bordeaux mixture.

Nicotine sulphate, H.E.T.P., and T.E.P.P. are poisonous and must be kept out of reach of children. If the materials come in contact with the operator's skin, they should be washed off promptly with plenty of water. Operators should not smoke or eat while handling these materials.

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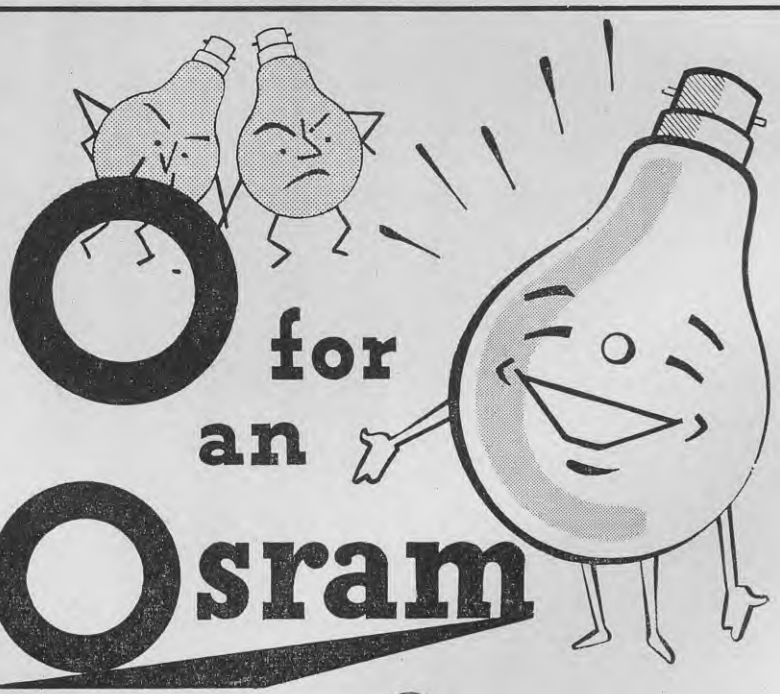

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cultivation is to destroy weeds, which use plant nutrients and soil moisture needed by the growing crops.

Thinning

It is a common practice to sow vegetable seeds fairly thickly so that there will be an even stand along the row and to allow for possible poor germination. Under these circumstances thinning out seedlings so that the crop will grow evenly and fast is very necessary. Thinning should be done as early as possible after seedlings have reached the true-leaf stage. Spacing of the crop should be sufficient to allow for full plant development.

Harvested Crops

Where a crop has already been harvested and the land used for it is required for winter cropping with brassicas, preparations should be put in hand. The ground should be turned over and limed at an early date. If time permits, a green crop, preferably a legume, which will add considerably to the nitrogen supply in the soil, can be sown for digging in later.

Sowings

Marrows, squash, and pumpkins can be sown in all districts toward the middle of November. Several good varieties of each are available and the following are among those giving consistently good results:—

Pumpkin: Crown, Triamble, and Queensland Blue.

Squash: Red Warren and Golden Hubbard.

Marrow: Long White and Green Trailing. For smaller gardens Green Bush is very suitable.

Cabbages: Sowings of Savoy Drumhead and Savoy Omega can be made this month to provide plants for setting out during early January.

Cauliflowers: To provide plants for setting out in the second week in January sowings should be made now of varieties maturing at different times. This will give a continuity throughout winter. Several good varieties are available, but only those which do well locally should be sown.

Cucumbers: Seed can be sown in the open or plants set out from a hot-bed as soon as danger of frost is past. Good varieties include White Spine, Long Prickly, Moneymaker, and Crystal Apple.

[*Sparrow*

Good varieties of pumpkin and squash. A—Crown. B—Triamble. C—Queensland Blue. D—Red Warren.

Beans: Dwarf and climber beans may be sown from now on, but where late frosts are likely some protection should be provided. Good varieties of dwarf beans are Canadian Wonder and The Prince; Scarlet Runner and Fardenlosa are popular climber varieties.

Peas, carrots, and beetroot: Small successional sowings may be made throughout November.

[*R. W. Orr*

Small successional sowings of peas may be made throughout November.

Plantings

Potatoes: Though the season is well advanced by November, main-crop potatoes may still be set out, provided this is done soon. Good varieties include Arran Chief, Aucklander Short Top, Inverness Favourite, and Dakota.

Kumaras: Kumaras are grown mainly in mild North Island districts and plantings should be completed as early as possible. Good varieties are New Zealand Red and New Zealand Pink.

Tomatoes may be planted in all districts throughout New Zealand during November. Good varieties include Moneymaker, Carters Sunrise, Potentate, and Stoners Prolific.

Lettuces: Small sowings may be made throughout the season, but during November summer varieties, such as Great Lakes and Neapolitan, should be selected.

Heading photograph by Sparrow.

USES OF THE ATTACHMENT

Upper left—The attachment will carry drums of oil, lime sulphur, or petrol and can easily lift over ½ ton. Upper right—If pallets are used to build up a platform, the attachment can be used when tops of high hedges are being pruned. The hedge shown is being cut at approximately 20ft. from the ground. Middle left—Carrying pallets. Note the light detachable framework used for stabilising pallets. The concrete counterweights can be seen at the back of the tractor. Lower left—A load of empty cases ready for transport to the orchard. Lower right—Loose cases of apples ready for transport to the shed.

Photographs at upper right and middle left by Russell Orr.

Fork Lift Attachment for Hydraulically Equipped Tractors

IN recent years there have been amazing advances in the mechanisation of agricultural production, and in this respect orchard work is no exception. Whereas a few years ago horses were relied on for all work of drawing cultivation equipment and trailers, tractors now do this work. Use of tractors has introduced various attachable implements which when used with the hydraulic system on some tractors have greatly simplified routine orchard operations. Such a device is the fork lift attachment described here by N. B. Congdon, Horticultural Instructor, Department of Agriculture, Hastings.

THE idea of a fork lift attachment for hydraulically equipped tractors in orchards was conceived by a Hastings orchardist and the equipment has recently been designed and constructed in conjunction with a local engineering firm. This implement has already proved its worth in the many uses to which it may be put on an orchard. Because of its versatility it is not restricted to orchard use, as wherever there is a need for lifting in farm work generally this device must be of immense value.

Above—Side view showing method of attaching the lift to steam piping supports, which extend the full length of the tractor. Below—Front view showing hydraulic ram and construction of main framework.

The attachment can be put to many different uses. Above—Pulling out fruit tree stumps. Below—Transporting timber.

The lift can be used for depositing prunings on the orchard fire.

Construction

The lift is approximately 6ft. high. The vertical framework, 22in. wide, is constructed of channel iron. The forks are 3ft. long. The unit is mounted on two lengths of steam piping of 2½in. diameter. These supports are bolted to the chassis of the tractor and run the full length of the tractor. The strain in lifting is therefore taken by the tractor as a whole and not just by the front axle. The method of attachment is simple so that the lift may be attached or detached in 10 minutes. The mountings and other permanent fixtures on the tractor do not prevent the use of any other implements which may be required.

The 2½in. steam piping also provides for the fitting at the rear of the tractor of two counterweights of reinforced concrete. These weigh 300lb. each and can be easily fitted on and adjusted according to the load the fork is to lift. The counterweights are necessary only for heavy lifting and are not required for average orchard work. The lift is operated in the normal way by a hydraulic lever. A foot-operated ratchet secures the load and eliminates the strain on the hydraulic system. Steel cables (5/16in.) are used to transfer power from a central hydraulic ram to the forks. The unit can be tilted either backward or forward as required, and this is effected by steel cables stretching from the rear of the tractor and attached on each side of the lift. This manoeuvrability allows the forks to be fixed at various levels and facilitates such jobs as disposal of prunings on to a fire and loading and unloading of timber. It virtually eliminates hand labour for such jobs.

The tractor is not hard to steer and is easily controlled when carrying 30 loose bushels of apples and travelling in top gear. The accompanying photographs show what weights can comfortably be lifted by a relatively light tractor.

Uses

The following are some uses to which the fork lift attachment may be put:—

It is very useful for carting fruit from orchard to shed and loading pallets of packed fruit on to a truck. It is estimated that one man can cart 250 loose cases of apples for ½ mile in 55 minutes. Eight pallets of packed fruit can be loaded on to trucks in 19 minutes.

As a sweeper attachment for sweeping prunings it has proved extremely useful. An advantage is that prunings may be placed directly on to the fire heap and the forks can be used to compact prunings.

It has been used effectively for pulling out stumps of fruit trees. This is usually an annual job with most orchardists and if done by hand, is irksome and time consuming.

The lift also has the following uses which make it equally valuable for both orchard and farm work generally.

It can lift 3 drums of lime sulphur or petrol from a truck.

It has been used as a jack to lift up the front end of a 30cwt. truck.

It has proved useful for jacking up a building with sunken piles.

With a platform fixed to the forks the lift can be used when hedges are being trimmed and as a scaffold when buildings are being painted. With the lift raised to its full extent and by the use of a number of pallets to build up the platform a hedge 20ft. high can be trimmed quite comfortably.

In transporting timber the attachment has been used for carrying 1000ft. of 6in. x 1in. timber of 12ft. length.

On farms it would be valuable in simplifying many every-day tasks such as carrying baled or loose hay and milk and cream cans. With the addition of a bin or platform it would be useful for carrying metal, fencing gear, concrete posts, or other bulky material. It has been used effectively for drawing out fence posts. Maximum lift for this purpose would be obtained by using a crossbar placed horizontally along the elbows formed by the forks.

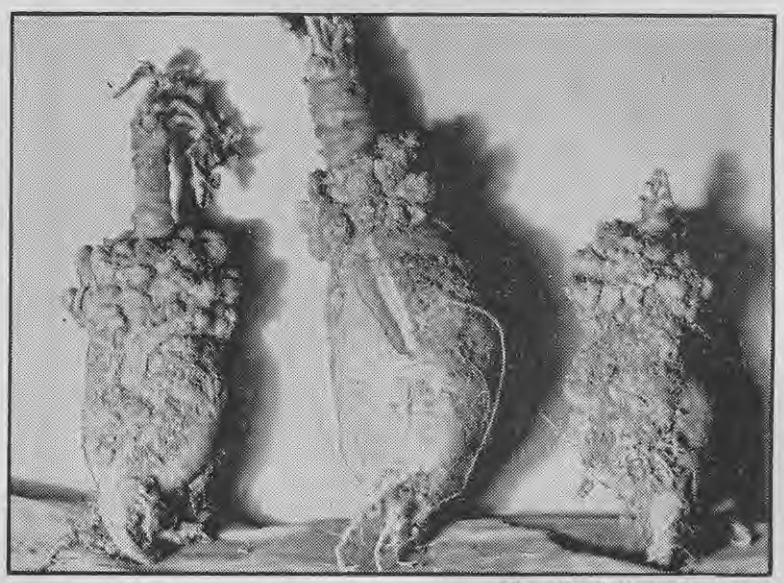
In general the attachment is useful for any job requiring lifting or transport that can be done within the capacity of the tractor and its hydraulic system.

The unit is being manufactured by a local firm and is being retailed at approximately £160.

Acknowledgments

The author thanks Mr. J. A. Boyes, orchardist, Twyford, for information and photographs and time spent in demonstrating, and Welders and Engineers, Hastings, Ltd., for advice on construction.

Danger of Weedkilling Spray Drift



[*Dunedin Photographic Service*

DRIFT from modern hormone weed-destroying sprays can be disastrous to many types of plants, and consequently care should be taken when they are being used. A drift of air-borne spray being applied for the destruction of a light growth of gorse on a roadside caused the cankerous growth on the swede bulbs illustrated above. Though the plants were small when the spray came in contact with them, it did not cause their destruction, but subsequent growth was malformed and retarded to the extent illustrated in what would otherwise have been a 40 ton per acre crop. Sections of the crop a chain from the sprayed gorse were affected.

—J. O. WALLACE, Seed Production Officer,
Department of Agriculture, Dunedin

Services Provided by the Extension Division

IN the September issue of the "Journal" the first part of this article described the general research work of the Extension Division of the Department of Agriculture. It stressed the need of farmers for accurate and up-to-date information about their problems and described how the Division obtains its extension knowledge. This second and concluding section describes the seed certification scheme and the working of the extension services and associated activities.

THE time of an Instructor in Agriculture of the Extension Division is fairly evenly divided between advisory visits to individual farms and general extension and research work. The individual farmer has his own particular problems, such as a swamp to drain, marginal land to grass, topdressing to do, or a crop failure to be resown, and instructors are at the service of farmers to advise and assist on such work or problems either from their own knowledge or with the help of specialists. Such work is essential, but with a relatively small staff the Division can reach only a small percentage of farmers through individual visits each year. The Division has then an additional duty of general advisory work through lectures, radio talks, field days, articles, and farm schools to bring to the notice of farmers advances in the science and practice of farming, and each instructor has a similar duty to the farmers in his district.

The individual instructor's district advice is, however, more specific than the general advice of the Division. Divisional advice may, for instance, be concerned with topdressing in general, but the instructor's advice is concerned with the treatment of pastures on specific soil types. However, probably the most important general service that the Division provides is that of seed certification, which ensures farmers of adequate supplies of high-class seed of definite strain or variety.

SEED CERTIFICATION

Thirty years ago, before seed certification was inaugurated, the result of sowing down of permanent pastures was often uncertain, for there was no guarantee that the species chosen for a permanent sward would be perennial. With supplies of Certified seed there is no uncertainty regarding quality, variety, or strain, and pasture and crop production can be undertaken with full confidence that the seed sown is suitable for the purpose intended.

In 1927 after investigations into the quality of the seed wheat and seed potatoes available commercially a certification scheme was introduced by the Department to cover both these crops. Investigations had also been proceeding into the strains of pasture plants available in New Zealand and in 1929 a scheme of seed certification for white clover seed was also begun. Since then other pasture and crop seeds have been added to the list until today Certified seed of all the more important farm seeds is available to the New Zealand farmer and large quantities of Certified pasture seeds are exported.

Before the Department introduced a scheme of seed certification the buyer was largely ignorant of the quality of the seed he purchased. Certain farmers claimed that they obtained superior results with seeds from certain districts. Hawkes Bay, Poverty Bay, and Sandon ryegrasses, for instance, were recognised in some quarters as being better in production and permanence than ryegrasses from other districts, and cocksfoot seed from Akaroa had already gained a reputation locally and overseas. Potato growers recognised the value of a "change of seed" without realising what was involved in such a change, or how to turn it to real advantage, and cereal growers either left it to their merchants to supply them with seed or more generally "kept some back for seed" from the harvest of the previous season. The superiority of certain seeds of certain origin was not generally recognised, however, and those who had formed opinions for themselves were not always able to purchase seed of the origin they preferred. The buyer was unable to obtain an assurance that any line of seed was what it was claimed to be.

Disquieting Situation

During the 1920s information was gradually becoming available as a result of investigation into pasture and crop plants. This disclosed a very disquieting situation. Many lines of seed potatoes were very badly mixed and others were sold under incorrect varietal names. Most lines showed signs of "running out"—symptoms now associated with the presence of virus diseases in the plants. Cereal crops were far from uniform in type and showed a high degree of loose smut infection.

Very few good lines of perennial ryegrass existed outside the three districts mentioned and even within these areas lines of poor type could be found.

HEADING PHOTOGRAPH: Farmers listening to an instructor at a field day.

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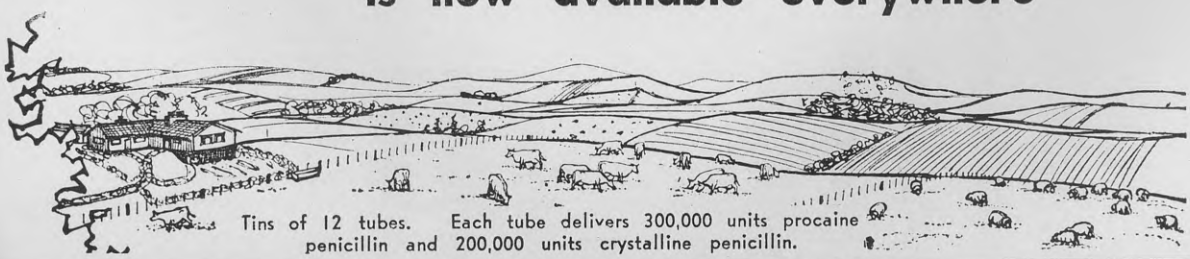

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A really satisfactory line of Italian ryegrass could not be located anywhere; the best lines were only fair and the worst were hybrid types which were sold either as Italian or as perennial ryegrass, depending on the market. They possessed none of the good qualities of Italian or perennial ryegrass and were far inferior to either species. Much seed was sold as Western Wolths, but a genuine line of this variety could not be found. It was just another name for Italian ryegrass.

There did appear to be a degree of uniformity in lines of cocksfoot seed, but as many tons of seed of Danish origin had been imported from time to time, there were grave doubts that all lines finally would prove to be of the strain originating on Banks Peninsula.

Browntop was found to be uneven in type owing on the one hand to mixture and hybridisation with other species of *Agrostis* and on the other to the development of specific regional strains.

The descriptive terms applied to lines of red clover seed appeared to have no real merit. Cowgrass contained the same range of plant types as Giant red clover and in similar proportions and buyers were misled by attempts to create distinct types by the use of different names. At this stage Montgomery red clover had not been introduced into New Zealand and all lines of locally grown red clover were very similar in composition.

The position regarding white clover was also obscure. In some areas a truly permanent, leafy, and high-producing strain was flourishing, but in many areas, particularly in arable districts, white clover had deteriorated virtually to an annual. This type of plant had low production and its claim to permanence was based on its ability to re-establish each season by seeding.

Isolation of Superior Strains

Pasture Species

The performance of New Zealand farm seeds as disclosed by investigations of that period was certainly far from impressive, though there were some bright aspects. Some good lines of perennial ryegrass and white clover could be found and nowhere in seed producing areas did it appear that Danish cocksfoot had become established.

Though local strains of Italian ryegrass were mediocre, New Zealand was fortunate in receiving from Europe two or three parcels of Italian ryegrass seed of very good type. There were large areas of browntop of pure and uniform type which were capable of producing seed ideal for incorporation in lawn grass mixtures and at least there was no great variation between lines of red clover.

It is true that even in the best lines of pasture species a considerable range of types could be seen in individual plants; though under plot conditions these differences were unnoticed, they were all too apparent when species were grown out as individuals. This variation proved to be a blessing, as it enabled superior strains of all New Zealand's main pasture plants to be isolated.

Potatoes

Lines of seed potatoes from a few sources did produce crops true to description and with a minimum infection of diseases which limited the ability of the plants to return a satisfactory yield.

Cereals

The work of Canterbury Agricultural College, Lincoln, on cereal varieties had made available small lots of seed true to name and the discovery of the hot water treatment as a means of controlling loose smut in these crops meant that nucleus lots of seed could be treated to eliminate this disease.

In other countries similar investigations into pasture and crop plants were also being undertaken and the discoveries there have been similar to those in New Zealand. In no other country, however, have these discoveries been extended so far into farming practices as they have been here. The reason for this is undoubtedly that in New Zealand a means—seed certification—was developed which enabled the findings and results of research to be carried right through to the practical farmer on his own land. That is the real purpose of seed certification, which was first introduced to meet the demand for better seed potatoes and seed wheat, but was rapidly modified to meet first the necessity for identifying seed of superior natural strains of pasture plants and later the seed of pedigree strains as these were evolved. What is really meant by the value of seed certification is the value of the strains of seeds which are recognised under the certification scheme.

Operation of Scheme

Seed certification in New Zealand is operated by the Department of Agriculture as an impartial body. It gives the seed buyer an assurance of the strain of seed he is purchasing. Its success has resulted from the close

Steps in seed certification. Above—Field inspection. Upper right—Branding and sampling. At right—Sealing the bag after the seed has been machine dressed. Seed certification is one of the most important services provided by the Extension Division, for it ensures farmers of adequate supplies of high-class seed of definite strain or variety. Generally each seed producing area is registered, the origin of the seed sown on the area identified, and the type or strain of plant grown on the area determined by field inspection. After the crop is harvested the seed sacks are branded and temporarily sealed pending machine dressing of the seed.

co-operation of three parties—the farmer growing the seed, the merchant cleaning and marketing it, and the officer of the Department of Agriculture responsible for its certification. Seed certification is not operated under any Act or Regulation. It is controlled by the Department of Agriculture, but depends for its success on the good will of all co-operating parties. Experience over the years the scheme has been operating proves that the present method of administering it is entirely satisfactory.

The aim of any certification scheme is to give the buyer of seed an assurance regarding some point of quality which cannot be determined readily by an examination of the seed itself. It is widely recognised that strain in pasture plants, varietal purity, and disease freedom in cereals and potatoes cannot be determined by an examination of the seed. This places the purchaser at a disadvantage, as hardly ever is he in a position to observe, even less to evaluate, the plants from which the seed is saved. The certification scheme provides in the interests of the buyer for determination of the qualities required under the certification scheme and for the resultant seed to be identified until the time comes for it to be sown, perhaps in New Zealand, perhaps in some foreign country.

Stages in Certification

The scheme varies with the particular species under consideration. In general the seed producing area is registered, the origin of the seed sown on the area identified, and the type or strain of plant grown on the area is determined by a field inspection at the appropriate stage of growth. After the seed crop is harvested the sacks are branded and temporarily sealed pending machine dressing of the seed. The cleaning of the seed is carried out under supervision, after which the sacks are tagged with labels bearing the identification of the seed and are again sealed. At this stage all the sacks of each line are sampled by an officer of the Department of Agriculture. Samples are examined for purity and germination, and certificates relating to these factors are issued to the owner of the seed. The samples are also submitted to any plot or laboratory test which may be considered desirable to confirm the plant type of the seed certified.

For potatoes the procedure is somewhat different. The origin of the seed being planted is determined and a sample of 200 tubers is taken for planting in central trial grounds where all lines can be compared under the same growing conditions. The trial plots are carefully inspected for varietal impurities and for the presence of plants infected with virus and other diseases, and a similar inspection is made of the farmer's own crop. From the observations recorded a provisional classification of each crop is made and the results are published.

After the seed produce of the provisionally Certified crops has been graded it is inspected to see that it complies with certain requirements as to size and freedom from those diseases which are apparent in the tubers. Certification labels for attachment to the containers are then supplied, but the sacks themselves are left unsealed so that the contents may be picked over as required to maintain a satisfactory standard of quality.

The chart on the next page shows the varying stages of multiplication under certification which apply to those grass and clover seeds for which pedigree strains are available. These include perennial ryegrass, short-rotation ryegrass, Italian ryegrass, cocksfoot, timothy, white clover, Montgomery red clover, cowgrass, and lucerne. A similar procedure applies for the more popular varieties of wheat, oats, barley, and ryecorn, except that one or more of the steps of multiplication may be omitted, depending on the seeds in demand. Thus with wheat varieties it is Certified Pedigree seed which is distributed by the Department of Agriculture and with oats it is Certified Mother seed. With seed potatoes two classes, Certified Mother and Certified Commercial, are recognised, but degrading from the first to the second class is not an automatic procedure. Classification in one class or the other depends on such factors as freedom from virus disease, varietal purity, locality in which the crop is grown, and so on.

Seeds of other species—subterranean clover, browntop, *Phalaris tuberosa*, maize, linen flax, onion seed, rape, chou moellier, thousand-headed kale, turnips, and swedes (these last three described as Government Approved)—are also certified under conditions appropriate to the needs of the particular species.

Benefits from Certified Seed

The first and most obvious effect on farming of the availability of Certified grass and clover seeds has been that purchasers have been assured that the seed they buy is of good strain. In addition a channel has been provided whereby the work of the plant breeder developing pedigree strains is rapidly and assuredly passed on to the farming community.

A knowledge of strain coupled with a knowledge of purity and germination of the seed has enabled a more accurate evaluation of the seed, and buying and selling have been undertaken with more confidence. Though it is almost impossible to measure the effect of the scheme on individual species, a comparison of the position in regard to some species before the scheme was instituted with the position today is given below.

Perennial ryegrass: Before the introduction of the scheme 25 per cent. of the perennial ryegrass being harvested might have been expected to reach the certification standard of the first years of certification. Today, when a much higher standard of certification applies, fully three-quarters of the perennial ryegrass seed produced is certified and and it is not difficult to believe that the quality of much of the remainder is not far short of the present standard for certification.

Italian ryegrass: When certification was first introduced no local strains had reached the standard of certification set; today the greater proportion of the seed harvested is recognised under certification. This is all of pedigree strain, which is superior even to the imported strain which provided the first material to be certified.

Short-rotation ryegrass: Only the certification scheme has made it possible to preserve with certainty the identity of lines of short-rotation ryegrass seed, and practically the whole seed crop is certified.

White clover: When a laboratory test for white clover certification was first introduced in 1937 the total production amounted to 485 tons, of which 40 per cent. was accepted for certification. Ten years later production reached 2648 tons, yet despite a higher certification standard, 70 per cent. of the crop was certified, a proportion which has been at least maintained since then.

Montgomery red clover: This seed would not have been identifiable from cowgrass without a scheme, such as is provided by seed certification, under which it could be recognised.

Potatoes: Crops planted with Certified seed are true to variety and yield on the average about 25 per cent. better than those planted with uncertified seed. Probably half or more of the New Zealand potato acreage is now planted each year with Certified seed.

Cereals: Impurities and smutted heads in all cereal crops are now rare and seed true to its varietal name is now regularly supplied as a result of seed certification.

Brassicas: Seed of strains and varieties of different species of brassica crops is now available correctly described. New strains and varieties have been developed to meet local conditions and the production of these seeds for New Zealand use, previously the prerogative largely of overseas countries, has now become almost entirely a local industry.

Changes in Farm Practice

There are other less obvious though no less important effects of the seed certification scheme. Before its introduction it was essential with perennial species, if quality was to be maintained, to harvest seed from old

pastures. This uneconomic process can be eliminated under a certification scheme emanating from a nucleus supply of seed derived from regularly selected material of pedigree strain. Farmers have been able to take the fullest advantage of the heavier and cleaner seed crops harvested from younger pastures. The undesirable practice of saving seed from pastures of mixed ryegrass species has been almost eliminated. Seed production under certification has become primarily an activity of the arable areas where crops and pastures are associated in the farming practice.

Saving of grass and clover seed, though not a primary activity on most farms, is nevertheless a planned one. In general the whole outlook on pasture seed harvesting has been lifted from that of a haphazard, catch crop undertaking to be indulged in at the whim of the farmer and the season to that of an operation which warrants careful attention and planning. This change in the attitude to seed production, though perhaps affected to some extent by other factors, has been the result largely of the direct influence of the certification scheme.

The effect of Certified seeds on New Zealand farming practices has been revolutionary. Better pastures with longer life and higher carrying capacity have been produced, soil fertility has been built up, resulting in increased production both of pastures and crops, greater freedom from disease of crop seed has meant a better yield, and trueness to variety has meant more uniformity and maturity with greater ease of harvesting, a factor more important since the advent of the header harvester.

The full effect of the availability of Certified seeds can never be measured, but many farmers know from the progress they have made on their own farms what the use of Certified seed has meant to them. The results achieved by the regular users of Certified seeds are the best indication of the value of the seed certification scheme to the country as a whole.

Seed-testing Station

The Seed-testing Station operated by the Extension Division is situated at Palmerston North, and as the relative values of most of the seed grown in New Zealand are determined on tests made at the Station, a large and efficient staff is necessary. The rapid development of the seed industry, particularly the export trade, has been reflected in the number of tests undertaken at the Station, increasing from 45,000 in 1942 to 93,000 in 1952. The three main kinds of tests carried out on seed are for purity, germination, and strain determination, the last being an integral part of seed certification, as is also the process of plot testing, which is done by the Grasslands Division of the Department of Scientific and Industrial Research at Palmerston North in collaboration with the Station.

The main tests during 1952 were approximately 32,000 for purity, 46,000 for germination, and 15,000 for strain determinations, and there were many incidental tests such as estimations of blind seed disease in ryegrass.

Seed samples which arrive for testing may have been drawn from the lines they represent by a Departmental officer, a merchant, or a farmer. All agricultural and horticultural seeds are represented in the samples received at the Station. The cost per test when the result is reported in certificate form is 5s. for a single test or 10s. for both purity and germina-

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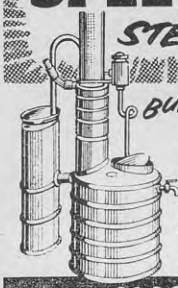

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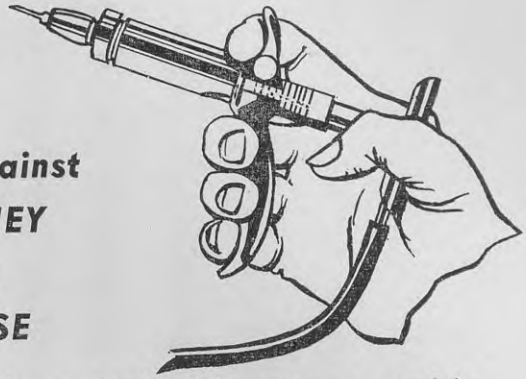

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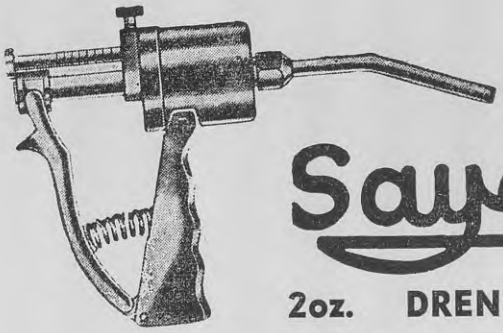

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tion tests. Samples from farmers, who generally require a test only for guidance in their own farming operations, are tested without charge if the result is not required in certificate form.

Purity Analysis

When the sample is to be subjected to more than one type of test the purity analysis is undertaken first. A working sample is weighed out from the bulk sample received by the Station and examined seed by seed. Anything in the working sample which is not a seed of the line the sample purports to be is put to one side and is classified into one of three groups: Other crop seeds, weed seeds, and inert matter.

Germination Tests

For the germination test each type of seed is given optimum conditions of temperature, moisture, air, and light, the combination of these varying according to the seed species. The aim is to get the maximum germination possible under ideal conditions. Seed of white clover is germinated for 7 days at a day temperature of 20 degrees C. and a night temperature of 18 degrees C. Seeds like browntop require a higher light intensity, a longer period for full germination, and a temperature up to 30 degrees C. The seeds are germinated on filter paper squares.

Strain Testing

Usually it is necessary to grow the plant in plots or rows so that comparisons of strain may be made, but at the Seed-testing Station two laboratory tests are used to distinguish between different strains of white clover and perennial ryegrass.

With white clover the picric acid (P.A.) test is used to distinguish between the vigorous, desirable leafy type and the poor, less desirable type of plant. The laboratory test consists of placing germinated seedlings into a test tube with a strip of yellow picric acid paper. The tubes are then incubated in an oven for 48 hours, after which they are graded according to the colour of the paper strips, the darker orange-brown indicating the better strain.

The ultra-violet light (U.V.) test is used to distinguish truly perennial strains of ryegrass from the shorter-lived strains. A ryegrass sample is germinated for 10 days on blotting paper. It is then placed under the ultra-violet lamp. The shorter-lived strains of ryegrass occurring in New Zealand, including Italian ryegrass and short-rotation ryegrass, when placed under the lamp all show a high percentage of seedlings with a characteristic blue fluorescing light round the roots. The truly perennial strains give no reaction.

These tests are used almost entirely as an aid to the certification of perennial ryegrass and white clover seeds, the feature of the tests being that the result is obtained within a fortnight, whereas a plot test with living plants takes many months.

Pre-harvest Tests

Pre-harvest tests are available to farmers to assist in the successful harvesting of ryegrass seed and wheat. Seeding ryegrass crops are very subject to attack by blind seed disease (*Phialia temulenta*), which kills infected seeds and lowers the germination of the line. During December and January each year a blind seed service is provided in Palmerston North and a sub-station is established at the office of the Department of Agriculture in Timaru for the pre-harvest examination of ryegrass for blind seed disease. Samples are taken by the farmer from his crop and sent in for a binocular microscope examination by trained seed analysts to establish the degree of infestation. This service spares the grower the labour and expense of harvesting crops which have been so seriously affected by the disease that they are capable of producing only seed of low germination.

In the direct heading of wheat it is very important that the moisture content of the grain is sufficiently low to prevent later heating and deterioration. The Seed-testing Station carries out pre-harvest moisture tests of wheat samples from growers in North Island districts as a guide to whether the moisture content is low enough for harvesting to begin.

Research

Some research on production, storage, and methods of testing seeds is carried out at the Station. The seeds of each crop possess different characteristics and require varying treatment to obtain results in the laboratory commensurate with their behaviour in the field. Similarly, the many problems associated with the newer methods of harvesting have to be studied and all techniques employed at the Station must be continually checked.

Seed testing for purity (left) and for germination (right).

EXTENSION SERVICES

Instructors of the Extension Division deal with the following main subjects in their advisory work: Soil management, crop and pasture production, and farm management. Divisional work is organised on a district basis with four Fields Superintendent districts and with instructors stationed in the main small country towns. The field staff are assisted in their work by the following specialist sections: Crop experimental, agrostology, seed industry (agronomy), economics and farm management, engineering, forestry, and sociology. Also attached to each Fields Superintendent's district are special instructors in drainage, farm machinery, and home economics. The work of instructors, special sections, and research stations is co-ordinated by a Director and Assistant Director at Head Office.

It is the duty of each instructor to arrange his research and advisory work to secure the progressive development of farming in the district in which he serves. In one district marginal land improvement may be of prime importance; in another drainage or irrigation; or in a generally well farmed area the desired results can be secured only by helping to raise the general standard to that of the most progressive farmers. The investigation and solution of soil fertility and management problems are basic for any improvement plan, for if fertility can be raised economically, increased production is generally assured.

Soil Management

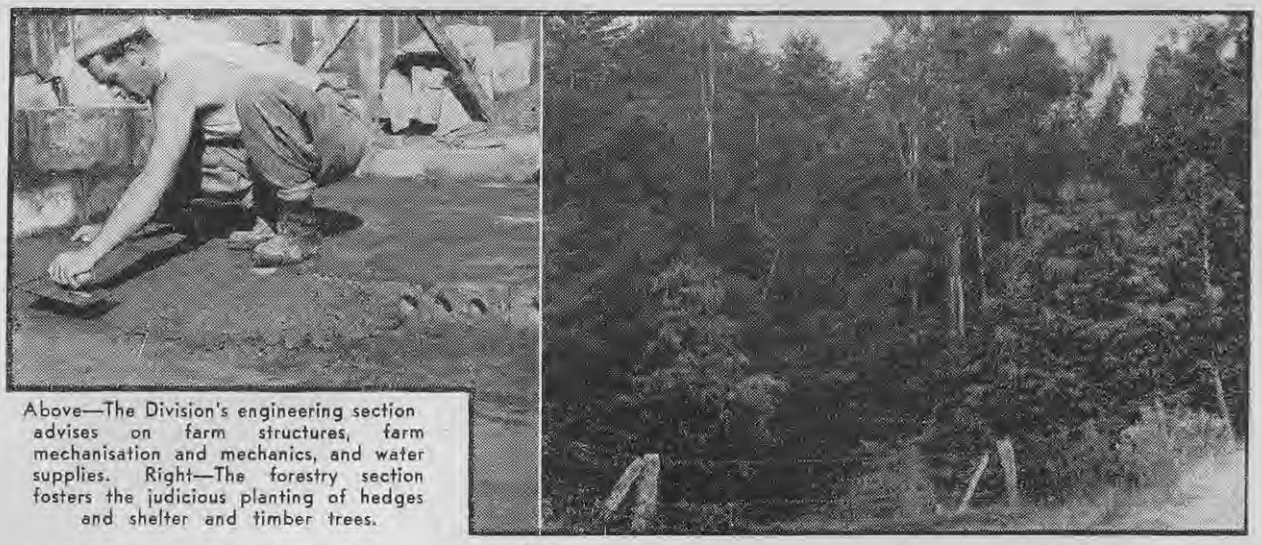
Fertiliser, lime, and minor element treatment are the most common soil management questions asked of instructors. Their advice is based on a knowledge of district soil types and farm practices, the results of field trials, and soil tests. The older the practice of topdressing is in a district the more need there is for soil tests and related trials, as with complicated fertiliser and management histories, fields now give very different responses to those occurring 10, 20, or 30 years ago.

Soil fertility problems are likely to increase as farming becomes more intensive, and instructors with their local trials and knowledge and the assistance of research stations and related facilities are likely to remain the farmer's best source of information for local problems.

The Division has recently improved its advisory service on land drainage and expects to expand it still further on the basis of charging for the detailed planning and supervision of the installation of tile and mole drainage systems. Instructors trained in drainage work are stationed in each Fields Superintendent's district. Thorough land drainage is likely to

EXTENSION SERVICES

Upper left—Topdressing. Upper right—Drainage work. Middle left—Irrigation. Lower left—Land development. Lower right—Break feeding. Main subjects in the advisory work of the instructors of the Extension Division are soil management, crop and pasture production, and farm management. It is the duty of each instructor to arrange his research and advisory work to secure the progressive development of farming in the district in which he serves. In one district marginal land improvement may be of prime importance, in another drainage or irrigation, or in a generally well farmed area the desired results may be best secured by helping to raise the general standard to that of the most progressive farmers. Photograph at lower left by "New Zealand Farmer".



Above—The Division's engineering section advises on farm structures, farm mechanisation and mechanics, and water supplies. Right—The forestry section fosters the judicious planting of hedges and shelter and timber trees.

be a very important factor in raising the productive level of very large areas of land and the Division's drainage advisory service is expected to play an increasingly important part in this work.

The Division has centred its irrigation advisory work at its Winchmore Irrigation Research Station, Ashburton, and has several instructors specially trained in irrigation available for advisory work in Canterbury and Otago. Research work on spray irrigation has been carried out at the Rukuhia Soil Research Station and district advisory work on spray irrigation installations is carried out by Machinery Instructors.

Land development and seed-bed preparation have long been important subjects in instructors' work and the Division has carried out a great deal of research work in scrub land development and hill country improvement. Instructors in all districts are available to give authoritative advice on methods and economics of land improvement.

Crop and Pasture Production

As has already been described the Division concentrates a great deal of effort through its seed certification scheme to see that supplies of high-quality seed for both annual crops and pastures are available to farmers and also carries out a wide testing programme of new strains and varieties produced by the plant breeding stations of the Department of Scientific and Industrial Research.

District instructors are available for advisory work on all phases of crop and pasture production, and research and demonstration work is carried out continuously to raise the efficiency of production, disease and weed control, and harvesting and utilisation methods.

Local instructors can call on specialist officers whenever new problems occur. Hill country pasture problems receive special attention from the agrostology section, crop production and the seed trade from the seed industry section, weed control from the weeds research section, and new problems in plant disease control are referred to Plant Diseases Division of the Department of Scientific and Industrial Research.

Advances made during the past 30 years in grassland farming in New Zealand have been due largely to the adoption of the practice of topdressing, the use of Certified seed, and improved methods of utilising pastures on ploughable land. Increased attention is now being given to hill country grassland improvement, particularly topdressing and oversowing of North Island surface-sown grasslands and the introduction and trial of species for the improvement of South Island tussock grasslands.

Farm Management

Pastoral, dairy, and mixed farm management methods follow a general district or regional pattern, but are necessarily subject to variation to suit particular farm conditions. The Division is concerned with raising the efficiency of general farm managerial methods and with the problems of the individual farmer and has done a great deal of farm management investigative work. Recently in co-operation with Federated Farmers it has organised farm improvement groups in which participating farmers work to a prearranged management plan and the group studies the results from both the physical and financial aspects. District instructors are particularly concerned with pasture utilisation and grazing methods, the relationship of crops to grass in the production of dairy produce and meat, and in mechanisation and labour organisation. The detailed work of investigating farm costs and returns in relation to general farm management and in relation to particular crops or products is carried out by farm management officers who work in close liaison with district instructors. Costing work is also undertaken in all phases of land improvement work and instructors assist the field officers of the Department of Lands and Survey in investigating applications for financial assistance under the Marginal Lands Act.

Economics

The main objectives of agricultural economic research work of the Division are first to provide farmers, through instructors, with information on the economic aspects of farm production and second to provide data for the guidance of agricultural policy. The economics section undertakes land use investigations and farm management and cost of production studies, reviews problems associated with the supply of farm requisites, and prepares general reports on primary production. The section is also responsible for the collection and preparation of material for the Food and Agriculture Organization and is closely associated with certain aspects of the work of the South Pacific Commission and the Colombo Plan.

Engineering

The Division's engineering section is mainly concerned with advisory work in farm mechanisation and a Farm Machinery Instructor is stationed in each Fields Superintendent's district to provide expert assistance to Instructors in Agriculture. The general subjects covered by the engineering section are farm mechanics, farm buildings and structures, water supplies, drainage, irrigation, farm mechanisation, and general agricultural engineering. Farmers with inquiries about such work should first get in touch with their local Instructor in Agriculture.

Farm Forestry

The Division through its instructors fosters the judicious planting of shelter hedges and trees by farmers, and to assist instructors and advise on difficult problems maintains a small farm forestry section of two specialist officers. Tree planting advice is given on selection of site and layout, fencing requirements, choice of suitable species and planting stock, spacing of trees, planting methods and procedure, and care of growing trees and hedges. Precise technical information is being collected by regional surveys on the best species to plant on different soil types and by field trials set up to investigate such problems as the exact influence of shelter belts on the production of crops and livestock, the most suitable species to use for special purposes, and the value of species for special conditions.

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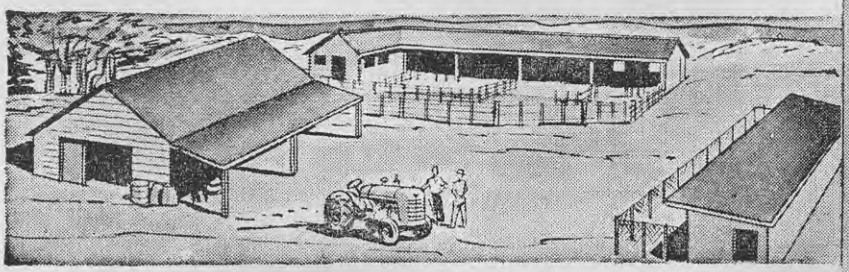

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Home Economics

An extension service for the rural housewife operates through the Rural Sociology Section. This service covers such matters as cookery, preserving, household equipment, housing, clothing, textiles, interior decorating and furnishing, and household management. The staff providing this service are stationed at Dunedin, Christchurch, Wellington, Palmerston North, and Auckland. They are graduates of the Home Science School of the University of Otago. Consulting work on the problems of individual housewives, a service provided by women trained in home science, has been steadily increasing since the service was established in 1945.

Young Farmers' Clubs

The promotion of the Young Farmers' Clubs movement in New Zealand is an important part of the work of the Extension Division. Though the New Zealand Federation of Young Farmers' Clubs is a self-governing incorporated body, appointing its own officers from among its members and controlling its own affairs, the Division is largely responsible for the actual organisation on which the movement depends. The activities of the movement are directed mainly toward agricultural education, and on that account the

Illustrations at right and below—General extension work is carried out through lectures, field days, demonstrations, radio talks, newspaper and "Journal" articles, and exhibits at A. and P. and winter shows. The Division assists the New Zealand Federation of Young Farmers' Clubs and the New Zealand Federation of Country Girls' Clubs and maintains the Flock House Farm of Instruction for the farm training of youths. Upper—A Y.F.C. stock judging event. Middle—A demonstration girls' club meeting. Below left—A show tent with the Department's exhibit. Below right—Instruction in shearing at Flock House. Photograph at middle right by Sparrow.

Green *Phormium tenax* leaf being weighed on a loading bank at Moutoa. The Division supervises the Moutoa and Makerua *Phormium* plantations, which produce about 12,000 to 15,000 tons of green leaf annually.

clubs present an excellent avenue for the extension work of the Department. Officers of the Extension Division assist by giving lectures and demonstrations and by arranging field days and other events both on a club and on a district scale; officers of other divisions also assist when called on. It is certain that more work of a very valuable nature can be done in this direction, particularly as the youth of the farming community provide the logical field for extension work. Clubs are also assisted by talks and demonstrations by research workers, practical farmers and stock breeders, business men, and others.

Club and district activities include debating, stock judging, shearing contests, and pasture, hay, silage, and crop competitions. The social and recreational side is developed, and members are encouraged through their clubs to assume community responsibility. Tours on a billeted basis are arranged from one district to another throughout the Dominion, and overseas exchanges are being developed between New Zealand and the United States of America, the United Kingdom, and the states of Australia.

The aims and objects of the Y.F.C. movement can be summed up briefly as follows: To develop interest in the well-being and advancement of farming; to promote agricultural education and instruction; and to foster the spirit of leadership and self-reliance among the youth of the farming community.

At present there are 349 clubs affiliated to the federation, with a total membership approaching 10,000. There is also a valuable honorary and advisory membership of about 1500. Of the clubs, 41 are in post-primary schools. Age limits for active membership are from 14 to 30 years.

Country Girls' Clubs

The Federation of Country Girls' Clubs, a parallel organisation to the Y.F.C., receives assistance from the Division on similar lines to that given to the Young Farmers. There are now 50 clubs, with a total membership of 1200, in the federation.

General Extension Work

General extension work is carried out through lectures, field days, demonstrations, radio talks, newspaper and "Journal" articles, and exhibits at A. and P. and winter shows. Prominent at many A. and P. showgrounds and winter shows in recent years have been the marquees housing the Department of Agriculture's show exhibits, which are maintained each year as completely separate units in the North and South Islands. They are already familiar to many show visitors from both town and country. The Department's objective is not only that the exhibits will portray the many services and advisory functions of the Department, but that they will bring together those needing the Department's advice and the divisional officers of the Department who staff the exhibits.

With so many associations and societies holding shows in the few months of the show season it is impossible to have the Department's exhibits at all shows. A schedule of appearances is worked out before each show season that will obviate retravelling of the same route and allow visiting of shows unavoidably missed in previous circuits. No particular preference is given to the larger shows, and other things being equal the Department is as ready to exhibit at a 1-day fixture in a remote area as it is at the larger shows.

It is impossible even in the generous space of the large marquees to show all the activities and services of the Department. At each show, however, there are in attendance on the various divisional sections of the exhibit district and visiting specialist officers with whom practically any aspect of the Department's work can be discussed. It is hoped that visitors to the exhibit, especially from the country, who come to see only the main features of extension work and research that can be shown in the marquee, will be encouraged to seek advice on and discuss other related aspects. Bulletins and other literature can be procured either from officers in charge of sections of the exhibit or from the publications stall in the centre of the marquee.

Each year during the off-season for shows the marquee and exhibits are used for travelling farm schools and visits are made to small country centres which are not normally served by shows or schools. In recent years most of the outlying centres in both islands have been covered by this means.

Flock House Farm of Instruction

Flock House Farm of Instruction is organised to give youths between 15 and 18 years a 12 months' course of practical instruction in farming. The property was purchased in 1937 from the trustees of the New Zealand Sheepowners' Acknowledgment of Debt to British Seamen Fund and the Extension Division is responsible for its management.

Flock House is 9 miles from Bulls in Rangitikei County on the west coast of the North Island. The property is used primarily for training youths who desire to make farming their career and is farmed on commercial lines with emphasis on correct training in sound farm practices. The farm maintains a milking herd of 80 Jersey cows, a flock of 2500 Romney ewes, and a beef herd of 100 Aberdeen Angus cows.

The farm is under the control of the Superintendent, who is assisted by qualified instructors. When off duty trainees are under the supervision of a competent officer and the domestic arrangements are controlled by the matron, who also takes care of the trainees' health.

Phormium tenax Plantations

The Moutoa and Makerua *Phormium tenax* areas have been controlled by the Extension Division since March 1949. The Moutoa Plantation is in Manawatu County and is approximately 9 miles from Foxton on the Foxton-Shannon road. It consists of approximately 4300 acres, of which 2000 acres has been developed and planted in *Phormium tenax*; approximately 1500 acres are in an undeveloped state, and on this area patches of native *Phormium* are growing. Some 400 acres were planted during 1953-54 and further areas have been cleared and grassed in preparation for more planting. The development programme is designed to develop and plant 300 to 400 acres each year.

The Makerua area is in Horowhenua County and is just off the main road approximately 12 miles north of Shannon. It is 420 acres in extent, of which some 300 acres have been planted in *Phormium*; about 100 acres are undeveloped with some native *Phormium* growing, and 20 acres are in the initial stages of development before planting.

The green leaf is cut on a 4-yearly cycle and approximately 12,000 to 15,000 tons is taken off these two properties annually and supplied to New Zealand Woolpacks and Textiles Ltd.'s factory at Foxton.

The Instructor and the Farmer

The first duty of an instructor of the Extension Division is to raise the standard of farming in the district in which he serves. He has behind him the organised research and specialist services not only of the Extension Division but of other Divisions of the Department of Agriculture and of other Departments of State. His sphere of work is linked with that of other workers so that he may give farmers answers to their own particular farm problems. In recent years advances in the science and practice of farming have necessitated sectional specialist approach to most problems of soil fertility, crop and pasture production, and animal and farm management, but local interpretation is the sphere of the local instructor. Farmers with problems should bring them before their local instructor.

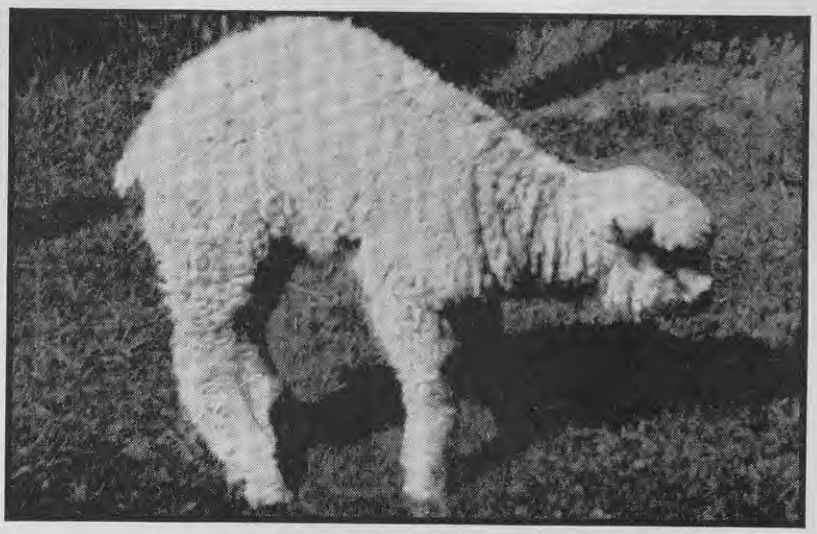
White Muscle Disease of Lambs and Hoggets

WHITE muscle disease is a condition which affects lambs (stiff lamb disease), hoggets, and calves, and which is characterised by a stiff gait and occasionally sudden death in animals in which the heart muscle is affected. Though there is no record of the disease in calves in New Zealand, this is the only country in which it has been recorded in hoggets; no cases have yet been reported in the North Island. In this article D. C. Dodd, Veterinary Research Officer, Department of Agriculture Animal Research Station, Wallaceville, describes the symptoms and causes of the disease and treatment and prevention methods.

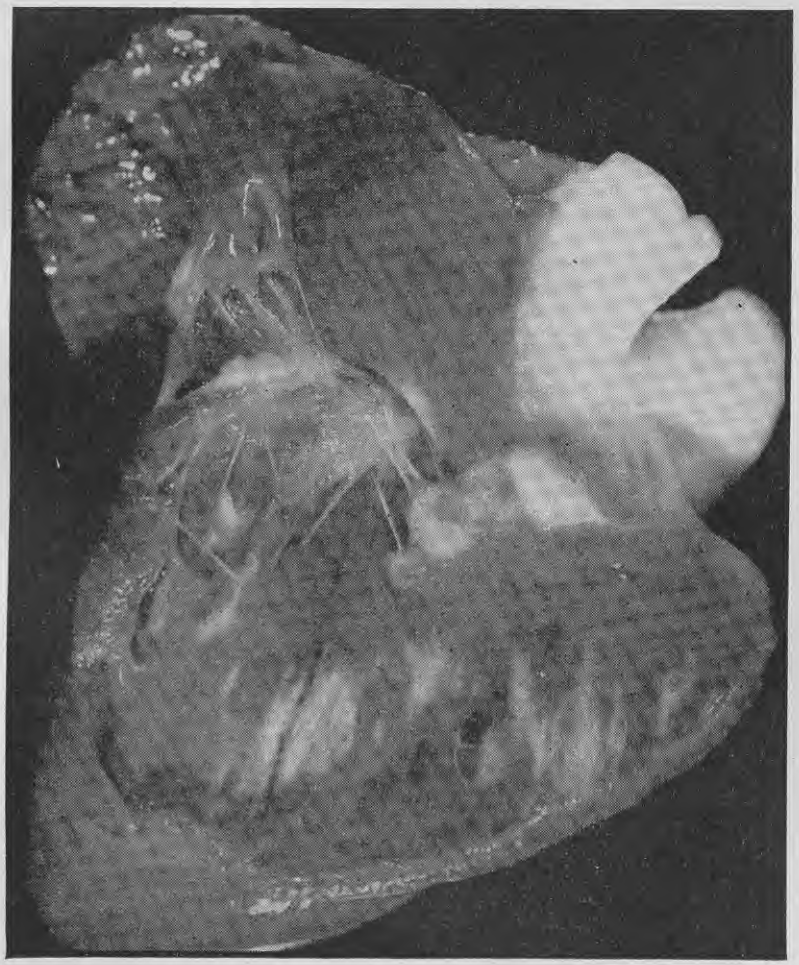
WHITE muscle disease has been recorded in the South Island since 1950, but it came into prominence because of its wide distribution and increased incidence during the latter part of 1953.

Conditions of Occurrence

In both lambs and hoggets increased muscular activity is usually necessary before the clinical signs of the disease are evident, but it is by no means always essential. Muscular activity is thus only a precipitating factor which causes muscles already damaged to show outward signs of the changes which have taken place in them. This increased muscular activity occurs in hoggets when they are driven to pasture after wintering on turnips and in lambs when they are driven or rounded up for marking; thus most cases occur in lambs at 3 weeks of age. The disease has occurred in lambs in the Nelson and Canterbury districts and in hoggets in South Canterbury, Otago, and Southland. The incidence in any one flock can be up to 10 per cent. or higher on occasions.



Typical posture of a lamb with stiff lamb disease.



Heart of a lamb, showing the white patches where the muscle fibres have degenerated.

There seems little doubt that the cause of white muscle disease is a deficiency of vitamin E (a-tocopherol), either absolute or induced by one or more anti-vitamin E factors. Experimental work will have to be done to prove that this is true in New Zealand, but both the clinical and post-mortem findings are identical with those found in England and the United States and in artificially induced vitamin E deficiency in lambs.

Clinical Signs

Clinical signs of the disease are as follows:—

In lambs the age incidence is from the first week to at least 12 weeks after birth, with the majority of cases occurring at about 3 weeks. Obviously affected lambs have a stiff, stilted gait and arched back and tend to walk on the front of the hooves (see illustration on this page). They are disinclined to move about and spend much time lying down. All degrees of severity occur, so that in mild cases the lamb differs only slightly from normal, whereas severely affected lambs are unable to rise and if not attended to, invariably die from either starvation or pneumonia. Sudden deaths may occur in apparently normal lambs,

but in these the heart muscle is affected. Muscular stiffness may be very difficult to detect in mild cases, though often they do not do as well as the unaffected lambs in the flock. Wasting of the muscles, especially of the limbs, is prominent in lambs in which the muscle changes are progressive.

In hoggets the clinical signs are essentially the same as for lambs, but a number of affected hoggets may pass red-brown urine. This coloration of the urine is probably a direct result of muscle damage.

One may confuse white muscle disease with a number of the common diseases of lambs, but it is most likely to be confused with arthritis or tetanus. Arthritis differs in that affected lambs walk with a limp and and it may be possible to detect swollen joints. Mild cases of tetanus may appear to be similar to white muscle disease because of the general stiffness of the body, but the typical spasms of tetanus, in which the limbs are held rigidly outstretched and the head thrown back, should serve to differentiate them. When older lambs in good condition are found dead it is likely that they will be regarded as cases of pulpy kidney, unless a careful examination of the body muscles and heart is made.

Post-mortem Findings

When a post-mortem examination is made by simply opening the carcass along the midline indications of white muscle disease may be and often have been overlooked. All the muscles of the body, but particularly those of the hind limbs and back, should be incised and the heart examined externally and internally. The muscle changes take the form of either yellow-white streaks in the muscle or a generalised paleness similar to the appearance of fish flesh. The muscle changes are usually equal on both sides of the body. If the heart is affected, similar changes will be found (see the lower illustration on the previous page).

Treatment and Prevention

No work has yet been done in New Zealand on treatment and prevention of the disease, but it has been shown overseas that vitamin E both prevented and cured naturally occurring stiff lamb disease. The disease was prevented in lambs by dosing them soon after birth with vitamin E. Even though severely affected lambs were cured, treatment was not considered satisfactory, since they failed to thrive. It may yet prove to be economical to treat mildly affected lambs and hoggets, but this will depend on the results of treatment trials. No work has yet been done on the prevention of the disease in hoggets.

The dose rate and period of treatment of lambs or hoggets depend on the severity of the case. Based on results reported from overseas and the small numbers of animals treated in New Zealand, the suggested dose rates are as follows:—

Lambs, 100 to 500 mg. a-tocopherol.

Hoggets, 500 to 1000 mg. a-tocopherol.

One treatment may be sufficient in early cases, whereas it is necessary to continue daily dosing for 4 or 5 days or longer in advanced cases. However, since the economics of sheep raising make doubtful the value of treating the worst cases, it may be more profitable to carry out preventive dosing of the unaffected animals in a flock when there is evidence that a large number may be affected. For such preventive dosing 50 to 100 mg. is recommended for lambs and 200 to 300 mg. for hoggets.

Since driving is an important factor, the incidence can be lowered by not driving lambs and hoggets at the critical period; if driving the flock is essential, it should be done very quietly and in easy stages.

Summary

White muscle disease of lambs and hoggets is a comparatively new disease in New Zealand and farmers and veterinary surgeons should be on the alert for its appearance. It is recommended that if a farmer suspects that this condition is present in his flock, he should consult a veterinary surgeon to confirm the diagnosis and advise treatment and preventive measures.

The disease occurs in young lambs from birth onward and in hoggets while wintering on turnips or within 24 hours of being driven off. Increased muscular activity can precipitate an outbreak with heavy losses.

A deficiency of vitamin E is considered to be the cause and treatment of mild cases with this vitamin is recommended.

Measures suggested for prevention include taking particular care to drive lambs or hoggets as little as possible at the critical times and dosing unaffected animals with vitamin E.

Experimental work on prevention and treatment of the disease is now in progress and it is hoped that more precise recommendations regarding these aspects will be possible as a result of this work.

Show Dates

THE following are dates and venues of A. and P. shows from November to the end of January:—

NORTH ISLAND

November

*4, 5, and 6 November—Manawatu and West Coast A. and P. at Palmerston North (Royal Show).

6 November—Tokoroa A. and P. at Tokoroa.

12 and 13 November—Wanganui A. and P. at Wanganui.

*12 and 13 November—Whangarei A. and P. at Whangarei.

13 November—Clevedon A. and P. at Clevedon.

*17 November—Thames Valley A., P., and H. at Te Aroha.

19 and 20 November—Egmont A. and P. at Hawera.

20 November—Bay of Islands P. and I. at Waimate North.

20 November—Waihi A. and P. at Waihi.

*25, 26, and 27 November—Auckland A. and P. at Auckland.

26 and 27 November—Stratford A. and P. at Stratford.

27 November—Kaikohe A., P., and H. at Kaikohe.

December

4 December—Helensville A. and P. at Helensville.

*4 December—Hauraki A. and P. at Paeroa.

January

*7 and 8 January—Rotorua A. and P. at Rotorua.

14 and 15 January—Wairoa County A. and P. at Wairoa.

*15 January—Marton District A. and P. at Marton.

*22 January—Central Hawkes Bay A. and P. at Waipukurau.

*25 and 26 January—Feilding I., A., and P. at Feilding.

28 and 29 January—Horowhenua A. and P. at Levin.

29 January—North Kaipara A. and P. at Paparoa.

SOUTH ISLAND

November

*1 November—Ashburton A. and P. at Ashburton.

*10, 11, and 12 November—Canterbury A. and P. at Christchurch.

17 November—North Otago A. and P. at Oamaru.

19 and 20 November—Nelson A. and P. at Richmond.

20 November—Courtenay A. and P. at Kirwee.

*20 November—Waimate A. and P. at Waimate.

20 November—Taieri A. and P. at Outram.

27 November—Motueka A. and P. at Motueka.

*27 November—South Otago A. and P. at Balclutha.

27 November—West Otago A. and P. at Kelso.

December

4 December—Tokomairiro A. and P. at Milton.

*7 and 8 December—Gore A. and P. at Gore.

11 December—Wyndham A. and P. at Wyndham.

11 December—Otago Peninsula A. and P. at Portobello.

14 and 15 December—Southland A. and P. at Invercargill.

January

8 January—Blueskin A. and P. at Waitate.

15 January—Waikouaiti A. and P. at Waikouaiti.

22 January—Palmerston and Waihemo A. and P. at Palmerston.

29 January—Waiau A. and P. at Tuatapere.

* The Department of Agriculture exhibit will be staged at this show.

Wheat Growing Patterns in Canterbury and Their Effects on Yield

IN the production of a crop of wheat many operations are involved, and almost all may be done in a large number of ways with varying success. Some of the factors which may vary are the variety and grade of seed sown or the previous history of the field, and these are dependent on the will of the farmer. Others such as the date of sowing are dictated partly by the farmer's choice and partly by the outside circumstance of weather. The way these factors fall into patterns and the effects of these patterns on yield were studied in two limited areas over 5 years by officers of the Department of Agriculture, and here Jean G. Miller, Biometrician, Department of Agriculture, Wellington, describes the results of the surveys.

THE farmers in the two districts, one near Christchurch and one in Ashburton County, supplied details of all their operations on wheat throughout the period.

CHRISTCHURCH SURVEY

The survey taken near Christchurch lasted for the 5 years 1945 to 1950 and covered parts of the districts of Yaldhurst, Prebbleton, Springston, Broadfields, and Weedons, where the farms were all on similar soil types. Results from about 60 fields on 30 farms were recorded each year. The soil types are all related silt loams formed from greywacke alluvium. The farming of the district is mainly arable for the production of cereals, pulse crops, potatoes, and pasture seeds, with some fat lamb raising. Few of the farms are large and most of the wheat fields in the survey were between 6 and 25 acres.

Variety

Cross 7 was the most popular variety in all the local districts except Weedons, where Fife Tuscan and Solid Straw Tuscan were more favoured. The relative positions of the varieties were stable by the time the survey began, and no change was noted during the period. The yield of the Tuscan varieties was on the average equal to that of Cross 7.

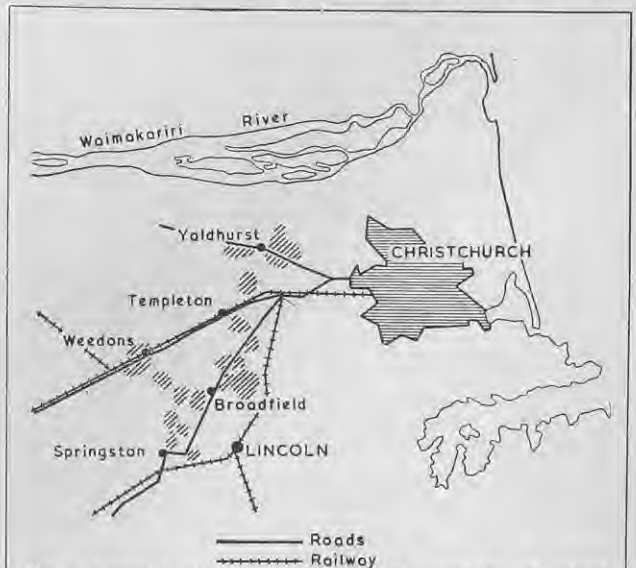
Fertiliser

Almost all crops were sown with 1cwt. or 1¼cwt. per acre of superphosphate, and wherever more or less than these standard amounts was used, no consistent effect on yield was observed.

Seeding Rates

In autumn-sown crops the seeding rates varied from 1½ to 2¾ bushels of seed per acre, but among the spring-sown crops, though some were sown at these standard rates, more were sown at 2½ or 3 bushels per acre. The lowest rate of 1½ bushels per acre was used only for crops sown in May. Thus there seems to be an over-all trend that the later the sowing is made the higher is the seeding rate used.

Variations within the standard range did not appear to affect yields, and this finding agrees with experimental results where slightly lower seeding rates have been shown to induce greater tillering, and thus give the same yield as the higher rates. This,



The diagonally shaded areas show the position of wheat growing farms in the Christchurch survey area.

HEADING PHOTOGRAPH: A Canterbury wheat crop being threshed with header harvesters. National Publicity photograph.

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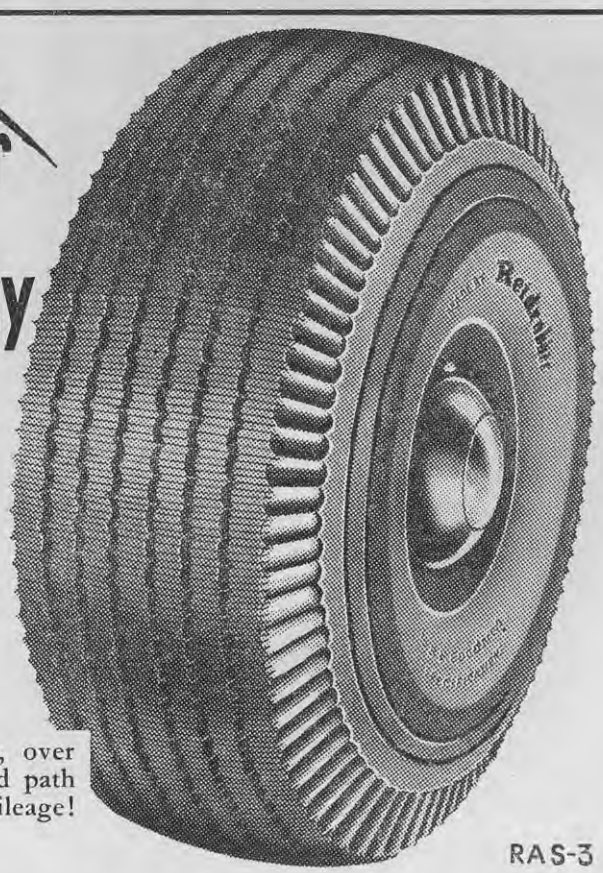

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of course, is not true for extreme variations in seeding rate.

Time of Sowing

It is known that in Canterbury most farmers now prefer to sow wheat in autumn, that is in May and June. This is not always possible, because of weather or because of the farm programme with other crops. It was hoped that the survey would give an estimate of the relative yields obtained from spring- and autumn-sown crops. Unfortunately, in all years other than 1945, only very few crops were sown after the end of July; none at all was sown in 1948 and 1949, so no yield comparison could be obtained. The results for 1945 when the percentage of spring-sown crops was higher cannot be relied on, since the number of crops in 1 year alone is not sufficient to give an accurate estimate of the true difference.

Crop Rotations

At least 9 different rotation patterns were followed in this area and no one in particular was outstandingly popular. In the earlier years of the survey immediately after the war there was an even wider range of rotations, but the patterns gradually became more stabilised at the 9 standard ones. Wheat was sown immediately after grass in 8 per cent. of the fields, and was sown after grass but with an intermediate crop in 25 per cent. of the fields. The remaining two-thirds of all fields had been in crops for at least 2 years before the wheat crop. This shows that either a wheat crop is being taken fairly late in the rotation from grass to grass or that many farms are practising almost pure cropping with very

Wheat being drilled. In the Christchurch survey area seeding rates varied from 1½ to 2¼ bushels per acre for autumn-sown crops and generally were 2½ or 3 bushels per acre for spring-sown crops. In the Ashburton survey area the standard rate was 1½ to 2 bushels per acre.

A crop of Solid Straw Tuscan. This variety and Fife Tuscan were favoured in the Weedons district of the Christchurch survey area, but elsewhere in the area Cross 7 was the most popular.

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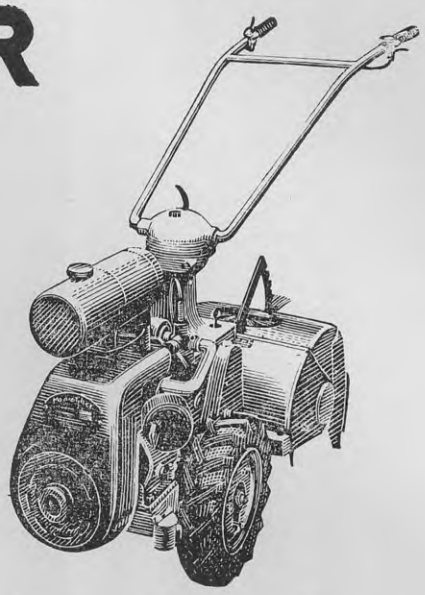

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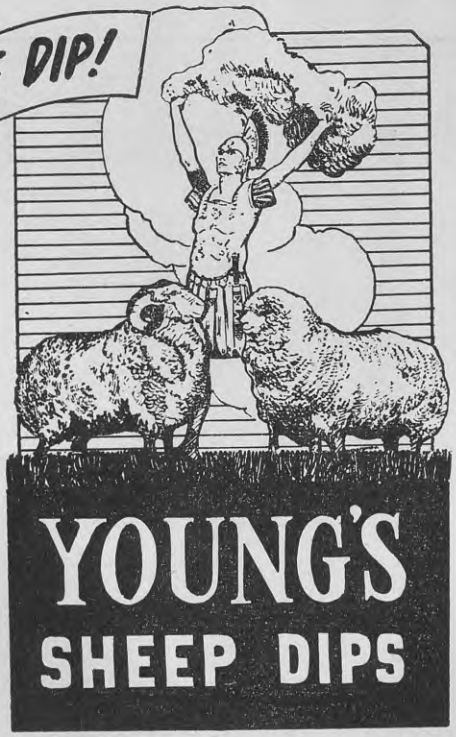

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[*V. C. Browne*

The Ashburton survey area included parts of the localities of Methven, Lyndhurst, Lauriston, Winchmore, and Rakaia. This view southward from Methven includes some of the farms in the survey.

little grass farming. However, apart from the settling down to one of the standard types, the main trend in rotations during the period of the survey has been a tendency for an increase in the number of crops sown in the first or second year after grass. The principal rotation patterns and the percentage of fields in each were:—

Rotation	Fields in the rotation as a percentage of all fields in survey
1. Grass, grass, wheat	9
2. Grass, potatoes, wheat	14
3. Grass, other crop, wheat	15
4. Any crop, cereal crop, wheat ..	12
5. Cereal crop, peas, wheat ..	7
6. Any crop, potatoes, wheat ..	14
7. Any crop not a cereal, peas, wheat	10
8. Fallow in either year, wheat ..	9
9. Any crop, fed-off crop, wheat ..	9

The "other crop" in rotation 3 was mostly peas, sometimes rape, and occasionally chou moellier or linseed. The above rotations do not account for quite all the crops surveyed, but little useful information can be obtained from study of the odd crops.

The wide variety of rotation patterns probably arises because the area is very near the marketing centre of Christchurch and farmers may frequently alter rotation plans to take advantage of special market conditions.

The effect on yield of rotation pattern was not obtained very accurately, because with the large number of patterns there were not very many crops in each one and allowances had to be made for variations in other factors such as variety. However, it could clearly be seen that when wheat was grown as the second crop after grass the yield, compared with that from wheat in fields which had been cropped for 2 years, was higher by 2.6 bushels per acre. The best yields were obtained from wheat after grass, and the poorest from wheat after another cereal crop, the difference between these two extremes being 7.4 bushels per acre. Though these differences do not seem large, they are the **average** differences for all crops in the rotation and include some very good and some very poor crops. Other differences in yield between rotations were smaller. These main results, comparing rotation 1 with 4, and rotations 2 and 3 with all others except 1, may be set out thus:—

Rotation	Difference from general average yield Bushels per acre
General average yield	41.6
1. Grass, grass, wheat	+3.3
4. Any crop, cereal crop, wheat ..	—4.1
2 and 3. Grass, any crop, wheat ..	+1.5
All others except 1. Any crop, any crop, wheat	—1.1

Cross 7 wheat was the dominant variety on the surveyed farms.

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9.4C

Cultivation Patterns

On the important factor of cultivation patterns the survey failed to give a clear picture. No standard systems of cultivation seemed to be practised, and this is not surprising in view of the variety of rotation patterns. Because cultivation was so related to other factors and was so diverse, a survey of this size was not large enough to measure accurately the yield effects of different cultivations as a single factor. A general comparison between fields which had been ploughed out of grass then fallowed for at least 6 months and fields where the fallow and cultivation period was shorter than 6 months showed no yield differences.

Yearly Differences

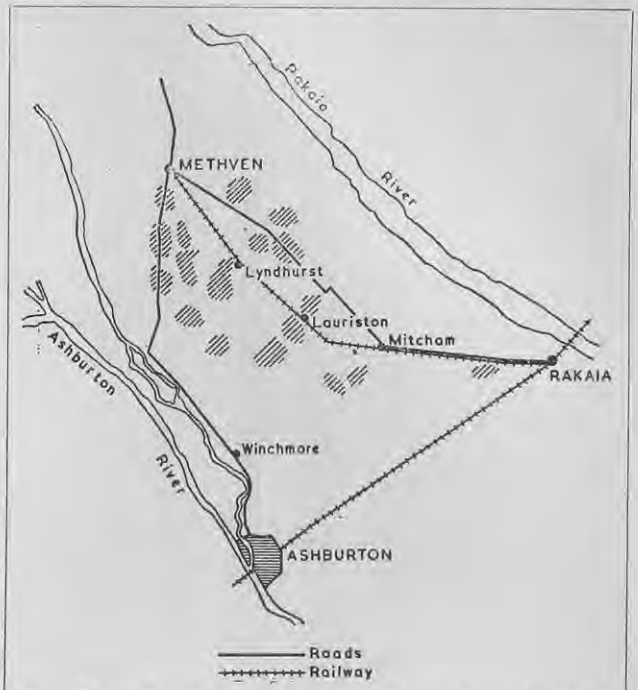
The average yield in the survey was 41.6 bushels per acre with a variation of 11 bushels per acre between the lowest yield of 35.8 bushels in 1945-46 and the highest yield of 46.6 in 1947-48.

ASHBURTON SURVEY

The area covered by the Ashburton survey included parts of the localities of Methven, Lyndhurst, Lauriston, Winchmore, and Rakaia, and contained about 120 fields on 64 farms for each year from 1947 to 1952, except in the last year, when the numbers were somewhat reduced.

The production of cereals and pasture seed crops and sheep farming for the production of fat lambs form the farming pattern for the area, with considerable local variations. With restricted pasture growth in summer because of a low effective rainfall and again in winter because of cold conditions supplementary feed crops are necessary and considerable areas of rape, root crops, lupins, and oats are grown. Of the Canterbury acreage of wheat, oats, barley, and pasture seeds, Ashburton County grows about a third, with about the same fraction of the area of supplementary fodder crops. This survey did not, of course, cover the whole of Ashburton County, but it applied to what is thus a most important cropping district.

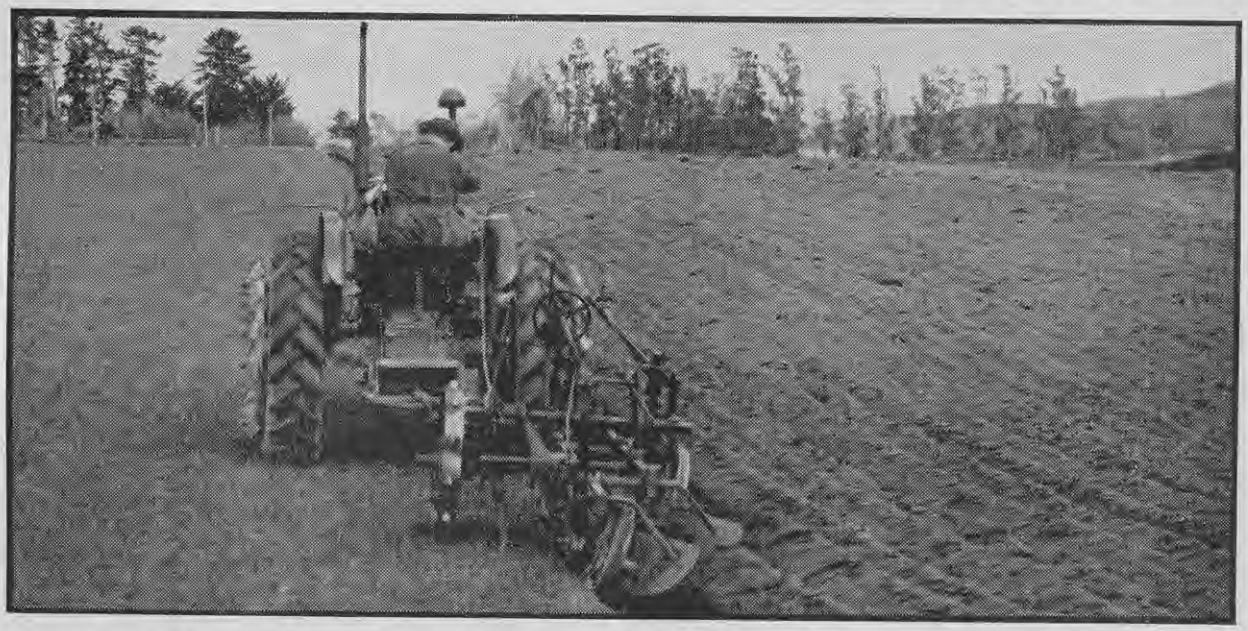
The soils are all silt loams or shallow silt loams of what are now known as the Lyndhurst, Lismore, Hatfield, and Mayfield series. The more droughty soils are found around Lauriston, where cereal cropping is not important in farming. Revenue from sheep forms the greater part of the total farm income. The soils of the Methven, Mitcham, and Lyndhurst districts are more moisture retentive and cereal cropping is more important in the farm management practices. Yields of all kinds of crops are higher on the heavier soils along the south bank of the Rakaia River and along the north bank of the Ashburton River, and on these heavier soils cereal cropping and sheep farming for production of fat lambs are equally the important features. On these soils some of the highest cereal yields in Canterbury have been obtained.



The diagonally shaded areas show the position of wheat growing farms in the Ashburton survey area.

Variety

In this survey the dominant variety was again Cross 7, which was grown in 77 per cent. of the fields; but on the lighter soils of the Lauriston district Fife Tuscan and Solid Straw Tuscan were more favoured than on the other soils, particularly in the earlier years of the survey. However,



Pasture being ploughed as a first step toward a wheat crop. Of all the wheat grown in the Ashburton survey area 37 per cent. was sown as the first crop after grass.

between 1947 and 1952 Tuscan was almost completely replaced by Cross 7 on the lightest of all soils in the survey (Lismore shallow silt loam). When allowance was made for the fact that Tuscan was grown more on the lighter soils the yield of Cross 7 was shown to be 2.5 bushels per acre greater than that of Tuscan.

Time of Sowing

Two-thirds of all crops were sown in May. In no year other than 1947 was more than 13 per cent. of the crops sown in spring; that is, after the end of July. Small differences in sowing date showed no effect on yield, but a comparison between the 64 spring-sown crops against the 400 autumn-sown crops showed that there was a yield difference of 9 bushels per acre in favour of autumn sowing.

Rates of Seeding

The standard rate for most crops in the survey was 1½ to 2 bushels of seed per acre and very few crops were sown at other rates. The higher rate of 2 bushels per acre was used more on the heavier soils which are found at Methven and along the banks of the rivers.

Soil Type

As was to be expected soil type played an important part in causing differences in yield, and these differences were larger than those caused by any other factor. The exact classification of some of the fields and soil types in the survey has been changed since the survey was begun, but the modern names of the soil types used here are approximately correct for the fields. The following table shows the average yields for each soil type.

	Bushels per acre
Lyndhurst silt loam	37.0
Lismore shallow silt loam	29.0
Mayfield silt loam	43.8
Hatfield silt loam	38.0
Mayfield silt loam (on clay loam) ..	39.9
Mayfield silt loam (on clay loam) (heavier)	34.5

The Lismore shallow silt loam, which is rightly regarded as one of the lightest of Canterbury wheat soils, has thus given an average yield which is almost 15 bushels per acre less than that from the Mayfield silt loam. These two types are good representatives of the range from light to good wheat lands of Mid-Canterbury. Variations in the subsoil, sometimes bringing drainage problems, can modify the yield from a soil type, as can be seen from the last two entries in the table, these being variants of the Mayfield silt loam.

Crop Rotations

In the Ashburton survey standard patterns of crop rotations were much more apparent than in the Christchurch survey, and most crops conformed to one of 7 patterns. Of all the wheat crops in the survey 37 per cent. were sown as the first crop after grass and 24 per cent. in the rotation "grass, fed-off crop, wheat". There was no marked trend in the relative popularity of different rotations during the period of the survey. Best yields were obtained after peas irrespective of whether the field had been in crop or pasture 2 years before the wheat crop. Poorest yields were obtained after a cereal crop, particularly when the field had been in another crop, rather than grass, before that. Yields after grass and fed-off crops were rather below average. This is in contrast to the results from the Christchurch area, where the best yields were obtained after grass. The average yields for each of the rotations with the percentage of crops in each are shown in the next table.

Rotation	Average yield bushels per acre	Percentage of crops
1. Grass, grass, wheat ..	35.9	37
2. Grass or fed-off crop, cereal, wheat	36.6	12
3. Grass, peas, wheat ..	42.5	10
4. Grass, fed-off crop, wheat	38.2	24
5. Fed-off crop, fed-off crop, wheat	36.1	7
6. Any crop, peas, wheat	42.1	5
7. Any crop, cereal, wheat	33.8	5
General average ..	37.7	

Summary

In the Ashburton survey the relative effects of the various factors on yield may be summarised thus:—

	Difference bushels per acre
Effect of variety	Very little
Autumn v. spring sowing	9
Rotational history (best v. poorest)	9
Soil type (heaviest v. lightest) ..	15

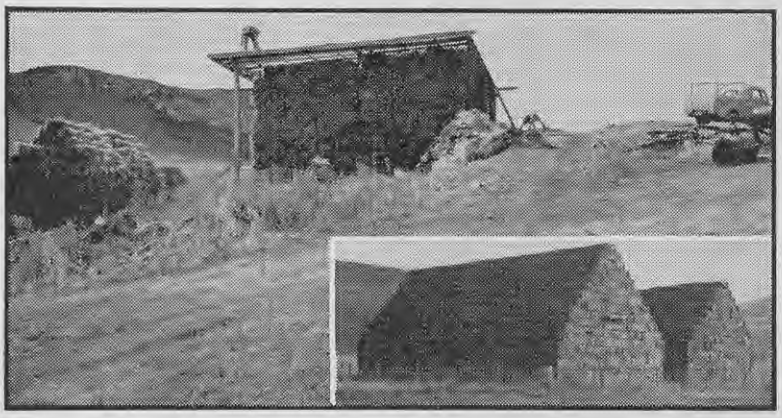
The soil type cannot unfortunately be altered by a farmer, but the results for the other factors indicate ways in which yield can be increased and the amount of increase to be expected on the average.

Because the results from the two districts do not agree, particularly in respect to previous history, it would be unwise to draw from these results for two limited areas general conclusions for all the wheat growing soils in the South Island or even in Canterbury.

Acknowledgment

Thanks are expressed to the farmers who willingly co-operated in these surveys.

Dutch Barn Essential to Good Hay Storage



THE conservation of hay is an important feature in North Otago farming. Much of it is potentially high-quality lucerne hay. The area in lucerne has doubled in the last 2 years, and improved methods of haymaking notably with rollers, have been introduced. This high-quality fodder is a reserve which can be and is being used at all times of the year. Many farmers rely on it for the bulk of their winter feed, it is valuable for summer and autumn droughts, and it is being increasingly used as a supplement to the lush spring growth with which sheep have difficulty in coping. Hay these days is not a particularly cheap item and it is obvious that a great deal is lost after the expense of cutting and baling has been incurred.

For the proper storage of hay Dutch barns are essential, but not enough of these are in use. Baled hay can be carefully and well stacked, as shown in the inset illustration, but for complete and adequate protection a Dutch barn is preferable. The partially completed barn shown in the illustration above utilises a natural hummock in limestone country at Enfield, North Otago, to give low access and cheaper construction. Thus the back and floor are permanent, solid, and weatherproof, but the back of the barn is so situated that there is no source of seepage into it. Similarly at the front the hummock slopes both to the front and sides, thus giving well-drained access to the front and lower tiers of bales. This barn is excellently sited to utilise gravity for loading in and out and there are possibly many similar sites.

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Milking Goats

By A. G. BRASH, Veterinarian, Christchurch, and C. P. HARRIS, Farm Dairy Instructor, Wellington, both of the Department of Agriculture

FEW people realise the extent to which the milking goat has been developed. In relation to her size she produces a greater quantity of human food than any other domestic animal; a good milking goat is quite capable of producing her own weight of milk in less than a fortnight.

VARIOUS aspects of keeping milking goats will be discussed in this article, the second part of which will appear in next month's "Journal".

The value of goat's milk, especially for the feeding of infants and children where there has been an unfavourable reaction to cow's milk, has been proved beyond doubt.

This, together with the ease with which goats can be kept and their comparative freedom from disease, accounts for most of their popularity. The demand for goat's milk has brought about the development of some commercial herds, but these are still too few to produce the amount required. Further development may make desirable the inclusion of goat's milk under the Dairy (Milk Supply) Regulation 1939 of the Dairy Industry Act. This will insure that the milk is produced and handled under the same standards of hygiene as cow's milk for town supply.

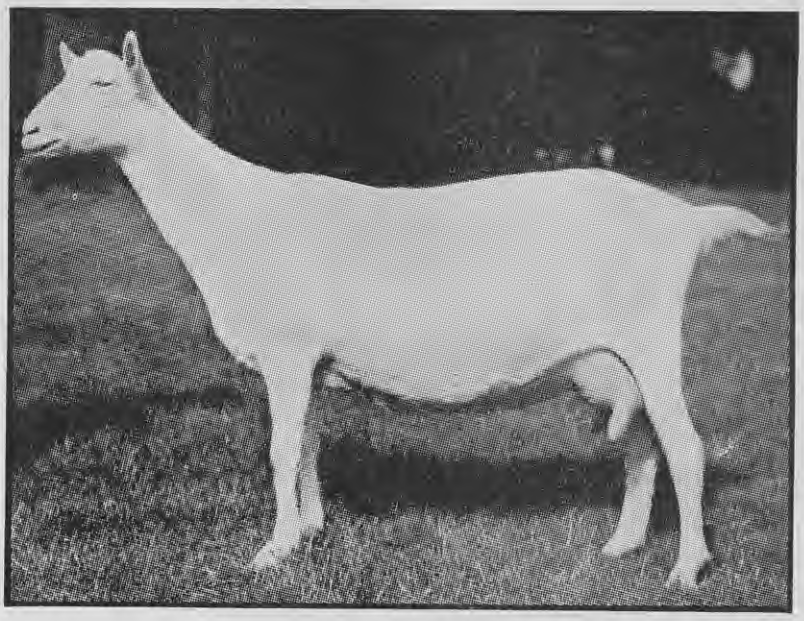
Farm Dairy Instructors can give advice on the construction of reliable goat milk dairy premises.

Breeds

There are many goats in New Zealand, but they are of mixed types and generally inferior as milkers. Of the better types those showing Saanen or Toggenburg characteristics predominate. Milk goats are usually short haired and their colour varies with the breed. As in dairy cows good breeding is important for milk production, and milk recording is essential both for pedigree and commercial producers. Saanen and Toggenburg goats — both Swiss types — have been bred especially for abundant production of a high-quality milk which is entirely free from taint. Pedigree goats of both breeds are available in New Zealand, though in short supply, and imported animals are being used by breeders to improve their stock. The Saanen is by far the more popular breed.

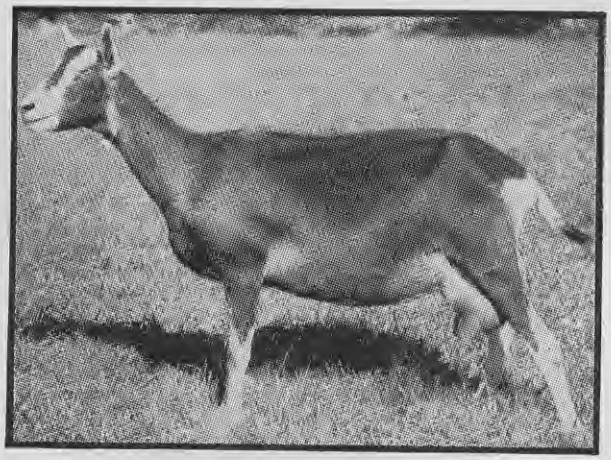
The Department of Agriculture can supply information which will assist anyone wishing to purchase milking goats of good type in New Zealand.

Saanen: The Saanen is pure white or pale biscuit coloured. It is an Alpine type with upright ears giving it an alert, deerlike appearance. The dairy conformation is especially well developed. The hair is short and fine, sometimes with a fringe of longer hair along the back and down the hindquarters. It is usually hornless, but horns are not uncommon.



[From "The British Goat Society's Year Book"
A British Saanen female goat.

Toggenburg: The Toggenburg is another Alpine type with erect ears. The colour varies from a silver fawn through all the shades of drab and brown to dark chocolate. White markings occur as bars down each side of the face from above the eyes to the muzzle, on the edges and tips of the ears, on the rump, and on or about the tail. The legs are white from the knees and hocks downward. The hair is usually short, but as in the Saanen, may be longer along the back and down the hindquarters. The breed is hornless, though a goat with horns is seen occasionally.



[From "The Modern Dairy Goat", by J. and H. Shields
A British Toggenburg female goat.

British Alpine: Goats of this breed are alert and resemble fairly closely the Saanen in general conformation. They are black or rusty black with the same white markings as the Toggenburg. The hair is short. They are usually hornless.

Anglo-Nubian:. This is an Oriental type which may be any colour with no uniform pattern. It is lop-eared. The outline of the face is convex, the forehead being especially prominent. The Nubian, which is a large goat and carries more flesh than the Swiss breeds, is also considered a hornless breed. It gives rich milk, but not in quantity. Tassels are seldom present.

Points of a Good Milking Goat

In general conformation all goats bred for milk production are similar. The breed characteristics in which they differ are mainly colour, shape of head and ears, and to some extent size and length of leg and coat. In conformation Toggenburg, Saanen, and British Alpine goats are identical.

In general appearance the doe should be alert and active with good health indicated by a soft, pliable skin and silky hair. She should be truly feminine with absence of coarseness and should possess a mild temperament. Good conformation and breed character should give an all-over appearance of quality.

The head should be carried well and possess a feminine appearance. It should be of medium length with plenty of width between the eyes, the facial line being straight or slightly dished. The absence of horns,

[*Green and Hahn*

Bucks must be securely fenced in a separate run.

whether naturally or by disbudding, is preferred, though this has no bearing on milk production. The muzzle should be full and well developed and the nostrils prominent. The adult goat has eight front teeth on the lower jaw which should meet the pad on the upper jaw. The teeth may be used as a guide to age. A kid under 1 year has eight small milk teeth; by about the fourteenth month the central pair of these will have been replaced by the large, adult teeth. Two more milk teeth are replaced during each of the third, fourth, and fifth years, so that a goat with a "full mouth" will be over 4 years old.

The neck should be long and slim, of good depth, and connect evenly with the withers and shoulders. Whether tassels are present is of no consequence.

To have milk-producing qualities a doe must have a well-developed body. She should be well grown and a height of at least 30in. at the withers is desirable. The so-called wedge shape of the dairy cow is clearly defined in a good milk doe. The wedge is seen both from the side view from the neck to the udder and from above from the neck and withers to the hip bones. Good depth of body and well-sprung ribs are important. Any marked dip behind the withers or shoulders or any undue thickness of the shoulders is undesirable. The back should be fairly level from the shoulders to the hips and then drop slightly to the tail.

The doe should stand well on her feet with no tendency to drop at the pastern or walk on the "heels". The legs should be clean, strong, and straight, and placed squarely under the body. The thighs need to be thin, leaving plenty of room for the udder.

The udder should be round or globular and carried well under the body, to which it should be attached over a large area. A pendulous udder or one that is "split" between the halves is not desirable. The udder must not be fleshy; just after being milked it should have a collapsed appearance and soft texture. The teats should be of moderate size and should point downward and slightly forward. They should be quite distinct from the udder; the type of udder of which it is difficult to say where the udder ends and the teats start is unsatisfactory.

The Buck

To make progress in breeding great care should be exercised in selecting the buck; good bucks like good bulls are scarce. Select a buck from a high-producing doe and a persistent milker. Nothing in breeding is more important than evidence that the entire family to which the sire belongs is especially good in performance and in conformation. Only a purebred buck should be used and once he has proved to be leaving good stock he should be used as long as possible.

The buck should be a vigorous type with strong masculine appearance and good conformation and breed character. Good depth of body is one of the most important considerations. Most breeders prefer bucks that are naturally hornless. However, hermaphrodism is associated with the hornless animal. The fact that horn growth has been prevented by disbudding should in no way detract from the value of a buck. Thinness is no objection if the buck is healthy and a good feeder. A buck is seldom in good flesh, especially during the breeding season.

Breeding

Age to breed: As a rule young does should not be bred until they are 15 to 18 months old. Thus doe kids born during spring should be bred the second autumn after birth. To obtain a milk supply during the entire year it would be necessary to breed for both autumn and spring kidding; in such cases young, well-grown does may be bred when 12 to 15 months of age. The goat if well nourished may reach sexual maturity at 4 to 5 months old. Early mating is not desirable and often results in stunted growth. Does have been known to kid when less than 9 months old.

Male kids are capable of giving service at 3 months. Young bucks may be put to service at from 6 to 10 months, but they should not be used to excess in their first season; a dozen services widely spaced is ample.

Mating: The natural breeding season is autumn. With mating extending from the end of February to the end of July kids would be born from July to December, but goats have been known to breed at any time of the year. Where goat dairies are operated breeding will be encouraged over as wide a season as possible to provide a continuity of milk supply. This, however, is one of the major difficulties of goat breeding.

There is a marked tendency for the milk yield to drop after the does have been in kid for some time. One method of maintaining a milk supply through winter is to withhold half the does from service each year; does not in kid can be milked right through. Though this involves the maintenance of virtually two herds, it may be considered worth while to keep up the milk supply throughout the year in a commercial dairy.

The gestation period for a goat is approximately 150 days, but it may extend from 140 to 156 days.

Oestrus or heat periods: Does come in heat regularly between March and August, after which only an occasional doe can be bred. The oestrus cycle is usually from 17 to 21 days, but a shorter cycle is not uncommon. Does may remain in season from 1 to 3 days, the shorter period being more common at the beginning or end of the season. It may be very difficult to detect oestrus in some does and they may then be allowed to run with the male for a time. The usual signs are restlessness, switching of the tail,

Standards for Judging Milking Goats

THE following allocation of points for the judging of a doe or buck will give some indication of the emphasis which should be placed on the various aspects of conformation:—

	Doe	Buck
General appearance, style and quality, temperament ..	16	20
Head	6	10
Neck	3	3
Forequarters	10	15
Body	13	15
Hindquarters	10	15
Legs	5	5
Udder and teats ..	30	0
Size and weight ..	5	5
Genital organs (bucks)		12
Polled (naturally) ..	2	0
	100	100

Twenty points should be deducted for horns on a buck, but it may well be considered that few, if any, points should be deducted where a buck's have been neatly disbudded.

drop in milk yield, continuous bleating, and swelling and redness of the vulva. The period of oestrus at the beginning of the breeding season may be short, sometimes only a few hours. Does coming in heat in the off season may show only one of the usual signs.

Pregnancy: The best indication that the doe is in kid is the cessation of the oestrus or heat periods, but a temporary increase in milk yield is also considered to be a sign of successful mating. During the first 3 months of pregnancy there is little alteration in the shape of the in-kid does. The head of the foetus can sometimes be felt at from 6 to 8 weeks. The appearance may be deceptive in an old goat or in a young goat that is going to have only one kid.

Milk goats are very prolific, the usual number of kids for mature goats being two, but frequently there are three, and four is not rare. The tendency to produce four kids is hereditary. It is not desirable and should be guarded against when access to breeding records is possible.

The care of the doe during pregnancy will have a big influence on the vigour of the kids at birth. Does need to be well fed, allowed plenty of exercise, and to be protected from rain and cold weather.

Parturition or kidding: At this time the doe should be segregated, preferably in a clean stall thinly bedded down with straw. A day or two before kidding a change in the shape of the doe will be noticed. The flanks become more hollow and the swollen area shifts to a lower position. At the same time the udder will begin to swell. A few hours before kidding there is a marked softening of the ligaments at the base of the tail. A white or colourless discharge may now be seen together with restlessness and swelling of the vulva. Straining now starts, followed by appearance and bursting of the water bag and birth of the first kid usually within half an hour. The usual presentation is with the head between the fore feet, but kids are sometimes born hindquarters first, and this is quite normal. Goats seldom require assistance when kidding and it is advisable to avoid interference if possible. The afterbirth, a separate one for each kid, is usually expelled within a few hours. Steps to be taken in a case of retained afterbirth will be discussed in the second portion of this article, in next month's "Journal".

The doe may now be given a drink of a pint of oatmeal gruel to which a dessertspoon of treacle or molasses has been added, followed in 2 or 3 hours with a bran mash. To prepare the mash take ½lb. of bran and 1 teaspoon of salt; over this pour ½ pint of boiling water, cover the mixture with dry bran, and then cover the whole with a lid or cloth cover. The mash is fed when cool and should be made fresh as required.

Hermaphrodism: A hermaphrodite is an animal whose genital organs have the characters of both male and female. There is a hereditary factor for this condition, which appears to be intensified by close breeding. It is also closely associated with polled or hornless animals and horned goats are not affected.

Feeding and Management

As goats are browsing, not grazing, animals, good pasture by itself is not

[*Green and Hahn*

Above—These Saanen goats are rapidly clearing gorse and broom on this property. There is a good sole of grass in the cleared areas. Below—Kids may be reared on the doe, though hand feeding is recommended.

[*Green and Hahn*

as fully appreciated as it is by the dairy cow. Roughage such as leaves and shrubs and good-quality hay is an essential item of their diet. Goats relish an immense variety of foods. They will strip the foliage off broom and gorse and eventually destroy it. Provided they are fenced in on the area, they will also clean up blackberry. They are, however, fastidious and decline to eat food that has been soiled. Hay must be fed from a rack and hedge clippings and similar material should be tied in bundles where the goat can reach them. Variation of diet is essential, as goats tend to have marked likes and dislikes which vary with individuals. Household scraps, particularly bread, vegetables, and fruit peelings, are useful additional foodstuffs often greatly appreciated.

It must not be concluded from the above remarks that the type of feed the goat obtains when browsing is sufficient for milk production.

Hand feeding with good-quality roughage such as lucerne hay and also concentrates is essential if the doe is to produce to her capacity. Good quality is very necessary in the supplementary feeds to make up for the lack of quality in those readily taken when browsing.

The daily feeding programme will depend to some extent on the weather. It is generally not advisable to allow the goats to graze wet pastures, as this tends to increase worm infestation. Concentrates are fed after the morning milking followed by as much hay as the does will eat. If conditions are suitable, they are then put out to graze or browse and a further ration of hay may be given at midday. The herd is brought in again for the evening milking and for housing at night, concentrates and hay being fed again after the evening milking.

Pasture: Good pasture is an excellent feed for goats, but hay and some concentrates should always be fed with it. Palatability can best be maintained if pasture is rotationally grazed in small units, and the electric fence is useful in this respect. Three wires are needed on an electric fence for goats. (Ordinary fences should preferably have 8 wires, and sloping wooden strainers should not be used, as goats are nimble and can use them as means of egress.) This type of management will also help reduce worm infestation.

Roughages: Does in milk should be given all the roughage, that is, hay or chaff, that they will eat. The best roughage is lucerne or clover hay or lucerne chaff. If this is not available, oaten chaff can be used. The average consumption of hay or chaff per day is about 3lb. to 4lb. This would be reduced to 2lb. if about 3lb. of silage, root crops, or leafy vegetables are available. Swedes, mangolds, and sugar beet are nearly always appreciated; carrots sometimes, but turnips seldom. Potatoes should preferably be cooked. If silage is fed, a little should be fed at first, and the amount gradually increased. Care should be taken not to introduce it too freely, as dietetic disturbance will result.

Concentrates: Roughage must be supplemented with concentrates such as crushed oats, maize, or barley or bran, pollard, oatmeal, or linseed meal.

[Green and Hahn

Goats' feet should not be allowed to become overgrown. Regular trimming will keep them in good condition.

The amount of concentrates fed will depend mainly on the milk production and the type and quantity of other feed available. Each doe should be studied if the best results are to be obtained. Where no grazing is available concentrate mixtures should be fed at the rate of 1lb. per day for every quart of milk produced. When the does are on pasture 1lb. to 2lb. of concentrates daily, depending on milk yield, would be an average ration, with hay available in whatever quantity they will eat. The feeding of concentrates is well worth the extra cost, as it will considerably increase the milk yield and also the quality of the milk.

The type of concentrates necessary will vary with the type of roughage available. With lucerne hay or lucerne chaff a mixture with comparatively low protein content may be used, but where oaten chaff is fed a comparatively high protein mixture is needed. Of the grains, oats are best, but maize is also good. A combination of grains may be used, such as 2 parts of crushed oats to 1 part of crushed maize, and bran and pollard may be mixed.

Examples of suitable concentrate mixtures (given in parts by weight) for feeding with lucerne hay or chaff are:—

1. Crushed grain (oats, maize, or barley), 1; bran or pollard, 3.

2. Crushed grain (as above), 5; linseed meal, 1.

3. Crushed grain (as above), 5; linseed meal, 1; bran or pollard, 2.

Examples of suitable mixtures (given in parts by weight) for feeding with oaten hay or oaten chaff are:—

1. Crushed grain (oats, maize, or barley), 2; linseed meal, 2.

2. Crushed grain (as above), 1; bran, 1; linseed meal, 1.

Concentrates should always be fed from clean troughs or dishes. They are usually fed dry, but mashes are welcomed if goats are used to them. Molasses is a useful adjunct to feeding, and a mash may be made with watered molasses, allowing about a tablespoon of molasses for each goat.

Water: A plentiful supply of clean water is essential at all times. Milking goats on dry rations will drink a considerable amount, especially in warm weather. Shortage of water will lead to a drop in the milk production.

Mineral lick: A lick of 2 parts of bone flour and 1 part of coarse salt in boxes protected from the weather should be available. Such a lick is especially necessary where no grazing is provided.

Tethering: Tethering of goats is not recommended, but it may be necessary where only one or two are kept and fences are not suitable. Goats need exercise and fresh feed and do better if running free. Where tethering is adopted the rope should be as long as possible, about 20ft., with a swivel where it is attached to the collar to prevent twisting. Fix the rope over the stake with a loop so that it can revolve freely. A better method is to attach the rope by a sliding ring to a wire running between two posts.

Rearing of kids: Kids may be reared on the doe or hand fed. Kids that are allowed to suckle their dams not only make good growth but require very little attention compared with those raised by hand. Where hand rearing is adopted kids may be left with the doe for the first 2 or 3 days, and this is recommended. Alternatively they are not permitted to suckle their mother and the colostrum is milked from the doe and fed to the kids through an ordinary infant's bottle. The doe should not be milked right out for the first 2 or 3 days.

The usual method of hand rearing kids is to begin with a feeding bottle and gradually teach them to drink from a pail or dish. There should not be undue haste in removing the kids from the bottle. When this stage is reached see that they do not gulp the milk down too rapidly, as this may lead to digestive troubles.

The milk should be fed warm four times a day until the kids are a month old, and then twice a day. Feeding bottles, dishes, and other utensils must be kept thoroughly clean. The amount of milk required daily by kids until they begin to graze is about 1½ to 2 pints. Though goat's milk is preferable, kids can be raised satisfactorily on whole cow's milk. The milk should be from tuberculin-tested cows.

When the kids are a month old they may be given a little calf meal in gradually increased quantities. Either of the following meals is suitable: One part by weight of crushed maize or barley and 1 part of crushed oats; 1 part by weight of crushed maize or barley, 1 part of bran, and 1 part of linseed meal.

Salt (2oz.) and bone flour (4oz.) should be added to each 25lb. of mixture.

Kids may be weaned at from 3 to 4 months, and it is advisable to dose them for worms with phenothiazine at this time. They should be allowed plenty of room for exercise in a well-grassed paddock for preference.

Disbudding: Disbudding should always be done, as it improves the appearance and the horned goat can be a nuisance. It must be carried out before the kid is a week old, from 2 to 5 days old being the best time. The horned kid is easily distinguished by the shape of the forehead and the whorls of hair surrounding the horn buds. Disbudding with either a caustic potash or caustic soda stick is carried out as follows: Clip the hair from around the two horn buds and smear petroleum jelly on the surrounding area but not on the part to be treated with caustic. Moisten the end of the caustic stick and then rub it on to each horn bud until the skin is broken, gradually widening the area until it is about the size of a penny. The bud must be well blistered for the treatment to be effective, but there should not be any bleeding. Protect the kid from rain for a few days after treatment. Disbudding can also be carried out with a special iron applied at a dull, red heat to sear a ring round the horn bud and prevent its growth by destroying the circulation.

Care of the stud buck: A buck from 12 to 18 months of age can be bred to at least 25 does. An adult buck in good condition is capable of mating 100 or more does. Stud bucks should have separate and safe yards and runs and separate housing. Does in season should be served and then removed from the buck. To run the buck with the does may be the easiest way, but for many reasons it is not desirable. Not only do the bucks overwork themselves—one service is usually sufficient—but they contaminate the does with the objectionable odour so often associated with the buck at mating season.

The buck alone is responsible for the common belief that all goats smell. He may be the culprit, directly or indirectly, in many cases of tainted milk and must not be permitted to wander or remain within 50yds. of the milking or dairy premises.

Given plenty of exercise, kept in clean surroundings, and treated kindly, bucks will be less of a problem. With ill treatment or teasing, however, they develop bad temper and can become difficult to manage. Most bucks show a tendency to go off their feed during the breeding season. Although becoming rather thin, they appear to retain their health and vigour, but no opportunity should be lost to tempt them with a variety of food.

Care of feet: Hooves require regular trimming to prevent them becoming overgrown and misshapen. Pare down the outer horny growth until it is level with the sole. A goat that has at any time been subject to laminitis will need to have the hooves trimmed more often.

Glasshouse Tomato Spacing Trials

By K. C. HOCKEY and E. BALL,
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THERE has always been difference of opinion among glasshouse tomato growers concerning the best planting distances. It is well known that the more room each plant has the greater will be the crop from it, but the commercial grower is not so much concerned with maximum individual plant yield as with maximum yield per unit of area. He wants the greatest yield per glasshouse irrespective of the area covered by each plant, and with this in mind a trial was conducted in the Massey Agricultural College tomato glasshouse to see what effect, if any, there would be with two planting densities on total yield and also, and this is a very important point, what effect there would be on dates of maturity.

It is obviously of advantage to the grower to have the smallest number of plants that will maintain maximum yield and early maturity over a given area. English experiments along these lines showed that crop yield per acre and maturity dates were only slightly affected by a very substantial reduction in the normal plant population. Trials at Massey College were conducted to give a 25 per cent. reduction in plant population, and the following information secured over one crop is of interest.

Plants are usually planted at Massey College in double rows 18in. apart, with 27in. between the double rows and 14in. between the plants in the row. This spacing gave each plant 315 sq. in., with a theoretical total of 1200 plants in a house 100ft. x 30ft. For the purpose of the trial the house was divided into four equal parts, two of these being planted at the normal distances and the other two with spacings increased from 14in. in the rows to 18in. in the rows. The other distances remained constant. At this increased planting distance each plant had 405 sq. in., with a theoretical total of 894 plants in a 100ft. x 30ft. house. This meant a reduction in number of plants of 153 during the trial, or 306 if the whole house were planted at the wider spacings. With this 25 per cent. reduction in plants it is reasonable to suppose that there was a similar reduction in labour for the individual work on plants and in their initial cost. The total number of plants in the house during this experiment was 600 at the 14in. spacing and 447 at the 18in. spacing.

Picking dates		Quantity picked 14in. spacing lb.	Quantity picked 18in. spacing lb.
October	7	27½	36
	12	38	36
	14	27	29
	19	34	40
	21	48	42½
	26	89	82½
	28	110	96
November	1	65	76
	2	102	105
	4	155	150
	5	45	51
	8	30	38
	9	65	60
	11	59	44
	15	33	52
	16	142	105
	19	139	158
	22	78	—
	23	147	224
	24	56	—
	25	185	243
	26	108	103
	30	352	395
December	1	—	137
	2	281	197
	3	115	95
	6	130	13
	7	220	372
	8	73	66
	9	254	269
	10	31	100
	16	203	223
	21	152	138
	29	47	58
January	5	130	126
	10	42	57
	Totals	3,812½	4,017

The harvesting records are given at left, the stage of picking in all cases being fully red.

From early January onward individual recordings were discontinued, a total of 246lb. being harvested after this date and before the plants were removed. The total fruit harvested was therefore 8075½lb.

It will be seen from these figures that the total crop was slightly in favour of the wider spacing and that the quantity picked at any given date during the early part of the season from either spacing was reasonably uniform. The increase in yield with the wider spacings occurred toward the end of the crop.

If the yield is expressed in terms of lb. per sq. yd. (a significant means of expressing crop yield) it is 23.8lb. at the narrow spacing and 25.1lb. at the wider spacing. These figures include the 246lb. not recorded separately, half having been assumed to be from each spacing.

It is hoped to determine in future whether further decreases in plant population would be advantageous.

Control of Swarming in Honey Bees

Seasonal Notes for the Domestic Beekeeper

BY the middle of spring most normal, healthy colonies of bees will have greatly increased in strength and the impulse to swarm will be becoming manifest. Swarming is the natural method of propagation of honey bee colonies as distinct from the reproduction of the individual, and though much time and study has been devoted to this phenomenon, an efficient, absolute method of control has yet to be devised. In this article D. Roberts, Apiary Instructor, Department of Agriculture, Auckland, describes some methods which will assist to keep swarming to a minimum.

A well laid out domestic apiary. [*Rendell's*

IN earlier times beekeepers gauged the success or otherwise of their efforts by the number of swarms their colonies produced in a season. The more swarms there were the happier the beekeeper was. Today successful beekeepers recognise that the casting of a swarm before or during a honey flow very seriously affects a colony's production of honey and they direct their hive management to control swarming as far as is possible without undue disturbance of colony routine.

By the middle of this month all colonies should have been thoroughly checked over for brood disease and the condition and vigour of the queen.

Factors to Control Swarming

Healthy colonies with vigorous queens will now have up to 10 or more frames of brood and very heavy inroads will have been made on their stores of honey and pollen. As long as sufficient food is available brood rearing will continue. At this time it will be found that the bees are also rearing quantities of drones. This is an indication that they are preparing to give way to the natural impulse to propagate the species and at this point swarm control must be started if it is to be at all effective. The main factors in swarm control are:—

1. The provision of young, vigorous queens of good strain.

2. Good brood combs which must be free of drone comb.

3. Ample room for expansion and storage of honey and pollen.

4. Good ventilation.

Observation of these points and a few simple manipulations will tend to reduce swarming in most colonies and ensure a satisfactory honey crop.

Introducing a New Queen

Colonies with an old queen whose egg-laying ability is declining will tend to swarm much more readily than those having young queens at the peak of their egg production.

At this period of colony build up the egg-laying powers of a queen are taxed to the utmost, and because older queens are unable to meet requirements, the bees quickly become eager to replace them and begin to raise queen cells. Introduction of a young laying queen at this time will stimulate colony morale and assist greatly toward attainment of that strong force of bees so necessary for the collection of nectar when the main honey flow begins.

Introduction of a new queen should, of course, always be preceded by the removal of the old queen. This should be accomplished with as little disturbance as possible and the new queen should not be introduced until the colony has quietened down some hours later. Acceptance of the new queen will be more likely if there is some nectar being gathered at the time. If there is a dearth of nectar at the time of introduction, artificial feeding will help to ensure acceptance.

Queens supplied by commercial breeders will usually be forwarded in cages suitable for introduction and accompanied by printed instructions. The introduction of a new young queen will not be of much value if the brood combs of the hive are old, distorted, and full of drone comb. For the best results brood combs should be well constructed and consist of all worker cells built right out to the top and bottom bars and the ends. Brood combs should be carefully examined each spring and any with more than a few drone cells culled out.

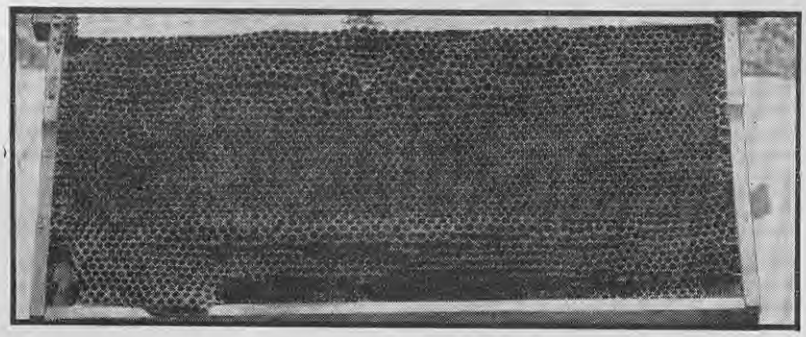
Ample Worker Comb Essential

The provision of an ample amount of good worker brood comb to allow unrestricted laying space for the queen is essential to swarm control. If a new queen is introduced to a colony where sufficient worker brood space is unavailable because of damaged, faulty combs with excessive amount of drone cells, the whole advantage of the introduction will be lost and the colony will very likely swarm. The work of culling and replacing faulty, worn-out combs is amply repaid by better swarm control, ease of manipulation, and improved honey crops.

With the rapid expansion of the colony much more room for brood rearing and honey and pollen storage will be required. Colonies that have been wintered in a single box should now be given a second super of drawn combs. If the single box is packed with brood and bees, it will most likely be found that the side combs are full of honey and pollen. These should be lifted into the second box, where they can be again placed to the sides and their position in the brood chamber filled by good empty drawn combs.

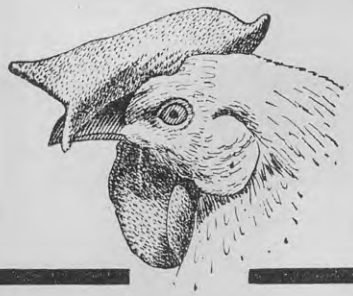
Congestion Must be Avoided

Bees will not tolerate congestion of the brood nest, as this throws the colony population out of balance and queen cells are soon started in preparation for swarming. The brood nest should be kept as free as possible from any condition which will lead to congestion. Ample comb space is essen-



[*Green and Hahn*

A brood comb which should be culled. Note the amount of undesirable drone cells.



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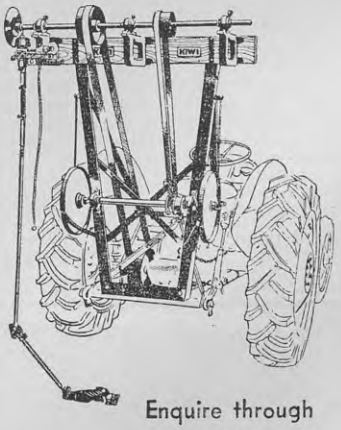

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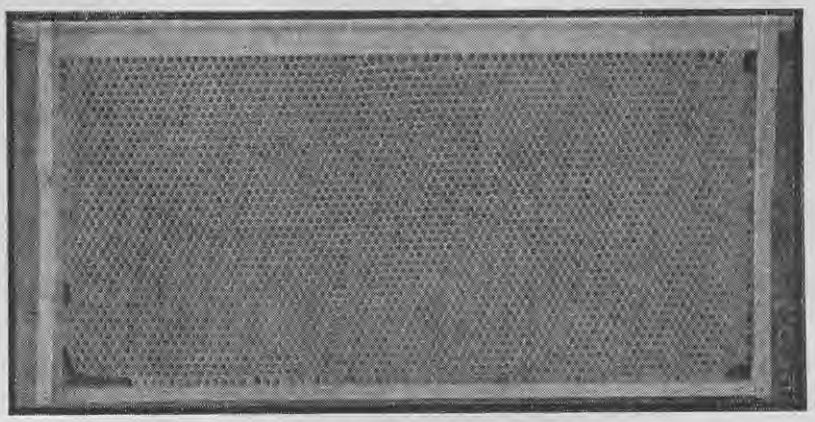
tial and if drawn combs are not available, frames fitted with full sheets of worker comb foundation should be given. If foundation only is available, two frames containing honey and pollen should be taken from the lower box and again placed one on each outside edge of the top box. The space thus left in the brood nest is filled with frames of foundation which are not put on the extreme outside but are placed one away from the edge. Though sufficient room for expansion and storage must be given, too much space is a disadvantage and over-supering should be avoided. The aim is to provide the bees with sufficient space in advance of their requirements without making it difficult for the bees to maintain correct hive temperature.

In some northern areas there may be a considerable flow of nectar from manuka (*Leptospermum scoparium*) during this period. In such cases foundation will be readily drawn out and rapidly filled. If a flow begins, a close watch should be kept and an additional super given when it is found that white wax is being built on the upper part of combs in the top super.

Ventilation Requirements

Good ventilation is necessary at all times, but more particularly when the colony is expanding rapidly. If the bottom board is of the reversible type generally in use today, it should be turned so that the deepest entrance is used. If the board is not reversible, a full-width entrance not less than ¾in. deep should be provided. All growth of grass and weeds should be cleared from the front and sides of the hive and care taken to see that there is no accumulation of dirt and rubbish on the bottom board which might obstruct the flow of air. If hive mats are used under the lids, they should be examined and, if damp, replaced with dry ones. If dampness is found, the lid should be checked to see if it is leaking and, if so, made waterproof. If dampness of the hive mat persists in spite of waterproof lids, the mat should be discarded or so shortened that there is a free flow of air over the ends. This will help by allowing moisture-laden air to pass up past the mat and escape under the lid.

The situation of the hive may have an important bearing on the development of the swarming impulse. If it is too sheltered, overheating can quickly occur on warm days. This can often be recognised from the cluster of bees which will form at the outside of the hive. Should this occur repeatedly, a cooler site should be sought. If one is not available, additional ventilation can be given by raising the lower hive body on 1in. blocks placed under each corner between the bottom board and the hive body. The site of the hive is an important factor in colony welfare generally, and though too much shelter is a serious disadvantage, draughts and dampness must also be avoided. Hives should not be placed under open hedges or rows of trees where cool draughts are likely to prevail.



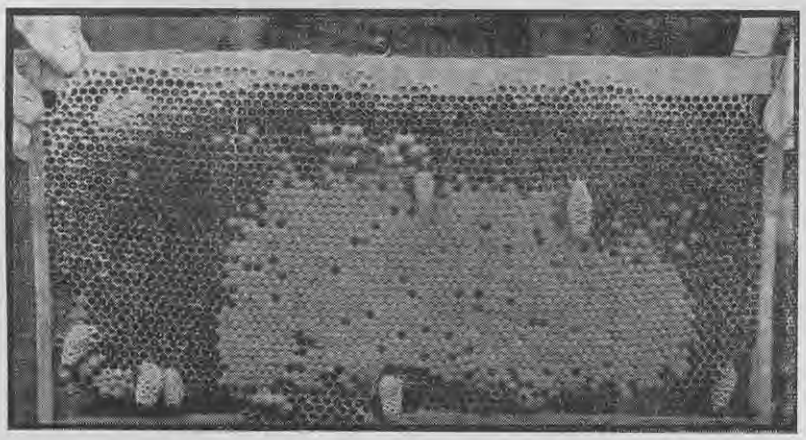
Good, well-built brood comb of worker cells.

Management of Hives

Apart from the natural urge to propagate, many other factors such as the age of the queen, ventilation, overcrowding, and weather conditions resulting in interference with, or cessation of, nectar flows influence the development of the swarming impulse. The beekeeper can by good management mitigate the effects of most of these factors, but a period of unfavourable weather may result in widespread swarming despite the beekeeper's best endeavours. Other than the provision of young, vigorous queens of good strain, good combs, ample brood space, and ventilation, there are no set rules to control swarming.

Beekeepers with only a few hives should be able to examine the brood chambers every 8 to 10 days until the beginning of the main honey flow to see if the bees have started raising queen cells. When cells are found they should be destroyed, preferably by crushing them with a hive tool. If the cells are found before the eggs in them have hatched, there is a good chance that their destruction will cause the colony to abandon the idea of swarming, provided brood space and ventilation are adequate. Should the eggs have hatched and the larvae been supplied with royal jelly, it is unlikely that the bees will desist and further cells will be continually constructed. The removal of two frames of unsealed brood from the brood nest to the super above will draw a considerable number of young bees from the brood chamber, thus relieving congestion there. This action sometimes is sufficient to control the swarming impulse. The spaces left should be filled with two good empty brood combs. If the colony is of exceptional strength, the removal of sufficient bees and brood to establish a nucleus colony can be safely done and this will often be sufficient to check swarming. If the nucleus colony is not required for expansion, it can be united to the parent hive when the honey flow has begun. For best results the nucleus should be taken before cells are actually constructed.

Where two brood chambers are in use it will generally be found that the queen lays mostly in the upper one. If the position of the chamber is reversed every fortnight in the swarming period by placing the upper chamber at the bottom, the extra comb space is immediately available to the queen. As the mature brood hatches in the lower chamber room becomes constantly available, so that when the boxes are again reversed in 2 weeks the queen is supplied with further laying space. This method is often of considerable assistance, but it should not be applied unless the colony has ample honey and pollen. Because at this period there is often a dearth of nectar, a close watch must be kept for signs of robbing. All work should still be carried out as quickly as possible and honey should not be exposed more than is necessary.



Completed natural swarm cells, some hatched. [*Stewart*

Care of Livestock during November

Contributed by the Animal Research Division

VACCINATION has reduced the New Zealand average rate of abortion in dairy cows from about 5 per cent. to about 1 per cent. There are, however, still too many dairy farmers who do not have their calves vaccinated. Past freedom from abortion is no excuse for not vaccinating, as infection may be introduced into a herd at any time. Though vaccination does not start until January or February, application for vaccination should be made now, as Veterinarians and Livestock Instructors have to plan their vaccination itineraries, and late applications make this very difficult. Calves should not be vaccinated until they are over 4 months old. Poor immunity results if they are vaccinated before this.

VACCINATION AGAINST CONTAGIOUS ABORTION

Dry sows should have access to good pasture, and in addition should receive from 2 to 4 gallons of milk per day, depending on their condition. They should be kept thriving, but should not be allowed to become too fat. Keep only as many of the spring litters for baconers as can be fed adequately. The remainder should be sold as porkers.

CARE OF PIGS

During the season of maximum grass growth the problem is to control pastures at their most leafy, nutritious stage. This is best achieved by conserving all growth surplus to requirements as silage and hay. Later on in the season it is important to maintain sufficient pasture cover to ensure growth during the dry summer period. As grass growth declines the period which paddocks are spelled between grazing should be gradually increased and as much silage as the cows will clean up should be fed out.

GRAZING MANAGEMENT OF DAIRY PASTURES

Preparations for shearing should be made now. Attend to sheepyards and scrub out the woolshed. This will reduce trouble from such diseases as blood poisoning, tetanus, and caseous lymphadenitis ("lympho") after shearing. Check over all machinery to see all parts are in good working order. Dag all dirty sheep and shear hoggets, wethers, dry ewes, and rams. When culling sheep before shearing pay particular attention to teeth and udders and watch for dropped bellies. On fat lamb farms ewes are best shorn after one or two drafts of lambs are away.

SHEARING PREPARATIONS

If dry ewes have not already been removed from the flock, they should be separated immediately. It is a good plan to shear them and, during shearing, they should be inspected carefully for udder abnormalities. All ewes whose udders were empty at lambing and ewes with diseased udders, damaged teats, very large teats, very small teats, or badly placed teats should be culled. Dry ewes with defective mouths and old ewes which did not have a lamb this year should also be culled. Dry ewes which are retained should not be allowed to get too fat during summer. If kept in hard store condition, they are more likely to hold when mated next autumn.

DRY EWES

Pastures on which ewes and lambs are grazing should never be allowed to become rank. If pastures are getting too long, they can best be controlled by cattle. Yearling beef cattle soon become quiet and they can then be run with ewes and lambs even in small paddocks.

CONTROL OF FAT LAMB PASTURE

DIP RAMS EARLY

Rams should be dipped before they begin to flush, preferably before Christmas. Flushed rams sometimes scald after dipping.

Where bidi-bidi comes away early, and is troublesome, ewes should be shorn toward the end of this month. Cull run cows not required for breeding. Brand calves and handle them as opportunity permits. In warmer districts put bulls out with the breeding herd. Where water is not laid on attention should be given to dams and springs so that water supplies will be plentiful during the hotter weather.

HILL STATIONS

Numbers of Seeds per Pound

INQUIRIES are received from time to time about the numbers of seeds of different species contained in a certain weight of seed.

Information of this nature can be found in textbooks dealing with seeds and in periodicals and handbooks. It is probably based on overseas determinations, however, and so may not apply to seeds grown in New Zealand. Figures for some seeds were published in volume 33 of the "Journal" (page 393).

These figures have now been revised and the list has been extended. To obtain the determinations below the results from at least five samples of seed of each kind, taken from two season's harvests and from as wide a range of districts as possible, have been averaged. They can be taken only as average figures, as samples from different lines vary considerably. This variation was most noticeable in the crested dogstail, chewings fescue, alsike clover, and turnip samples.

The approximate numbers of seeds per pound in the kinds examined were as follows:—

Perennial ryegrass ..	245,000	Alsike clover ..	580,000
Italian ryegrass	215,000	Montgomery red clover	245,000
Short-rotation ryegrass ..	235,000	Cowgrass	245,000
Browntop	7,000,000	Subterranean clover ..	65,000
Chewings fescue	450,000	Lucerne	225,000
Crested dogstail	800,000	Rape	125,000
Phalaris tuberosa ..	335,000	Turnip	220,000
Cocksfoot (including attached empty florets)	510,000	Swede	185,000
White clover	740,000	Linseed	70,000

—Department of Agriculture Seed-testing Station, Palmerston North

Silage Making; Supplementary Fodder Crop Production

Seasonal Notes by the Extension Division

EARLY ensiling of pastures usually results in good aftermath growth which is particularly valuable for grazing in early summer. Care is necessary to make good silage from young leafy growth; if it is well made, this early-cut silage will be of high food value and very useful for the milking herd in the dry summer period. Early-cut pasture growth is soft, sappy, and often wet and requires special care during harvesting to avoid it turning into sour, poor silage.

HARVESTING In the harvesting of this type of material wilting is necessary to reduce the moisture content, and slow harvesting is also important, especially with the buckrake, which gives much greater consolidation than the previously conventional method of stacking. To allow sufficient rise in temperature in a buckrake stack, after the first day's stacking it is generally necessary to spell 2 or even 3 days before further material is put in. It is also necessary to spell every second day during the building of the remainder of the stack. For efficient use of labour and time, two or even three stacks may be under construction at once. The material for later main crop silage is cut when the ryegrass is beginning to break into flowerhead, and the speed of harvesting depends largely on the climatic conditions prevailing. If the weather is wet and the material sappy, harvesting must be slow to allow heating, but if climatic conditions are relatively dry, the pasture quickly becomes stalky and harvesting must be speeded up to prevent excess heating.

STACKING For minimum wastage, harvesting of silage in pits or trenches, correctly battered at the sides, is desirable, but it is not always convenient. The conventional round stacks built with the stacker have now been superseded by stacks which may be built several different ways with the buckrake. The most popular type of buckrake stack is the wedge which takes full advantage of gentle slopes commonly found on many dairy farms. These stacks should be sited in a suitable central position involving a minimum of haulage and on a slope where a stack may be built to hold a large quantity of material, which will give good silage and a minimum of wastage over the exposed surfaces. As stacking proceeds some spreading of the dumped buckrake loads is necessary to ensure that the stack has firm sides, is evenly built, and is consolidated. Sides should be straight, and the big end of the wedge should slope slightly inward. Consolidation is assisted by running the tractor with empty buckrake over the surface after the completion of a layer. The extent of this treatment depends on the moisture content of the material being harvested. When finishing off it is desirable to camber the top and so assist water run-off. On flatter country the ramp or double wedge type of stack is frequently built, and it is quite satisfactory. For flat land the "bun" type stack is one of the best, and it entails the minimum of wastage. All stacks must be properly fenced from stock.

—R. B. GORDON

* * *

WHITE TURNIPS TURNIPS are usually classified as white fleshed and yellow fleshed. The white-fleshed varieties are rapid in their development and stand fairly well out of the ground. If they are sown early, they deteriorate in quality when mature, but bulbs from later sown crops are of comparatively good keeping quality.

Varieties in this group are N.Z. Green Globe, N.Z. Red Globe, N.Z. Purple Globe, and the recently introduced variety N.Z. York Globe. The last-named variety is particularly valuable for late sowing, as it has a very rapid maturity, and when sown after Christmas bulbs of good size for early autumn feeding can be obtained.

YELLOW TURNIPS Yellow-fleshed turnips are generally slower growing. Varieties differ markedly in hardness of flesh, those with the hardest flesh being also latest in maturity and growing lower in the ground. These varieties are frequently referred to as the "Aberdeen" types. Their use is on the harder country where swedes cannot be grown with success. The varieties in this group include N.Z. Purple Top Yellow, N.Z. Green Top Yellow, N.Z. Purple Resistant, and N.Z. Green Resistant, the last two possessing considerable resistance to club root disease. The N.Z. Waites Eclipse, N.Z. Victory Yellow, and N.Z. Champion Hybrid are softer yellow-fleshed varieties which grow to larger bulbs, and they are suitable for late autumn feed.

SWEDES Swede varieties now commonly grown in New Zealand include N.Z. Superlative, N.Z. Grandmaster, N.Z. Crimson King, and N.Z. Wilhelmsburger. These varieties are in approximate order of maturity, and Wilhelmsburger appreciably the latest. Two other varieties of intermediate maturity—N.Z. Sensation and N.Z. Calder—are particularly suited for drier climates and where aphides are prevalent.

About 160,000 acres of swedes are grown each year. Two-thirds are in the South Island and these are mainly for the wintering of ewes. In the field it is generally found that once the bulb becomes mature, disease increases. Hence for the efficient use of this crop it is essential that notice should be taken of maturity. Superlative should be fed off first, followed by Grandmaster and Crimson King, which mature about the same time, and finally the very hard, green-top swede Wilhelmsburger. It is advisable to sow a selection of swedes and to feed each block at maturity. This tends to reduce the incidence of disease, particularly dry rot, which today is the greatest single cause of swede loss. In districts where aphid attack in summer can be severe Sensation and Calder varieties should be sown, as they have good powers of resistance to this insect.

—J. G. RICHARDS

* * *

TURNIP AND SWEDE SEEDS ALL lines of Government-approved turnip and swede seeds distributed this year have given germination tests not lower than 90 per cent. Government-approved seed is packed in 1lb. and 2lb. lots in specially printed calico bags. The letter E has been branded on all bags distributed this year to serve as an identification.

—J. H. CLARIDGE

* * *

BROWN HEART THE condition known as brown heart, which often seriously affects the quality of swedes and turnips, is due to a deficiency of boron in the soil and it can generally be overcome by an application of commercial borax. Borated superphosphate (which contains borax) may be used in ridger sowing if direct contact with the seed is avoided, as, if contact occurs, the borax content is likely to reduce germination severely. An alternative method is to apply borax at 15lb. to 20lb. per acre as a broadcast dressing before sowing the seed, and to drill the seed with a reverted phosphate such as reverted superphosphate or serpentine superphosphate.

—F. H. COLLIN

Ventilation and Design of Laying and Brooder Houses

By S. G. HADDON, Poultry Instructor, Department of Agriculture, Auckland

GOOD poultry housing may be described as that which gives adequate space for freedom of movement, possesses adequate ventilation to maintain a satisfactory supply of oxygen and to remove impurities in the atmosphere (mainly carbon dioxide and water vapour), and provides shelter. It is difficult to separate adequate space, oxygen supply, and ventilation from one another and though they will be discussed more or less separately, their interlocking effects must be recognised.

A PULLET or hen in full lay is a high-speed machine; its daily or hourly turnover of food, air, and water is incredibly fast. Fowls, for example, drink about twice as much water per unit of body-weight as do beef cattle, sheep, or pigs.

Poultry have a very high oxygen requirement. The amount has been measured by different methods and it is now recognised that an adult bird will pass through its lungs about ¼ litre of air per pound of body-weight every minute, or 30 cub. ft. of air every 24 hours. The second figure is really the basis for generally accepted floor area allowances for poultry.

Most poultry sheds—certainly commercial types—have an average height from floor to roof of about 7ft.; 30 cub. ft.—the daily air requirement per bird—divided by 7 gives the area or cross-section of a column of air 7ft. high. The area is approximately 4 sq. ft. Therefore, a house with an average height of 7ft. providing 4 sq. ft. of floor space per bird ensures about 30 cub. ft. of air per bird.

This reasoning explains some slightly confusing facts. For instance, a small bird does not need as much air (or air space) as a bigger, heavier bird. Within breeds the difference is negligible, but between breeds it can be allowed for and Leghorns, for example, can be housed in larger numbers than can Australorps in houses of the same dimensions. Again, modern deep houses of 30ft. to 40ft. deep and 8ft. or 9ft. high can carry stock safely on a smaller floor area per bird than 4 sq. ft. because the cross-section or area of the 30 cub. ft. column of air is much less than 4 sq. ft. It may work out at as low as 2½ sq. ft., though this is not recommended. In large houses a floor space of 3 sq. ft. per bird should be regarded as a minimum. Freedom of movement is the deciding factor, as timid birds must be able to get away from the bullies to be found in every flock.

Object of Ventilation

Oxygen is used and must be replaced. Food, particularly fats, is broken down by the birds into simpler substances, with the formation of large amounts of carbon dioxide and water vapour. Digestion of fats and oils actually makes water (metabolic water) and this is voided in the droppings and as vapour in the breath. Consequently it is highly important to remove this waste product; if this is not done, the litter soon becomes a soggy mess and the moisture-laden air causes the birds to increase their already very rapid respiration. This panting can be observed even on cold days in damp, poorly ventilated sheds.

The prime object of ventilation is to carry away the two waste products carbon dioxide and water vapour, and removal of water vapour is more important than replacing oxygen or removing carbon dioxide. The air in a closed building must be changed 8 times per hour. A higher speed than this will mean draughts and a lower speed will not handle sufficient air. In New Zealand's comparatively mild climate it is customary to build poultry houses which are so open that ventilation can be forgotten, provided certain provisions are made during construction. It is different with night arks, range shelters, fold units, and small cabins. Usually an air inlet low down is made which works in conjunction with an outlet at the highest point, thus ensuring a through current of air. That at least is the theory. In practice many so-called ridge ventilators work very well in reverse and cause bad down draughts on the birds.

Ventilators

The simplest and most efficient ridge ventilator is the type known as the flat ridge. The familiar V-shaped capping along the ridge is replaced by a 12in. wide, flat, horizontal board kept about 2in. above the ridge opening. Any wind can then blow straight through under this wide, flat board and in doing so causes a suction effect upward through the ridge opening. There is no possibility of a down draught, however strong the wind,

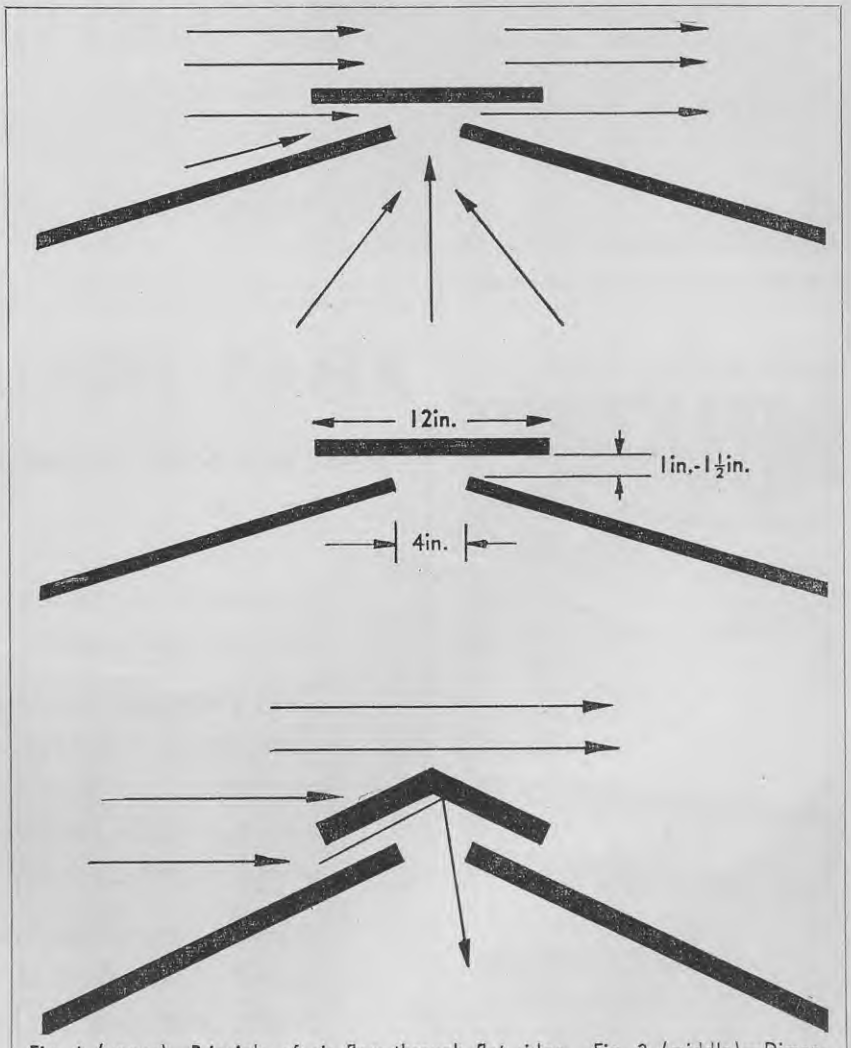


Fig. 1 (upper)—Principle of air flow through flat ridge. Fig. 2 (middle)—Dimensions of flat ridge. Fig. 3 (lower)—Down draught with V-ridge ventilator.

irrespective of its direction. When there is no wind ordinary convection comes into play with a greater degree of certainty than with a V-ridge ventilator. Contrary to expectation the flat ridge board is entirely weather proof. (See Figs. 1, 2, and 3.)

The dimensions of this type of ventilator can be altered to suit the size of building and the weight of timber used. A gap of 1in. or 1½in. is sufficient between board and ridge, with a width of 2in. to 4in. between the two sides of the roof. On small roofs a flat ridge board 6in. to 8in. wide will be sufficient.

Where rafters are butted on to a ridge plate this plate must not be carried above the line of the roof each side of the ridge opening, as if this is done the free flow of air from one side to the other under the flat ridge board is obstructed and the whole object of this type of ventilator is defeated.

The flat ridge ventilator can be applied safely to all ridge roofs, provided it is built correctly. It could also be applied efficiently to other types, such as the reversed lean-to, which is fairly common in the South Island (see Fig. 4).

Special types of sheds, incubator rooms, and brooder sheds, for example, can be regarded as closed rooms and the ventilation must be based on the dimensions so that the eight air changes per hour take place. To do this there must be a definite relationship between the areas of inlets and outlets and the volume of the room. Eight times the cubic capacity (length x breadth x average height) of the building will give the volume of air required per hour. This figure divided by 50 gives the minimum area in square inches of the required inlets. The area of the inlets divided by 2½ gives the area in square inches of the outlets required. These sizes may be increased safely, and probably should be, provided the inlets are always 2½ times the areas of the outlets. Having them larger than the minimum allows control by sliding shutters or baffles. The rate of flow of air is governed by the outlets, but the volume of air passed is controlled by the area of the inlets, as obviously a hole in the roof or ceiling will not let out more air than is coming in lower down. In practice the two must balance, but better control is obtained by shutting off the outlets rather than the inlets.

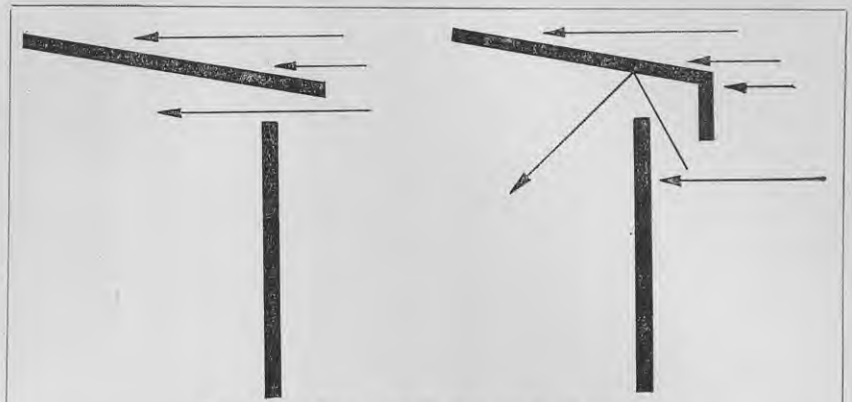


Fig. 5—Air flow through rear vents at eaves.

Basically the foregoing applies to open-fronted sheds. Air can enter through the open front, but its passage through the house will be uncertain and confusing unless a definite opening is made for it to go out. If the open front is regarded as the normal exit of used air, an inlet for fresh air must be provided. In both instances the ventilation opening along the top back wall plate under the eaves should be satisfactory. Care should be taken if this opening is baffled, as a straight-through flow of air often does less harm than the oblique downward draught caused by many of the baffles used today (see Fig. 5).

Depth of House

The floor area of a laying house is fixed by the number of birds it has to hold and to a degree by the depth of the house, because, as discussed earlier, this will affect the height. Experience has shown that it is safer to have a house too deep rather than too shallow. Depths of between 16ft. and 18ft. were once accepted as being satisfactory, but the latter figure should be regarded as the absolute minimum depth for a 100-bird house. The deep house will provide an amount of fresh air and direct sunlight which the comparatively shallow house cannot.

The latest trend, in the Auckland area at least, is for houses up to 40ft. deep with open, wire netting fronts very nearly to ground level. Several houses with what may be called floor-to-ceiling wire netting fronts are all working very well. Rain certainly does not beat in to the extent previously feared, and in any case the floor is freely exposed to air and sun, which quickly dry out the surface and damp litter.

A small backyard poultry house built in Auckland on these lines has 6ft. of wire netting on the front studs, which are only 6ft. 6in. high. The only protection for this open front is a 3ft. overhang of a straight lean-to roof and a low front wall of less than 18in. Yet conditions in this comparatively shallow (10ft.) shed are first class in spite of the abnormal amount of north-easterly weather experienced.

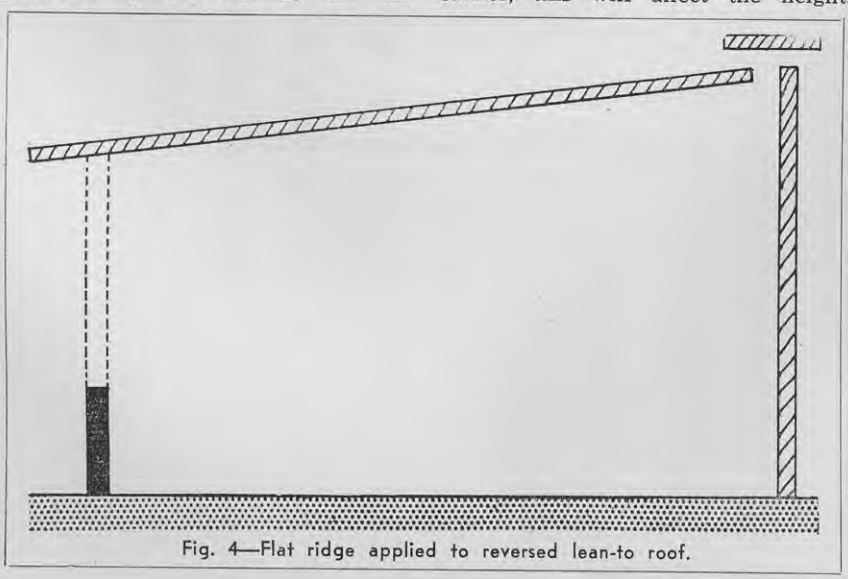


Fig. 4—Flat ridge applied to reversed lean-to roof.

Importance of Winter Sun

As far as possible all poultry sheds should be orientated to face the midday winter sun. In midwinter the minimum elevation of the sun at midday is about 18 degrees above the horizon, and in midsummer the maximum elevation at midday is about 74 degrees above the horizon. Winter sun streaming into the sheds at midday is of far more value to birds than is a fleeting glimpse of early-morning or late-afternoon sun. Midday summer sun is too hot for birds, and a house designed to take advantage of winter sun will still allow summer sun to enter during the morning and afternoon though excluding oppressive, midday summer sun.

The extensive, open, wire netting fronts becoming more common today can be given protection from driving rain by carrying the lean-to roof forward for 3ft. or so and fitting a 12in. barge board along the front of the rafters. A simple scale drawing

will show that this type of roof will give as much protection as a lean-to roof finishing flush with the front wall and fitted with a sloping hood (see Fig. 6). The former type has other advantages: It is simpler to construct and carries all the roof water to one drainage channel at the back. Heavy and continuous drip from a front hood causes more dampness inside than rain, besides making a mess all along the front wall of the shed.

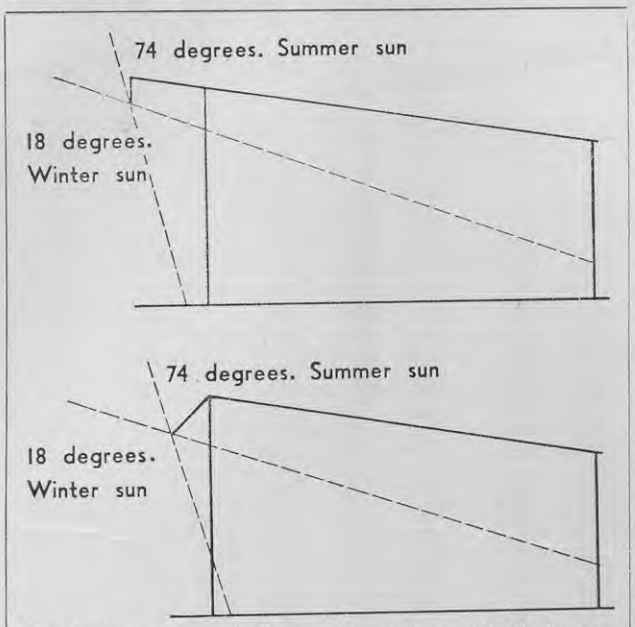


Fig. 6—Comparison of 3ft. straight overhang with 1ft. barge board (upper) and 2ft. sloping hood (lower).

In large sheds the difference in cost between a lean-to roof and a ridge roof is negligible. In fact the ridge roof can be cheaper, as it can be made largely self-supporting, requiring less timber for floor supports than a lean-to roof covering the same floor area.

Timber sizes and wall and roofing materials are a question of carpentry and outside the scope of this article, but what can be used will be governed largely by local building regulations. Types of floors—earth, concrete, or wood—are also controlled by by-laws. Concrete foundation walls should be sunk at least 18in. below ground level as a vermin control measure and all wooden floors should be at least 12in. above ground level so that cats and small dogs can catch rats under them.

Multi-story House

A development new to this country but well proved overseas is the multi-story laying house. There are at least four of this type around Auckland and all are working well. Where land is scarce, as it often is on a suburban poultry farm, serious thought should be given to replacing obsolete multiple-unit sheds with a compact, two-story house. Even where electric hoists have to be installed and lorry ramps built the two-story house still merits serious consideration.

Most of the foregoing recommendations apply also to brooder houses. As ample head room is, or should be, provided, air space per bird is not so important, as small chicks have small oxygen requirements. However, chicks grow rapidly and their needs must be met by expanding air space, and floor, brooder, and feeding areas. It is possible to work backward from the adult capacity of a shed to its chick capacity, but the two classes should be provided for on separate bases.

With the brooder 7 sq. in. under the canopy should be allowed for each chick. Within the brooder house ½ sq. ft. of floor space per chick should be provided. By the eighth week, when the brooder is no longer in use, the floor space per bird must be 1½ sq. ft. The farmer can understock a shed with chicks at first so that they "grow into it" or he can stock a shed almost to capacity at first and then reduce the number of chicks as the birds grow.

The choice will depend on circumstances, but the first alternative should give better chicks, because at no time during their rearing should they have been overcrowded.

As temperature control is important, some means of closing the open front of the brooder shed must be adopted. Shutters, screens, and blinds all work reasonably well. A point often raised is: How open can the front of a brooder shed be? In fine, sunny weather there is no reason why it cannot be open down to floor level, but as the temperature becomes cooler during the afternoon the bulk of the open front must be closed. This is best done by a system of large hinged shutters arranged to swing outward like doors. They should be from floor level to about half-way or more up the front. These shutters can be used successfully on adult housing. Like laying sheds, brooder sheds should face north to obtain the maximum benefit from the sun. Again, what is used in their construction is a carpenter's problem, except that certain standards are set by local body by-laws.

Any outside runs provided must be regarded as additional to the space requirements for birds already outlined. Overcrowding and poor ventilation take their heaviest toll at night, when all the birds are inside the house, and not during the day when many of the birds may be in an outside run.

Soft Turnips for Summer Milk Production

By C. J. HAMBLYN, Fields Superintendent, Department of Agriculture, Palmerston North

DAIRY farmers fortunate enough to have sown a crop of soft turnips last season in the process of renewing an old pasture were well rewarded for the small extra cost of putting in this crop. Some comparisons of butterfat production from farms where a crop of soft turnips was available for the cows in January, February, and early March, compared with production from farms where dried up pastures only had to be relied on for milk production, showed that the soft turnip crops were responsible for a considerable increase. Soft turnips are undoubtedly one of the safest, easiest to grow, and best crops for keeping up the milk supply in hot, dry weather, when pastures quickly lose their succulence.

AS a wet or dry season cannot be foretold, it is not possible to plan for turnip crops for dry seasons only and thus avoid having a useless crop in the occasional wet seasons when frequent summer rains keep pasture succulent and growing strongly. By and large, however, there are very few seasons when there are not hot, dry periods from December on, when soft turnips would be invaluable in keeping up milk production. For this reason and also because the soft turnip crop leaves the ground in excellent condition for preparation of a good grass seed-bed, farmers who are making a round of their farms in a pasture renewal programme are strongly recommended to grow soft turnips in the process.

Growing the Crop

The white-fleshed varieties, of which there are four available from New Zealand-grown seed, are the best for the purpose. The varieties vary in time of reaching maturity and in keeping qualities, but for best results at least two sowings about 2 to 3 weeks apart should be made, using an early variety and a later one in the first seeding. Soft turnips give best results when used as they reach maturity. The land, old pasture for preference, should be ploughed in September. A good discing of the old turf before ploughing helps in the quicker breakdown of the turf and is well worth while in most districts.

The crop should be sown in 7in. drills in October, two sowings being made about 2 to 3 weeks apart. Seeding rate for drilled crops is 10oz. to 12oz. per acre and for broadcasting, up to 1lb. Drilled crops invariably give much better yields than broadcast crops. Serpentine superphosphate or lime-superphosphate mixtures at 3cwt. to 5cwt. per acre will give the crop a good start.

Varieties recommended are:—

First sowings: N.Z. York Globe, the quickest grower, and N.Z. Red Globe, an intermediate variety which gives a good crop on the lighter soils.

Later sowings: N.Z. Red Globe and N.Z. Green Globe are recommended, the latter being slower growing, hardy, and a good keeper. If the three varieties are used as recommended, with the first sowing in Mid-October, soft turnips in good condition should be available from early January to late March.

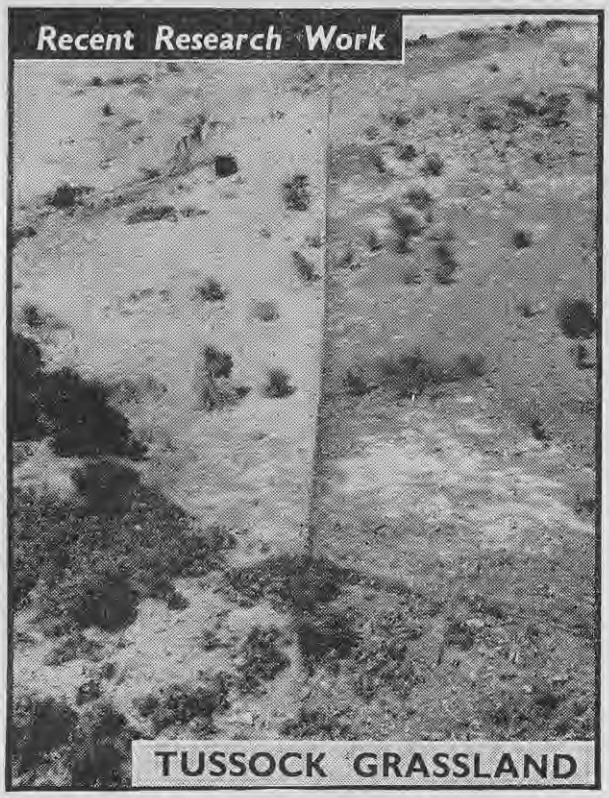
Using the Crop

Soft turnips can be break fed with the use of the electric fence. This method of feeding the crop, though somewhat wasteful compared with hand pulling and feeding out, cuts out a lot of work. The breaks should not be too big. The cows should go on to the turnips night and morning for 2 to 3 hours immediately after milking. If the cows are left on the crop too long or are on it too near milking time, objectionable flavours will develop in the milk and cream. The last of the roots can be harrowed out to clean up the break.

Where the electric fence has been used in feeding off the crop and the remains of the roots lifted with the harrows so that they are cleaned up before the next break is opened, the land will be fairly clean, well consolidated, and with increased fertility at the surface resulting from the fed-off crop. A good shallow discing and then harrowing and rolling should prepare an excellent seed-bed. Where the crop has been carted off, weeds are likely to be bad and the land is best reploughed. Turnips leave the soil in quite good condition and are much better in this respect than millet or maize. It is well worth while to use the electric fence for feeding off the turnip crop not only because of the reduction in labour but also because of the maintenance of fertility, the very desirable consolidation, and the clean surface left. If wet weather sets in before the crop is all used and there is plenty of grass, farmers should not hesitate to get on with the job of preparing the land for reseeding to grass, since early sowing is all-important in the establishment of a good pasture.

The soft turnip crop fits in very well in the process of pasture renewal, it is a cheap crop to grow, and there is no great loss if the crop is not required. It is easy to grow and reliable, and when it is break fed the land is left in excellent condition for quick and easy preparation of a good seed-bed for the new pasture.

The soft turnip crop fits very well into a pasture renewal programme, as it leaves the ground in excellent condition for preparation of a seed-bed for grass.



EXPERIMENTAL work in depleted tussock grassland follows a definite pattern. Nursery rows indicate what species of grasses and clovers are adapted to the particular soil and environment. Then come plot sowings which provide information about the best time to sow, how much to sow, and compatibility among species to afford cover and/or production. At this stage the grazing animal is introduced, but so far the studies have been purely observational and the measuring rod has been the survival of the grass when grazed by sheep.

LARGE-SCALE TRIALS

AFTER this information has been secured the next stage is relatively large-scale trials to make sure that the results on a small area can be related to the improvement of the depleted country as a whole. In Central Otago most of this basic information has come from the Cockayne plots (sown 1920 to 1922) and from the Pisa Experimental Area. By 1948 a large-scale trial was considered necessary. The difficulty lay in the choice of a suitable site, the main requirement being freedom from rabbits. In addition, seed of the species to be sown was in short supply.

The area finally selected was on the property of Mr. D. J. Kane near Hawea Flat. It consists of some 80 acres containing both exposed and shady faces and ranging from about 1200ft. to 2000ft. in altitude. Most of the block was depleted, with scabweed as the dominant vegetation on the sunny faces and sorrel and bidi-bidi on the dark faces. Half of the block was left as a control and the remainder was divided into three, on the basis of aspect, and different seed mixtures were sown by hand on these in March 1949. Apart from a few rabbits the area remained unstocked until May 1953, when 42 fine-wool hoggets were put on for 5 months.

RESULTS OF TREATMENTS

For the first 2 years there was only a slight response to oversowing. On the sunny slopes some plants became established, but these seemed to be barely existing and provided little growth. On the moderately sheltered and dark faces a better establishment was obtained, but again there was little growth. However, in the third and fourth years the picture changed. Wherever there was any depth of soil sown species made vigorous growth and set seed. The following summarises results so far:—

On exposed sunny faces there has been poor, patchy establishment of tall oatgrass and *Danthonia pilosa*. Only where there is any depth of soil is there evidence of seeding of these. On the lower slopes there has been a recovery of native species, particularly plume grass and blue wheatgrass. Over most of these areas, however, improvement as measured in terms of increase in perennial grasses has been slight.

On shady slopes with a fair to good soil cover and enjoying some protection from wind and sun there have been two distinct responses to the treatments applied. In the most sheltered sites the response has been a dense and vigorous establishment of sown species, mainly tall oatgrass with cocksfoot, sheep's burnet, yarrow, sweet vernal, and browntop. There is a carpet of tall oatgrass seedlings, and the resultant sward has largely crowded out the original cover of sorrel, bidi-bidi, and Canadian thistle. On less sheltered sites, however (and this is more noticeable with increasing altitude), the response has been recovery of native tussock species. At the time of sowing, these plants appeared to be dead or almost so, but spelling has permitted their regrowth and oversowing has resulted in only slight establishment and then only where there is more than about a square yard of bare ground. Recovery of the natives has involved good growth of hard tussock, blue wheatgrass, and blue tussock.

PRESENT CONCLUSIONS

On bare, exposed slopes with little or no soil cover no exotic species have been found which can establish and thrive after oversowing. It may be that the use of native species and strains would give better results, but the problem is difficult. Wherever there is an open, friable surface and some soil there are species which will grow and set seed, but the cover will take a long time to thicken up. On dark faces there is quite a range of species which will establish and which will rapidly provide a dense, useful sward. Wherever there is an existing cover of tussock, whether this is vigorous or merely recovering from ill treatment, oversowing of introduced grasses has been disappointing. In all cases, however, it must be stressed that proper management is essential if any improvement is to be effective and permanent. Species must be spelled at regular intervals to permit reseeding and a proper intensity of utilisation maintained.

—J. M. HERCUS

* * * *

OVERSOWING SUBTERRANEAN CLOVER

IN most districts autumn sowings finally result in a better density of clovers, though early spring may give a greater strike. There is always the risk with subterranean clover that this annual plant will not have the opportunity to flower and set seed if sown in spring. In two time of sowing trials, one in the Hamilton district and one in the Wellington district, the sowings of subterranean clover made in May and August gave the highest numbers of germinated clovers. In the Hamilton trial a January sowing was also made, and though the number of clover plants was as high as that of the May sowing, the wet 1953 summer was favourable to the initial growth of subterranean clover. From results of a time of sowing trial at Invermay Research Station it can be recommended that subterranean clover should not be sown later than February in districts where severe frosts occur or frost lift will cause a low survival of seedlings.

—S. M. MACLEAN

HEADING PHOTOGRAPH: This fenceline on a steep face separates the experimental sowings on Mr. Kane's property on the right from the adjoining property on the left. The photograph was taken in the early stages of the trial, and the better plant covering on the right is a reflection of lighter grazing rather than the result of the surface sowings. During the last 3 years the reduction of rabbits and very light grazing by sheep have both contributed to further improvement within the experimental area. In some parts of the area, particularly on the darker faces, the introduction of grasses and the regeneration of the native grasses have been very successful.

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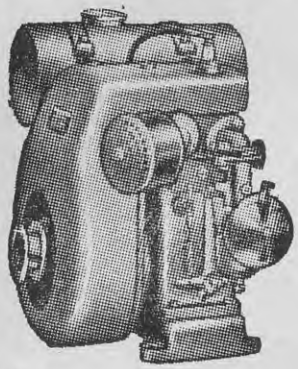

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The Propagation of Stone Fruit Trees

THE raising of fruit trees is frequently looked on as being difficult and requiring specialised knowledge and training, but this is not so. Provided certain operations are carried out carefully, any grower can establish a small nursery and raise his own trees. In this article J. Coombe, Horticultural Instructor, Department of Agriculture, Christchurch, describes the methods used to propagate stone fruit trees.

A stone fruit nursery on an orchardist's property.

THERE are many advantages in raising one's own trees. A number of varieties of stone fruit, particularly cherries, have several names for the one variety, some being incorrect; several distinct varieties may be known in different areas by the same name. Only after bought trees have been planted several years and have come into bearing is the grower sure that they are what he wanted. If he propagates his own trees, he can select the budwood himself from healthy trees of the variety and type he wants. He can also use the particular rootstock most suited to the situation in which he intends to plant.

Another advantage is that when the trees are moved from the home nursery into their permanent positions in the orchard the roots need not be cut back to the same degree as would be required if the trees had to be packed and transported long distances; nor is it necessary to remove all the soil from the roots; consequently far less damage is likely to occur. The possibility of the rooting system drying out is also eliminated, and trees raised on the property can be lifted and planted out when soil conditions are suitable.

Disadvantages are that for the commercial fruit grower, at least, the budding of the stocks to the required variety and general attention to the nursery often clash with the harvesting season, but as the amount of time required to raise the young trees is not great, their propagation is well worth while.

Site of Nursery

One of the most suitable sites for a nursery is a small area close to the house or the vegetable garden, as this is more likely to receive constant attention than one some distance away. Areas where tomatoes, potatoes, or strawberries have been grown should be avoided, as the soil where these plants have been grown frequently becomes infected with verticillium wilt fungus. Stone fruit trees, particularly apricots, readily become infected by this disease if it is present in the soil, and once a tree becomes infected it may stunt badly or even die.

The site chosen should have reasonably good, well-drained soil, be well sheltered from strong winds, and have sufficient water available for irrigation if it is needed.

Rootstocks

Most fruit trees are made up of two parts—the rootstock forming the rooting system and part of the trunk, and the scion variety which forms the top portion of the trunk and the branches. For some kinds of fruit trees there are various rootstocks available which give a wide range of vigour, from very vigorous to dwarfing. In addition some stocks are suited only to certain soil types and conditions and generally produce very poor trees if they are planted in unsuitable localities. It is necessary, therefore, to select the rootstocks most suited to the conditions under which trees will have to grow in the orchard.

VARIETIES OF ROOTSTOCKS SUITABLE FOR DIFFERENT STONE FRUITS

Scion	Stock	Raised from	Method and time	Remarks
Apricot	Myrobalan plum	Seed or cuttings	Bud in January	Best general stock
	Apricot	Seed	Bud in January	For suitable soils
	Peach	Seed	Bud in January	Only where known to do well
Cherry	Mazzard Mahaleb	Seed, cuttings, or root cuttings	Bud in December-January or graft in September	Mazzard better in suitable soils Mahaleb may be shorter lived, but tolerates wider range of conditions
Peach (and nectarine)	Peach	Seed	Bud in February-March	Plum stock can be used, but rarely makes good trees
Plum (European)	Myrobalan	Seed or cuttings	Bud in February or graft in September	Develops large vigorous trees, and has wide compatibility range
Plum (Japanese)	Myrobalan	Seed or cuttings	Bud in February or graft in September	Wide range of compatibility
	Marianna Peach	Cuttings / Seed	Bud in February	Suitable for vigorous varieties and in light soils

For Peaches and Nectarines

As a nectarine is really only a special type of peach, what applies to peaches will also apply to nectarines. Peaches are generally worked on peach stocks raised from seed. As commercial nurseries used to collect the seeds from canning factories, the majority of their trees are on Golden Queen stock. Seedlings raised from Lady Palmerston peach stones also make good rootstocks. Seeds of mid-season to late varieties of peaches should be chosen for raising rootstocks, as the percentage of germination of the early varieties is normally very low.

Plum rootstocks can also be used for peaches in some circumstances such as in soil inclined to be heavy or likely to be slightly wetter than peach roots will tolerate, but the trees usually do not succeed as well as on peach, and with cherry plum particularly the percentage of bud "takes" is often low. Peaches on plum stocks usually have a shorter life than those on peach stocks and the results are often disappointing; therefore it is better not to attempt growing them this way.

For Plums

Myrobalan (cherry plum) is one of the most suitable stocks to use for plums, as it develops a large, vigorous tree and is compatible with nearly all varieties. Trees on this stock take longer to come into bearing than those on less vigorous stocks, but once bearing begins the crops produced generally exceed those from the weaker-growing trees.

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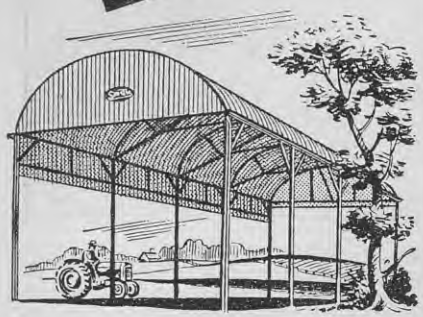

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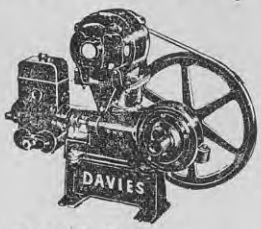

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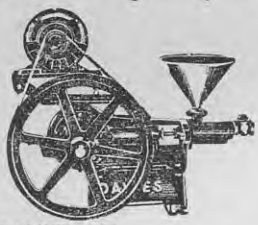

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Marianna plum is also quite a good stock, but the resultant trees are not quite as vigorous as those on Myrobalan. For very vigorous-growing Japanese varieties such as Purple King, Marianna is probably the more suitable stock to use. Like Myrobalan it does not sucker badly, but it is sometimes hard to bud, as the bark tightens early in a dry season, and it is not compatible with all varieties.

Plum suckers dug up from under mature trees are not suitable for stocks, as they themselves will sucker in the same manner as the tree from which they were taken.

Peach seedlings have occasionally been used as stocks for plums, but they usually reduce vigour considerably and shorten the trees' life. They may be suitable for vigorous-growing Japanese varieties such as Purple King in some localities.

Plum rootstocks for both European and Japanese varieties can be raised in various ways—by seed, by root cuttings, by hardwood cuttings, or from stool beds. Myrobalan stocks are generally raised from seed, but can also be propagated from both hardwood and root cuttings. Marianna stocks propagate quite readily from hardwood cuttings, and this is the method usually adopted for this stock, though root cuttings are also satisfactory.

Trees raised from seed vary to some extent in their vigour. There is also some variation in their compatibility with some varieties. Trees raised from cuttings are more even in vigour and compatibility does not vary.

Stool beds are necessary only where a large number of stocks are needed annually.

For Apricots

Apricots can be grown on plum, apricot, or peach roots, the choice depending largely on the soil conditions where the trees are to be grown.

Plum stocks are most suited to a soil which is inclined to be slightly heavier or slightly wetter than the ideal apricot soil, but even on this stock apricots should not be planted in heavy, wet soils. Apricots on apricot seedling roots are suited to well-drained, loamy to light soils; on peach stocks they often do well on some sandy or shingly soils. The life of the tree in most soils is much longer when it is grown on plum stock than when it is on peach.

Myrobalan plum stocks are often used for apricots, but some variation in compatibility will be found if seedlings are used, and the percentage of takes is generally less than where apricot or peach stocks are used.

Marianna has been used to a limited extent, but has a narrower range of compatibility than Myrobalan.

For Cherries

The Mazzard, a wild sweet cherry, parent of the cultivated varieties, is generally considered to be the best stock for cherries. It produces large, vigorous trees and is compatible with all varieties of cherries.

Another stock that has been used to some extent is Mahaleb, which can be grown in a greater range of soil types than Mazzard. Some varieties on Mahaleb stock may not last as long as on Mazzard, nor are they generally as vigorous.

Stocks for cherries are mostly raised from seed of the desired stock variety, but they can also be propagated from root cuttings and by layering.

The table on page 399 shows the stocks considered the most suitable for the various kinds of stone fruit, how they are raised, the method used to work the scion variety on to the stock, and the time of year to do it.

Selecting Rootstock

Except in minor details, the methods of raising seedlings of peach plum, apricot, and cherry are the same. Seeds should be saved from trees free from any signs of disease, especially any of the viruses. The seed should be collected from mature fruits, and all flesh should be removed, especially if it is to be held for some time, and the seed dried before storing.

Seeds of stone fruit trees, when freshly removed from fruit, will not germinate, even under ideal conditions of moisture and temperature. They need after-ripening, which occurs when they are kept moist, but not wet, at a low temperature, 33 degrees to 40 degrees F. being the optimum range. This process, known as stratification, may take from 1 to 3 months, depending on the kind of seed. Peaches, plums, and cherries will need at least 3 months at low temperatures; in warmer climates a longer period would be necessary unless artificial cold is used. Under most circumstances these seeds could be stratified almost as soon as they are harvested, because, though after-ripening may be completed before the end of winter, germination will not take place until conditions are favourable in spring. Apricot seeds need a much shorter after-ripening period, 1 month usually being sufficient. In addition apricot seeds germinate at a comparatively low temperature and therefore stratification should not be begun until a month or so before the expected time of sowing.

The seed is mixed with sand and placed in a frame or box, which is sunk into the soil in a cool position and maintained in a reasonably moist condition until the seed begins to swell; coarse sand is much better than fine, as it allows better penetration of air and provides better drainage. Swelling should start in late winter, and once it has started the sand must not be allowed to dry out or germination will be adversely affected.

The swollen seed should be sorted, those obviously not viable discarded, and those showing movement sown into nursery rows 30in. to 36in. apart. In the rows the seeds should be spaced 15in. to 18in. apart, the depth varying with the kind of seed—peaches at 2in. to 3in., plums and apricots at 1in. to 2in., and cherries at no more than 1in. By selection and spacing in this manner very few gaps are likely to occur.

The distances mentioned are far greater than those used by nurserymen, but the grower raising trees for his own use only does not require a large number, and more space can be given to each tree. These wider spacings also allow the tree to be grown in one spot until it is ready for

One-year peach seedlings which have been budded. Tops will be cut off in early spring, when the buds should begin growing.

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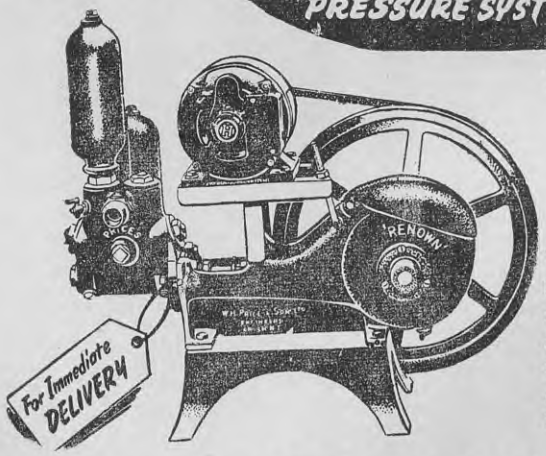

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planting in its permanent position in the orchard; there will be no check in its development through transplanting in the nursery.

General attention to the nursery bed, such as cultivation and irrigation, should be carried out when necessary so that the growth of the young stocks is not checked. Frequently the main stem of a seedling will send out a number of side growths; from time to time these should be pinched out, leaving only the main stem growing unchecked so that it has a better chance of developing to a size fit for budding in the first season.

Propagating Hardwood Cuttings

Hardwood cuttings should be collected from healthy trees only just before beginning of leaf-fall. Only well-ripened cuttings from the current season's growth should be taken preferably from the outside and top of the selected trees. The top of the shoot should be discarded and the remainder cut into pieces at least 12in. long. The advantage of a long cutting is that if there is insufficient young growth from it to be easily budded, the bud can be inserted into the bark of the original cutting. More satisfactory strikes are generally secured from cuttings taken from near the basal ends of the shoots. Water sprouts or soft, sappy growths should be avoided, as these seldom develop roots.

Best results are generally obtained if the cuttings are first planted in a special propagating bed, which should consist mainly of clean, coarse river sand. Three parts of sand to one part of soil, thoroughly mixed, will be found a satisfactory medium to start the callus forming. The cuttings may be planted as close as 2in. apart in rows in the propagation bed. They should be planted about 8in. deep in trenches. On no account should they be pushed into the soil, as this damages the bark at the basal end and may prevent callus and root formation. After planting, the sandy soil must be thoroughly firmed and kept moist, but not excessively wet. Small roots should be formed by late winter, when the cuttings can be carefully lifted and planted out in the nursery rows about 15in. to 18in. apart and about 5in. to 6in. deep. This should leave sufficient of the cuttings above ground for the insertion of the bud. Rows should be 30in. to 36in. apart for easy cultivation.

Propagating Root Cuttings

Root cuttings from some varieties of plums and cherries strike fairly readily, and, like hardwood cuttings, they produce an even line of trees. Better strikes are usually secured from the roots of young trees (1 or 2 years old) than from those of older ones. Where propagation by root cuttings is done the root prunings from young trees being transplanted may be saved. These should be from ¼in. to ⅜in. thick and about 5in. long. For a root cutting it is advisable to make the cut at the top of the root straight across and that at the lower end on the slant, to ensure that the cutting will be planted the correct way up.

The cuttings should be completely covered with moist sand until early spring. They should then be lined out 15in. to 18in. apart in a row in the nursery, with the top of the cutting level with the soil surface.

Frequently a number of shoots grow from each cutting. All except one of these should be eliminated by carefully rubbing them off when they are an inch or two long. It may be necessary to do this several times during the season. In favourable years a number of the root cuttings may produce sufficient growth to be budded the same season.

It is important that the nursery into which either hardwood or root cuttings are planted has good soil which will hold moisture readily and not pack too tightly, thereby excluding air. If the soil is inclined to be heavy, it can be improved by mixing coarse sand with it and by placing a small quantity of sand at the base of each rooted cutting.

Budding and Grafting

There are two methods by which the scion variety can be worked on to the stock—budding and grafting. The choice of method is determined largely by climatic conditions. Peaches, nectarines, and apricots can be budded successfully in most districts. With plums and, particularly, cherries the buds seem to be more easily killed by cold in the winter and in some districts, for instance, Canterbury and Otago, better results are obtained by grafting.

Budding

Time to Bud

The time to bud varies a little from season to season and is influenced by the condition of the sap flow in the stock. Budding must be done while the bark still lifts readily from the stock. If it is not possible to lift the bark cleanly from the wood without tearing it, budding should not be attempted. During a drought period it may be found that after a few days the bark will become hard to lift. If this occurs, budding should be postponed and the trees given a good watering to start the sap flowing again and so enable budding to be done.

The various kinds of fruit are normally budded in a definite sequence, though there may be some overlapping owing to the condition of the stock, and also a difference in the maturity of the buds of different varieties within each kind of fruit. First come cherries in December or January, depending on the season and district, then apricots, followed by plums, and lastly peaches and nectarines, the best time for the last-named being from the middle of February to nearly the end of March.

Selecting Budwood Sticks

Budwood should be taken only from the best trees available. Any tree to be used as a source of budwood should be examined several times during the growing season to make sure that there are no symptoms of disease and that the fruit is of good typical shape and colour. Whenever possible budwood should be taken only from trees which crop consistently. Shoots of about pencil thickness will be found most suitable for budsticks, as buds taken from thick shoots are sometimes hard to fit snugly, particularly if the stocks are thin.

The shoots on the outside and top of the tree, where they get the maximum light, usually have good foliage and bud development and are the best. Water or sucker shoots that arise direct from the heavy wood, particularly on the inside of the tree or where saw cuts have been made, should be avoided, as the buds on these shoots are generally under-developed. If budwood is required from a special tree and the growth is poor, it can be invigorated by severe pruning the year before the buds are required. The shoots must not have completed their growth nor the buds be fully ripe when the wood is collected. The sap must still be flowing in both the bud and the stock before a union can take place.

One point that cannot be stressed too strongly is that the trees from which the budwood is collected must be inspected thoroughly to ensure that they are not infected with virus or any other disease

Side growth should be cleaned off the lower part of the stock a few weeks before budding is done. Left—Before the side growth is cut off. Right—The trunk pruned ready for budding.

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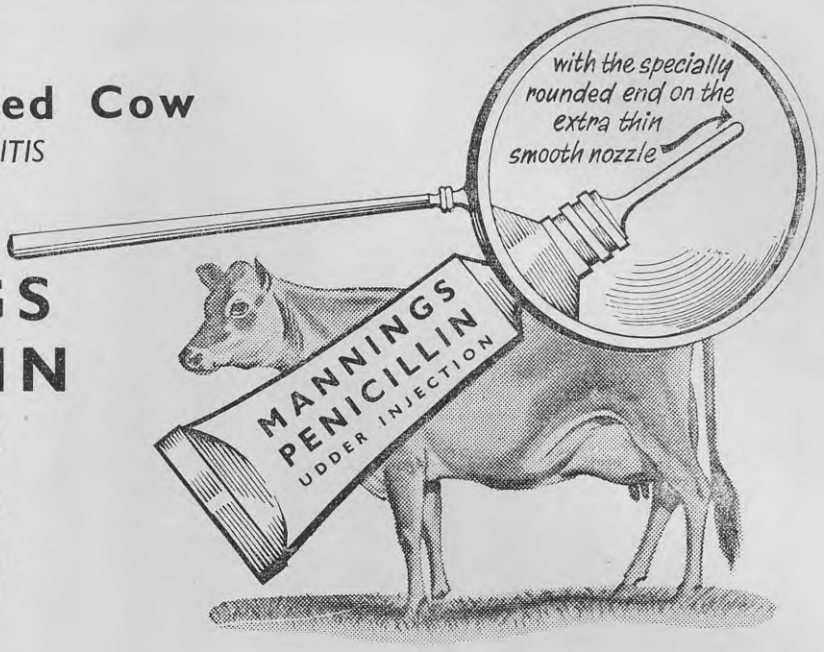

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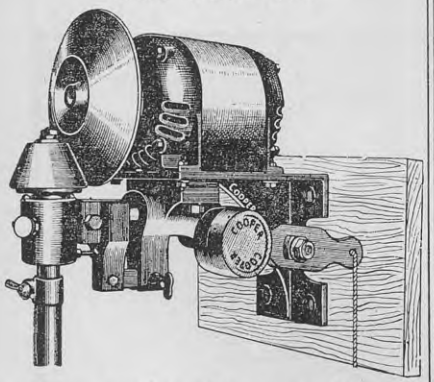

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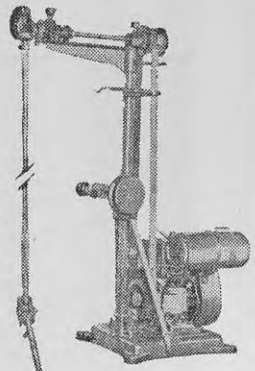

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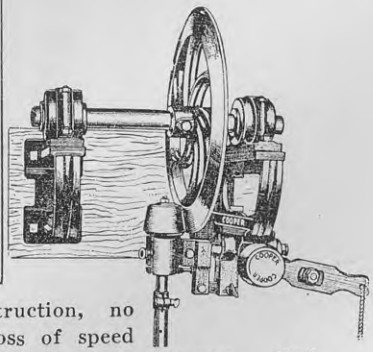

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Operation of budding. Above left—When the operator is standing in position ready for budding, the remaining side growth is held back by his legs. Above middle—Making the T-shaped cut in the stem of the stock ready for insertion of the bud. Above right—The bud has been inserted and the single-wrap tie is being made. At right—Finishing the single-wrap tie.

which can be transmitted to the stock. This also applies to trees from which cuttings or seeds are collected for propagation of stocks.

Preparation of Budsticks

The leaves should be removed from the budsticks as they are collected or as soon after as possible. This operation is important, as it reduces the loss of water by transpiration through the foliage. When the leaves are being removed about ¼in. to ½in. of the petiole (leaf stalk) should be left attached to the budstick. This short piece of stalk acts as a handle when the bud is placed in position on the stock and makes the operation easier. A few inches of both the top and bottom of the budstick should also be removed, as the buds on these portions are usually not well developed. The stipules, which are small, leafy outgrowth from the base of the petiole, should also be removed to reduce transpiration. This applies particularly to varieties of fruit which have large stipules. On other varieties the stipules are insignificant.

Once the budsticks have been prepared they should be stood in a bucket containing an inch or two of water, covered with a damp cloth, and kept in the shade. If only a few trees are being budded, the budsticks can be wrapped in damp cloth or paper and left in the shade.

Operation of Budding

Side growths should be cleaned off the lower parts of the stocks a few weeks before budding (see illustration on page 403). This not only allows the budding to be done more speedily, but also assists in the development of a thicker stock.

To do budding neatly and quickly a very sharp knife is necessary. A special budding knife will be found most suitable, as the end of the handle is shaped for lifting the bark of the stock. Some strands of raffia about 12in. long or rubber bands specially made for budding will be necessary to bind the bud in place.

Speed is necessary in budding so that the back of the bud shield and the exposed part of the stock do not dry out. Rough handling with the knife should be avoided; otherwise the wood or the bud may become damaged and spoil the union.

It is essential that wood buds be selected, as blossom buds will not grow. Wood buds are more pointed and thinner than fruit buds. When in doubt as to whether the buds are wood or blossom ones, especially with peaches or nectarines, it is better to select double or triple buds or bud clusters, as one of the buds is always a wood bud.

The operator should stand just in front of the tree with his back to it, then move backward until the tree is between the legs (see upper left illustration on this page). This pushes any side growths out of the way and enables the tree to be held firmly between the knees. All trees in each row should be budded on the same side so that inspection of the buds and cutting of the ties are simplified. The general practice is to insert the buds on the south side of the stocks to avoid excessive heat from the sun.

When the bud is removed from the budstick the shoot should be held with the thick or base end away from the body. The knife should be inserted into the budstick about ¼in. to ½in. below the bud and then drawn up until it is about ½in. past it (see upper illustration on page 407). At this point the blade should be turned slightly so that it nearly reaches the surface about ¾in. to 1in. above the bud. The bud shield

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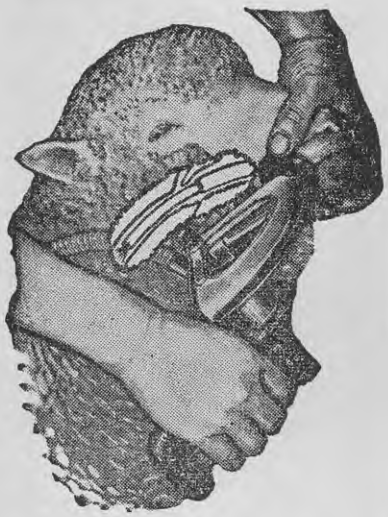

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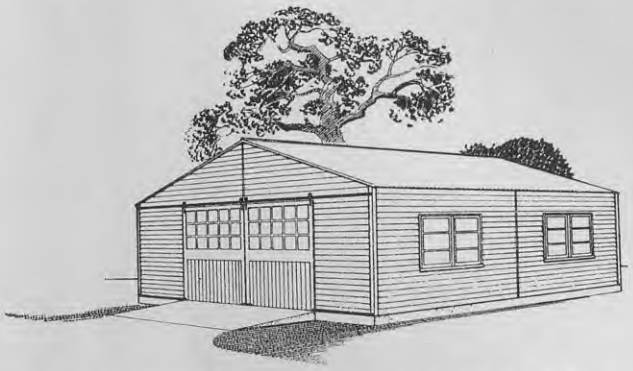

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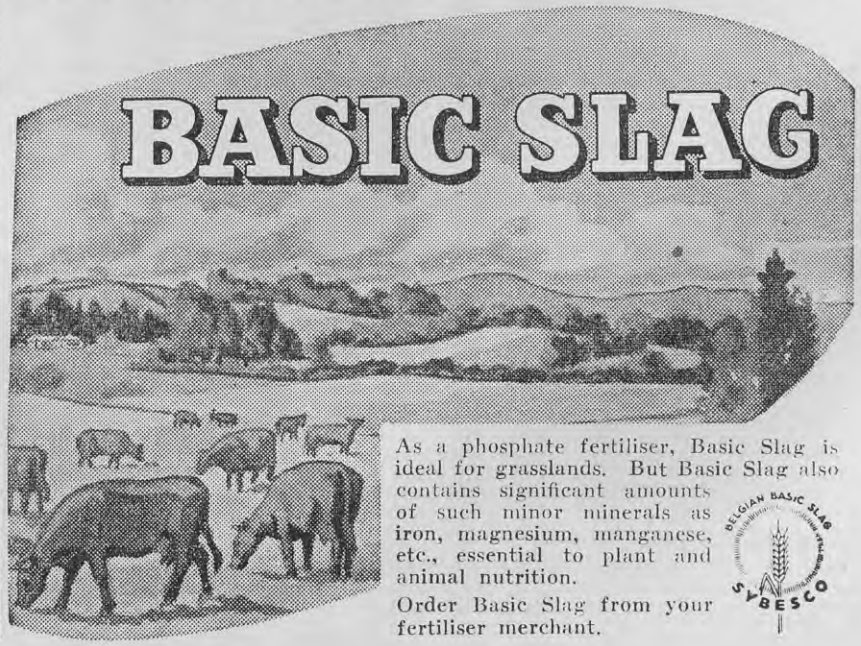

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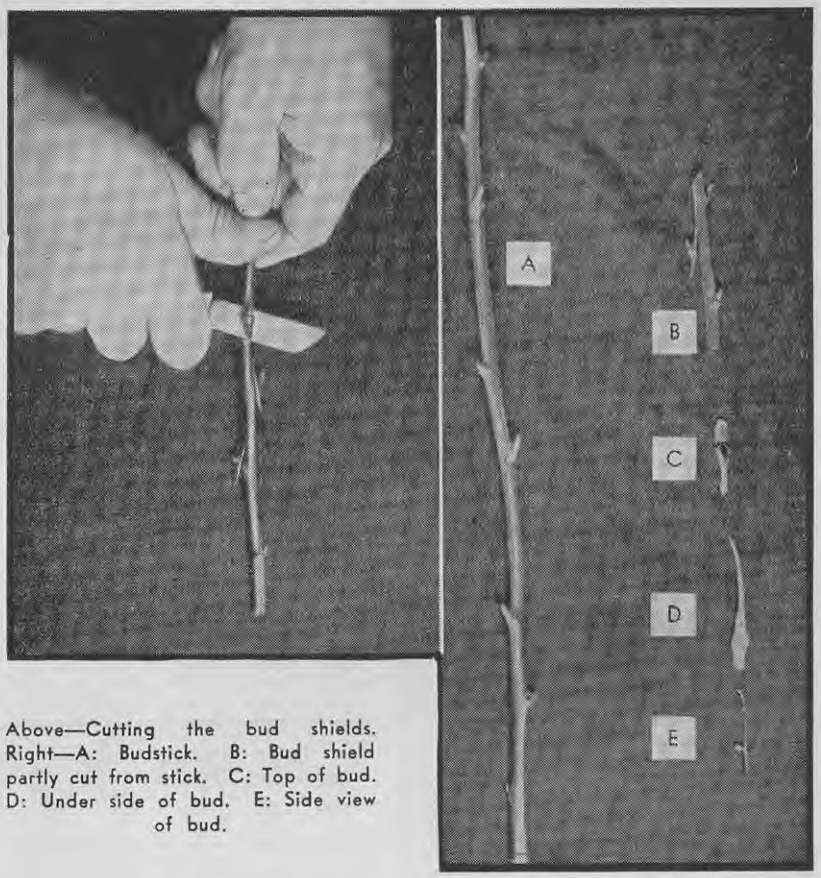
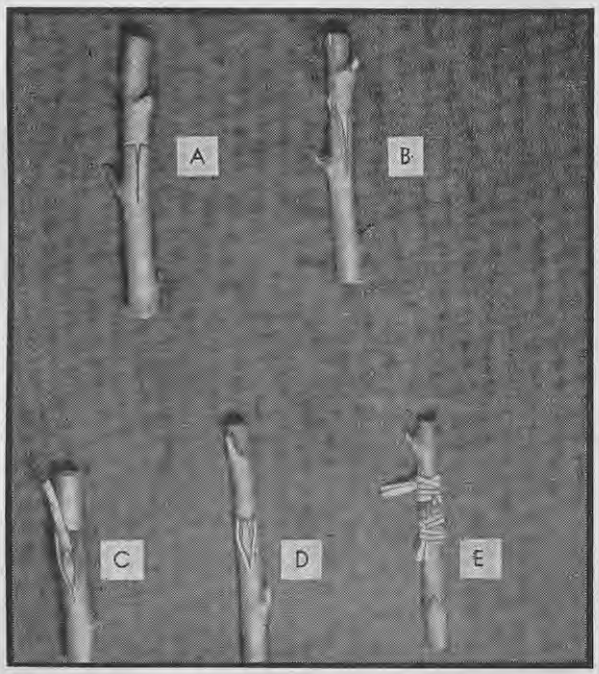
is then held between the thumb and the knife blade and given a quick pull upward, which will drag off a strip of bark. When the bud shield is being cut from the stick a shallow cut should be made so that the piece of wood at the back of the bud does not require removing. If the cut has been made too deep and the wood is not removed, it will be hard to make the bud shield curve around the stock to secure a good union. The wood behind the bud can be removed quite readily by inserting the point of the knife under the wood above the bud and pulling sharply downward. After the wood has been removed the bud germ can be seen at the back of the bud as a small raised lump; if a hollow appears instead, the bud should be discarded, as the bud germ has been destroyed and the bud will not grow. Generally it is only on wood in which the buds are too ripe that the bud germ is damaged when the wood is removed. However, it is not necessary to remove the wood when shallow cuts are made, and it speeds up the work to leave the wood in (see upper illustration on this page).

Before any cut is made in the stock dirt should be cleaned off so that there is no chance of its getting on the cut surfaces and spoiling the union. A T-shaped cut should be made in the stock from 3in. to 6in. above ground level. The height varies according to the condition of the stock. On stocks which are thin or have had a number of fairly thick side growths it is much easier to bud low, where the wood is thicker and is free from knots (see lower illustration on this page). The horizontal cut should be made first, by pressing the knife into the stock to the depth of the bark. The vertical cut is made by inserting the point of the knife about 1in. below the horizontal one and then drawing the knife up



Above—Cutting the bud shields. Right—A: Budstick. B: Bud shield partly cut from stick. C: Top of bud. D: Under side of bud. E: Side view of bud.



Inserting the bud in the stock. A—The T-shaped cut on the stock. B—The T cut with the bark lifted. C—The bud inserted. D—The top of the bud shield cut off level with the cross cut. E—The bud tied.

until the cuts meet. Before the knife is removed it should be given a slight twist to both sides to lift the bark at the intersection of the cuts, thus avoiding the necessity of using the flattened end of the handle. The cuts are made right through the bark, but should not go into the wood.

The bud is placed in position by inserting the lower end of the bud shield under the bark at the intersection of the cuts and pushing it gently downward. Either the short piece of stalk remaining on the bud shield or the bark at the top of the bud can be used as a handle for placing the bud shield into position. The lower end of the shield must go down to at least the bottom of the vertical incision. The bark at the top of the bud, which projects above the cross cut, is cut off by pressing the knife into the original horizontal cut. This will allow the shield to fit snugly under the bark of the stock.

It is a wise precaution for the beginner to collect a few shoots and practise cutting the bud shields and placing them in position before beginning to bud good stocks.

The bud should be bound into position as soon as it has been inserted; otherwise drying out may occur. To do this the centre of the raffia should be placed against the back of the stock and both ends brought around simultaneously so that they pass over the incision just below the bud. A further one or two turns are made below the bud, then both ends are brought around the stock just above the bud, where one or two more turns are made before tying.

Care must be taken that the bud is not covered or damaged by the raffia.

The horizontal cut above the bud should be completely covered by the raffia, but it is not important to cover the vertical cut fully. The binding must be done firmly, particularly the first round below the bud, but it must not cut into the bark.

Another simple and fast method of binding is to place one end of the raffia around the stock, holding it firm

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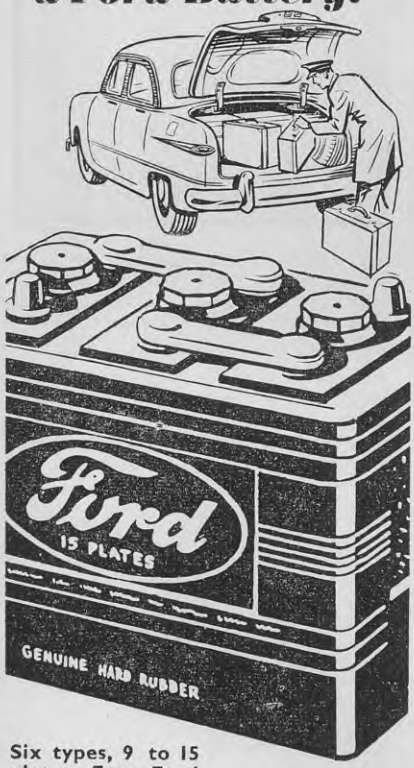

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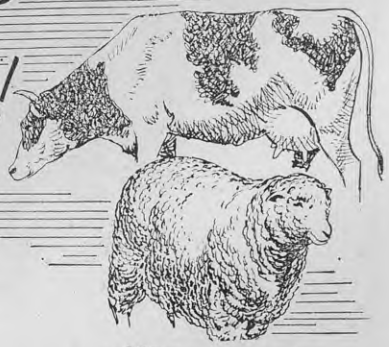

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with the first complete turn, then bind upward until past the cross incision, where two half hitches are made. Such binding should also begin below the bud.

It will be found that raffia which has been soaked in water before use will be stronger and also far easier to tie securely. It is not necessary to use a sealing compound after budding.

Rubber bands which are specially made for tying buds will also be found satisfactory and easy to use. These bands expand as the stocks increase in size and do not cut in to the same extent as the raffia. Only bands specially made for this purpose should be used, as they are made to rot and fall away within 3 to 4 weeks. The second method of tying described should be used with rubber bands.

Treatment after Budding

At the time of the year when budding is carried out the stocks should be growing strongly and increasing in circumference fairly rapidly. This rapid growth makes it necessary to examine the stocks 10 to 15 days after they have been budded to make sure they are not becoming strangled. If this is occurring, the raffia should be cut on the back of the stock with a sharp knife, but the ties should not be removed, as they assist in shading the bud. The ties should not be cut until at least 10 to 12 days have elapsed from the time of budding.

The portion of leaf stalk left on the bud shield is quite a good indicator as to whether the bud has taken. If these stalks shrivel and adhere to the bud when not supported by the binding material, the bud has failed. Another bud may be inserted in a fresh position on the stock, provided the stock is still in a suitable condition.

Rootstocks on which buds have taken should not be cut off until the end of the winter after budding. The stock can then be cut off either 4in. to 6in. above the bud or immediately above it; in the latter method the cut should slope away from the bud to run rain off. If the stock is cut off immediately above the bud, it may be necessary to support the young growth from the bud with a stake to prevent wind damage. If a stub is left, the young growth can be tied to it, but when the stub is finally removed, the cut does not callus as quickly as one made earlier. (See illustrations on this page.)

The treatment of the resultant growth depends largely on how it develops, and this is influenced by soil, climate, and other factors. If under favourable conditions strong growth is made early in the season, this can be pinched back at about 15in. from ground level, causing the stem to branch. Three strong, well-placed branches are retained to form the basic framework of the future tree.

Where only weak growths are made it is better to grow a single stem in the first season, all side growths being removed as they appear. In the winter this stem is cut back to about 15in., care being taken that the top three buds are sound and well spaced. In the following growing season three main arms should develop.

Grafting

In the grafting of nursery trees the whip and tongue graft is used. The operator will require a supply of tree-sealing compound as well as a knife and some raffia. The best sealing agents are those specially prepared for grafting. These are the least likely to be harmful to the bark of the tree and they remain pliable, thereby excluding air and moisture from the wound made in grafting.

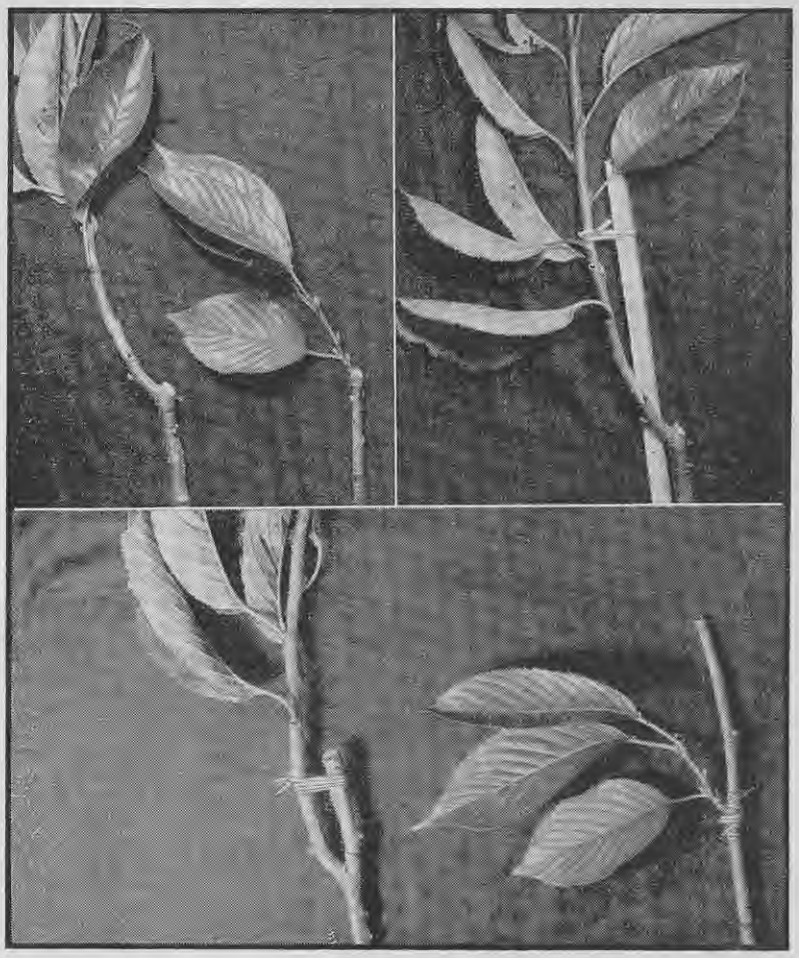
Grafting is done in spring, but as it is necessary for the stock to be in a more forward condition than the scion, the grafting wood is collected while it is still dormant. When a source is being selected the same precautions should be taken as when choosing budwood; the trees selected must have been carefully examined during the growing season to make sure that they are healthy and carry good crops of fruit which is true to type. The trees should be clearly marked.

Neither rank, sappy growths nor spindly twigs are suitable as scions. Well-grown shoots of the previous season's growth, showing good bud development, should be selected and cut off at their bases. Wood of each variety should be bundled up separately and labelled; the tips of the shoots should not be cut off.

The wood must be stored so that it will not dry out, and the most suitable place is in the shade of a building or beneath a tree, where the soil will remain moist without waterlogging and where there is no likelihood of the wood becoming frozen.

A trench should be opened deep enough to take one-third of the length of the shoots. Care should be taken that the bases of the shoots touch the bottom of the trench before the soil is filled in round them. It is immaterial whether the shoots are upright or at an angle.

Grafting can usually be begun when stocks are at the advanced green-tip stage, and normally can be done over a period of 2 weeks or 3 weeks. It is useless starting before the sap in the stock is flowing sufficiently for the bark to be lifted readily from the wood, for if grafting is done too early, the scion will dry out and die before a union is made. The stocks should be tested by making a cut and lifting



Growths from buds. Upper left—Stocks cut off close to the buds. Upper right—A small stake is used to support the bud shoot when the stock has been pruned close to the bud. Lower—Stubs left for tying bud shoots for support.

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the bark, as various kinds of stocks may differ by a week or more in the time required to reach the correct stage.

Operation of Grafting

It is advisable to prepare the scions before beginning to graft, but only enough for about 1 hour's work should be cut at a time; a small box to keep this quantity clean and shaded from the sun will be found useful. The wood should be taken from the trench where it has been stored, a few inches of both tip and base of each shoot should be discarded, and the remainder cut into scions with three or four buds on each. The cut at the top of each scion is made immediately above, and sloping away from, a bud (see illustrations on this page).

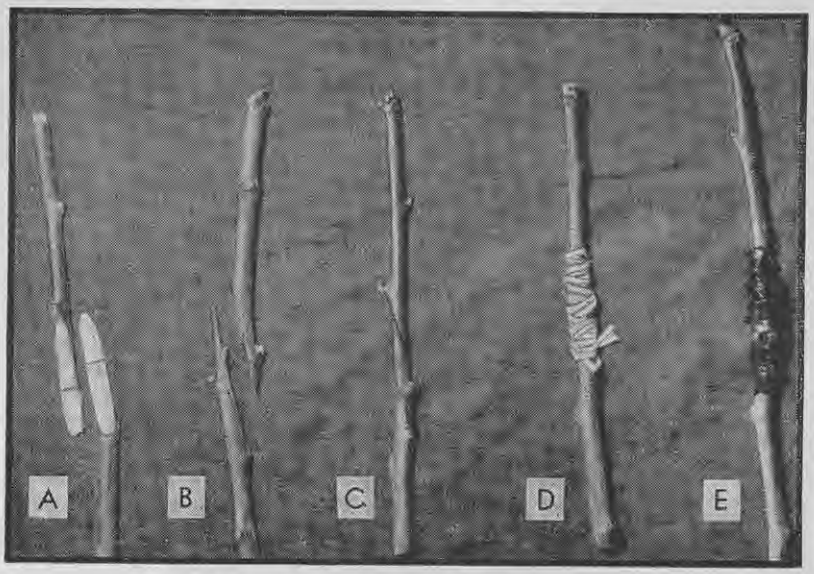
The base of the scion is prepared by making a slanting cut, about 2in. long, on the side opposite the lowest bud, as shown in the illustration at right. The base is then split by another cut (see illustration) to form a tongue; this cut is made parallel to the bark from nearer the pointed end of the slanting cut rather than up the centre.

At a height of about 12in. similar cuts are made on the stock and the two pieces are fitted together (as in the illustration at right) so that they are held firm by the tongues.

To ensure a good union between stock and scion the cambium of one must be in contact with that of the other to the greatest extent possible. (The cambium is the layer of actively dividing cells between the wood and the bark.) If the scion is of the same diameter as the stock, and the two barks are of equal thickness, the main precaution necessary in fitting them together is to see that the cut surfaces of stock and scion are in contact. If the scion has a smaller diameter than the stock, it should be placed toward one side, so that the cambium layers on that side are in close contact.

When the scion is in its correct position the join is bound firmly with raffia and sealed. The method of binding is similar to that described for budding trees. The material used for sealing should make a pliable, airtight, waterproof film over the union. There are many recipes for grafting wax, and many need to be applied hot. Some bitumastic compounds are suitable, and green crude petrolatum is often used successfully. It is essential that the join be covered completely, particularly all exposed cut surfaces; the top of the scion should also be sealed to prevent drying out.

Two workers can do grafting much more satisfactorily than one; the more skilful should do the cutting and fitting of the grafts and the other the tying and sealing.



Whip grafting when the stock and scion are the same thickness. A—Cuts made on stock and scion. B—Side view of stock and scion. C—Scion placed in position. D—Scion bound in position. E—Graft sealed and completed.

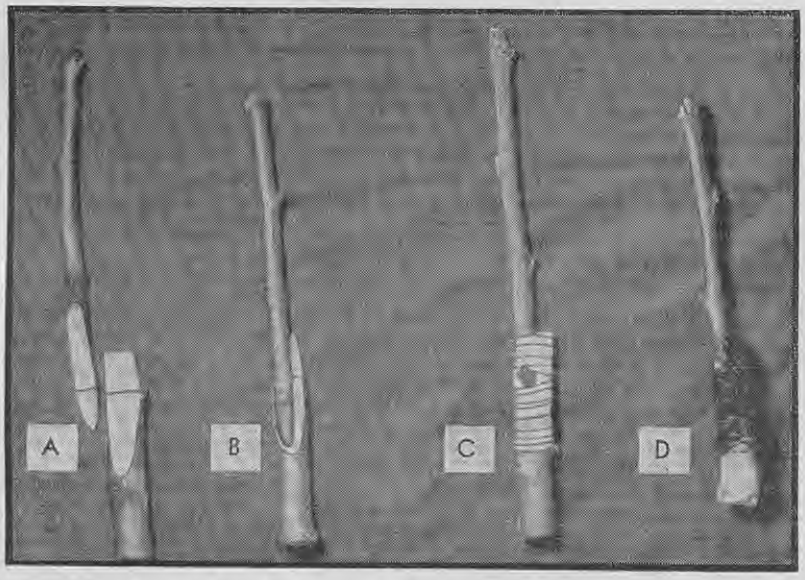
If only one person is doing the complete operation, extreme care is required to see that the hands are cleaned thoroughly each time the sealing compound is handled, as the slightest trace of foreign material on the cut surfaces of stock and scion that are in contact may cause failure of the union.

Within a few weeks of the buds being grafted the scion should begin to grow, and both scion and stock will swell. As soon as this occurs the raffia should be cut with a sharp knife, but not removed, care being taken not to damage the union.

Buds on the stock may also start growing. These shoots should be rubbed off from time to time, preferably before they have grown more than an inch or so. Rubbing off is better than cutting, as it reduces the chances of the shoots growing again.

During the first growing season after grafting the trees should develop at least three good shoots. Provided these are well spaced, all three should be allowed to grow until the following winter, when they should be headed back to about one-quarter to one-third of their original length and any other shoots removed. If fewer than three shoots come away, the tree should be reduced to a single rod, which should be headed back in the winter to form a head in the following season.

In the late summer preceding transplanting to the orchard the trees should be wrenched when the soil is in a suitable condition. Wrenching assists in forming a more compact rooting system, which enables the tree to recover from transplanting more readily.



Whip grafting when the stock is larger than the scion. A—Stock and scion prepared for fitting together. B—Scion fitted to stock (note how the scion is fitted to one side so that the cambium layers meet). C—Scion tied in position. D—Graft sealed and completed.

Reference

"Fruit Tree Raising: Rootstocks and Propagation", Bulletin No. 135, Ministry of Agriculture and Fisheries, England.

University Students' Attitudes to Farming Life

THIS is the age of public opinion surveys on all manner of subjects, and though results are sometimes greeted with a certain amount of scepticism, particularly if they run counter to firmly established ideas or prejudices, they are still of considerable interest and value. Because of the significance of farming in New Zealand's economy a survey on attitudes to farming life conducted at Victoria University College by Mr. A. A. Congalton, Lecturer in Psychology, among a group of students is of special interest.

THE technique of the survey was to take a selected sample of students (77 men and 30 women, members of a first-year class in psychology), ascertain the extent of their farming or farm life experience, including holidays on farms, and ask them eight questions in the form of a questionnaire which was completed during the regular work of class and took 15 minutes to answer. It was found that the majority of students had had some experience of farm life, though generally it was for holidays only. Between a fifth and a sixth had never been on a farm.

As might have been expected, the results of the questionnaire are as interesting for what they reveal indirectly as directly; principally the woeful ignorance of farming and farm life of what must be a large section of the population.

The first question was "Where would you like to live permanently?" and gave as alternatives a farm, city, small town, and large town. Eighty-four per cent. of the answers indicated a preference for an urban residence (city or large town) and only 4 for a country town; 12 per cent. favoured a farm.

Question 2 posed as a hypothesis an equal fixed and liberal income from each of farming, business, or professional occupations and requested a choice under these circumstances. The postulate is such an extraordinarily unnatural one that it is difficult to see how the answers could have any significance, but the results were similar to those of question 1, with those people who had at some time lived in a farm forming the majority in favour of farming as an occupation.

Types of Farming

The third question was concerned with preference for types of farming and, as might be expected, sheep farming had an easy victory, though what type of sheep farming was not indicated by the question. This confirms the existence of the popular belief that a sheep farmer's life is one of leisure. Among the reasons for the preference no one gave "social prestige", though one has a sneaking conviction that it must have been at least slightly in the thoughts of some of the respondents.

Such possibilities as dairy farming with a sharemilker which eliminate the main reason given as favouring sheep farming (lack of tie and routine drudgery) were not envisaged.

The fourth question encroached on the somewhat delicate ground of matrimony, that for the men being "Would you like to marry a girl who has lived all her life on a farm?" and for the women "Would you like to marry a farmer?" The personal factor was covered by the phrase "other things being equal". Though analysed together, these two questions seem to relate to totally different concepts. Though 65 per cent. of the women had indicated earlier that they preferred to live in a city, and 95 per cent. preferred a professional occupation, 70 per cent. indicated that they would marry, or be likely to marry, a farmer, "other things being equal".

Probably the answer to this question might have been influenced by the national income statistics.

Question 5 related to whether university bursaries should be weighted in favour of those going in for agricultural work because of the importance of farming to New Zealand. The students were two to one against the idea, but some of the reasons given were important as indicative of confused thinking and lack of knowledge. Though the question was a wide one, most seemed to interpret agricultural work as farming, quite forgetting the numbers of research, extension, and administrative workers required in an agricultural country where farming is likely to encounter the law of diminishing returns unless these things are expanded. One answer was startling enough to be worth quoting: "Farming requires little knowledge, but a lot of hard work". Clearly a visit to a Ruakura or Massey or Lincoln farmers' week would not go amiss.

New Zealand Aristocracy

The next question reads "In so far as we have an aristocracy in New Zealand are the 'top tops' to be found mainly in cities or mainly in farming areas?" It is difficult to see how this question relates to attitudes to farming and in the absence of any definition of an aristocracy it is not clear what the question means. The 58 per cent. of the students who replied "both" gave the only possible intelligent answer.

Question 7 asked for an opinion on the contention that those people with the best brains and talent are likely to settle in the cities rather than on the farms. The question did not indicate what it was the brains were supposed to be best for. The fact that it obviously requires a higher I.Q. to be a successful research scientist or to hold a university chair than it does to run even a large farm suggests that the 85 per cent. who answered "in cities" may be correct; but in practice such a comparison is rather meaningless. Had the question been worded to suggest a comparison of agriculture as a whole with city life, the respondents might have been less definite in their answers. A third alternative was possible—the best brains and talent are likely to go overseas. Possibly what the question was trying to get at was a comparison of I.Q. and capacity levels per unit of population in town and country. This could be ascertained only by a survey, if any really satisfactory measure of capacity can be found.

The final question, "What kind of a person is more likely to enjoy living on a farm? (that is, what values would you expect to find?)", provided some interesting material. The most popular answer was "likes hard physical work", followed closely by "fond of outdoor life", "likes animals and nature", and "likes solitude". Among the subjective qualities "reserved", "placid", "patient", "stable", "practical", and "self-reliant" ranked high, though "low intelligence" and "unambitious" both found some adherents. Unless included under the heading "other qualities mentioned once only" the attributes of ambition, initiative, and desire for financial independence are not mentioned, though these have been the outstanding qualities in bringing New Zealand land from bush, scrub, and swamp to the world's finest pastures.

Townsman's Concept of Farmer

It would seem that the New Zealand townsman's idea of his country cousin is still based largely on the earlier "Punch" concept of the village yokel, that he or she has very little conception of the thought, skill, and enterprise required in modern farm management, but that farming would be quite a good job if one did not have to work so hard, and that in any case a farmer is a fairly good marriage prospect even for the professionally trained woman.

It must be remembered, of course, that the average age of the sample was only about 22; thus it is natural that the students should be influenced by conditions during the period of their adolescence.

In spite of what appears to be unfortunate choice of the wording of one or two questions and the inclusion of one or two others, the survey does draw a clear picture of the thought of what is probably a fairly typical sample of young budding professional people of today. If the picture is somewhat different from what some think it should be, that is not Mr. Congalton's fault, but it would be interesting to know whether it really is a true picture and, as it was stated to be a preliminary investigation, one looks forward to the result of the fuller survey which will presumably be based on a wider sample.—*J.V.W.*

By ELEANOR COUSTON, Field Officer in Rural Sociology, Department of Agriculture, Christchurch

"GOOD Housekeeping's Home Encyclopaedia" describes a souffle as "A light fluffy dish, sweet or savoury, made with a panada base and fresh eggs, the egg whites being well whisked before they are added; a souffle may be either steamed or baked, and should be served very hot". The ideal time to include a souffle in the menu is when eggs are plentiful and when the cook can depend on her family or guests to be punctual.

A SOUFFLE which is delicate and palatable when removed from the oven will soon shrink and lose its attractiveness unless served immediately. However, it is wrong to suppose that souffles are difficult to make, and from a foundation recipe many variations can be made.

Hot Souffles

The basis of a good souffle is a smooth, properly thickened white sauce. When this is cooked it is removed from the heat and the flavouring ingredients are added. The hot sauce is then stirred into the beaten egg yolks until the two are blended. This mixture is folded carefully but thoroughly into the stiffly beaten egg whites. The whites should be beaten to the stage where they are stiff but not dry, and the blending can best be done by using a spatula with a wide blade and working gently with a down up-and-over movement. The lightness of the souffle will depend largely on the amount of air incorporated with the egg whites.

The mixture is then poured into an ungreased baking dish, sufficient room being allowed for it to double in size. If a straight-sided souffle dish is being used, a double layer of greaseproof paper can be tied round the outside to give extra height and then removed before the souffle is served.

If the souffle is to be steamed, the top of the dish should be covered with well-buttered greaseproof paper. A steamer is best for the purpose, but a saucepan with a rack on the bottom may be used. A pressure cooker rack is suitable. The saucepan should have about 1in. of gently boiling water in the bottom. A steamed souffle will take from ¾ hour to 1 hour to cook, depending on its size.

In the following recipes all measurements are for standard measuring cups (8 fl. oz.) and standard measuring spoons and are level measurements.

Foundation Recipe for Souffles

2oz. of butter
1oz. of flour
1 cup of milk
3 eggs, separated
½ teaspoon of salt

(Serves 4)

Melt the butter, add the flour and salt, and cook until blended but not brown. Remove from the heat and add approximately a third of the milk. Return to the heat and stir until thickened. Repeat until all the milk is used and the sauce is thick and smooth. Beat the egg yolks and add the hot sauce to them. Stir until blended. Beat the egg whites until stiff, add the sauce mixture, and fold them into the mixture gently but thoroughly. Pour into an ungreased baking dish. Bake in a slow oven (325 degrees F.) over a pan of hot water for 1 hour.

Savoury Souffles

Cheese souffle: Add 1 cup of finely grated cheese and a shake of pepper to the hot sauce and stir until the cheese is melted.

Fish souffle: Add ¾ cup of cooked flaked fish, a shake of pepper, and 1 teaspoon of anchovy sauce to the sauce. If smoked fish or salmon is used, omit the anchovy sauce.

Oyster souffle: When making the sauce use some of the oyster liquor to replace part of the milk. Add 1 teaspoon of lemon juice, a shake of pepper, and 1½ dozen bearded and cut up oysters to the sauce.

Meat souffle: Add 1 cup of minced ham, corned beef, or chicken and a shake of pepper to the sauce.

Sweet Souffles

Prune or apricot souffle: Add 1 tablespoon of sugar and ¾ cup of fruit pulp to the sauce; 9oz. of dried fruit gives ¾ cup of puree.

Chocolate souffle: Mix together 2 tablespoons of cocoa, 2 tablespoons of sugar, and ¼ cup of water. Cook to a thick paste. Add to the sauce and flavour with vanilla.

Caramel souffle: Caramelise 3 tablespoons of sugar and blend with the sauce.

Cold Souffles

The term souffle is sometimes applied to certain cold desserts with a light texture which have whipped cream and egg whites added to a gelatine base.

They should give the impression of having risen in the same way as a hot souffle and can be set in a straight-sided souffle dish which has been given extra height by a double piece of greaseproof paper being tied round it so that the paper comes about 3in. above the edge. The collar is removed before the souffle is served and the souffle garnished with cherries, angelica, or nuts.

If a straight-sided souffle dish is not available, the dessert can be set in a glass or crystal bowl.

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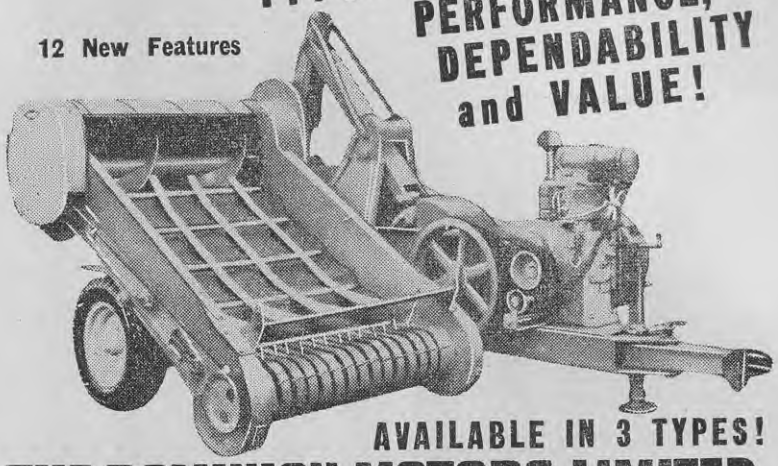

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Lemon Souffle

1 dessertspoon of gelatine
2 tablespoons of water
2 eggs, separated
2oz. of castor sugar
1 lemon (rind and juice)
¼ pint of cream or evaporated milk

(Serves 3)

Soak the gelatine in the water; then place the bowl over hot water and stir until the gelatine is dissolved. Beat the egg yolks, sugar, and lemon rind and juice over a pan of hot water until thick and creamy. Remove from the heat and continue beating until cool. Add the dissolved gelatine. Whip the cream and beat the egg whites until they are stiff. Fold the cream into the egg yolk mixture and blend thoroughly. Fold this mixture carefully into the whites. When it is set decorate it with whipped cream, glace cherries, or nuts.

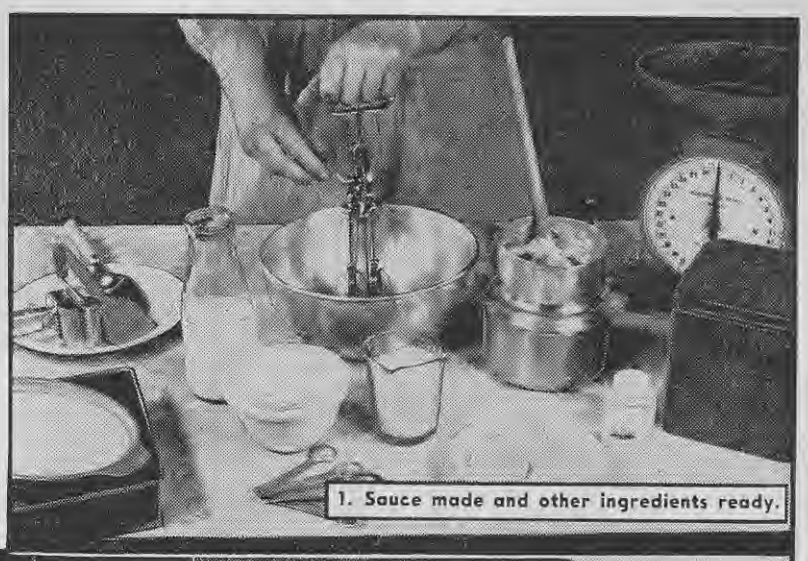
Chocolate Souffle

1 dessertspoon of gelatine
2 tablespoons of water
2 eggs, separated
½oz. of castor sugar
Rind of 1 orange
3oz. of cooking chocolate softened in 2 tablespoons of water
¼ pint of cream or evaporated milk

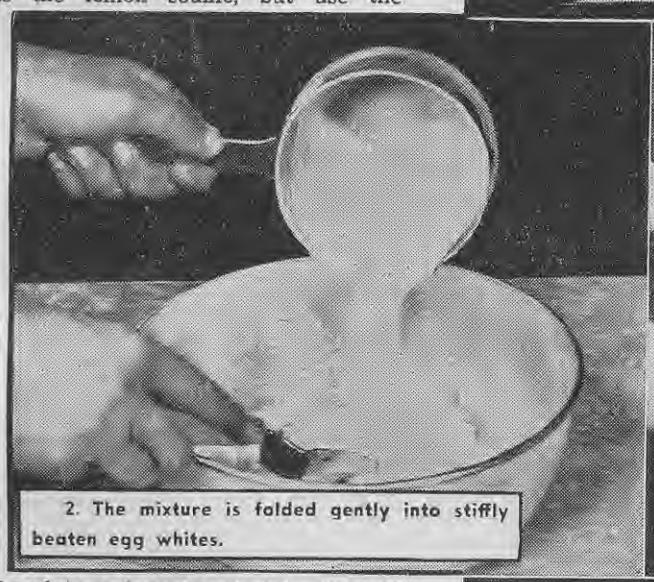
(Serves 4)

Make this dessert in the same way as the lemon souffle, but use the chocolate and orange rind in place of the lemon juice. Garnish with nuts or orange sections.

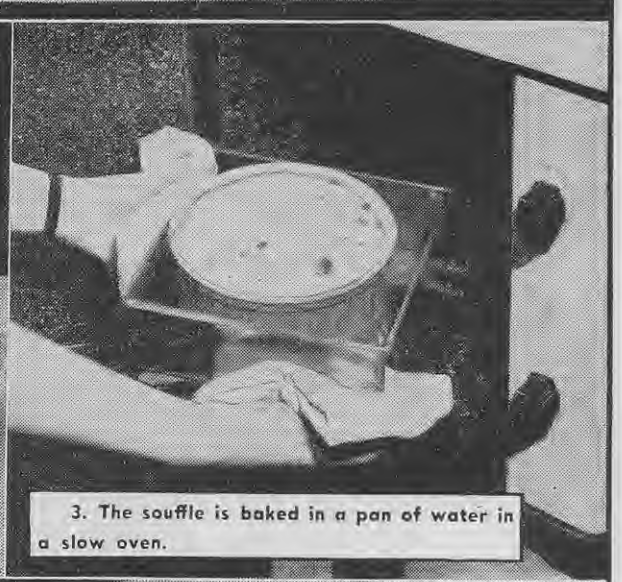
If evaporated milk is used in place of the cream, chill it thoroughly before whipping.



1. Sauce made and other ingredients ready.



2. The mixture is folded gently into stiffly beaten egg whites.



3. The souffle is baked in a pan of water in a slow oven.

Economical Dessert

When eggs are dear or when cream is not available an economical dessert can be made in the following way:—

Mock Chocolate Souffle

1 tablespoon of gelatine
2 tablespoons of water
4oz. of sugar
1½ tablespoons of cocoa
1 cup of milk
16oz. tin of evaporated milk

(Serves 6)

Soak the gelatine in cold water. Mix the sugar and cocoa to a smooth paste with a little of the milk. Add the remainder of the milk and bring the mixture to the boil. Remove from the heat and add gelatine. Stir until the gelatine is dissolved. Cool. Chill the evaporated milk and whip. Blend the whipped milk with the chocolate mixture and leave to set.

Cold lemon souffle ready for serving.

Bringing Colour to Meals

ATTRACTIVE meal service is an art on its own. The added garnish or the unusual arrangement of the simplest meal gives that extra fillip to the appetite. A little imagination and just a few minutes' attention will give very pleasing results.

Next time a left-over dish is served, pipe mashed potatoes (previously mixed with a little milk to give a workable cream) on top through a biscuit forcer. The cottage pie will have quite a festive look.

For added colour to meals serve diced carrots and green peas mixed together and sprinkled with finely chopped parsley. Light-coloured vegetables can be made to look more interesting by serving them with cheese sauces or white sauces to which chopped parsley or chopped hard-boiled eggs have been added. Mint leaves and watercress can be used as garnishes in place of parsley.

Here are some new ways of serving tomatoes. Firm, ripe tomatoes should be chosen. Dip them in boiling water for ½ minute or run over them with the back of a knife to aid easy peeling.

1. Place a tomato stem down and with a sharp knife cut it in a series of strips two-thirds through. The strips should be about ½in. wide. Turn the tomato and cut again at right angles, which will produce cubes. Spread the cubes out slightly and sprinkle with grated cheese and chopped walnuts, garnish with parsley, and serve on a nest of lettuce leaves.

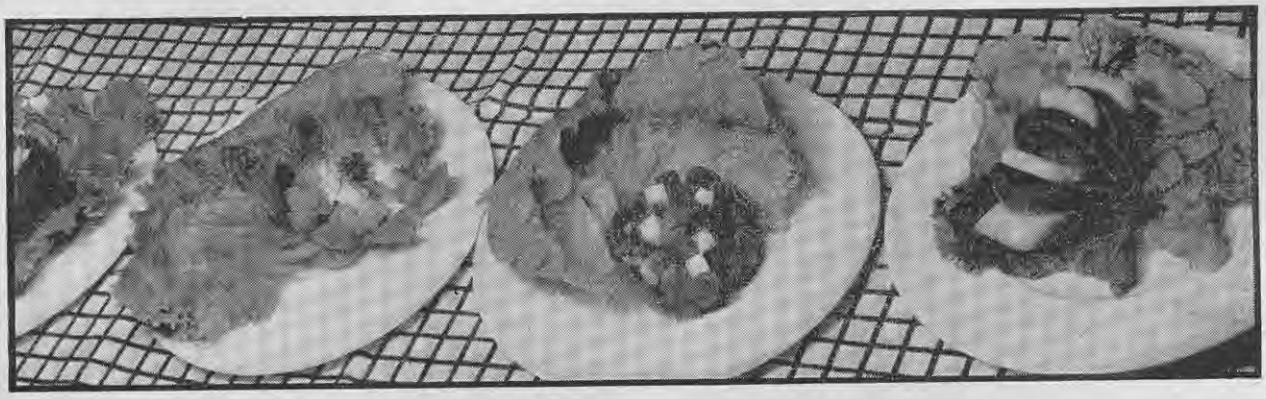
2. Hold a tomato stem down and cut just through the flesh to form eight petals. Ease out these petals and remove most of the pulp and seeds. Pile mixed cooked vegetables, which have been tossed in salad dressing, into the hollow formed and garnish them with finely cut chives.

3. Again place a tomato stem down; insert a sharp-pointed knife at an angle about one-third the way down the tomato and cut out a cone-shaped wedge. Fill the hollow with cream cheese and put the "lid" on cut side uppermost. Garnish with parsley.

—*DAPHNE EILERS,*
Field Officer in Rural Sociology, Department of Agriculture, Auckland

[*Sparrow*

Upper—Various garnishes. Middle—Removing tomato skin. Lower—Cutting skinned tomatoes. Below—Finished individual salads.



Flower Garden Hygiene: Control of Pests and Diseases

MOST people who take a pride in establishing and maintaining a flower garden wage a continual war against pests and disease, which are among the main limiting factors in the success of an attractive garden. It is most annoying to the keen gardener to find special or prize blooms and plants being devastated by an attack from one or more of these common enemies. Counter attack is best carried out by a system of garden hygiene as well as combating and controlling pests and diseases, the campaign being outlined in the following article by L. C. Hurndell, Horticultural Instructor, Department of Agriculture, Christchurch. The section on flower garden work for November is by M. Joanna Lockie, Horticultural Instructor, Department of Agriculture, Auckland.

GOOD garden hygiene is essential, as it helps greatly in keeping pest and disease attacks to a minimum. Rubbish should be gathered up and disposed of. Old boards, bricks, pieces of sacking, and even large stones left lying about provide ideal places for insect pests to hide and breed. Old leaves and twigs of disease-infected plants and whole diseased plants themselves, if left, will provide sources of infection for healthy plants. Diseased plants and plant parts should not be placed on the compost heap, a practice which is widely carried out. They should be destroyed by burning to prevent any further spread of the disease. Some soil-borne diseases can be carried over from composted diseased plant material, thus infecting the flower beds on which that compost is used the next season.

All litter should therefore be disposed of and the garden kept as clean as possible to eliminate all probable breeding places and sources of infection.

Weeding

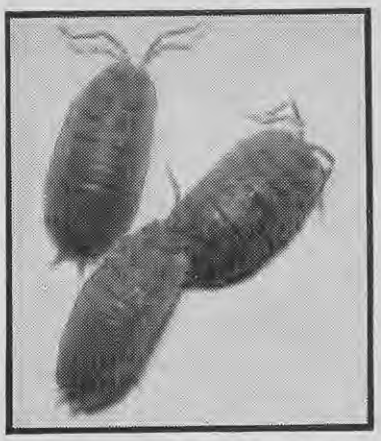
A number of weeds act as hosts for pests and diseases attacking flowering ornamental plants and may often provide a home for these enemies when the ornamental plant is in its dormant stage. For example, the weed known as groundsel is a host of the magpie moth larvae (*Nyctemera annulata*), known to most gardeners as woolly bear. This pest is particularly troublesome on cineraria and salvia. Weeds such as wild turnip and shepherd's purse may act as hosts for the virus disease turnip mosaic (*Brassica* virus) which affects the garden stock, also fungous diseases such as downy mildew (*Peronospora parasitica*), and club root (*Plasmodiophora brassicae*) of stock and wallflower. If weeding is neglected, these weeds are liable to become a nursery for these pests.

In the eradication of weeds care should be taken, if a hoe or any other instrument is used, not to damage the stems of plants; otherwise the injured parts can become points of entry for disease organisms. Every gardener should realise the importance of weeding for appearance as well as disease control and to prevent competition with cultivated plants both for nutrients and moisture. Staking and tying of tall growing subjects to prevent injury by wind and boisterous weather also minimise the risk of disease entering damaged tissue.

Wound Protection

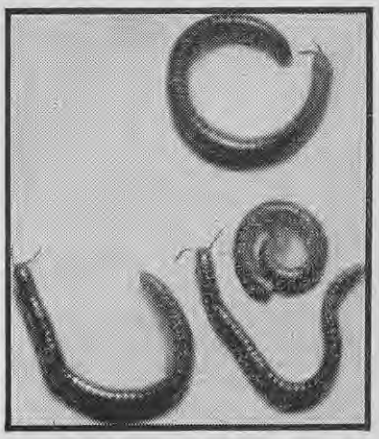
Often when deciduous trees and shrubs are pruned and trained large

An adult of the large narcissus fly, the larvae of which attack a wide range of flowering bulbs.



[*Green and Hahn*
Woodlice.

[*Shell Photographic Unit*
Colony of bean aphides on under side of a leaf of spindleberry tree. Inset—Eggs of bean aphides on shoot of spindleberry tree.



[*Green and Hahn*
Millepedes.

INSECT PESTS AFFECTING THE FLOWER GARDEN, AND METHODS OF CONTROL

Insect pest	Hosts	Control
Aphides (many species)	Flowering annuals, perennials, and shrubs	Spray with nicotine sulphate plus activator. H.E.T.P. or lindane
Army worm	Dahlia and salvia	Spray with D.D.T. or arsenate of lead
Brown beetle (adult of grass-grub)	Lily, rose, and many other shrubs	Spray with D.D.T. or arsenate of lead
Bronze beetle	Rose and many shrubs	Spray with D.D.T. or arsenate of lead
Bulb mite	All bulbs	Destroy badly infested bulbs; hot water treatment
Bulb flies	Iris, narcissus, and lily	Destroy badly infested bulbs; hot water treatment. Spray plants with D.D.T.
Cyclamen weevil	Cyclamen, begonia, and gloxinia	Apply arsenate of lead or paris green baits to the soil around plants. Water with D.D.T.
Cutworm	Flowering annuals and perennials	Apply arsenate of lead or paris green baits to the soil
Cherry slug	Flowering cherry and plum	Spray with D.D.T. or arsenate of lead
Diamond-backed moth	Stock	Spray with D.D.T. or lindane
Earwig	Flowers of many plants	Apply poison baits or traps at base of plant
Fuller's rose weevil	Rose and flowering annuals	Spray with D.D.T., arsenate of lead, or lindane
Grass-grub, subterranean grass caterpillar (porina)	Lawns and many plants	Apply D.D.T., arsenate of lead, or lindane to the soil
Green vegetable bug	Flowering annuals and perennials	Spray with D.D.T. or H.E.T.P.
Leaf roller	Geranium, rose, chrysanthemum, and many other plants	Spray with D.D.T., arsenate of lead, lindane, or D.D.D.
Looper caterpillar	Dahlia, salvia, and geranium	Spray with D.D.T., arsenate of lead, or lindane
Leaf miner	Cineraria, dahlia, and chrysanthemum	Destroy infected foliage; spray with lindane
Leaf hopper	Flowering annuals and perennials	Spray with D.D.T. or nicotine sulphate plus activator
Leaf and bulb eelworm	Chrysanthemum and bulbs	Hot water treatment
Magpie moth	Chrysanthemum, cineraria, salvia, and geranium	Spray with D.D.T. or arsenate of lead
Mealy bug	Ferns and succulents	Spray with nicotine sulphate plus activator, D.D.T., or summer oil. Paint insects with methylated spirit
Millepede	Seedlings and many flowering plants	Spray infested area with nicotine sulphate plus activator or dust areas with lindane; use traps
Red spider mite	Carnation, gladiolus, violet, and shrubs	Spray with nicotine sulphate plus summer oil or H.E.T.P.
Root eelworm	Chrysanthemum, begonia; many plants	Destroy infected plants; sterilise soil where practical
Slugs and snails	Seedlings and many flowering plants	Apply metaldehyde baits to the soil
Slaters (woodlice)	Seedlings of many plants; ferns	Apply poison baits to the soil or dust infested areas with D.D.T.
Springtails	Seedlings of many flowering plants	Soak infested areas with nicotine sulphate plus activator
Scales (many species)	Rose and many other shrubs	Spray with summer oil or winter oil on deciduous shrubs in dormant season
South African weevil	Carnation and gerbera	Spray with D.D.T. or lindane
Thrips	Dahlia, gladiolus, rhododendron, etc.	Spray with D.D.T. emulsions or nicotine sulphate plus summer oil
Vegetable weevil	Gerbera	Spray with D.D.T. or arsenate of lead
White fly	Begonia, chrysanthemum, and coleus	Spray with D.D.T. Fumigate under glass with nicotine sulphate
White fringed beetle	Ranunculus, anemone, and flowering annuals	Spray with D.D.T., arsenate of lead, or lindane
Wireworm	Bulbs and many flowering plants	Apply lindane to infested areas. Thorough cultivation and hand picking

open surfaces are left exposed, especially where large branches are cut off. These open surfaces can be points of entry for disease organisms. An example is the disease known as silver leaf (*Stereum purpureum*), which is a wound parasite attacking many trees and shrubs in the flower garden. Large wounds should therefore be protected by coating the exposed surface with a protective covering such as petroleum seal or a bitumastic paint. When pruning is being done the cuts should be made as close as possible to the standing part to encourage rapid healing; stumps of branches should not be left.

Control Measures

The success of measures used to combat pests and diseases depends on several factors.

With insect pests the gardener must first determine what type of insect he has to combat, and then use a specific material or method.

Many people become disheartened and wrongly blame a material for not doing its job when they see a pest apparently thriving despite their efforts to control it. They may not have used the correct insecticide or may not have used it as directed. For instance, an insecticide such as nicotine sulphate is practically useless unless an activator is added to the diluted material already prepared for spraying; also results are disappointing if the same material plus activator is used when temperatures are lower than 70 degrees F. It is also used mainly for sucking insects such as aphides and thrips and is not very effective against most chewing insects, such as caterpillars and beetles.

To combat chewing insect pests a stomach poison is necessary, and of these arsenate of lead is popular, though some of the newer chemicals are more efficient. Most gardeners should be able to distinguish the different types of insect pests and apply the specific control measures.

Insect pests can be divided largely into two groups: One containing the sucking insects such as aphides, thrips, scales, and red spider mites, and the other chewing insects, caterpillars, which are the larvae of moths and butterflies, beetles, weevils, and certain underground pests such as wireworms and slugs.

Of the former group perhaps aphides rank as the most important, for besides the injury they cause to plants they are the main transmitters of virus diseases. This group can be controlled by the use of sprays containing chemicals which kill by contact or fumigation. Such materials include nicotine sulphate, winter and summer oils, D.D.T., B.H.C., and H.E.T.P., the last two being newer introductions.

The chewing insect group may be controlled by stomach poisons: These include arsenate of lead, D.D.T., and paris green applied to the foliage of plants as sprays or dusts or to the soil as baits for soil pests.

Diseases

Diseases are divided broadly into three groups: Fungous (the largest group), virus, and bacterial diseases. Fungous diseases (which include some of the most important plant diseases) are probably the most common in home gardens. A number of these fungous diseases can be controlled by sprays containing sulphur in the form of lime sulphur or colloidal sulphur used separately or in combination, or copper in the form of Bordeaux mixture or copper oxychloride. Among a few which cannot be controlled by the use of sprays are sclerotinia (*Sclerotinia sclerotiorum*), with its wide host range; also silver leaf, which is an internal parasite of many shrubs. Damping off wilt (*Pythium ultimum*) of seedling plants can be minimised by soil sterilisation, which will also kill most other soil fungi such as verticillium wilt (*Verticillium* sp.) and fusarium wilt (*Fusarium* sp.).

The rust fungi, of which there are several species attacking plants in the flower garden, are recognised by brownish orange pustules on the under sides of leaves causing malformation, eventual yellowing, and death. Most of the species can be controlled by spraying infected plants with lime sulphur or colloidal sulphur.

Mildews are important fungous diseases attacking many plants in the flower garden. Among the plants

attacked are rose, delphinium, sweet pea, and anemone. Powdery mildew is recognised by the white powdery appearance on the growing points of plants, on flower buds, and on young leaves. It can be controlled with sulphur sprays or dusts. Downy mildew appears as a fine, down-like growth on leaves and stems and is usually controlled with copper sprays. These are only a few of the more common fungous diseases occurring in most flower gardens.

Virus

A number of virus diseases attack many plants and are usually recognised by the way they discolour, dwarf, and distort. Once a virus disease has infected a plant it cannot be controlled or eradicated by spraying, for it inhabits the internal tissues. Care taken to eliminate the ways of spread will reduce the rate of infection. Some virus diseases can be spread by tools such as secateurs and knives, hands when handling infected plants, birds, and insects; others can be spread only by insects. Aphides are probably the greatest single agent assisting the spread of virus diseases. Therefore it is essential that this pest be eradicated whenever it appears in the garden.

Whenever a plant in the garden is known or even suspected of being infected with a virus disease, it should be destroyed by burning as soon as possible. Hands and tools should be washed in disinfectant before other healthy plants are handled.

Spotted wilt (*Lycopersicum* virus 3), whose hosts include anemone, calendula, cineraria, Iceland poppy, and dahlia, is perhaps the most common virus disease in the flower garden. Its symptoms are small, brown spots appearing on young leaves with subsequent dwarfing and distortion. Another is cucumber mosaic *Cucumis* virus 1 which rarely kills its hosts, but causes a narrowing and distortion of the leaves and a generally unthrifty plant. Some hosts among flowering plants are daphne, aster, polyanthus, lily, and violet, but these are by no means all, as its host range is wide.

There are several virus diseases which are less known but nevertheless important in the flower garden, such as tobacco mosaic (*Nicotiana* virus 1), tulip break (*Tulipa* virus 1), turnip mosaic (*Brassica* virus 1), and dahlia stunt virus (unidentified). Control is by burning irrespective of the value of the plant; otherwise, apart from an unthrifty and sickly plant, a source of infection remains.

CONTROL OF VIRUS

Control: Remove and destroy infected plants by burning. Control sucking insects, especially aphides and thrips

Spotted wilt	Anemone, chrysanthemum, calendula, cineraria, dahlia, Iceland poppy, sweet pea, and zinnia
Cucumber mosaic	Aster, daphne, lily, pansy, polyanthus, and violet
Dahlia stunt	Dahlia
Daphne mosaic	Daphne
Iris mosaic	Iris
Narcissus and lily mosaic	Lily and narcissus
Tulip break	Tulip
Violet mosaic	Violet
Turnip mosaic	Stock and wallflower

FUNGOUS DISEASES AFFECTING THE FLOWER GARDEN, AND METHODS OF CONTROL

Disease	Hosts	Control
Rust (several species)	Antirrhinum, anemone, cineraria, carnation, chrysanthemum, geranium, hollyhock, and rose	Remove and destroy infected parts. Apply lime sulphur sprays
Powdery mildew Downy mildew	Anemone, cornflour, delphinium, rose, and sweet pea	Remove and destroy infected parts. Apply lime sulphur plus colloidal sulphur sprays
	Antirrhinum and sweet pea	Spray with Bordeaux mixture, copper oxychloride, or thiram
Damping off wilt	Seedlings of many plants	Sterilise soil for use in boxes. Water infected areas with Cheshunt compound
Black spot	Rose	Spray with Bordeaux mixture or copper oxychloride
Botrytis rot (several species)	Antirrhinum, lily, rose, and zinnia	Remove and destroy infected plants. Spray with Bordeaux mixture, copper oxychloride, or thiram
Sclerotinia	Many flowering plants	Remove and destroy infected plants at first sign of infection; also remove soil with roots
Chrysanthemum mildew	Chrysanthemum	Spray with lime sulphur plus colloidal sulphur
Smut	Calendula and dahlia	Remove and destroy infected plants
Basal rot	Bulbs and corms	Remove and destroy infected plants
Verticillium wilt	Aster, antirrhinum, dahlia, and stock; various shrubs	Remove and destroy infected plants
Fusarium wilt	Aster and carnation	Remove and destroy infected plants
Club root	Stock and wallflower	Remove and destroy infected plants, making certain of the roots
Silver leaf	Many trees and shrubs	Remove and destroy infected part or whole plant
BACTERIAL DISEASES		
Fireblight	Cotoneaster, hawthorn, japonica, and loquat	Remove and destroy infected parts of plant
Crown gall	Japonica, prunus sp., and rose	Remove and destroy infected plants. Where possible, treat area with soil fumigant
Blast disease	Dahlia and rose	Remove and destroy infected parts of plant. Spray with Bordeaux mixture
Bulb rot (yellow)	Hyacinth	Destroy all infected bulbs

Precautions with H.E.T.P. and T.E.P.P.

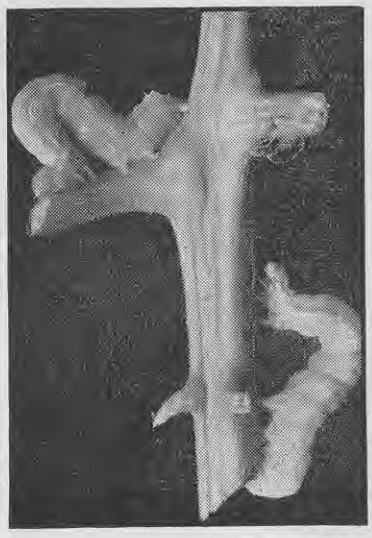
Particular care should be taken when the organic phosphorus insecticides H.E.T.P. (hexaethyl tetraphosphate) and T.E.P.P. (tetraethyl pyrophosphate) are being used. Gardeners should not eat, drink, or smoke when handling them and they should wash their hands thoroughly after spraying. The chief danger is from the concentrated material and every precaution should be taken to prevent it from coming in contact with the skin. If any is spilt on the hands, it should be washed off immediately. Empty containers should be disposed of by burying.

Bacterial

Not many bacterial diseases invade the flower garden, but those which do are of no less importance than those in the other two groups. The two most commonly found by the gardener are fireblight (*Erwinia amylovora*) which infests cotoneaster, loquat, and hawthorns, and crown gall (*Agrobacterium tumefaciens*), whose hosts are mainly rose, japonica, flowering cherry, and plum.

The symptoms of fireblight are leaves, flowers, and young shoots dying back and appearing as though scorched by fire. This condition may appear on one branch or on several, weakening the plant as well as being unsightly.

Crown gall appears as gall-like growths on the roots and occasionally on the stems where the bacteria have invaded the plant tissues and multiplied, causing irregular cell growth. Parts of a plant infected with either of these bacterial diseases should be removed and burnt. Other bacterial



[*Green and Hahn*

Looper caterpillars.

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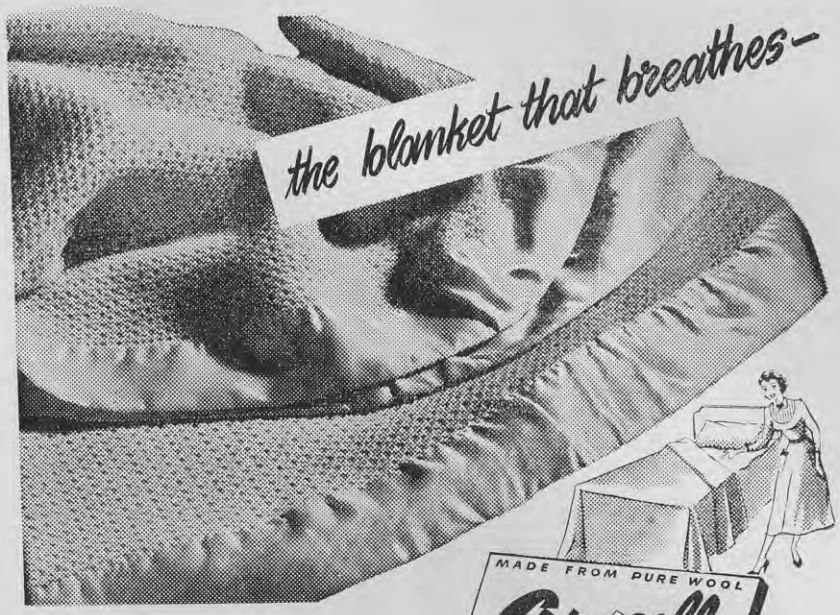

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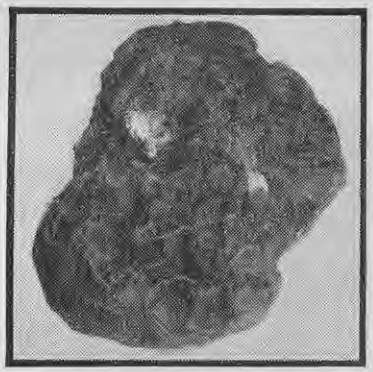


Shrivelled gladiolus corm affected with fusarium rot.

diseases affecting the flower garden are bulb rot (*Bacterium hyacinthi*), which is confined mainly to hyacinth, and blast disease (*Pseudomonas syringae*), whose hosts are lilac, rose, dahlia, flowering cherry, and plum.

Thoroughness of Spray Application

Thoroughness of spray application is a factor of considerable importance in pest and disease control. It is necessary to obtain complete coverage of all parts of a plant with the material used; otherwise the effort and expense are more or less wasted. Partial coverage gives only a low percentage of control and untreated plant parts remain to further the ravages of the pest or disease.

Some gardeners are careless when mixing chemicals for use in sprays. Quantities should be measured accurately according to the recommendations. Haphazard mixing is unwise, as besides being uneconomical and inefficient it is liable to cause plant damage which may be more severe than that caused by the actual pest or disease. Adhering to the recommended amounts is an important factor in pest and disease control and the prudent gardener benefits both economically and in the degree of control gained.

Wetting Agents and Activators

With plants which have waxy or smooth leaf surfaces such as carnations and succulents, it is necessary to add a wetting agent to the spray mixture. The action of the agent is to break down the surface tension of the water globules, thus spreading the spray mixture evenly over the leaf surface and preventing excessive run-off.

Casein powder or a detergent is a useful wetting agent that may be recommended.

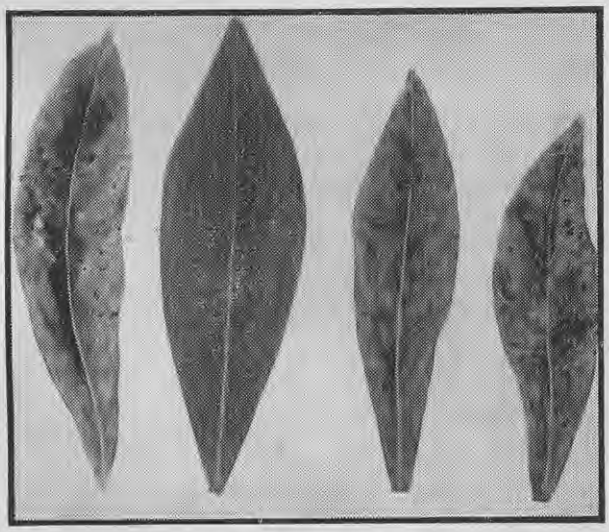
Materials such as nicotine sulphate are very stable in their make-up and therefore require an activator to liberate the fumes that kill insect pests. Soft soap or summer oil is used for this and as the latter is in itself an insecticide, the combined effect of the two materials will prove still more effective.

To be most efficient nicotine sulphate, even with an activator added, must be used when temperatures are high. Below 70 degrees F. its efficiency is very much reduced.

Natural Enemies of Insect Pests

Even with a system of garden hygiene eliminating possible breeding grounds and the modern insecticides and control methods, insect pests would be increasing if not preyed on by certain beneficial insect parasites. Birds also play a big part in keeping down the populations.

A number of parasites have been selected by entomological research as a means of pest control and have proved to be of great value to horticulture generally. However, regardless of the efficiency of these parasites, they will not gain complete control of their hosts. Unfortunately, a large number of them are killed each year, mainly by the indiscriminate use of D.D.T., which is not very selective in the insects it kills, and, by gardeners who do not realise that they are disposing of beneficial insects. Of these garden allies the ladybird is perhaps the best known; both larvae and adult feed upon aphides and scales. Lacewings, hover flies, and tachinid flies are equally important, their larvae destroying such pests as aphides and caterpillars. The ichneumon fly also destroys many destructive caterpillar pests. The common hedgehog is another garden ally; being a night prowler, it disposes of numerous nocturnal pests which attack the flower garden such as slugs, snails, earwigs, and cutworms.



[*Department of Scientific and Industrial Research*

Cucumber mosaic of daphne leaves with healthy leaf second from the left.

A gladiolus plant completely ruined by thrip damage.

Quantities of Spray Materials

Quantities of materials required to make 4 gallons of spray are:—

D.D.T.: ½oz. 50 per cent. wettable powder or 1 fl. oz. of emulsion.

Arsenate of lead: 1oz. plus 2oz. of hydrated lime.

Nicotine sulphate: ¾ to 1 fl. oz.

H.E.T.P.: ¼ to ¾ fl. oz.

Lindane: 16 per cent. material 1oz.; 25 per cent. material ⅜oz.

Winter oil: 1 pint 12 fl. oz.

Summer oil: 8 fl. oz.

Activator for nicotine sulphate: 2oz. of soft soap.

Bordeaux mixture: Summer strength, 4oz. of bluestone plus 5¼oz. of hydrated lime.

Bordeaux mixture: Winter strength, 6½oz. of bluestone plus 5½oz. of hydrated lime.

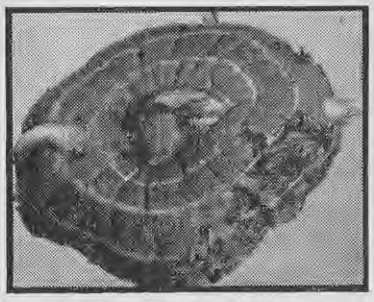
Copper oxychloride: 3½oz.

Colloidal sulphur: 1¼oz.

Lime sulphur: 4¼ fl. oz.

Thiram: 1¼oz. 50 per cent. wettable powder.

Cheshunt compound (at maker's recommended strength).



Gladiolus corm affected with hard rot.

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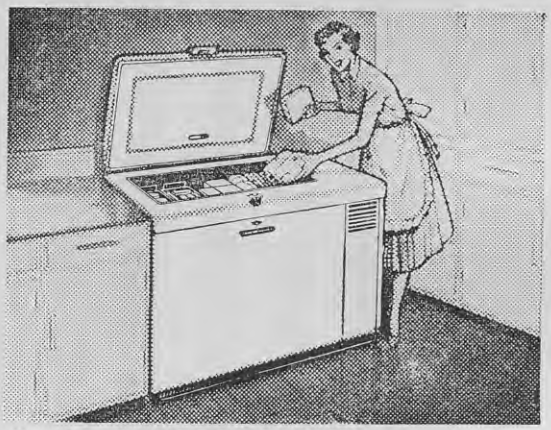

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Traps for Soil Pests

Crumpled pieces of paper under inverted flower pots placed around infested areas will trap earwigs. Destroy the pests by emptying flower pots into a bucket of water containing a little kerosene.

Pieces of freshly cut potato under an inverted flower pot will attract millepedes and the trapped pests can be destroyed by pouring boiling water on them.

Half a potato buried a few inches deep in the soil, under a marker, will attract wireworms. It should be lifted periodically and the pests destroyed.

Poison Bait Mixtures

1. Arsenate of lead, 2oz., and bran, 1¼lb., mixed with 5 fl. oz. of molasses or treacle and 1 pint of water, applied to the ground in small heaps or broadcast.

2. Paris green, 1oz., blood and bone manure, 4lb., mixed and spread on the ground at 1oz. per square yard.

3. Paris green, 1oz., bran, 1½lb., mixed with ¼ pint of molasses and treacle and 1½ pints of water. Broadcast or place in small heaps on infested area.

4. Metaldehyde, 1oz., mixed with 3lb. of bran slightly dampened and broadcast or placed in small heaps on infested area.

5. Bran, 1lb., ¾ pint of water, ⅓lb. of treacle or molasses, and 1oz. of sodium fluoride. Dissolve the sodium fluoride in water and mix in treacle or molasses and bran. The addition of a little glycerine keeps the mixture moist longer. Mix together in a crumbly mixture and distribute the bait in small heaps over infested area.

6. Slices of potato dipped in arsenate of lead or paris green.

Poison baits should be covered to ensure that animals and birds cannot reach them.

Pests controlled by the baits are cutworms (1 and 3), slaters (2 and 6), slugs and snails (4), and earwigs (5).

Special Considerations

Nicotine sulphate, lead arsenate, paris green, sodium fluoride, and metaldehyde are all poisonous in the concentrated form to human beings. When these materials are being handled protective clothing should be worn, such as overalls and a cloth hat. These should be washed regularly. A person mixing or spraying should not smoke. Containers of poisonous spray materials should be marked POISON and kept locked up in cupboards out of reach of children. Empty containers should be burnt or buried.

It is unwise to use an alkaline wetting agent with H.E.T.P., as it weakens the insecticidal action. A casein preparation is suitable.

Nicotine sulphate should be used only when the temperature is 70 degrees F. or above.

Hot water treatment consists of immersing infected bulbs in water kept at a temperature of 110 degrees F. for 2 to 4 hours according to the size of the bulbs.

The correct therapeutant for the control of specific pests and diseases should be used.

Quantities of spray material required should be measured accurately. For small liquid measurements a special medicine glass should be used.

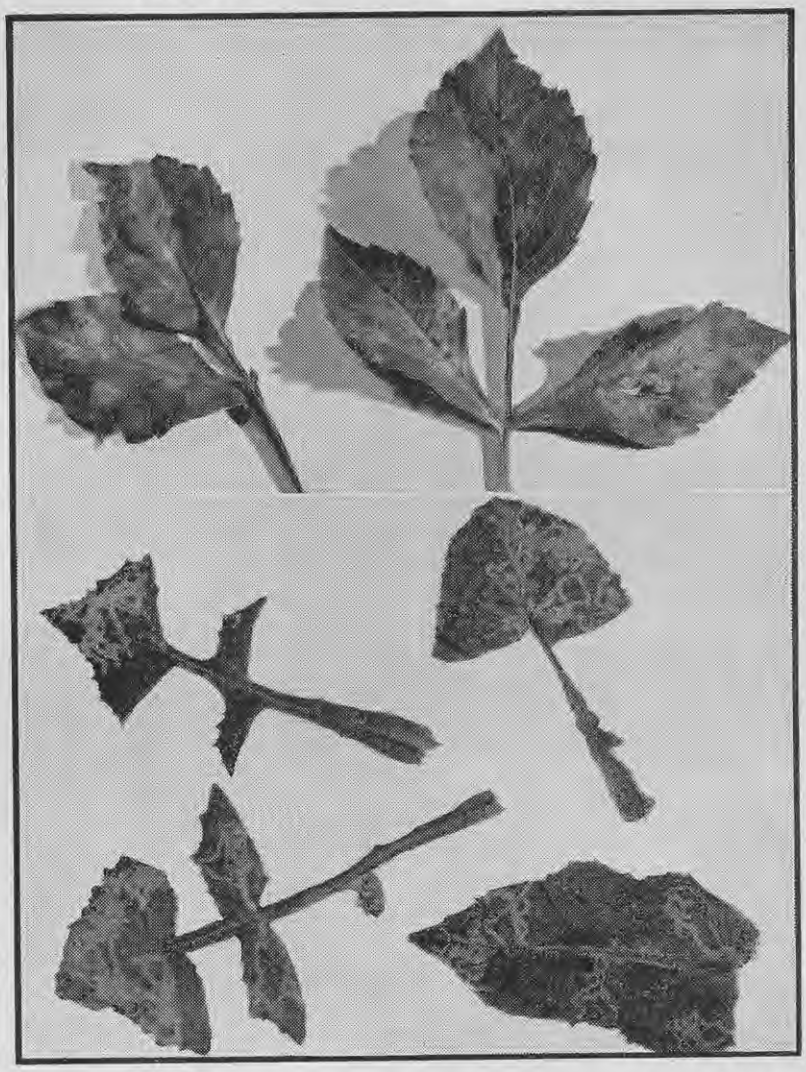
Bordeaux mixture should be used as soon as possible after mixing; if the mixture is left, the fungicidal properties deteriorate.

Lime sulphur is dual-purpose material controlling certain sucking insects as well as fungous diseases.

One spray can control both a disease and an insect pest; that is, nicotine sulphate may be combined with lime sulphur or Bordeaux mixture. Where nicotine sulphate is combined with other sprays an activator (usually soft soap) should not be used.

D.D.T. and arsenate of lead may be used with Bordeaux mixture and sulphur sprays.

Bulbs should be examined thoroughly for diseases and pests before they are planted. Affected ones should be treated or destroyed by burning.



[*Photo News*

Upper—Dahlia leaves showing the "watermarking" characteristic of the spotted wilt virus disease. Dahlias are among the many garden plants attacked by this virus. Lower—The cineraria leaf-miner, shown tunnelling in sow thistle leaves, also attacks the chrysanthemum and dahlia.

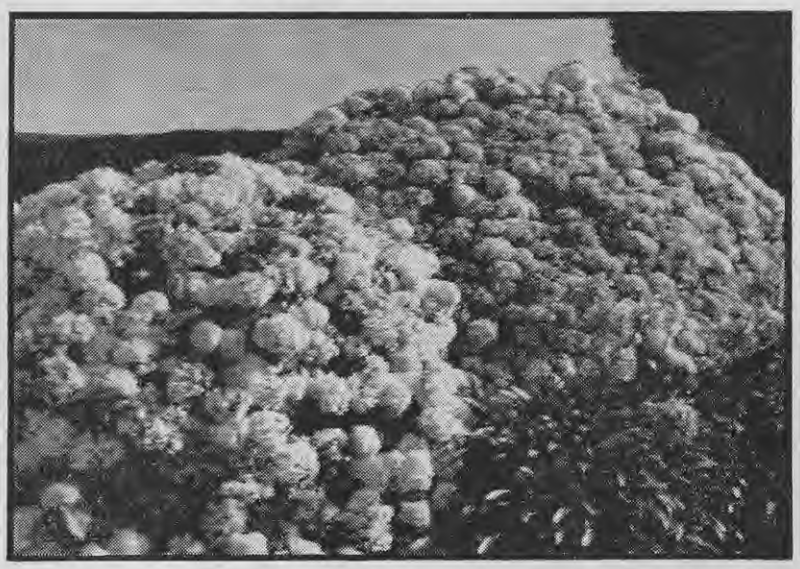
The use of sprays, dusts, baits, and traps to control garden pests and diseases should be complementary to good garden hygiene.

Work for November

Annuals

Planting of tender annuals, such as bonfire salvias, zinnias, Mexican sunflower, and French and African marigolds may be carried out now. These plants establish and grow better under warmer soil conditions.

Sowings may still be made of annuals to grow in the open border. Drifts of such plants as larkspur, godetia, clarkia, and nigella fill in a shrub border and give better results if they are left to grow where they



Pruning of hydrangeas must be carried out every year if the flower production is to equal this display. All weak, spindly, or damaged growth should be cut out and the remaining vigorous growth should be cut back to the lowest pair of strong buds.

are sown. For this reason seed should be sown thinly so that later thinning need not be too drastic and if it is forgotten, the plants will not be too crowded and drawn.

In drier districts the sooner planting of annuals is completed the better, as soil quickly becomes too dry and the plants cannot establish and make a good start.

Where seedlings are to be planted in dry ground the planting hole should be filled with water and allowed to soak for a minute or so before the plant is placed in it.

Dahlias

All dahlia tubers should be planted. Where large clumps are being divided each tuber should have at least one vigorous shoot on it. Any tuber planted without a shoot or without a piece of the old stem will only rot and provide a hiding ground for slugs, slaters, and snails.

Dahlias planted earlier will require staking, and any which appear stunted, with pale yellow foliage or yellow rings showing on the leaves, are infected with dahlia mosaic virus and should be dug up and burnt. Some of the plants showing less infection may be retained, because some seem to be able to grow in spite of the virus and carry quite good flowers. A really badly infected plant can never produce a good display and is far better removed.

Gladioli

Gladioli corms can still be planted. They should be dusted with D.D.T. to kill any overwintering thrips. In northern districts dipping in a mercuric wash is desirable to check development of scab. (Proprietary preparations are available.)

Bulbs

Early spring flowering bulbs will be dying down now, but though the foliage looks drab and untidy, it must not be cut off until it is withered and dry. Not until then is all the food from the leaves returned to the bulb.

Freesia seed ripens readily in hot, dry districts and may be saved for spring sowing. With coloured varieties particularly this helps to build up stocks, though some mixing of colours may result.

Trees and Shrubs

Young trees 3 or 4 years old grow vigorously at this time and many of them, liriodendron, flowering almond, liquidamber, and prunus, tend to throw from the bases of the trees succulent growth much like suckers, which are not required. These should be cut out, and if they are stock suckers from below ground level, a sharp tug is the most effective way of getting rid of them. If not removed, these shoots grow rapidly ahead of the remainder of the tree and cause crowding and can spoil the tree's shape.

Planting of new shrubs should cease this month, as shrubs would not have sufficient time to establish before dry weather begins.

While the ground is still moist, mulches of compost, sawdust, wood shavings, or seaweed may be placed around the roots of shrubs to keep them cool and moist during summer. Shrubs which appreciate this treatment are azalea, kalmia, rhododendron, daphne, erica, pieris, and heath and heather.

Spring flowering shrubs should be pruned as the flowers fade. Rhododendron, azalea, and lilac should be prevented from setting seed by spent flower heads being nipped off where practicable. Leptospermum, broom, prostranthera, and erica should be pruned by cutting away two-thirds of the growth which carried the flowers. This keeps them compact and bushy and prevents the formation of seed, which is a drain on the plants' energy.

In districts subject to frosts pruning of fuchsia and hydrangea shrubs may be carried out once danger of frost is past. Cut out all weak, spindly wood and cut plump, firm wood back to strong buds.

If fuchsias are cut before they are breaking into growth, they weep badly.

Weeds

Rising temperatures bring about a good germination of weed seed. These seedlings should be hoed or pulled out before they become too large. Small weeds are relatively easy to deal with, but once they put down long roots and spread out they crowd other plants and shade them. When weeds are removed ornamental plants are often worked loose in the soil and may suffer a setback.

Hedges

Once hedges break into growth they move rapidly. Young growing hedges should be allowed to make a little growth and consequently should not be clipped back too severely. Full-grown hedges should be trimmed back as nearly as possible to the point from which the most recent growth commenced or they will extend upward and outward more quickly than is desirable. Severe cutting back into old wood should be practised only on hedges which have extended too far and must be treated drastically. Such treatment should be avoided as much as possible, because the hedge may take several years to recover and regain its attractive appearance. The best time of the year for severe cutting back is early spring just before growth commences.

Staking

Tall perennials and lilies will require staking. Stakes should be less than the estimated height of the plant when it is fully grown. They are then concealed by growth and do not detract from the general effect. Poinsettia and hibiscus should be pruned hard back this month. This does not mean taking the hedge clippers and levelling the top off. Each hibiscus or poinsettia should be gone over, all weak and spindly growth cut right out, and the remaining healthy wood cut back by about half. The shrubs should break into growth in a month's time, when they can be given a dressing of blood and bone at 4oz. per square yard.

Layering

Ornamental shrubs which have proved hard to root by cuttings can be layered this month. *Magnolia stellata*, daphne, and rhododendron can all be tried, and any other shrub which has growth which can be pulled down and pegged into the ground without snapping can be layered.

Cyclamen and Begonia

Pot-grown cyclamen should be finishing now and watering should gradually be reduced until the foliage dies down. When the corms are dry the pots can be stored on their sides in a cool place under a hedge or a bench in a shed.

Tuberous begonia and gloxinia start into growth this month and should be potted up into a mixture of 2 parts of soil, 1 part of sharp sand, and 1 part of leafmould or peat. The corms should be set only half their depth in the soil and the top exposed.

Pretty Twin Set for 10-year-old Girl

A 10-YEAR-OLD girl would find the jersey illustrated very appealing, especially as it is part of a pretty twin set in white, with an attractive motif in four colours. Directions for making the set are given in this article.

MATERIALS required are: 8oz. of 3-ply wool in white (W.); four small balls of 3-ply wool, one each of brown (B.), yellow (Y.), pale blue, and dark blue, for the motifs; two No. 10 and two No. 12 knitting needles, and nine buttons.

Measurements

Cardigan: Length, 16½in.; chest, 28in.; sleeve seam, 14in.
Jersey: Length, 15½in.; chest, 28in.; sleeve seam, 2½in.

Tension: 8 st. to 1in.

Abbreviations: K., knit; p., purl; st., stitch(es); st.st., stocking stitch; m.st., moss stitch (k. 1, p. 1 alternately on an odd number of stitches); beg., beginning; inc., increase; dec., decrease; sl., slip; cont., continue; d.c., double crochet.

The Cardigan

The Back

Using No. 10 needles, cast on 95 st. and work 1in. in m.st. Cont. in st.st. until the work measures 2½in., then inc. 1 st. at both ends of next and every following 8th row until there are 111 st. Cont. straight until the work measures 10½in.

Shaping the armholes: Cast off 3 st. at beg. of next 2 rows, then dec. 1 st. at both ends of every row until 87 st. remain. Cont. straight until the work measures 16½in., ending with a p. row.

Shaping the shoulders: Cast off 9 st. at beg. of next 4 rows, then 10 st. at beg. of next 2 rows. Cast off.

Pocket Lining (Left Front)

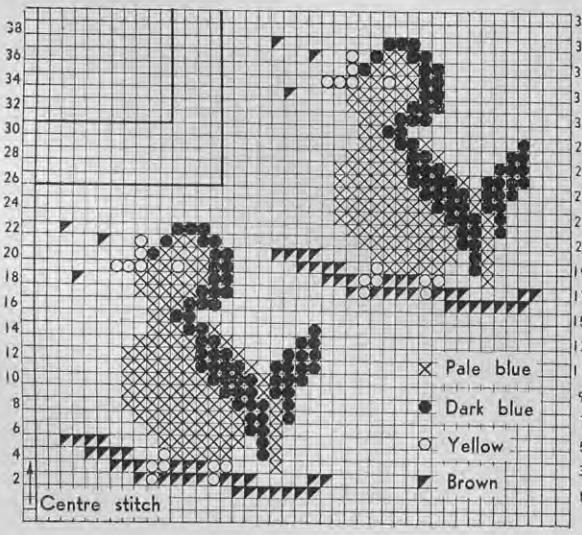
Using No. 10 needles, cast on 30 st. and work 3in. in st.st., ending with a k. row. Leave these stitches on a spare needle.

The Left Front

Using No. 10 needles, cast on 45 st. and work 1in. in m.st. Cont. in st.st. until the work measures 1½in., ending with a p. row. Now work one of the birds from the chart, placing it as follows:—

1st row: K. 12 W., 7 B., 26 W.

2nd row: P. 18 W., 1 B., 1 Y., 4 B., 1 Y., 3 B., 4 W., 2 B., 11 W.



Cont. working the bird from the chart until the work measures 2½in., ending with a p. row.

Keeping the bird correct, inc. 1 st. at beg. of next and every following 8th row until the bird is completed, then work 3 more rows in st.st., thus ending at the front edge.

To insert pocket lining: Next row: P. 8, sl. next 30 st. on a spare needle, work across pocket-lining stitches, p. to end.

Cont. in st.st., still inc. 1 st. at the side edge on every 8th row until there are 53 st., then cont. straight until the work measures 9½in., ending at the front edge.

Shaping the front: Dec. 1 st. at beg. of next row and at this same edge every following 3rd row until the work measures 10½in., ending at the side edge.

Shaping the armholes: Still dec. 1 st. at the front edge on every 3rd row, cast off 3 st. at beg. of next row and dec. 1 st. at this same edge on next 9 rows, then keeping armhole edge straight, cont. dec. at the front edge as before until 28 st. remain. Cont. straight until the work measures 16½in., ending at the armhole edge.

Shaping the shoulder: Next row: Cast off 9, work to the end. Next row: Work to the end. Rep. these 2 rows once. Cast off remaining stitches.

The Right Front

Make a pocket lining as described for the left front, but end with a p. row instead of a k. row.

Work as for the left front, but when the work measures 2½in. reverse shapings by inc. at end of next and every following 8th row instead of at beg. To reverse the bird work odd-numbered rows from left to right and even-numbered rows from right to left thus:—

1st row: K. 26 W., 7 B., 12 W.

2nd row: P. 11 W., 2 B., 4 W., 3 B., 1 Y., 4 B., 1 Y., 1 B., 18 W.

The Sleeves

Using No. 12 needles, cast on 55 st. and work 1in. in m.st. Cont. in st.st., inc. 1 st. at both ends of 3rd and every following 8th row until the work measures 2½in.

Change to No. 10 needles and cont. in st.st., inc. 1 st. at both ends of every 8th row until there are 87 st. Cont. straight until the work measures 14in.

426—TWIN SET FOR 10-YEAR-OLD GIRL . . .

Shaping the top: Dec. 1 st. at both ends of next and alternate rows until 63 st. remain, then dec. 1 st. both ends of every row until 43 st. remain. Cast off 3 st. at beg. of next 6 rows. Cast off.

The Front Bands

Using No. 12 needles, cast on 9 st. and work ¼in. in m.st.

Make a buttonhole in next 2 rows, thus:—

Next row: M.st 3, cast off 3, m.st. 3.

Next row: M.st. 3, cast on 3, m.st. 3.

Cont. in m.st., making buttonholes at 2in. intervals until 5 have been worked in all.

Cont. in m.st. until the band, when slightly stretched, is long enough to fit all round the fronts and the neck. Cast off.

The Pocket Tops

Slip the 30 st. from the spare needle on to a No. 12 needle and work ½in. in m.st. Cast off.

The Make-up

Join the side, shoulder, and sleeve seams and sew in the sleeves. Sew down the pocket linings neatly on the wrong side, sew down the pocket tops, and sew on the front bands. Sew on the buttons to match the buttonholes.

The Jersey

The Front

Using No. 10 needles, cast on 95 st. and work 1in. in m.st. Cont. in st.st. until the work measures 2½in., then inc. 1 st. both ends of next and every following 8th row until there are 111 st. Cont. straight until the work measures 10in.

Shaping the armholes: Cast off 3 st. at beg. of next 2 rows, then dec. 1 st. at both ends of every row until 87 st. remain. Work ½in. in m.st., ending with a row on the wrong side. Now work the yoke from the chart, working from right to left; then work the centre st., always with W.; then work back along the chart from left to right. Thus the first 2 rows will be:—

1st row: K. 20 W., 7 B., 16 W., 1 W. (centre st.), 17 W., 7 B., 20 W.

2nd row: P. 19 W., 2 B., 4 W., 3 B., 1 Y., 4 B., 1 Y., 1 B., 8 W., 1 W. (centre st.), 8 W., 1 B., 1 Y., 4 B., 1 Y., 3 B., 4 W., 2 B., 19 W.

Cont. working the birds from the chart, using separate balls of wool for each bird, until the 25th row has been completed.

Shaping the neck: Next row: Patt. 28, m.st. 31, patt. 28. Rep. the last row four times.

Next row: Patt. 28, m.st. 4, cast off 23, m.st. 4, patt. 28. Work on the last set of 28 st., working 4 st. at the neck edge in m.st. until the bird patt. has been completed. Work 2 rows in st.st. Cast off.

Rejoin the wool to the remaining stitches and work to match the first side.

The Back

Work as given for the front until the 25th row of the yoke patt. has been completed.

Cont. working the patt. from the chart, working in st.st. across centre stitches, until the 35th row of patt. has been completed.

Next row: Patt. 28, m.st. 31, patt. 28. Rep. this row until the bird patt. has been completed. Work 3 rows in st.st., keeping centre 31 st. in m.st. Cast off.

The Sleeves

Using No. 12 needles, cast on 63 st. and work ¾in. in m.st.

Next row: * K. 1, inc. in next st., k. 2. Rep. from *, ending last rep. k. 1 instead of k. 2 (79 st.).

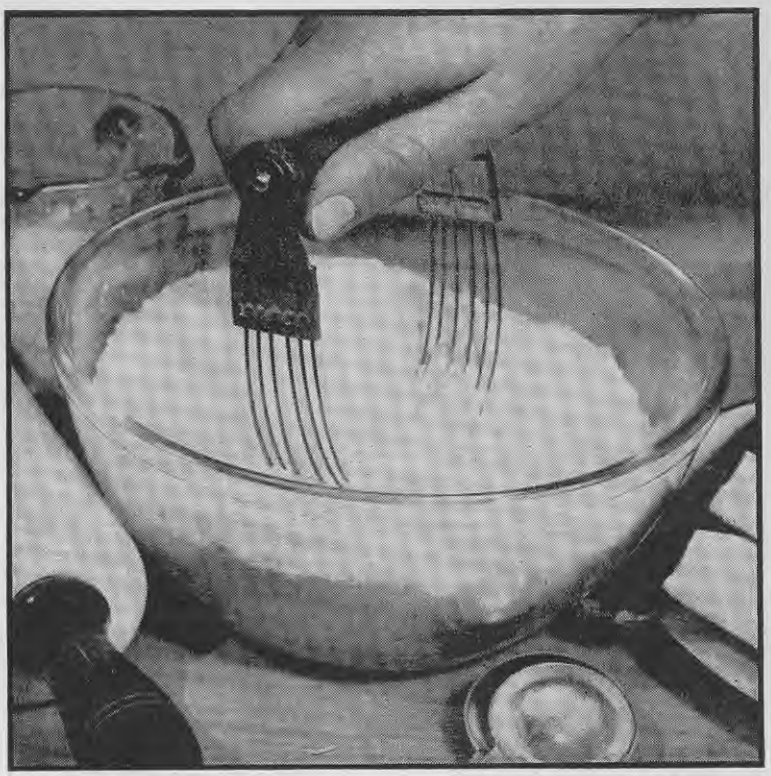
Change to No. 10 needles. Cont. in st.st. until the work measures 2½in.

Shaping the top: Dec. 1 st. at both ends of alternate rows until 47 st. remain, then both ends of every row until 41 st. remain. Cast off 3 st. at beg. of next 6 rows. Cast off.

The Make-up

Join the side and sleeve seams. Join the shoulder seams for about ½in. from the armhole edge. Work a row of d.c. along each shoulder edge, making 2 button loops in each front shoulder. Sew in the sleeves. Sew on the buttons to match the loops.

Advantages of a Pastry Blender



[*Oddie*

THOUGH few New Zealand housewives will have used a pastry blender, this practical cook's aid has been a standard piece of kitchen equipment in the United States of America for many years. Now it is being produced in Britain and will be available in New Zealand.

One of the essentials for good pastry making is that all the ingredients should be kept as cool as possible. If the fat becomes warm or slightly oily, a less flaky product will result. Except in very cool weather the method of rubbing the fat into the flour with the fingertips means that some heat is transferred from the fingers to the fat. The alternative method of using two knives is more satisfactory but laborious.

The pastry blender, which consists of stainless steel wires attached to a comfortable handle, cuts fat into the dry ingredients quickly and efficiently. Other uses will be found for the blender such as chopping hard-cooked eggs and cooked salad vegetables and crushing berries for jam making.

—ELEANOR COUSTON, Field Officer in Rural Sociology, Department of Agriculture, Christchurch

Rural Water Supply Amenities in South Canterbury

A GENERAL picture of the exterior and interior water supply and plumbing amenities in country homes in South Canterbury was given in the two previous articles in this series by Eirene E. Unwin, formerly Field Officer in Rural Sociology, Department of Agriculture, Christchurch, who carried out a field survey into this subject recently. This month the rating scale which was used to assess the houses surveyed is discussed, and the preferences of the housewives for the various plumbing amenities available are given. Though rural South Canterbury homes appear well off when compared with homes in some other countries, the author concludes that by generally accepted standards in New Zealand the survey result gives no cause for complacency.

APPARENTLY three main factors contributed to the final standard attained in any house water supply. The first was the natural supply of water—its adequacy, purity, and ease of attainment; the second comprised what the occupier had done with the water before bringing it into the house—provision of storage, purification where necessary, and increase in pressure; and the third included provision of interior facilities for use of the water—bathroom and laundry, fixed equipment with drains, plumbing, and a water-heating system.

With almost any natural supply it is possible for a rural home to be provided with every water-using convenience available in town, but if the natural supply is poor, greater enterprise is demanded of the householder to reach this standard than would be required if the natural supply were good.

Thus each house can be rated on three scales—the natural supply scale, the external treatment scale, and the house amenities scale. The total of the scores on these three scales gives the final water supply rating.

Natural Supply Scale

In the district covered by the survey there were nine alternative sources and these were given seven different scores (see Table 1 and Graph 1). The highest score of course went to a piped high-pressure water supply, for example, the town supply and the downlands supply (see article on page 195 of "Journal of Agriculture" for August 1954). The other sources were given scores depending on the amount of work required to bring them up to the standard of a piped supply. The more work required the lower the score.

External Treatment Scale

The external treatment scale measured what the householder did to the water before bringing it into the house, and the scores possible varied according to the source of supply. The treatment required for a piped supply (score 80) is provision of storage adequate to tide over an emergency and ensurance of good

Farm home inconveniences. Too often country housewives have to go to a pump or a tap outside, perhaps some distance from the house, for all their water, which is an extremely labour-making arrangement. Added to the labour of carrying the water, the inconvenience of always having to use it frugally is a great handicap to the smooth and pleasant managing of a home.

TABLE I—NATURAL SUPPLY SCALE AND NUMBER OF HOUSES RECEIVING EACH SCORE

Source	Score	Extra score if water soft	No. of houses
Piped supply (downlands or town supply)	80		55
High spring	70	5	6
Shallow ground water or low spring (that is, having to be pumped)	50	5	105
Deep ground water (if flow ample for all needs)	45	5	7
Deep ground water (if flow not adequate)	40	5	8
Water-race or stream			
Rain-water (plus a good supplementary supply or in an area where there are no long dry spells)	25		11
Rain-water only (dry area; much storage necessary)	15		8
Total			200

TABLE 2—EXTERNAL TREATMENT SCALE

Natural supply	Natural supply score	Treatment possible	Treatment score	External supply score
Piped	80	Storage; pressure	20	100
High spring	70	Storage; pressure (good, medium); softened; protection of intake; purity	30	100
Shallow ground water, etc.	50	Storage; pressure (good, medium); softened; power pump; protection; purity	50	100
Deep ground water	45	Storage; pressure (good, medium); softened; deep well pump	55	100
Water-race, stream	40	Storage; pressure (good, medium); softened; power pump; purified or alternative pure source for drinking	60	100
Rain-water (wet area or supplemented)	25	Storage (good, fair, poor); pressure (good, medium); power pump (from underground storage); filtered or alternative pure source for drinking	75	100
Rain-water only (dry area)	15	Storage (more needed, good, fair); pressure (good, medium); power pump; filtered or alternative pure source for drinking	85	100

pressure. These together were given a score of 20, bringing the total possible for "natural" and "treatment", or the external supply score, up to 100. Table 2 shows how the treatment scores were assessed for each of the natural sources of supply.

Each item in the treatment was scored separately, so that the final external supply rating for each house is out of a possible 100. A rating of 100 meant that whatever the natural supply the house had ample pure water under pressure, so that maximum use could be made of it inside by the housewife if internal plumbing fixtures were adequate.

It was interesting to discover that in all the natural water supply groups some houses had achieved an external supply rating of between 91 and 100, and in all the groups also some had a rating barely above that given for their natural supply (see Graph 1). Thus it is clear that the difficulty or convenience of obtaining the water in the first place does not absolutely control the final standard achieved.

House Amenities Scale

The house amenities scale (Table 3) was a standard scale used for all houses and was independent of the rating achieved on either the natural supply scale or the external treatment scale. The scores allotted for each item were fairly arbitrary. Higher scores were given for items which involved a higher cost of installation or which saved more work.

The score attained by each house on this scale was halved to compare it with a possible total of 100.

When the houses were rated on this scale the majority of houses rated quite well, indicating that they were fitted with the usual water amenities. A few rated very well, an indication of luxury amenities, noticeably washing machines and water closets with septic tanks. However, more than a few rated very badly. Twenty-two houses (11 per cent. of those visited) rated less than 20, and as many as 16 (or 8 per cent.) rated less than 10. This means that the housewives living in these houses have to fetch and carry all their water and heat it in kettles on the range (or in the copper when larger quantities are wanted) and have little or no fixed equipment with drains, so that all the used and dirty water has to be carried outside to be thrown away.

It might have been expected that these low-rating houses were mostly old or had been lived in by their present occupiers for only a very short time, or that they had a poor natural water supply (see Table 4), but this was not so. In fact the only particular factor about this low-rating group was that it contained a higher proportion of houses without electricity than the proportion of similar houses in the total number surveyed. (Possible reasons for this are discussed later.) There was also a very slightly higher proportion of rented houses in the low-rating group than in the whole group.

Total Rating and the Human Factor

If all three ratings for each house—internal amenities, external amenities or "treatment", and natural supply—are added and the total reduced to a percentage, the result gives a total water supply rating for each house. None of these ratings is of course as low as some of those for house amenities only, as a certain minimum score is always given for the natural supply, and this is higher the better the supply. However, once again there is a noticeable proportion of houses with fairly low ratings, though the majority have good and a few very high ratings. To show more clearly how important the human factor is in this distribution the houses in the largest natural water supply group only (those with shallow ground water) have been rated, and the results shown graphically (see Graph 2).

All the differences revealed in Graph 2 are man made, and it is clear that in quite a number of cases where the rating is low man has made very little of his basic natural water supply. In the 14 per cent. of houses where the rating is 40 or under man has done little more than provide a hand pump to raise the water above the ground.

He has usually a copper as well, and perhaps a washhouse, or in a few cases tubs or a sink or a bathroom, though possession of the last-named does not necessarily mean he also has a fixed bath with a drain.

On the other hand in the 10 per cent. of houses where the rating is 91 or over man has made practically the maximum of his supply, providing ample pressure and storage outside and "all modern conveniences" and some luxury conveniences inside his home. These two extremes are developed from the same basic water supply.

Of course the majority of houses had good average amenities, as indicated by the 77 per cent. with ratings between 61 and 90. It is to be hoped that in time the luxury amenities

TABLE 3—HOUSE AMENITIES RATING SCALE

Fixed equipment (with drains)

Sink, 6; bath, 8; tubs, 6; copper, 6; washbasin, 3

Cold piped water

Taps at sink, 7; bath, 7; tubs, 7; copper, 7; washbasin, 3
(Alternatives: Cold tap over bench, 5; cold tap outside, 1; hand pump outside, 1)

Hot piped water

Taps at sink, 8; bath, 8; tubs, 8; washbasin, 3
(Alternative: Hot tap at cylinder only, 6)

Second hot water supply (second cylinder or water heater or alternative method of heating main cylinder), 10

Drainage

Closed pipe, 8
(Alternatives: Open lined, 5; open unlined, 1)

Septic tank and water closet, 15

Grease trap, 5

General

Bathroom in house, 25
(Alternative: Outside with laundry, 15)

Laundry: Attached, 10
(Alternative: Detached, 7)

Washing machine, 15

Good washing facilities for men, 15
(Alternatives: Fair, 10; poor, 1)

Shower, 5

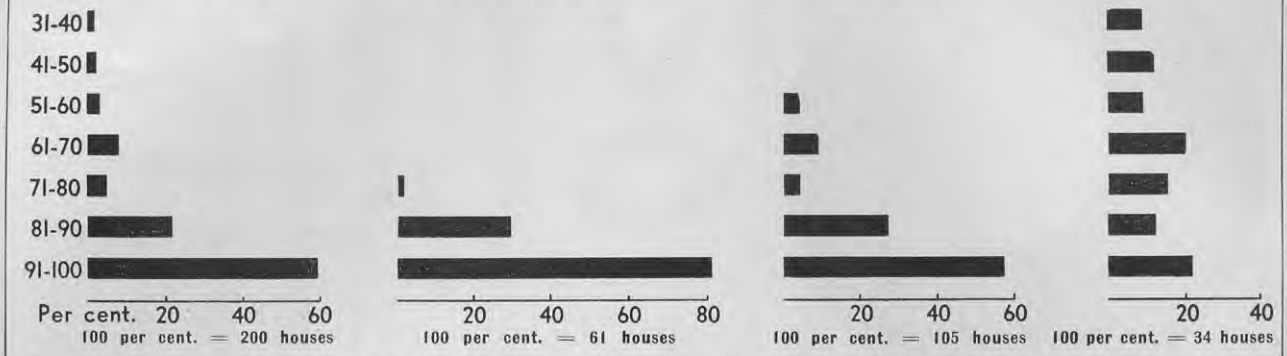
Garden tap, 5

Total 200

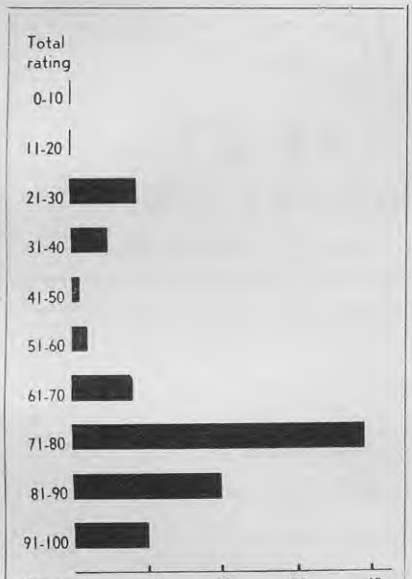
TABLE 4—PERCENTAGE OF HOUSES GAINING VARIOUS RATINGS ON THE HOUSE AMENITIES SCALE IN THE WHOLE AREA AND IN EACH NATURAL WATER SUPPLY GROUP

Rating	Percentage of total houses (100 = 200)	Percentage of houses with piped supply or high spring (100 = 61)	Percentage of houses with shallow ground supply (100 = 105)	Percentage of houses with "other natural supply"* (100 = 34)
1-10	7	5	7½	9
11-20	4	6½	4	0
21-30	2½	1½	2	6
31-40	2	1½	1	6
41-50	3	5	1	6
51-60	10	10	8½	14½
61-70	29½	31	27½	32
71-80	21½	16½	25½	17½
81-90	16½	18	18	9
91-100	4	5	5	0

* "Other natural supply" means a deep well, stream or water-race, or rain-water.



Graph 1—Percentage of houses gaining various ratings on the external supply scale in the whole area and in each natural supply group.



Graph 2—Percentage of houses in shallow ground water group gaining various ratings on the total water supply scale. (100 per cent. = 105.)

which put the ratings of the top 10 per cent. up into the 90s—that is, really high pressure, washing machines, alternative methods of heating water, a water closet and septic tank, and a cloakroom and washbasin or shower for the men—shall come to be looked on as conventional necessities, for they are tremendous labour-savers. In fact with them water is put to work for the housewife; without them she must do a great deal more of the work herself. This applies of course particularly to the washing machine.

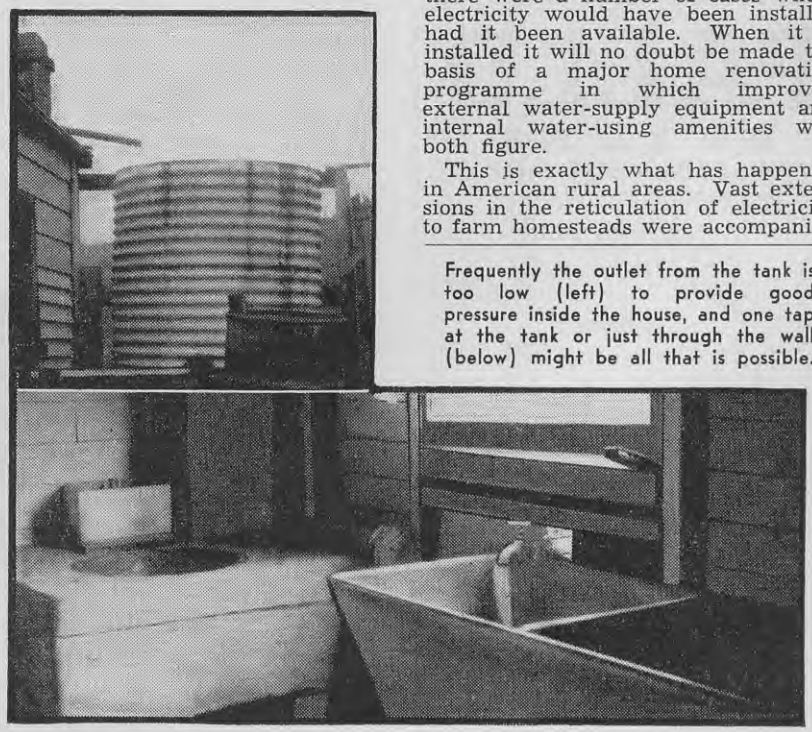
Table 4 and Graph 2 show that there are very few houses scoring only fair ratings. There are a group with low ratings and another, larger group with good or very good ratings, but scarcely any between these two groups. This means that on the whole the houses tended either to lack all or almost all internal and external plumbing amenities or they had all or almost all the conventional necessities. This is of course due to the fact that as a rule the provision of high-pressure water and internal plumbing is viewed as a whole project, and once water is piped into the house under pressure it is not usual to stop short of providing fixed equipment with drains in bathroom, kitchen, and washhouse, all with cold water piped to them, if not a hot water system too.

Electricity and Water Supply

It was noted earlier that the only notable thing about the group of houses with the lowest "house amenities ratings" was that among them there was a higher proportion of houses without electricity than there was in the total group surveyed. This may be due partly to the fact that the installation of both water-supply and water-using equipment and of electrical equipment involves a fairly heavy capital outlay. No information was obtained about the economic position of any of the families visited, but it is fairly probable that in houses where water supply amenities and electricity were inadequate at least part of the reason was economic.

Nevertheless it is also probable that in some cases the lack of electricity was the cause, or part of the cause, of the lack of water amenities, for there were a number of cases where electricity would have been installed had it been available. When it is installed it will no doubt be made the basis of a major home renovation programme in which improved external water-supply equipment and internal water-using amenities will both figure.

This is exactly what has happened in American rural areas. Vast extensions in the reticulation of electricity to farm homesteads were accompanied



Frequently the outlet from the tank is too low (left) to provide good pressure inside the house, and one tap at the tank or just through the wall (below) might be all that is possible.

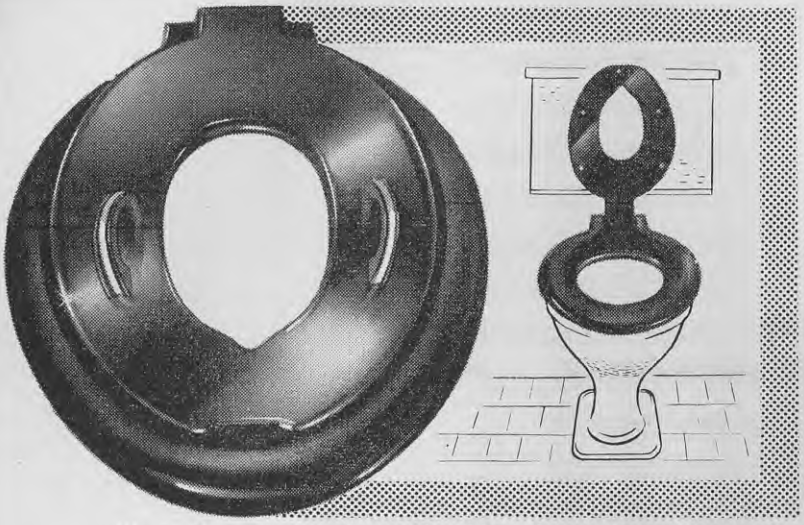


Illustration above shows the hinged supplementary seat lowered in position for children . . . note the correct size for tiny tots and the safety hand grips—if required, scarf or strap can be slipped through handles and around child for added security.

Train the kiddies early

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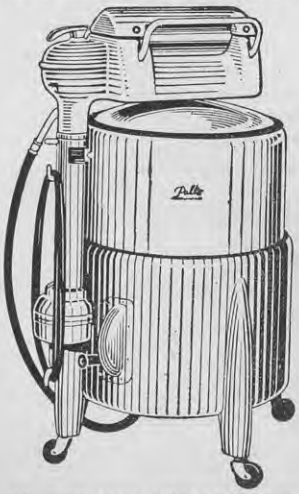

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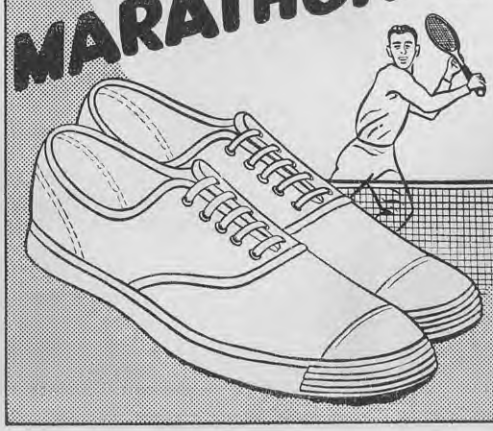


TENNIS SHOES

by a marked rise in the proportion of houses with high-pressure water and adequate plumbing.

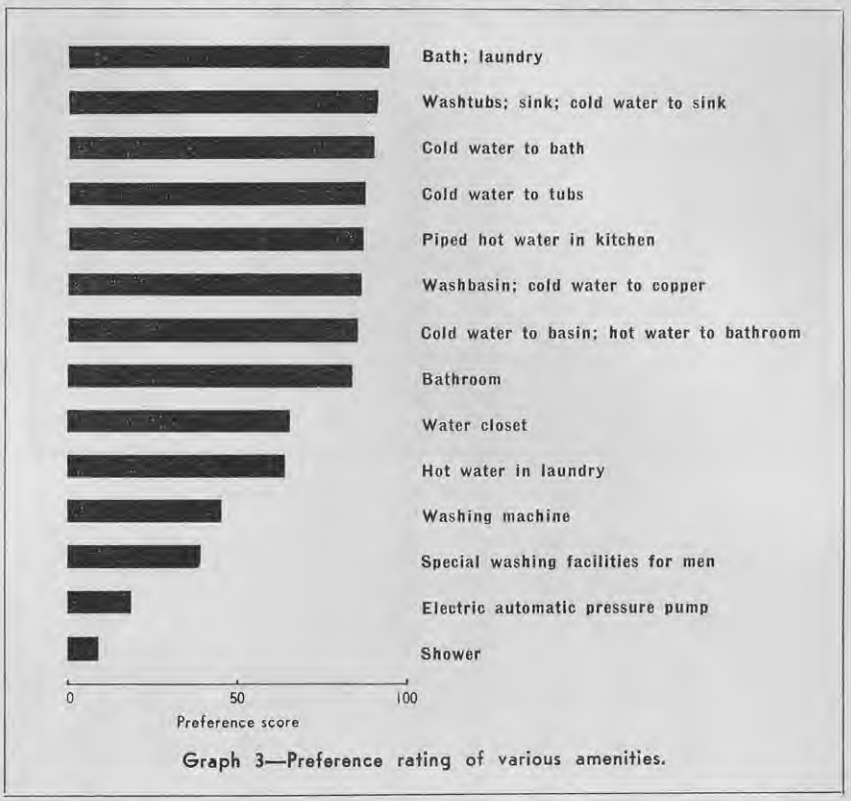
The present acute power shortage is not considered by the South Canterbury Power Board to be an adequate reason for delaying the further reticulation of its district.

The board considers that everyone is entitled to a share of the available current, which must be rationed, if necessary, but must not be deliberately denied to new consumers to avoid reducing the ration to existing ones.

The true reasons for the slowness of increasing reticulation in South Canterbury are nothing to do with the power shortage. First, there is an urgent need to use all available resources not to extend the reticulation system but to reconstruct much of the present one, which, especially in the boroughs and built-up areas, has been neglected and not brought up to capacity; now it is essential that it be reconstructed and made adequate for present and future loading, which is and will be far heavier than in the past. Second, there has been an acute shortage of men and materials—transformers, good timber poles, steel for concrete poles, and copper wire. Today, however, this shortage is easing, and though deliveries of materials may still be long in coming, they do come, whereas formerly they frequently did not come at all.

Because of the high cost of labour and materials the power board will have to charge high guarantees to recover the loan and other costs of installing the new lines shortly to be erected. Costly though they will be, it is doubtful whether the expense to the consumer of these high guarantees will act as a further deterrent to rapidly increasing reticulation.

It is possible even with a rain-water tank, if it can be placed high enough, to obtain adequate pressure for a piped interior water supply. However, this small storage tank would not supply the house for more than a few days without rain.



Graph 3—Preference rating of various amenities.

Housewives' Preferences

If someone is asked what amenity she would most like, or which she rates the highest, she will often unconsciously exclude from her field of choice those which she already has. For example, a housewife with electricity but no hot water system would say, "Oh, I'd like hot water best", and one with hot and cold water may say, "I would like a water closet", when they probably both value what amenities they have more highly than those they lack.

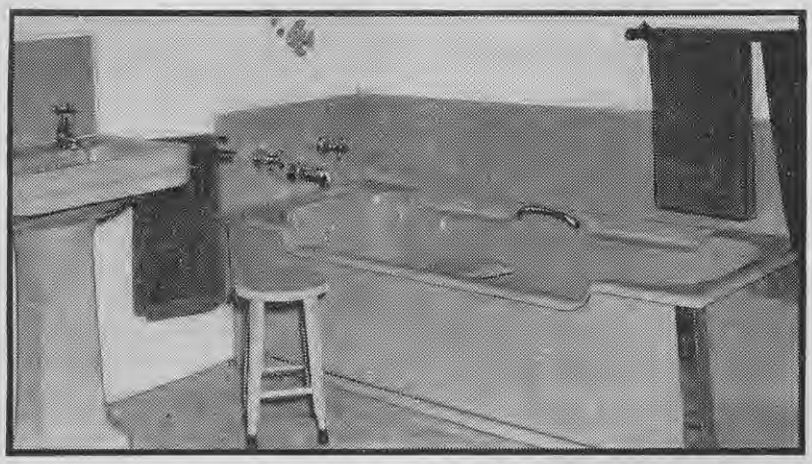
Therefore, to arrive at a preference rating scale in this survey each housewife was given a standard list of amenities from which were crossed out those she already had, and was asked to pick from the remaining ones her first, second, and third choice, regardless of cost. If she had few, she would frequently group a number together, such as fixed equipment with drains, or hot water piped to bath, basin, and sink, and rate the whole group as one choice. She was also asked whether there was any other water-using amenity not listed which she would prefer to those that were.

Each amenity was then scored as follows: Every time it was installed in a house, 5; when a first choice, 4; second choice, 3; third choice, 2; and any further choice, 1. These scores were then added for a final preference rating. Had any amenity been installed in every one of the 200 houses, its total rating would have been 1000, or, divided by 10, 100. The nearer the rating of any amenity approaches this maximum the more highly is it valued, according to the double criterion of being actually installed or of being listed as a choice for a "next installation". The common amenities are listed in descending order of preference in the graph above. It is noteworthy that no item scored 100 per cent. Even a copper, which was not included in the list, would not have received this maximum rating, for there were a few houses that did not have one. It would, however, have received more than the 93 per cent. gained by a bath and a laundry.

The amenity most frequently chosen but not listed was electricity, with 13 firsts. This was not strictly a water-using amenity, but it is probable that all those desiring it would have made use of it to improve their water supply. Eight listed a more adequate water supply and sufficient storage facilities to tide them over temporary shortages as first choice. Five listed better pressure as first or second choice, but only one listed pressure and amount adequate for fire fighting, in spite of the fact that at over 100 houses there was neither an adequate amount of water nor was it under sufficient pressure to be of any use in fighting a fire. Two housewives listed purer water, one as a first choice and one as a fourth. Three listed a dishwasher.

Evaluation of Preference Rating

It was to be expected that the first six items (bath, sink, and tubs, cold water to the first two, and a laundry)



There is no reason why such a bathroom as this should not grace a farm home as well as a city one, whatever the shortcomings of the natural water supply.

should head the list. The four items sink, bath, tubs, and copper are involved in the use of nearly all the water in a house, and piping of water to them and drainage from them relieve the housewife of much heavy carrying. Piped hot water in the kitchen is a tremendous convenience, but saves time and the frequent carrying of small quantities rather than of heavy bucketfuls of water. It saves **much** labour rather than **hard** labour, so it is understandable that it comes lower on the list.

The rating for a bathroom seems too low, probably because most of those who did not have one had no piped water either and gave as their first three choices cold and hot piped water, fixed equipment with drains, and a drainage system. The need for a bathroom to house the fixed bath and basin at least might not have occurred to them or more probably they assumed its presence as a matter of course. Had the matter been considered, a bathroom would probably have been listed as equally desirable as the items given. There were seven more laundries than there were bathrooms, which would help to account for the relatively higher position for laundries.

This scale does not measure the needs of country housewives. To discover these the choices only should be used. However, the scale does attempt to measure what is probably more valuable—the relative importance to the housewife of the various amenities. With the lists of what are present in the houses, it is a guide to the needs and indicates the most urgent. The scale rather discriminates against the more expensive items such as the water closet (with septic tank) and the washing machine. The reason for not having one or both of these is more likely to be expense than desirability. But the scale and method of scoring do not indicate the reason why these two received fairly low ratings. That the water closet scores nearly half as high again as the washing machine probably indicates a real preference difference, since both cost a fairly high figure, and if anything the water closet and septic tank are the more expensive.

It is interesting to compare this preference rating with an American one worked out by the United States Department of Agriculture in 1936. It takes the preferences of farm families only and lists them in descending order:—

1. Sink.
2. Cold water piped to sink or hand pump to sink.
3. Bath.
4. Cold water to the bath.
5. Water closet.
6. Washbasin.
7. Cold water to the basin.
8. Shower.
9. Hot water to the bath.
10. Hot water to the sink.
11. Hot water to the basin.
12. Washtubs.
13. Cold water to the tubs.
14. Hot water to the tubs.
15. Sink in work-room (room for preparing vegetables and farm produce, preserving, etc.).
16. Cold water to this sink.
17. Hot water to this sink.
18. A sink or washbasin for men's washroom.
19. Cold water to this basin.
20. Hot water to this basin.

It has not been possible to discover how the United States Department of Agriculture arrived at this order of preferences, or whether it indicates preferences regardless of needs or of needs only. But the similarity to the results obtained in the South Canterbury survey is striking, though the low position for washtubs and water piped to them is surprising. Apparently the convenience and demands of the family, as met by the bath and cold and hot water and by the water closet, were considered before the saving of labour for the housewife, which is achieved with the installation of tubs and water piped to them.

Conclusion

Compared with conditions in other Pacific countries the conditions revealed by this survey might be said to be very good, but by New Zealand's own urban standards the rural situation is not one about which anyone can afford to be complacent.

Water supply is after all only one aspect of housing, and it is unlikely where water amenities are inadequate that all other amenities will be entirely satisfactory; and the survey has revealed that too frequently water amenities are not adequate.

It has also shown that it is not the adequacy and quality of the initial natural supply which ultimately controls the standard achieved within the house, though a poor natural supply will make the achievement of a high standard more difficult and more costly. Much further research would be necessary to discover what are the chief controlling factors, though there is no doubt that the economic factor is important. Where electricity is available the problem is usually more easily solved, for electricity on the farm is one of the great aids to putting water to work for the farm housewife.

Unlimited hot and cold water, under pressure and at the turn of a tap, is one of the greatest labour savers that modern engineering and plumbing can make available to even the most remote farm home.

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