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THE GRASSLANDS OF NEW ZEALAND.

REGRASSING EXPERIMENTS ON DETERIORATED HILL COUNTRY IN WHANGAMOMONA COUNTY, 1925 AND 1926.

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DURING the past three years some 347 acres of hill country in Whangamomona County have been burnt and sown with experimental seed mixtures by the Department of Agriculture. The sowings have been made on different types of primary forest and secondary growth, on different soil and slope aspects, and on areas where varying systems of farm-management were practised.

The first of these sowings, made in 1924, are recorded in the *Journal* for August of that year. In the sowings made in 1925 the mixtures were considerably altered as a result of detailed analytical work on the plots sown the previous autumn. In 1924 the cost of the mixtures was not taken into consideration, but in 1925 the use of the most economical mixtures, based on work done on the previous year's sowings, was the main objective. Certain species sown in 1924 were outstanding, and these were made the base upon which to construct the most economical mixture. Species regarding which there was a doubt as to their suitability for the country were considerably reduced in quantity, while others were eliminated altogether.

At the end of the first year the outstanding questions to be definitely proved were the following :—

(1.) Are cocksfoot and perennial rye-grass worth while ?

(2.) Will danthonia come in naturally (without being sown artificially), provided sufficient feed from other more-cheaply-establishing species is secured to keep stock working on the area, in order that secondary growth may be so effectively controlled that light can reach the ground surface ? One cannot but think that if only all the hill country can be kept open to the light danthonia will ultimately come in and take charge. The question is whether we can get other cheaper-establishing species that will immediately pay for their sowing, and that will keep going long enough to enable such development to take place.

(3.) Is the inclusion of small quantities of seed of Danthonia pilosa, Lotus major, paspalum, Poa pratensis, subterranean clover, yarrow, and Lotus hispidus justified on the score that these plants—so successful in other parts of New Zealand—will come on in later years if some seed is sown, and spread by their own inherent capacity to establish through reseeding or by their capacity to tiller out vegetatively? To rely on any of these species to form an early sward seems quite futile, in the Taranaki back-country at least.

The outstanding success of brown-top and crested dogstail as good establishers and rapid sward-formers determined us to make these two species the basis of the mixtures, which determination has not been modified after three years' close examination of results.

The 1925 Trials.

The different seed mixtures used in the 1925 trials are given in the tables which follow :—

Table 1.—General Mixtures for Secondary Burns, 1925: Each Plot 1 Acre.

Mixture-numbers	1.	2.	3.	4	5.	6.	7.	8.	9.	10.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Perennial rye-grass ..	..	..	4	4	4	4	2	..	..	..
Cocksfoot	..	..	3	3	3	3	6	10	..	..
Crested dogstail ..	4	4	4	4	4	4	4	4	4	4
Brown-top	2	2	2	2	1	1	1	½	2	3
Danthonia pilosa ..	..	3	..	3	..	3	3	3	3	..
Paspalum	1	1	1	1	1	1	1	1	1	..
White clover ..	½	½	½	½	½	½	½	½	..	..
Lotus major ..	½	½	½	½	½	½	½	½	½	1
Lotus hispidus ..	½	½	½	½	½	½	½	½	½	..
Subterranean clover ..	2 oz.	2 oz.	2 oz.	2 oz.	2 oz.	2 oz.	2 oz.	2 oz.	2 oz.	..
Yarrow	1 oz.	1 oz.	1 oz.	1 oz.	1 oz.	1 oz.	1 oz.	1 oz.	1 oz.	..
Wild white clover ..	..	..	..	..	..	..	..	..	1	..
Ratstail	..	..	..	..	..	..	..	..	1	..
Chewings fescue ..	..	..	..	..	..	..	..	..	2	..
Total amount per acre	8·7	11·7	15·7	18·7	14·7	17·7	18·7	20·2	15·2	8

The first four mixtures in the above table are designed to give information regarding the need or otherwise of including danthonia in the mixture, and whether the inclusion of rye-grass and cocksfoot help materially in the formation of the ultimate sward. Mixtures 5 and 6 were included for country somewhat above the average, or where top-dressing with artificial manures might be carried out. Whether or not it is necessary to include danthonia is again tested here. Mixtures 7 and 8 contain more cocksfoot for the purpose of giving this grass a further trial. Mixture 9 contains the base of finer and harder grasses, to which wild white clover, ratstail, and Chewings fescue have been added. Mixture 10 contains the three outstanding species that up to the present are promising best on the slightly more fertile soils and where a certain amount of top-dressing is practicable.

Table 2.—Mixtures for Primary Forest Burns: Each Plot 2½ Acres.

Mixture-numbers ..	1.	2.	3.	4.
	lb.	lb.	lb.	lb.
Cocksfoot	15	8	4	..
Perennial rye-grass	..	6	6	..
Italian rye-grass	2	2	2	2
Crested dogstail	4	4	4	4
Brown-top	½	1	2	3
Danthonia pilosa	..	1	2	3
Paspalum	1	1	1	1
White clover	1	1	1	1
Lotus major	½	½	½	½
Lotus hispidus	..	..	..	1
Subterranean clover	2 oz.	2 oz.	2 oz.	2 oz.
Yarrow	1 oz.	1 oz.	1 oz.	1 oz.
Total amount per acre	24·2	24·7	22·7	15·7

In the above series of plots (Table 2) the trial centres largely on a comparison of cocksfoot in varying amounts associated with brown top and Danthonia pilosa, these also in varying amounts. Where the cocksfoot is highest in amount the brown-top and the danthonia are low or absent altogether, and where the cocksfoot is reduced and absent these two hardier grasses are increased in amounts. Each mixture costs approximately the same—approximately 35s. per acre. None of these mixtures is intended to be ideal for the country, but is sown specially for careful comparative analytical work on the species themselves.

Table 3.—Crested Dogstail, Brown-top, and Lotus major Trials: Each Plot ¼ Acre.

Mixture-numbers ..	1, 1A.	2, 2A.	3, 3A.	4, 4A.	5, 5A.	6, 6A.	7, 7A.	8, 8A.	9, 9A.	10, 10A.	11, 11A.	12. 12A.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Crested dogstail	20	..	..	4	15	..	..	4	10	..	..	2
Brown-top	..	5	3½	2½	..	3¾	3	2	..	2½	2	1½
Lotus major	..	..	1½	1½	..	..	¾	¾	..	..	½	½
Total amount per acre	20	5	5	8	15	3¾	3¾	6¾	10	2½	2½	4

These small plots were sown in duplicate, one lot being sown in the ordinary way after the burn, and the other (in each case the A plot) top-dressed with 1 cwt. of superphosphate per acre at the time of seeding. Weak turf as well as burnt patches was sown with these mixtures. It was thought that by increasing the fertility of the surface layer of soil, upon which the seed germinates, a more ready establishment would be effected.

The mixtures of Table 3 fall into three groups. In each of the first four mixtures, 20s. worth of seed per acre is sown; in each of the middle four, 15s. worth of seed per acre; and in each of the last four, 10s. worth. When the mixtures were sown crested dogstail was 1s. and brown-top and Lotus major 4s. per pound.

NEW INTRODUCTIONS AND LESS COMMONLY USED SPECIES.

In addition to the foregoing, other species than those more regularly used were tested. A mixture consisting of the following fifty-three species was sown at the rate of approximately 60 lb. per acre: Tall fescue, meadow-fescue, hard fescue, sheep's fescue, various-leaved fescue, fine-leaved sheep's fescue, Chewings fescue, Wakeman's fescue, red fescue, sand fescue, *Festuca decolorans*, *Scleropoa rigida*, tall oat-grass, golden oat-grass, prairie-grass, *Bromus inermis*, *Bromus patulus*, *Bromus racemosus*, *Bromus erectus*, *Bromus polyanthus*, *Bromus pendulus*, *Bromus macrostachys*, sweet vernal, Yorkshire fog, red-top, paspalum, ratstail, yarrow, chicory, Tambootie grass, *Phalaris canariensis*, *Phalaris arundinacea*, *Phalaris caroliniana*, *Phalaris paradoxa*, *Poa anceps*, *Poa nevadensis*, *Poa Astonii*, Poa nemoralis, serradella, Danthonia semiannularis, strawberry-clover, Lotus corniculatus, English trefoil, *Melilotus alba*, *Melilotus arvensis*, Hubam clover, *Medicago arborea*, snail clover, elephant-eared mustard, haresfoot trefoil, suckling-clover, kikuyu (planted), *Triodia decumbens* (planted).

RE-ESTABLISHMENT OF PASTURE AND PASTURE MAINTENANCE COSTS.

Experiments were initiated towards determination of cost of bringing deteriorated country back and of maintaining that country over a period of years. It is not so much the initial regrassing costs connected with the bringing back of the country that determines whether or not the proposition is economical. The determination of the maintenance costs is an essential prerequisite to the formulation of any plan for the economic working of the country. One-sheep country where the maintenance costs are high is an entirely different proposition from one-sheep country where the maintenance costs are low.

This work is not a matter of small plots, but entails whole paddocks, a fairly large expenditure of money, and exact records of incomings and outgoings so far as the particular area being studied is concerned. Up to the present the work has been attempted co-operatively with farmers, but it would appear that the control of whole farms for this purpose will be necessary before really satisfactory results can be secured.

LOCATION AND DESCRIPTION OF AREAS SOWN IN 1925.

Table 4.

NOTE.—Except where otherwise indicated the mixture-numbers in third column refer to Table 1.

Area on Property of	Type of Country.	Mixtures used.	Remarks.
F. Coxhead, Tahora ..	Patchy bracken fern, on westerly aspect	1, 2, 3, and 4	Fairly good burn; seed sown almost immediately after burning.
Claude Carter, Tahora ..	Wineberry, bush-lawyer, soft fern, bracken, and hard fern	7	Cost of regrassing and maintenance experiment; 30 acres burnt and sown.
E. B Roberton, Tahora ..	Bracken and manuka. Manuka felled, and area top-dressed in 1924 and 1925 after seed sown	6	To compare with remainder of paddock that is being brought back by top-dressing alone. No burning of cut manuka and no sowing of seed.

AREAS SOWN IN 1925—*continued.*

Area on Property of	Type of Country.	Mixtures used.	Remarks.
J. Selby, Tahora ..	Hard-fern patches on hillside run predominantly to danthonia	3	On this area certain hard-fern patches burnt but not sown. Object of experiment is to test whether sowing of burnt patches situated in danthonia-dominant pasture is at all necessary.
J. Ostler, Kohuratahi ..	Hard-fern patches; N.E. slope	5 and 6	Danthonia spreading throughout area. Object of experiment to test out whether it is necessary to include danthonia in mixture when this grass is once well established on area. Patches burnt early in February, but not sown until early April.
J. Ostler, Kohuratahi ..	Stunted bracken; S.W. slope	1 and 2	Sown almost immediately after burning.
A. Bottomley, Whangamomona	Bracken and manuka; easterly slope	1, 2, 5, and 6	Owing to poor and patchy nature of burn, and difficulty of marking out plots, these mixtures were mixed together and sown as one plot.
J. McCluggage, Whangamomona	Hard fern, bracken, and slips; very steep; S.W. slope	1, 2, 3, 4, 9, 10, and 11	Good burn secured; area sown almost immediately after the burn.
A. Coxhead, Whangamomona	Hard fern and bracken; N.E. slope	1, 2, 3, 4, and 11	Areas burnt early in February; not sown until early in April.
A. Coxhead, Whangamomona	Hard fern	All Table 3	Area sown soon after being burnt.
Murphy Bros., Aotuhia ..	Wineberry and bracken; various aspects	2 and 6	10 acres of each mixture. Cost of regrassing and maintenance experiment.
Murphy Bros., Aotuhia ..	Primary forest burn; S.E. and W. slopes	All Table 2	Good clean burn; burnt about Christmas-time; grass sown first week in April.
A. McCluggage, Pohokura	Bracken and hard fern; N. and W. slopes	1, 2, 3, and 9	Sown soon after being burnt.
E. J. Wilde, Pohokura ..	Hard fern and bracken; N.W. slope behind homestead	1 and 2	Good burn; sown soon after burning.
E. J. Wilde, Pohokura ..	Bracken and water-fern; up from wool-shed	3	Good burn; sown almost immediately after burning.
A. J. Stonewigg, Te Wera	Manuka, hard fern, and bracken; various slopes	1, 2, 3, 9, and 11	Manuka and hard fern moderately good burn. Where certain of the manuka was winter-cut among bracken and water-fern, extremely difficult to get good burn.
A. J. Stonewigg, Te Wera	Manuka and hard fern; N.E. and N.W. slopes	All Table 3	Fairly good burn; seed sown soon after burning.
H. Mayo, Strathmore ..	Bracken and manuka; N.E. slope	1, 2, 3, and 4	Rather poor burn; in many places thick mass of dead bracken left unburned on ground.

AREAS SOWN IN 1925—*continued.*

Area on Property of	Type of Country.	Mixtures used.	Remarks.
Areas outside Taranaki back-country also sown.			
Jepson Bros., Otaki Forks	Hard fern, water-fern, and bracken; S.E. slopes	1, 2, 3, 4, 5, 6, 7, 8, 9, and 10	Fairly good burn, but rubbly nature of country prevented access of hot fire to rhizomes of hard fern.
Corrigan Bros., Otaki Forks	Water-fern and wineberry —secondary log fire; N.W. slope	1, 2, 3, 4, 5, and 6	Owing to wet season very poor cleaning-up burns secured.
C. Morel, Murchison ..	Bracken fern; W. slope	1, 2, 3, 4, 5, 6, 7, 8, 9, and 10	Fairly good burn.

The season of 1925 was not a particularly good one for surface-sown seed. After the fine spell in early February little good burning weather was experienced until late in March. Most of the foregoing plots were sown early in April, but some not until rather late in April —too late to get a really good take.

The sowings of 1925 in the aggregate cover 140 acres of hill land, and the areas sown are representative of very large tracts of hill country throughout New Zealand.

Experimental Sowings of 1926.

In the autumn of 1926 additional areas were burnt and sown, the objective in these latter sowings being more or less to duplicate certain of the earlier ones so as to obtain fresh material for analytical work. The general mixtures for secondary burns were modified to some extent, but the general base of crested dogstail, brown-top, white clover, and Lotus major was retained much as in the general sowings of 1925. Following is a tabulation of the general mixtures used for secondary burns, each plot being 1 acre or more according to burn and aspect :—

Table 5.—General Mixtures for Secondary Burns, 1926.

Mixture-numbers ..	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Crested dogstail ..	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2
Brown-top ..	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
White clover ..	½	½	½	½	½	½	..	½	½	½	½	½	½	½	1	..	½	½	½	½
Lotus major ..	½	½	½	½	½	½	½	½	½	½	½	½	½	½	½	½	½	½	½	½
Lotus hispidus ..	½	½	½	½	½	½	..	..	½	½	½	½	½	½	½	½	½	½	½	½
Subterranean clover	¼	¼	¼	¼	¼	¼	..	..	¼	¼	¼	¼	¼	1	¼	¼	¼	¼	¼	1
Yarrow	1 oz.	1 oz.	1 oz.	1 oz.	1 oz.	1 oz.	..	..	1 oz.	2 oz.	2 oz.	2 oz.	1 oz.	2 oz.	2 oz.	2 oz.	2 oz.	2 oz.	..	..
Cocksfoot ..	..	2	3	4	6	8	..	..	..	..	..	..	3	..	..	..	..	..	..	3
Perennial rye-grass	2	2	2	2	2	2	2	2	..	..	..	..	4	..	..	..	..	..	..	..
Danthonia pilosa ..	..	4	3	2	1	½	1½	1½	..	..	..	..	1½	1½	1	1	..	2	..	..
Paspalum ..	..	½	1	2	3	4	1½	1½	..	1	1	1	1½	2	4	4	1	..	..	..
Wild white clover ..	..	..	..	..	..	..	½	..	..	..	..	..	..	..	..	1	..	..	..	..
Rhenish tall fescue	..	..	..	..	..	..	..	..	6	..	..	..	..	..	..	..	4	..	..	..
Chewings fescue ..	..	..	..	..	..	..	..	..	..	4	..	..	..	..	..	..	6	6	4	..
Hard fescue (No. 1)	..	..	..	..	..	..	..	..	..	..	4	..	..	..	..	..	..	..	..	..
Sheep's fescue (No. 2)	..	..	..	..	..	..	..	..	..	..	..	4	..	..	..	..	..	..	..	..
Golden oat-grass ..	..	..	..	..	..	..	..	..	½	½	½	½	..	..	..	..	..	..	..	..
Poa nemoralis ..	..	..	..	..	..	..	..	..	½	½	½	½	..	..	..	..	..	..	..	..
Italian rye-grass ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	4
Total amount per acre	9·8	16·3	16·8	17·8	19·8	22·3	12	12	14·8	13·8	13·8	13·8	17·8	12·1	13·3	13·3	18·8	15·8	15·7	14·5

No. 1 mixture in this table may be regarded as the base of the general mixtures, the first four species in the list—crested dogstail, brown-top, white clover, and Lotus major—together with perennial rye-grass, being the outstandingly important species for any mixture on secondary-growth country. Where no danthonia is established on the country, however, this also should be included as a basic species.

Mixtures 2 to 6 give differential sowings of cocksfoot, danthonia, and paspalum in addition to the base. These plots are particularly required for analytical work, more especially in testing once again whether cocksfoot should not be entirely eliminated from secondary-growth mixtures, and whether danthonia will spread sufficiently from very little seed sown or whether a heavier seeding is necessary.

Mixtures 7 and 8 form a test of wild white clover against the ordinary New-Zealand-grown white clover.

Mixtures 9 to 12 provide a trial of fescues and odd additional grasses specially secured from Messrs. Webb and Son, Stourbridge, England. The Rhenish tall fescue is not open to the disadvantages of the ordinary tall fescue, inasmuch as it is considered much more palatable to stock.

Mixture 13 is a general mixture for secondary-growth burns on the slightly better country, or where top-dressing is being systematically carried out. This mixture is specially sown for comparative analytical work in connection with top-dressing trials—top-dressing of weak turf, hard fern, bracken fern, &c., as against the burning and sowings of these growths.

In mixture 14 subterranean clover has been increased, and in mixtures 15 and 16 larger quantities of wild white clover and ordinary New-Zealand-grown white clover are being tested.

In mixtures 17 to 19 Chewings fescue is included as a dominant for hard surfaces and steep bluffs.

The primary-forest-burn mixtures of 1926 were similar to those sown in the previous year, with the exception of certain fescues added, and are tabulated as follows:—

Table 6.—Mixtures for Primary Forest Burns, 1926.

Plots 1–6, each 2½ acres; plot 7, 5 acres.

Mixture-numbers	1.	2.	3.	4.	5.	6.	7.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Cocksfoot	15	8	4	..	8	4	6
Perennial rye-grass	..	6	6	..	6	6	3
Italian rye-grass	2	2	2	2	2	2	2
Crested dogstail	4	4	4	4	4	4	4
Brown-top	½	1	2	3	1	2	2
Danthonia pilosa	..	1	2	3	1	2	2
Paspalum	2	2	2	2	2	2	2
White clover	1	1	1	1	1	1	1
Lotus major	½	½	½	½	½	½	1
Lotus hispidus	½	½	½	½	½	½	1
Subterranean clover	½	½	½	½	½	½	½
Yarrow	1 oz.	1 oz.	1 oz.	1 oz.	1 oz.	1 oz.	1 oz.
Rhenish tall fescue	6	..	..	..	..	..	4
Chewings fescue	..	4	..	..	..	..	..
Hard fescue (No. 1)	..	..	4	..	..	..	..
Sheep's fescue (No. 2)	..	..	..	4	..	..	..
Total amount per acre	32·1	30·6	28·6	20·6	26·6	24·6	28·6

PURE SOWINGS OF THE COMMONER GRASSES AND CLOVERS.

Pure sowings of the commoner grasses and clovers were made so as to have on hand material for the study of each individual species, both from its establishment point of view and from the sward-forming and lasting qualities. Fourteen species or varieties were included in the trial, and 20s. worth of seed per acre of each species or variety was sown in each case. These plots are in duplicate, and the duplicate (A) plot in each case was top-dressed in the winter following the sowing with 3 cwt. basic slag per acre. The top-dressed and non-top-dressed plots are side by side in each case. This series is set out in the following table :—

Table 7.—Pure Sowings of Individual Grasses and Clovers in 1926, using 20s. Worth of Seed per Acre : Each Plot $\frac{1}{12}$ Acre.

Mixture-numbers ..	1, 1A.	2, 2A.	3, 3A.	4, 4A.	5, 5A.	6, 6A.	7, 7A.	8, 8A.	9, 9A.	10, 10A.	11, 11A.	12, 12A.	13, 13A.	14, 14A.
Perennial rye-grass	20/-	..	..	..	..	..	..	..	..	..	..	..	..	..
Akaroa cocksfoot	..	20/-	..	..	..	..	..	..	..	..	..	..	..	..
Danish cocksfoot	..	..	20/-	..	..	..	..	..	..	..	..	..	..	..
Crested dogstail	..	..	..	20/-	..	..	..	..	..	..	..	..	..	..
Brown-top	..	..	..	..	20/-	..	..	..	..	..	..	..	..	..
Danthonia pilosa	..	..	..	..	..	20/-	..	..	..	..	..	..	..	..
Paspalum	..	..	..	..	..	..	20/-	..	..	..	..	..	..	..
Chewings fescue ..	..	..	..	..	..	..	..	20/-	..	..	..	..	..	..
White clover.. ..	..	..	..	..	..	..	..	..	20/-	..	..	..	..	..
Wild white clover ..	..	..	..	..	..	..	..	..	..	20/-	..	..	..	..
Lotus major	..	..	..	..	..	..	..	..	..	..	20/-	..	..	..
Lotus hispidus	..	..	..	..	..	..	..	..	..	..	..	20/-	..	..
Subterranean clover ..	..	..	..	..	..	..	..	..	..	..	..	..	20/-	..
Yarrow	..	..	..	..	..	..	..	..	..	..	..	..	..	20/-

MIXTURES USING 20S. WORTH OF SEED PER ACRE, THE SAME AMOUNT BEING SPENT ON EACH SPECIES INCLUDED.

In this series 20s. (or approximately) per acre was spent on grasses and clovers, the same amount of money in each sowing being spent on any one species included in the mixture. The sowings were designed to give greater comparison among those species indicative of being most successful, and less comparison among those species of minor importance only.

From this series it is hoped, by careful analytical work on the turfs formed, to be able to say fairly readily just what species in any one mixture sown is giving the cheapest cover. If, for example, we find that in mixture 6 brown-top is consistently giving a greater cover than any of the other species in that mixture then we know that the 3s. 4d. spent on this seed is more justified than in the case of any of the other seeds. By this means elimination of the unprofitable species may be secured. The measuring of the exact covering-capacity of each species is, of course, not a matter of a year or two's trial. Many years' constant work is necessary to allow for the rearrangement and adjustment of each species according to the habitat. A record from the initial sowing onwards should certainly ultimately ensure the minimum of waste and the maximum of efficiency in mixture formulas. As in the foregoing series (Table 7) these plots are in duplicate, and the duplicate (A) in each case has been top-dressed with 3 cwt. of basic slag per acre. This series is set out in the following table :—

Table 8.—Same Amount spent on each Seed included in Mixture: Each Plot $\frac{1}{12}$ Acre.

Mixture-numbers ..	1, 1A.	2, 2A.	3, 3A.	4, 4A.	5, 5A.	6, 6A.	7, 7A.	8, 8A.	9, 9A.	10, 10A.	11, 11A.	12, 12A.
Brown-top	20/–	10/–	6/8	5/–	4/–	3/4	3/–	2/6	2/3	2/–	1/9	1/8
Crested dogstail.. ..	..	10/–	6/8	5/–	4/–	3/4	3/–	2/6	2/3	2/–	1/9	1/8
Lotus major	..	..	6/8	5/–	4/–	3/4	3/–	2/6	2/3	2/–	1/9	1/8
White clover	..	..	..	5/–	4/–	3/4	3/–	2/6	2/3	2/–	1/9	1/8
Danthonia pilosa ..	..	..	..	..	4/–	3/4	3/–	2/6	2/3	2/–	1/9	1/8
Paspalum	..	..	..	..	..	3/4	3/–	2/6	2/3	2/–	1/9	1/8
Lotus hispidus	..	..	..	..	..	..	3/–	2/6	2/3	2/–	1/9	1/8
Subterranean clover ..	..	..	..	..	..	..	..	2/6	2/3	2/–	1/9	1/8
Perennial rye-grass ..	..	..	..	..	..	..	..	..	2/3	2/–	1/9	1/8
Cocksfoot	..	..	..	..	..	..	..	..	..	2/–	1/9	1/8
Chewings fescue ..	..	..	..	..	..	..	..	..	..	..	1/9	1/8
Yarrow	..	..	..	..	..	..	..	..	..	..	..	1/8

PURE SOWINGS OF NEWLY INTRODUCED SPECIES.

The following new species were secured during the year and sown on two areas: Shore bent (*Agrostis maritima*), smilo (*Oryzopsis miliacea*), sweet-grass (*Panicum laevifolium*), *Melica Californica*, *Danthonia Californica*, wallaby-grass (*Danthonia semiannularis* var.).

LOCATION AND DESCRIPTION OF AREAS SOWN IN 1926.

Table 9.

NOTE.—Except where otherwise indicated the mixture-numbers in third column refer to Table 5.

Area on Property of	Type of Country.	Mixtures used.	Remarks.
W. Gill, Whangamomona	Hard fern and weak turf infested with piripiri; E. slope	1–17 1–14 (Table 7) 1–12 (Table 8)	Area hard- and close-grazed prior to burning and sowing. Cleaned up whole face (approximately 36 acres) for cost - of - maintenance trial. Good deal of hard-fern rhizome not killed by fire. Most of paddock top - dressed with slag.
A. Coxhead, Whangamomona	(1.) Hard-fern patches	1–12 (Table 8)	Fairly good burn.
	(2.) Hard-fern patches; various slopes	1–9, 15 and 16	Fairly good burn; no top-dressing with slag.
	(3.) Bracken fern mainly; S.E. slope	13	Area of 4 acres sown. Top-dressed in 1925 among standing bracken. So little impression made by stock on bracken that decided burn and sow. Top-dressed in 1926 after seeding.
J. Anderson, Whangamomona	(1.) Heavy and sparse manuka and bracken mainly, with some hard fern; various slopes	1, 2, 3, 4, 5, 6, 14, 15, 16, and 18	Good burn; plots not top-dressed.
	(2.) Bracken and manuka ridge; E. and W. slopes	1–12 (Table 8)	Duplicate plots top-dressed.
J. McCluggage, Whangamomona	(1.) Bracken mainly, on steep face; N.E. slope	9, 10, 11, and 12	Very steep face; fairly good burn. Plots not top-dressed. Each plot 2½ acres.
	(2.) Bracken and hard fern	7, 8, 14, 15, and 16	Moderately good burn; no top-dressing.

AREAS SOWN IN 1926—*continued.*

Area on Property of	Type of Country.	Mixtures used.	Remarks.
J. McCluggage, Whangamomona—*continued.*	(3.) Hard-fern patches..	13	Burnt patches within top-dressed paddock in order to compare with control of hard fern by top-dressing without burning and sowing.
J. Ostler, Kohuratahi ..	(1.) Wineberry, tall bracken, and *Dicksonia* tree-fern, all felled prior to burning; ridge, E. and W. slope	7, 8, 9, 13, and 14	Fair burn; seed sown soon after burning; no top-dressing.
	(2.) Hard-fern patches ..	13	Burnt patches within top-dressed paddock.
A. Perry, Whangamomona	(1.) Young hard-fern patches; various slopes	13 and 14	Hard-fern patches small, appearing after two years' crushing of bracken. Top-dressed previous winter.
	(2.) Weak turf, two years crushed from bracken; S. and N. slopes	14	Paddock top-dressed previous winter. Establishment trial after bracken crushed out.
	(3.) Hard-fern patches	..	Pure sowings of newly introduced species.
F. Burch, Kohuratahi ..	Hard-fern patches; S.E. slope	13 and 14	Good burn of patches. Within dairying-area. Top-dressed in winter following burning and sowing.
A. Bottomley, Whangamomona	(1.) Felled manuka and bracken mainly; various slopes	15 and 16	Good burn; not top-dressed.
	(2.) Hard-fern patches	13	Good burn of patches within top-dressed area.
	(3.) Hard-fern patches; W. slope	..	Patches burnt but not sown; to compare with sown portion on very hard slope where sweet vernal predominates.
	(4.) Manuka and bracken	..	Pure sowings of newly introduced species.
A. McCluggage, Pohokura	Bracken and hard fern; N. slope	13	Burnt patches within top-dressed area.
E. J. Wilde, Pohokura ..	Wineberry mainly ..	9, 14, 15, and 16	Poor burn; not top-dressed.
G. Clifton, Whangamomona	Manuka, bracken, and hard fern	13 and 14	Fairly good burn of steep hard face; not top-dressed.
Wm. Fletcher, Whangamomona	(1.) Papa slips ..	9, 10, 11, and 12	Slips two years old.
	(2.) Primary forest burn; N.S. and N.E. slopes	5, 6, and 7 (Table 6)	Plots 5 and 6, each 2½ acres; plot 7, 5 acres. Light burn over most of area.
Murphy Bros., Aotuhia ..	Primary forest burn; N.E. slope	1, 2, 3, and 4 (Table 6)	Good burn. Each plot 2½ acres. Portion sown with turnips; portion with Japanese millet.
J. Carver, Kohuratahi ..	Bracken fern; N.E. slope	7, 8, 9, 14, and 19	Bracken burnt in spring and crushed during autumn; sown middle of April.
H. Mayo, Strathmore ..	Bracken fern; N.E. slope	20	Second fire over bracken; burnt in spring, and not sown until second week of April.

General.

Most of the plots in both years were sown during the latter half of March, and very good weather was experienced for the germination and establishment of the seed sown. A total of 123 acres was sown in 1926, thus aggregating 347 acres for the three years we have been working on the country. This area could not possibly have been burnt and sown without the hearty co-operation and assistance of the farmers themselves. In country such as Whangamomona, where good burns are difficult to secure, it is surprising how little one man can do, so far as the burning alone is concerned, during the limited number of days when burning is possible. It is only by availing oneself of the work done by the farmers concerned that a large area representative of all classes in the district can be secured. In the sowing also, where it seems imperative to get the seed on as soon after the burn as possible, the more hands on the job the better.

The writer wishes to express his appreciation to the farmers concerned; also to Mr. J. W. Deem, the Department's Instructor in Agriculture for the district, and to his assistants, Mr. D. Sidey and Mr. J. M. Smith. To the writer's own assistant, Mr. E. A. Madden, his thanks are also due for the long and strenuous hours put in while the work here referred to was in progress. For the loan of his woolshed for mixing and weighing out of seed, and for many helpful services rendered, special thanks are also due to Mr. A. Coxhead, farmer, Whangamomona.

A preliminary report (illustrated with photos) on the progress of the plots is being prepared for the March issue of the *Journal*.

(To be continued.)

OLD MOTOR-TIRES FOR FARM-IMPLEMENT WHEELS.

MR. W. J. MCCULLOCH, Instructor in Agriculture, Palmerston North, writes: "Recently while taking weights on Mr. M. Martin's experimental top-dressing plots, at Rangiwahia, my attention was directed to a rather novel idea which is worth the attention of other farmers. In closely settled districts at this season of the year one often meets mowing-machines travelling along metalled roads, either from farm to farm or to other hay-paddocks on the same farm, and it is generally recognized that such travelling is damaging to the machine, shaking nuts and bolts loose, &c. The machine referred to was fitted with old motor-tires, of which there are usually a number lying about most farms nowadays. The tires are cut through in one place at right angles, and are thus easily slipped over the mower-wheels, forming a cushion tire. They are just as easily removed on arrival at the field. To fit the tire in position, one end is placed on the ground in front of the mower-wheel, and the machine moved forward, when the tire automatically drops into position round the wheel."

Travelling of Fat Lambs.—The following points are suggested by J. M. Coleman, in the *Agricultural Gazette of New South Wales*, for minimizing the loss of condition and weight of fat lambs in transport by railway: (1) Muster and draft as late as possible; (2) drive some ewes to the trucking-yards to hold the lambs together and prevent them from continually "breaking"; (3) exercise care in driving to the yards; (4) spell the lambs before trucking them; (5) handle carefully while trucking; (6) do not allow the lambs to be trucked thirsty; (7) avoid overloading the trucks.

INSECT CONTROL OF NOXIOUS WEEDS.

JOINT SCHEME INITIATED AGAINST BLACKBERRY AND OTHER SPECIES.

A VISIT was made last year to America and Europe by Dr. R. J. Tillyard, F.R.S., head of the biological branch of the Cawthron Institute, on various scientific business. One of the most important investigations undertaken was that of the biological control of pest weeds, with special reference to blackberry (*Rubus*), with which New Zealand is particularly concerned. The line of biological control proposed by Dr. Tillyard is that of the introduction of insect natural enemies of the respective weeds—a method which involves considerable contingent danger, and which therefore had hitherto been deprecated by several leading entomological authorities.

Before Dr. Tillyard's departure from New Zealand an agreement was made between him and the Director-General of Agriculture in connection with any experiments to be undertaken for the control of blackberry by insect agency, with the object of safeguarding against the introduction of species which might also attack economic plants. The conditions of the agreement were as follows:—

(1.) No species to be forwarded from any country to New Zealand except such as are known to feed on species of the genus *Rubus* only.

(2.) All shipments on arrival in New Zealand to be taken charge of by an officer of the Department of Agriculture, who shall examine the cages to see that they are intact and that no insects can escape from them while being forwarded to Nelson. (This would allow of broken or damaged consignments being either destroyed or their cages repaired before forwarding.)

(3.) Dr. Tillyard to furnish to the Director-General of Agriculture an account of the life-history of each species selected for study.

(4.) The permits granted for introduction of all *Rubus*-feeding species to be permits restricting the study and rearing of such insects to closed insectaria and cages in the Cawthron Institute grounds and laboratories.

(5.) All such insects to be thoroughly tested within such insectaria or cages on all important economic plants, particularly introduced Rosaceae, such as apples, pears, stone-fruits, roses, &c.

(6.) If considered necessary similar tests to be made in country of origin before shipment.

During his visit Dr. Tillyard discussed his plans very fully with Dr. L. O. Howard at Washington, Dr. G. A. K. Marshall in London, and Dr. D. A. Imms at Rothamsted, with the result that all these representative authorities signified their approval of them.

When in England negotiations were initiated by Dr. Tillyard for the organization of research into the problem of control of noxious weeds by their natural enemies. The result was the acceptance of a scheme by the Empire Marketing Board, the New Zealand Government, and the Cawthron Trust. For the purpose of this work a grant of £4,000 per annum for five years has been made, one-half to be contributed by the Board, one-fourth by the Government, and one-fourth by the Trust. The work is to be carried out under the control of Dr. Tillyard, with the approval of the New Zealand Research Council. The annual expenditure is allocated to cover the salaries and expenses of a field entomologist and assistant in New Zealand,

and an entomologist and assistant in England; half-salary of Dr. Tillyard; supplies from Europe and America; insectaries and apparatus; travelling-expenses; and miscellaneous.

A report on his tour and investigations, dated 7th January, 1926, has been furnished to the Government by Dr. Tillyard. The first section of the report, dealing with the present subject, is as follows:—

SUMMARY OF THE PRESENT POSITION AS REGARDS BIOLOGICAL CONTROL OF NOXIOUS WEEDS.

There is at present only one completed piece of research along these lines—viz., the attempt to control lantana in the Hawaiian Islands by the introduction of its natural enemies. In this case the line of attack was to try to prevent the plant from seeding. This attempt, though carried out some years ago without such safeguards as we should now deem necessary, was entirely successful. The plants left on the islands, failing to seed, gradually died out, and some blocks were burnt and cleared also. At the present time lantana is no longer a menace in the Hawaiian Islands.

A much more ambitious attempt on a larger scale is that being now carried out by the Federal Government in Australia for the control of prickly pear by insect enemies. It is perhaps too early yet to prophesy complete success for this vast enterprise, where no less than thirty millions of acres of land are involved, with an increase of the pest engulfing another million acres annually; but the latest reports indicate that a number of valuable insects have been acclimatized, and can do very fine work in destroying the pear.

As a result of my studies and inquiries in America and Europe I feel able to state definitely that there is a very good prospect of either partial or complete control of a number of pest weeds in New Zealand without exposing the country to any serious danger in other directions.

The following is a short summary of the principal insects which, in my opinion, ought to be studies in connection with biological control of pest weeds:—

Blackberry.

(1.) *Insects which attack the Crown and Stem by Boring or Gall-forming.*

Coroebus rubi Linn.: A Buprestid beetle. The larva does great damage to blackberry in southern Europe, up to 60 per cent. of the new stems being destroyed in some years. It does not touch raspberry or any other plant, except that occasionally it is known to attack, more or less accidentally, the long runners of the Frau Karl Druschki and similar roses. This habit would bar this insect from entry into New Zealand under clause 1 of the agreement given.* As, however, the beetle is common right through Hungary, where roses of all sorts are grown in enormous numbers for perfume, and has never been known to attack roses anywhere else except at Grasse, in France, I am of opinion that it should be given a trial. It would be one of the exceptional cases where, it seems to me, a permit might be granted for the testing of the insect under New Zealand conditions, especially

* As quoted on opposite page.—ED.

as it is one of the few blackberry insects which does not destroy the raspberry, and in view of its great potential value in destroying blackberry.

Agrilus ruficollis Fabr.: A Buprestid beetle found in North America. Smaller and less destructive than *Coroebus rubi*, but does considerable damage at times. Attacks blackberry, raspberry, dewberry, but not roses or any other plants. A provisional permit has been granted for this insect, and the first consignment has been forwarded by Dr. Howard to Panama, where it was transhipped for New Zealand last month.

Bembecia marginata Harris: A rather large clear-wing moth from North America whose larva damages the crowns of blackberry and raspberry, forming galls which kill the stems. It can be controlled in raspberry by careful cutting out of the infected canes. Does not attack roses or any other plants. A vigorous insect of great potential value. A provisional permit has been granted for this insect, and the first consignment has been forwarded by Dr. Howard with that of *Agrilus ruficollis* mentioned above.

Bembecia hylaeiformis Lasp.: The smaller European representative of this genus, having a smaller larva which feeds in the same manner, but is only known to attack blackberry and dewberry. A most valuable insect, for which a provisional permit has been granted. Not found in England. Supplies will have to be obtained probably from Austria.

(2.) *Insects which attack the Twigs.*

Diastrophus rubi Htg.: A small Cynipid whose larvae form galls ranging from 2 in. to 8 in. in length on the twigs of blackberry, dewberry, and raspberry. Not known to attack any other plants, with the exception of a single record from bracken—probably an erroneous determination. Can be easily controlled on raspberry by cutting out the galls. A provisional permit has been granted for this insect. As it only occurs very locally in Europe and is not found in England, supplies will not be easy to obtain. A large number of parasites are known from this insect. When these are eliminated the damage which it is capable of inflicting on blackberry should be very considerable. The galls usually completely prevent the fruiting of the twig attacked. There are also large galls on blackberry in Europe formed by the Cecidomyiid fly *Lasioptera rubi;* but, as far as I can find out, these galls rather tend to stimulate than check the growth of the plant, the insect acting as a natural pruner. For this reason it will not be considered further at present.

(3.) *Insects which attack the Leaves and Shoots.*

The attack on these parts is to be regarded as auxiliary to the main attack on the stems. The leaves being the parts where the food-supply is formed, much weakening of the plant can be caused by a strong attack on them; but destruction of the leaves alone is not likely to succeed in controlling so vigorous a plant as blackberry.

Thyatira batis Linn. (peach-blossom moth): The name is given owing to the forewings having oval marks coloured white and pink, just like the petals of the peach-blossom. It is now known that

these markings are a natural protection to the moth while resting on blackberry, and really imitate, not peach-blossom, but blackberry-blossom. The caterpillar feeds on the leaves of the blackberry and raspberry. It can be easily controlled on the latter by a single arsenical spray, applied early in the season so as not to affect the fruit. It is common in England and all over Europe. A provisional permit has been granted for the insect, and two consignments of pupae have been sent from England. Broods are now being reared at the Cawthron Institute.

Habrosyne derasa Linn. (buff arches moth): Allied to *Thyatira batis*, but the larva has a different mode of feeding, and the pupa goes underground for the winter. The caterpillar feeds normally on blackberry, very rarely touching raspberry. Common in England and Europe. Owing to published but somewhat doubtful records of this moth having been found eating hawthorn and hazel, the supplies obtained by me in England have been left behind at Rothamsted, where Mr. Davies* has instructions to test the larva on these and other plants fully before sending it out to New Zealand.

Cidaria albicillata Linn. (beautiful carpet moth): This is a smaller geometrid moth whose larva feeds on blackberry and raspberry; also recorded from strawberry (wild), alder, and clematis by one writer (Scorer), but these records need verification. Supplies obtained by me in England this year, but left behind at Rothamsted for testing.

Tischeria marginea H.W.: A small Tineoid whose larva makes mines and blotches on the leaves. Only known from blackberry. Common in England and Europe. A provisional permit has been issued for this insect.

Notocelia uddmanniana Linn.: The larva, common in England and Europe, is a leaf-roller which attacks blackberry and raspberry. Easily controlled by arsenical spray. A provisional permit has been issued for this insect.

Schreckensteinia festaliella Hb.: A small Tineoid found in Europe whose larva feeds on the leaves of the *Rubus*. A provisional permit has been issued for this insect.

Typhlocyba tenerrima H.S.: A small leaf-hopper, very rare in England and Europe, but perhaps capable of doing considerable damage. Only known to feed on blackberry. A provisional permit has been issued for this insect, but I have instructed Mr. Davies to carry out very full tests at Rothamsted before forwarding supplies.

Monophadnoides rubi Harris: A sawfly found in North America whose larva does considerable damage to the leaves of raspberry and blackberry. Easily controlled by a single arsenical spray. A provisional permit has been issued for this insect, which should prove of considerable value against blackberry.

Metallus rubi Forbes: A small sawfly from North America whose larva forms mines and blotches in the leaves of the blackberry only. Probably of considerable value. A provisional permit has been issued for this insect.

* Mr. W. Maldwyn Davies, M.Sc., appointed entomologist at Rothamsted under the scheme of research.

(4.) *Insects which attack the Flowers and Fruit.*

I have not been able to find any insect so far which is effective in attacking these parts of the blackberry. Various species of *Byturus* attack the fleshy receptacle of the fruit of species of *Rubus,* but they all seem to prefer raspberry to blackberry, and in any case they do not prevent seeding, but only make the fruit unpleasant to eat.

The Anthomyiid fly, *Phorbia rubivora* Coq., known in America as the raspberry-cane maggot, is very deadly on raspberries, but prefers them to blackberries. There may be other species of this genus which will only attack blackberry, but I have no record of them so far.

The blackberry-fly, *Pterandrus rubivorus* Coq., found in South Africa, is stated never to attack raspberry or any other fruit. But in my opinion it will be necessary to have very full tests made with this insect in its country of origin before considering its use against blackberry in New Zealand.

General Summary.

From the above it will be seen that a very strong attack can be developed by means of insects against the blackberry. The main weight of the attack must be directed towards destruction of the crowns and stems, with a subsidiary attack on the food-supply of the plant by destruction of the leaves. The weak spot of the attack is the absence of reliable species to attack the flowers and young fruit, but quite probably future research may remedy this.

Allowing for the admitted toughness and rapidity of spread of this very vigorous plant, I am still of opinion that, under the favourable conditions available in New Zealand, control of blackberry can be obtained through its insect enemies, provided it is understood that such control carries with it a menace to raspberry requiring a single spring spraying with arsenic, and a certain amount of watchfulness in cutting out infected stems each winter when pruning. Even if we admitted *Coroebus rubi,* which I regard as the most promising of all blackberry insects, the menace to roses would be infinitesimal, and would probably be confined to occasional attacks on the water-shoots of Frau Karl Druschki.

Gorse.

The problem of controlling gorse is a very special one. It is admitted that this plant is of value in supplying nitrogen to the soil, and also in providing, when young, good fodder for sheep. Consequently it appeared to me necessary to find some insect which, while not destroying the plant, would as far as possible prevent it from seeding. The explosive scattering of the seeds from the ripened pods appears to be the only important method of spread of the plant. Consequently an insect which will eat out the pods without previously destroying the blossom is highly desirable.

Such an insect occurs in many areas in England, chiefly on commons. It is *Apion ulicis,* a tiny weevil which feeds on gorse without doing much damage, but whose larva feeds inside the green pod and destroys a very large percentage of the seeds. So successful has this insect been in its attacks during the last three or four years on Harpenden

Common, alongside the Rothamsted Experimental Station, that the botanist there has not been able to obtain supplies of seeds during that period. *Apion ulicis* Forst. is well known throughout Britain, and feeds only on gorse, though there is a record of its having been found on broom once, which needs confirmation. The mode of feeding of both larva and beetle indicated that it would not attack any of the softer leguminous plants. At Harpenden the beetle has been common for many years without ever touching the clover, lucerne, peas, beans, or any other Leguminosae. Dr. Imms has given it as his opinion, and I agree, that any further testing of this insect in England is a mere waste of time, as it is already quite clear that it will not attack any plants of economic value. I think it should be tested out on blue and yellow lupins under New Zealand conditions, but do not anticipate that it will be able to damage either. A provisional permit has been granted for a single consignment of these insects. In my opinion this one insect should suffice for the complete control of gorse in New Zealand. I regard it as one of the most valuable and also one of the safest insects so far discovered in connection with the control of pest weeds.

Tortrix ulicitana attacks the flowers of gorse, and might prove of value, but I should not recommend a study of this insect except in the improbable event of *Apion ulicis* proving a failure.

St. John's Wort.

This weed is more especially an Australian problem, but the possibility of its becoming a serious pest in the North Island of New Zealand and elsewhere in the Empire must not be lost sight of. In the Ovens Valley, in Victoria, it has greatly increased in size and vigour, and has put a very large area of land out of cultivation.

The plant presents a special problem owing to the general lack of the knowledge of the insects which feed on it. *Chrysomela varians* and *Chr. hyperici* attack the leaves, both as larvæ and as beetles; neither species is known to feed on anything else. *Anaitis plagiata* (treble-bar moth) and its close ally *A. effumata* are geometrid moths whose caterpillars attack both plants, but are so abundant in places where St. John's wort is rare that it seems highly probable that they do actually feed on other plants also. Several species of *Perrisia* form galls on the plant, especially *P. hyperici* and *P. serotina*. A number of Tineoid moths attack the leaves and shoots, especially *Depressaria hypericella, Cracilaria auroguttata, Epinotia hypericana,* and *Aristotelia atrella*.

Thus it will be seen that, provided the introduction of these insects can be made with safety to other plants of economic value, there is a strong probability of the insect enemies gaining complete control. The policy of attempting to control this weed biologically is a sound one, provided that sufficient work is done first in England to ensure the safety of the species later imported into Australia.

Ragwort.

This weed is spreading very greatly over large areas of the Empire, including New Zealand. As it is poisonous to both cattle and horses, and takes possession of large areas of both good and waste land, the problem of its future control is an important one.

There are two insects which attack the weed vigorously and to a large extent successfully in England—viz., *Tyria jacobaeae* Linn. (the cinnabar-moth) and *Homoeosoma cretacella* Rsl. The former has a voracious larva which often eats the plant completely to the ground, and must be considered a most valuable species for control; the latter has a smaller larva which mines in the stems and damages the flower-heads. The combination of these two species should ensure adequate control. The main difficulty would appear to be the acclimatizing of these moths in New Zealand. This may prove unexpectedly difficult, especially as the pupa of *Tyria jacobaeae* seems to be subject to a severe fungoid disease. *Tyria jacobaeae* feeds also on groundsel, and has once been recorded on coltsfoot (this needs confirmation); both these plants are weeds. *Homoeosoma cretacella* is only known on ragwort.

A provisional permit has been issued for both insects, and large supplies of *Tyria jacobaeae* have already been sent to New Zealand. Late frosts destroyed *Homoeosoma* in England in 1926, but supplies should be available in 1927.

Tests will be very carefully carried out with these moths to find out whether they will damage any of the native species of *Senecio* or allied genera.

Foxglove.

This is a very poisonous plant, which is likely to become a bad pest in hilly country in various parts of the Empire, including portions of New Zealand. Scarcely any insects are known to feed upon it. A small moth, *Eupithoecia pulchellata* Steph., attacks the flowers; the larva later bores into the seed-capsule and prevents seeding to a large extent. The heath fritillary, *Melitaea athalia*, is generally reared by breeders on foxglove, but its normal host plant appears to be the parasitic *Melampyrum*, another pest fortunately absent so far from New Zealand.

Provisional permits have been issued for both these insects, and a supply of hibernating larvæ of *Melitaea athalia* has been shipped in cool storage to New Zealand. The attempt to rear a race of this insect which shall normally feed on foxglove is of the greatest scientific interest. Normally a female moth or butterfly will only lay its eggs on the food plant on which its larva originally fed. Thus the problem is to rear a brood artifically on foxglove in captivity, and then select those females which show the greatest tendency to return to this plant for egg-laying. As *Melampyrum* is absent from New Zealand, non-success of this attempt will only mean that the insect will die out.

Convolvulus.

It appears to be the general opinion of botanists in England and New Zealand that this plant (*Calystegia Sepium*) will become a very serious menace in the near future. While at present there seems to be no prospect of control by means of insect enemies, the subject is by no means exhausted, and every effort will continue to be made to find a species which will prevent it from seeding or will destroy it in some other manner.

HEDGES AND SHELTER-TREES FOR HOMESTEAD AND FARM.

W. C. HYDE, Horticulturist, Horticulture Division.

As agricultural practice is so largely built up on the traditions of the past it was natural for the early settlers of this country to surround their paddocks with a ditch, the spoil from which was neatly built into a sod wall alongside, and along the top of which a hedge was planted or sown. For that was the common custom in their Mother-land; there a copious rainfall on heavy land demanded ample drainage, and whitethorn hedges carefully grown and plashed held the stock secure. On the small farms there, with their small fields and cheap labour, the method had long been successfully demonstrated, and it had become an established custom.

On the larger farms of this country, with its large paddocks and extended fence-lines and higher cost of labour, the trimmed hedge, plashed and stock-proof, has not kept pace with the extension of settlement. It has been replaced by the more immediate and effective fence of strained wire. This excellent fence, however, leaves the seed-bed of the field in crop exposed to prevailing winds, which frequently do serious damage, especially where the soil is light and friable; also to mature crops. Stock, too, are exposed to stormy weather in winter and spring, when considerable loss is frequently incurred from this cause, as also after shearing. In hot weather, also, the welfare of the stock demands suitable shade during the heat of the day, and crops derive benefit from an atmosphere that is tempered by the proximity of hedge and shelter trees.

SHELTER PLANTATIONS.

To meet this demand of farm economy shelter-belts are required to break the force of the main prevailing winds, with hedges of a desirable habit planted at suitable angles. The hedges, however, should be reduced to a minimum extent to avoid the labour which even the most suitable plants sometimes require, and the remaining intersecting fences may be of wire only. The best examples of this method of dealing with the problem have given such results as have led to considerable inquiry on the subject.

Shelter-belts on the farm are often unsatisfactory owing to quite inadequate planting. A row or two of Cupressus macrocarpa or Pinus insignis is planted to which stock is soon admitted, with a result that the trunks and lower branches become bare; and while affording a little useful shade in hot weather they are worse than useless as shelter in stormy weather, owing to the bleak draught created by the winds passing beneath the boughs. In other cases such trees as those above mentioned are planted on heavy land and grow into large, coarse timber that quite overgrows the situation and purpose for which they were planted.

The cost, importance, and permanence of shelter plantations is sufficiently great to warrant a long and careful study of the local conditions before plants are decided on, the latitude, altitude, climate,

and soil being carefully considered. In open country and broad valleys the matter is sometimes best dealt with under some system of co-operation between adjoining settlers. In any case a thorough study should be made of mature trees growing on the class of land and under the climatic conditions to be dealt with. A half-grown plantation that has been well managed generally looks attractive, but the question often still remains as to how it is going to mature.

Present-day planters have a valuable heritage in the experience of early settlers who have done important experimental work and demonstrated many successes and failures. An excellent summary of this work may be obtained free on application to the State Forest Service, together with methods of planting. It remains but to properly proportion the shelter plantations to the areas to be dealt with; while about the homestead some effect and economy may be considered by

FIG. 1. SHELTER-BELT OF THORNY ACACIA AND JACK PINE AT RUAKURA STATE FARM.

giving a little more variety to the planting and harmonizing it with the usual orchard of fruit-trees and nuts. Where a shade tree or group of trees are planted in a paddock it is as well to consider the advisability of planting chestnuts, stone-pines, or walnuts, which, besides affording the necessary shade, also give a useful return in nuts. The two former do well usually on hilly country, and the latter on alluvial ground.

Whatever plantations are made it is essential that they should be permanently fenced off from stock, which, if admitted, will very soon destroy the bottom growth and render the plantation worse than useless for shelter purposes.

SHELTER TREES AND HEDGES.

Transverse shelter-hedges planted at suitable intervals—they need not be down every fence-line—will afford valuable supplementary shelter in most districts. Indeed, in the more sheltered localities and on the smaller sections the single-line shelter-hedge may provide all that is required in this way.

Lawson's cypress (*Cupressus Lawsoniana*) has grown into high favour as a permanent evergreen shelter-hedge on medium to good land with a fair rainfall. Planted about 3 ft. apart it matures into a dense shelter about 10 ft. to 12 ft. high, naturally thickly clothed at the base, and tapering to the top in a way that demands no attention in the way of trimming after it is once established. It is sometimes seen with a ditch on the one side and a wire fence on the other in excellent condition and entirely satisfactory. Its immunity from troublesome diseases is a feature.

Lombardy poplar (*Populus fastigata*) deserves its popularity on flat country inclined to be wet. Planted rather close it makes a narrow

FIG. 2. MIXED PLANTATION—OREGON PINE, LAWSON'S CYPRESS, BIRCH, AND POPLAR—AT RUAKURA.

effective breakwind with a minimum of attention. An occasional shortening of the tops is about all that is necessary. Its deciduous character is in some instances an advantage. The value of this shelter-tree is generally improved if it is interplanted with a suitable evergreen shrub to ensure a close bottom growth.

Barberry (*Berberis vulgaris*) is an evergreen shrub that is very popular among farmers as a stock-proof shelter-hedge. As it is commonly grown from seed it is not surprising to find the great number of different types that now exist. Many of these are of very poor habit, some being almost deciduous and others carrying heavy crops of seed, which are carried by birds into hilly country, where they grow and add to the noxious-weed problem. On this account barberry is now included in the Third Schedule of the Noxious Weeds Act—that is, the local body can declare the plant a noxious weed. In

Taranaki barberry is now allowed only where it is regularly clipped to restrict fruit-bearing, and it is liable to be similarly declared in other districts.

One of the most desirable varieties of this excellent hedge-plant is grown extensively in the Thames and Waikato districts. It has been fully described by Mr. W. H. Taylor in an article in the *Journal* for March, 1922. It very rarely ripens fruit, and when planted 12 in. to 15 in. apart in a single line it forms a very dense hedge 10 ft. to 12 ft. high. This habit necessitates propagation by means of cuttings. These should be made about 7 in. to 8 in. long, in winter, and planted in nursery rows to root—which they do very readily—before they are planted out in the fields during the following planting season. The cuttings must be planted firmly with only two buds above the surface and the land kept free from weeds.

The hawthorn (*Crataegus oxycantha*), which was held in such high esteem by early settlers and planted extensively, has fallen into disfavour. In the mild climate of New Zealand it is subject to a great

FIG. 3. GROUP OF EUCALYPTUS MACARTHURI AT END OF SHELTER-BELT OF POPLAR UNDERPLANTED WITH LAWSON'S CYPRESS AT RUAKURA.

number of diseases, most of which also affect orchards and gardens. With this serious disability it is an undesirable hedge-plant compared with others that are available.

Osage orange (*Maclura aurantiaca*), the bow-wood of America, where it is the popular hedge-plant in the middle States, is a small tree of something the same habit as hawthorn. It is a thorny deciduous tree with rather large pear-tree-like foliage, the pistillate (female) plants of which bear large orange-like fruits that give the tree its name. It is easily raised from seed, and planted close—about 6 in. apart—it makes a dense stock-proof hedge of a similar class to hawthorn. It is free from serious pests, and has proved to be hardy under some rather severe tests made in this country. An important precaution in raising this hedge is to prune the tops back each winter for the first two or three years in order to induce strong lateral branches about the base of the hedge.

Boxthorn (*Lycium horridum*): This thorny evergreen from South Africa forms a hedge that is securely cattle-proof. It has been proved to effectively withstand the heavy salt-laden winds that prevail in

some coastal districts and are so destructive to trees in general. On well-drained soils this hedge is very thrifty. The large strong thorns with which it is armed, while effective in holding stock, set a heavy task for one who has to cut back a neglected hedge. Wounds from these thorns are often serious where they are neglected.

Gorse (*Ilex europeus*) was extensively sown by the early settlers as a hedge-plant on dry, light land, and in exposed situations it quickly formed valuable shelter, and fodder, too, that was of great value in dry seasons. As a hedge, however, it is insecure, owing to numerous gaps that soon develop. Its tendency to become a serious weed pest is also a menace.

In addition to Lawson's cypress reference should be made to macrocarpa (*Cupressus macrocarpa*), also *Cupressus torulosa*. On a good alluvial land where macrocarpa is sometimes planted it develops into a very large rough shelter, covering a great deal of land, but bare

FIG. 4. SHELTER-HEDGE OF LAWSON'S CYPRESS AT RUAKURA.

about the base, where shelter is most needed. Under such conditions it is generally unsuitable. On soils of fair quality *Cupressus torulosa* is a better tree for the purpose; it is of more moderate height, and the side branches are shorter and more compact. Without any trimming it makes an excellent shelter-hedge. On lighter land the macrocarpa cypress often does well, and planted in an untrimmed row about 3 ft. apart along a fence-line it is often found satisfactory. But with all of these cypresses that form such excellent shelter under right conditions it is necessary that they be fenced off from the traffic of stock, which otherwise very soon destroy the lower branches.

GARDEN HEDGES.

For planting about the homestead there is often a demand for a hedge-plant that, while it is not required to be stock-proof, is needed for a shelter or screen. For this purpose it would be hard to find anything better than our own native evergreen shrubs.

Taupata (*Coprosma Baueri*) is justly popular for the purpose. If the young plants are cut back for the first two or three years to cause

them to make strong side growth near the ground, this plant quickly forms an evergreen hedge of shining leaves that will stand the strongest sea-winds.

Silver akeake, of the Chatham Islands (*Olearia Traversii*), is also suitable for a hedge in exposed situations. It is a dark evergreen with a silver reverse to the leaves.

Tarata (*Pittosporum eugenioides*) is an evergreen of a brighter shade with fragrant flowers, and is as good as the silver akeake for a hedge exposed to cold salt winds.

Karo (*Pittosporum crassifolium*) makes a good evergreen hedge by the coast, but it is not quite so hardy as the preceding species.

Kohuhu (*Pittosporum tenuifolium*) is very hardy, and makes an excellent hedge in almost any situation.

Golden akeake (*Olearia Forsteri*) has been largely planted, its golden-green foliage with frilled margins being very familiar. Unfortunately, it is often seriously damaged by a native gall insect or attacked by scale insects and black fungus, and so is undesirable for hedge purposes.

Elæagnus japonica is a vigorous evergreen shrub with russet-green foliage. It has been largely used for underplanting pines and large tree shelter. Its vigorous spreading habit demands frequent trimming, and in the warmer districts it is subject to thrips and many insects that are troublesome in gardens.

Escallonias of various sorts are often planted for hedges in gardens, and, with a satisfactory rainfall, they are very suitable. They are natives of South America.

Common laurel (*Cerasus laurocerasus*) is a well-known evergreen from Asia Minor which makes a clean, handsome hedge when well kept. It does well even in shady situations.

Chinese privet (*Ligustrum sinensis*) is a hedge-plant that has long been popular. It also is valuable for underplanting forest-trees, in the shade of which it flourishes.

GENERAL.

The planting of hedges often fails owing to the lack of suitable preparation of the land and protection of the plants from stock. The land to be planted should be thoroughly cleaned of all weeds and growth, especially twitch. Unless this is done before planting it is almost impossible to maintain the necessary cultivation required for the first two or three years until the plants are thoroughly established. Neither will the plants while young and tender stand the treading and browsing of stock. A well-established shelter-hedge is an attractive and valuable asset to the garden or farm, and is well worth the trouble of the requisite preparation and care.

Hedges frequently suffer from neglect and unseasonable trimming; they are thereby often stunted and bare. Where they have been neglected, and it is necessary to cut back into the old wood, the operation should be performed at the beginning of spring in the case of evergreens, and rather earlier in the case of deciduous plants.

EXPERIMENTS ON MANURING OF POTATOES IN CANTERBURY, SEASON 1925–26.

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THE results of two experiments on the manuring of potatoes in Canterbury in the 1924–25 season were published in the *Journal* for April and May, 1926, under the names of F. E. Ward and the present writer. The experiments were continued with certain modifications on the same farms of Mr. L. C. Banks, Coutts Island, and Messrs. W. and A. Campion, Prebbleton, in the 1925–26 season. The method of conducting the work was described in the *Journal* for July, 1926, page 12.

Two experiments were carried out on each farm. Those on Mr. Banks's farm are here designated 1A and 1B, and those on Messrs. Campion's farm 2A and 2B. In each case the two experiments were contiguous.

In the 1924–25 season a mixture of superphosphate and bonedust, at 3 cwt. per acre, was compared with super, 3 cwt. per acre, on Mr. Banks's farm, and a mixture of super and Ephos phosphate, at 3 cwt. per acre, was compared with super, 3 cwt. per acre, on Messrs. Campion's property. In both experiments the straight super proved superior to the mixtures. These results, while conclusive enough for the farms and seasons in question, are not regarded as sufficient evidence for making a general statement on the relative merits of straight-out soluble phosphate as compared with a mixture of soluble and insoluble phosphates. It is noteworthy, however, that Sir E. J. Russell has said that super is the best form of phosphate for potatoes. It was considered that too many factors had been included in the trials of 1924–25, and a decision was made for the following season to use super alone as the phosphatic fertilizer, and at a later date again try the soluble phosphate against a mixture of soluble and insoluble.

Experiments 1a (Banks) and 2a (Campion).

Details of treatments and results for 1925–26 are as follows :—

	Quantity per Acre.
(1.) Superphosphate, 42/44 grade	3 cwt.
(2.) Superphosphate, 42/44 grade	5 cwt.
(3.) Superphosphate, 42/44 grade	7 cwt.
(4.) Control (no manure).	

Six replications of each of the manured plots and three of the controls were sown. The object of the experiment was to determine as near as possible the most payable quantity of super that could be applied.

EXPERIMENT 1A.

Variety : Dakota. Date sown : 25th and 26th November, 1925. Date dug and weighed : 2nd and 4th June, 1926. History of paddock : 1922–23, wheat ; 1923–24, clover, which became badly infested with twitch.

Observations during growth : On 13th January, 1926, the growth of tops on the control areas was very poor as compared with

that of the phosphated plots (see Fig. 1). The plots receiving 5 cwt. and 7 cwt. super showed a slightly better growth than those receiving 3 cwt.

FIG. 1. PORTION OF EXPERIMENTAL PLOTS ON MR. BANKS'S FARM.

Photo taken early in February. The three rows on right are those of a control (no manure) plot. To left of these are manured plots, the first three being super at 7 cwt. per acre. [*Photo by F. E. Ward.*

Results are shown in the following table:—

Table 1.—Experiment 1A.

Area of individual weighed plot, $\frac{1}{176}$ acre.

Grade.	Number of Paired Plots.	Yield in Tons per Acre.		Difference in Favour of		Difference significant (S.) or non-significant (N-S.).*
		Control.	Super, 3 cwt.	Control.	Super, 3 cwt.	
Total ..	9	5·72	8·48	..	2·76	S.
Table ..	..	4·54	7·00	..	2·46	S.
Seed ..	..	1·69	1·36	..	0·27	S.
Small ..	..	0·10	0·13	..	..	
		Super, 3 cwt.	Super, 5 cwt.	Super, 3 cwt.	Super, 5 cwt.	
Total ..	18	8·71	9·24	..	0·53	S.
Table ..	..	7·14	7·89	..	0·75	S.
Seed ..	..	1·44	1·28	0·16	..	S.
Small ..	..	0·13	0·07	..	..	
		Super, 5 cwt.	Super, 7 cwt.	Super, 5 cwt.	Super, 7 cwt.	
Total ..	18	9·24	9·32	..	0·08	N-S.
Table ..	..	7·89	7·81	0·08	..	N-S.
Seed ..	..	1·28	1·40	..	0·12	N-S.
Small ..	..	0·07	0·11	..	..	

NOTE.—Yields of "small" grade not examined statistically.

* A difference is regarded as "significant" when the chances are 30 to 1 or more in its favour.

Comments on Table 1.

Evaluation of increases are based on table potatoes at £3 per ton and seed at £1 10s. per ton (see *Journal*, April, 1926, page 259). The cost of super is the price then current at country stations—£7 per ton.

(*a.*) The amount of 3 cwt. of super per acre shows an extremely profitable increase of practically 2½ tons of table potatoes and ¼ ton of seed, to the value of £7 17s. 6d. The cost of manure per acre being £1 1s., the profit resulting from its use is about £6 16s. 6d. per acre. The super has caused a definite increase in the percentage of table, and decrease in the seed kind. The difference between percentages of small was not significant.

(*b.*) The addition of another 2 cwt. to the extremely profitable 3 cwt. application shows a still greater increase in yield of just over ½ ton per acre. The table potatoes on the 5 cwt. plots show an increase of ¾ ton (greater than the total difference on account of the increased percentage of table), and a decrease in the yield and percentage of seed and small. The value of ¾ ton table potatoes equals £2 5s., and this, less value of ⅙ ton seed (5s.), equals £2. Hence the increased profit over that resulting from the use of 3 cwt. super is £1 6s. (£2, less cost of 2 cwt. super).

(*c.*) 7 cwt. of super shows no significant difference from 5 cwt. Hence 3 cwt. has proved highly profitable on this farm, as it did in the previous season; 5 cwt. has given even better results, but 7 cwt. shows no superiority over 5 cwt.

EXPERIMENT 2A.

Variety: Dakota. Date sown: 12th November, 1925. Date dug and weighed: 30th April, 1926. History of paddock: January–April, 1925, rape; winter and early summer, 1924, fallow; 1923–24, wheat.

Observations during growth: 12/1/26—All the controls were backward in growth, and the plots receiving 7 cwt. super were slightly better than the remainder. 2/2/26—At this date the controls were in flower, as seen in Fig. 2 (next page). On the manured plots the flowers had almost disappeared. 17/3/26—The tops on the manured plots were commencing to die off, the controls still being green.

Results are shown in Table 2 (next page).

Comments on Table 2.

(*a.*) 3 cwt. super has increased the total yield by approximately ½ ton per acre. There is no increase in the table kind, the increase being represented by small and seed. The increased seed has a value of about 10s. 9d., and as the cost of super per acre was £1 1s. the application has not been profitable. The percentage of table potatoes is greater on the controls by about 4½ per cent., with a corresponding decrease in the smaller kinds. This result is contrary to those already recorded, and as an explanation it is suggested that the longer growing-period of the control plots enabled them to benefit from the late rains. The early part of the growing season was decidedly dry, while good rains fell in February.

(*b.*) The 5 cwt. quantity of super compared with the 3 cwt. shows an increase in total yield and yield of table potatoes, with a decrease

FIG. 2. PORTION OF EXPERIMENTAL PLOTS ON MESSRS. CAMPION'S FARM.

Photo taken early in February. Centre—three rows of control (no manure) plots; right—three rows super at 7 cwt. per acre; left—three rows super at 3 cwt. per acre.

[*Photo by F. E. Ward.*

Table 2.—Experiment 2A.

Area of individual weighed plot, $\frac{1}{267}$ acre.

Grade.	Number of Paired Plots.	Yield in Tons per Acre.		Difference in Favour of		Difference significant (S.) or non-significant (N-S.).
		Control.	Super, 3 cwt.	Control.	Super, 3 cwt.	
Total ..	17	9·42	9·95	..	0·53	S.
Table ..	..	7·55	7·53	..	..	
Seed ..	..	1·48	1·84	..	0·36	S.
Small ..	..	0·39	0·57	..	..	
		Super, 3 cwt.	Super, 5 cwt.	Super, 3 cwt.	Super, 5 cwt.	
Total ..	25	9·57	9·92	..	0·35	S.
Table ..	..	7·23	7·73	..	0·50	S.
Seed ..	..	1·80	1·67	0·13	..	S.
Small ..	..	0·54	0·52	..	..	
		Super, 5 cwt.	Super, 7 cwt.	Super, 5 cwt.	Super, 7 cwt.	
Total ..	25	9·92	10·26	..	0·34	N-S.
Table ..	..	7·73	7·81	..	0·08	N-S.
Seed ..	..	1·67	1·87	..	0·20	S.
Small ..	..	0·52	0·58	..	..	

in the yield of seed. The increased quantity of phosphate has somewhat retrieved the position so far as the percentages of various grades are concerned, and shows an increase in the percentage of the table kind. The value of the increase in table is £1 10s., and the value of the seed will be the value of the increase of the 3 cwt. super plots over control (10s. 9d.) less the value of 0·13 ton. This is approximately 6s. 9d. The total increase is therefore worth £1 16s. 9d., and since the 3 cwt. of super shows no benefit so far as table potatoes are concerned the whole of the cost of 5 cwt. must be charged against the increased return. The super cost £1 15s., and the resulting profit is only 1s. 9d., certainly not sufficient to justify the use of the phosphate in this case.

(*c.*) The 7 cwt. quantity shows no significant difference from the 5 cwt., except that there is a slight increase in the seed-potato yield. Hence the use of the former quantity has resulted in a loss.

Experiments 1b (Banks) and 2b (Campion).

The manurial treatments for 1B were as follows :—

	Quantity per Acre.
(1.) Super, 42/44 grade	3 cwt.
(2.) Super, 3 cwt., plus sulphate of potash at 1 cwt. per acre	4 cwt.
(3.) Super, 3 cwt., plus sulphate of potash at 1 cwt. per acre (potash top-dressed)	4 cwt.
(4.) Super, 3 cwt., plus sulphate of ammonia at 1 cwt. per acre	4 cwt.
(5.) No. 4 mixture, plus sulphate of potash at 1 cwt. per acre (potash top-dressed)	5 cwt.

For experiment 2B the treatments were as for 1B, except that 1 cwt. of dried blood was used instead of the sulphate of ammonia. Where the potash was top-dressed this was done a fortnight after sowing of the plots, the application being made with a Planet Jr. implement. The object of applying the potash as a top-dressing after sowing was to endeavour to find out if the method of application of potash was of consequence. The results of the previous year on Mr. Banks's farm showed that when the manures were top-dressed the potash had a marked effect in increasing the yield and percentage of table potatoes (see *Journal* for April, 1926, p. 263).

EXPERIMENT 1B.

Planting was done at the same time as that in Experiment 1A. Observations made during the growing-period showed that the plots receiving sulphate of ammonia were conspicuous by their greater growth and deeper-green colour. The other plots were similar to one another in appearance. Results are given in Table 3 (next page).

Comments on Table 3.

(*a.*) Super *versus* super plus sulphate of potash : The yields of these treatments do not differ to a statistically significant degree, although the increase in total yield of ½ ton, with chances of 22 to 1 in its favour, is approaching accepted certainty. Owing to mixing of plots a portion of this experiment had to be discarded, and the remaining portion was sufficient to give only sixteen weighings in each treatment.

Table 3.—Experiment 1B.

Area of individual weighed plot, $\frac{1}{194}$ acre.

Grade.	Number of Paired Plots.	Yield in Tons per Acre.		Difference in Favour of		Difference significant (S.) or non-significant (N-S.).
		Super, 3 cwt.	Super and Potash.	Super.	Super and Potash.	
Total ..	16	9·06	9·56	..	0·50	N-S.
Table ..	..	7·75	8·14	..	0·39	N-S.
Seed ..	..	1·17	1·25	..	0·08	N-S.
Small ..	..	0·14	0·17	..	..	
		Super and Potash.	Super and Potash (T.D.).	Super and Potash.	Super and Potash (T.D.).	
Total ..	16	9·56	9·09	0·47	..	S.
Table ..	..	8·14	7·81	0·33	..	N-S.
Seed ..	..	1·25	1·12	0·13	..	N-S.
Small ..	..	0·17	0·16	..	..	
		Super.	Super and S.A.	Super.	Super and S.A.	
Total ..	15	9·07	11·20	..	2·13	S.
Table ..	..	7·78	9·57	..	1·79	S.
Seed ..	..	1·15	1·45	..	0·30	S.
Small ..	..	0·14	0·19	..	..	
		Super and S.A.	Super, S.A., and Potash.	Super and S.A.	Super, S.A., and Potash.	
Total ..	15	11·20	10·98	0·22	..	N-S.
Table ..	..	9·57	9·37	0·20	..	N-S.
Seed ..	..	1·45	1·39	0·06	..	N-S.
Small ..	..	0·19	0·21	..	..	

NOTE.—T.D. signifies potash top-dressed; S.A., sulphate of ammonia.

(*b.*) Super plus potash *versus* super plus potash (potash top-dressed): The application of the whole mixture with the seed has had in this case an advantage to the extent of approximately ½ ton (total) yield per acre. The potash-top-dressed plots show practically no superiority over super at 3 cwt.

(*c.*) Super *versus* super plus sulphate of ammonia: The increase of 1·79 tons of table and 0·3 ton of seed due to the sulphate of ammonia is highly profitable. The cost of sulphate of ammonia is £1 2s. per cwt., and the value of the increase approximately £5 17s. The net profit is therefore £4 15s. In Table 1 it has been shown that the profit from 3 cwt. of super is £6 16s. 6d., and the total profit resulting from the use of super and sulphate of ammonia is therefore about £11 11s. 6d. per acre.

(*d.*) Super plus sulphate of ammonia *versus* super plus sulphate of ammonia plus sulphate of potash (potash top-dressed): The addition of potash has had no beneficial effect, the complete mixture yielding approximately the same as super plus sulphate of ammonia.

(*e.*) Neither sulphate of ammonia nor potash has affected the percentages of the various grades.

EXPERIMENT 2B.

This was sown at the same time as Experiment 2A. At no time during growth was there any appreciable difference in the appearance

of the plots, although those receiving blood appeared to have a slightly greater growth of top and a little deeper colour. Results are given in Table 4.

Table 4.—Experiment 2B.

Area of individual weighed plot, $\frac{1}{267}$ acre.

Grade.	Number of Paired Plots.	Yield in Tons per Acre.		Difference in Favour of		Difference significant (S.) or non-significant (N-S.).
		Super.	Super and Potash.	Super.	Super and Potash.	
Total ..	25	10·48	10·87	..	0·39	S.
Table ..	..	8·12	8·35	..	0·23	N-S.
Seed ..	..	1·88	1·97	..	0·09	N-S.
Small ..	..	0·48	0·55	..	..	
		Super and Potash.	Super and Potash (T.D.).	Super and Potash.	Super and Potash (T.D.).	
Total ..	30	10·83	10·71	0·12	..	N-S.
Table ..	..	8·34	8·52	..	0·18	N-S.
Seed ..	..	1·95	1·73	0·22	..	S.
Small ..	..	0·54	0·46	..	..	
		Super.	Super and Blood.	Super.	Super and Blood.	
Total ..	25	10·48	10·20	0·28	..	S.
Table ..	..	8·12	7·40	0·72	..	S.
Seed ..	..	1·88	2·13	..	0·25	S.
Small ..	..	0·48	0·66	..	..	
		Super and Blood.	Super, Blood, and Potash (T.D.).	Super and Blood.	Super, Blood, and Potash (T.D.).	
Total ..	30	10·23	11·13	..	0·90	S.
Table ..	..	7·43	8·53	..	1·10	S.
Seed ..		2·14	2·00	0·14	..	S.
Small ..	..	0·66	0·60	..	..	
		Super.	Super and Potash (T.D.).	Super.	Super and Potash (T.D.).	
Total ..	25	10·48	10·81	..	0·33	N-S.
Table ..	..	8·12	8·61	..	0·49	S.
Seed ..	..	1·88	1·74	0·14	..	S.
Small ..	..	0·48	0·46	0·02	..	
		Super.	Super, Blood, and Potash (T.D.).	Super.	Super, Blood, and Potash (T.D.).	
Total ..	25	10·48	11·04	..	0·56	S.
Table ..	..	8·12	8·43	..	0·31	N-S.
Seed ..	..	1·88	2·01	..	0·13	N-S.
Small ..	..	0·48	0·61	..	0·13	

NOTE.—T.D. signifies potash top-dressed.

Comments on Table 4.

(*a.*) Super *versus* super plus potash: The increase in total yield of 0·39 ton due to the potash is significant. It follows, therefore, that the increases in the various grades are real ones, although the chances in favour of significance are low. The value of 0·23 ton of table and 0·09 ton of seed kinds is approximately 17s., and since the potash cost 18s. per cwt. there is no margin of profit. The percentages of the various grades are not appreciably affected.

(*b.*) Super plus potash *versus* super plus potash (potash top-dressed): The top-dressing of the potash has caused diminution in the yield of seed potatoes. The increase of 0·18 ton of table is not statistically significant. However, the percentage of table is slightly increased, with a corresponding decrease of the smaller kinds due to top-dressing of the potash.

(*c.*) Super *versus* super plus blood: A diminution in total yield and yield of tables and an increase in the yield of seed has been caused by the blood. The percentages of the various grades are similarly affected.

(*d.*) Super and blood *versus* super plus blood plus potash (potash top-dressed): The potash has been instrumental in counteracting the bad effect of the blood, and the increase of 1·1 tons of table would be quite profitable under ordinary circumstances.

(*e.*) Super *versus* super plus potash (potash top-dressed): A direct comparison of these treatments shows a slightly profitable benefit from the potash. The increase of approximately ½ ton of table is worth about £1 10s., and this, less the value of 0·14 ton reduction in seed, equals approximately £1 6s. Hence the profit from potash (leaving out of account the phosphate, which in Experiment 2A was shown to be unprofitable at 3 cwt. per acre) is about £1 6s. − 18s. = 8s., and hardly sufficient to justify its use.

(*f.*) Super *versus* super plus blood plus sulphate of potash (potash top-dressed): Here the direct comparison of these treatments shows a significant total increase, and the table and seed increases are therefore regarded as real ones. Their value is about £1 2s. 6d. The blood, which, it has been shown, had the effect of diminishing the yield, has therefore placed a severe handicap on the potash.

The keen co-operation maintained by Messrs. Banks and Campion is much appreciated, and the Department's thanks to them is here accorded.

NEW ZEALAND AGRICULTURAL COLLEGE COUNCIL.

THE following appointments have been made, forming the first Council of the newly constituted New Zealand Agricultural College: Messrs. A. Morton, H. B. Stuckey, N. Francis, and R. A. Rodger (by the Governor-General) as Government representatives; Hon. G. Fowlds and Mr. T. U. Wells (by Auckland University College); Professor T. A. Hunter and Mr. P. Levi (by Victoria University College); Sir James G. Wilson (by the Board of Agriculture). The Council held its first meeting on 1st February current, and elected Hon. G. Fowlds as Chairman.

Empire Fruit in Britain.—The Temperate-fruits Sub-Committee of the Empire Marketing Board is planning an investigation into the question of Empire-grown fruit arriving in Britain damaged or unfit for sale. The committee's inquiries have already shown that the problem is one of concentrating, with scientific help, upon improvements in production, grading, packing, and marketing, rather than of merely measuring damage actually sustained. Plans are being worked out, in conjunction with the Cambridge Low Temperature Research Station, for the inspection of apple shipments on their arrival, and for the linking-up of observations made on the arrival of cargoes with observations made in the orchard and at the time of shipment.

TOP-DRESSING OF HILL-COUNTRY GRASSLAND.

TWO NEW HAND DISTRIBUTORS.

W. J. McCULLOCH, Instructor in Agriculture, Palmerston North.

THE great forward movement in the stimulation of our low-country grasslands where horse-drawn manure-distributors can be utilized has proved beyond doubt that the top-dressing of pastures is an economically sound practice. Although there are still large areas of this type of country awaiting the mechanical distributor, there is also a very extensive acreage of good hill country not accessible to the usual wheeled type of machine, but which can be profitably top-dressed.

The remarkable results achieved from manuring low-country grassland, coupled with the fact that much of the better-class hill country has deteriorated as the result of the steady drain of fertility in the shape of wool and mutton, has excited the keen interest of hill-country farmers —so much so that a general movement is perceptible in the direction of improving the lowered carrying-capacity by top-dressing. Only a few years ago the suggestion to top-dress steep hill country would have been ridiculed as impracticable and economically unsound; and although the practice is not yet general, it has nevertheless become an accomplished fact and is growing steadily. A significant feature is that the experience of top-dressing a small area of hill country practically always leads to the treatment of a larger area the following year.

Up to the present the only practicable method of top-dressing steep hill country has been to scatter the manure actually by hand from a sowing-sheet, sack, or benzine-tin with the side cut out, but all such devices necessitate carrying the container in front of the operator, attached by straps over the shoulder in such a manner that the manure is easily accessible to the hand. This greatly hampers freedom of movement in walking, and each time a handful of material is grasped a certain amount of spillage is likely to occur, which does not make for even distribution. The operator walks with a continuous cloud of dust about the upper portions of the body, a considerable quantity of which is unavoidably inhaled; the hands often become sore—and altogether it is disagreeable work and difficult to get men to undertake. A reasonable average acreage by this system works out at about 6 acres per man per day.

Recently a competition organized by Messrs. Wright, Stephenson, and Co., Ltd., who offered prizes for the best method of top-dressing hill country where a horse-drawn machine could not be used, resulted, it is understood, in a large number of methods and devices being submitted. Two of these the writer has been enabled to examine and see demonstrated—namely, the "Hildres Hand Manure Distributor," designed and patented by Mr. L. W. Knight, Opaki Road, Masterton (winner of the first prize), and "Howell's Manure Distributor," designed by Mr. L. I. Howell, Paraparaumu (winner of the second prize). Both methods are somewhat similar in principle—although the actual design differs—the manipulation being much alike in each case.

FIG. 1. THE HILDRES MANURE DISTRIBUTOR IN OPERATION ON HILLSIDE.

FIG. 2. FILLING THE HILDRES MACHINE.

The "Hildres" consists of a hopper-shaped galvanized metal container, which is conveniently strapped on the back high up between the shoulders in such a position that a reasonable load of from 40 lb. to 50 lb. of manure can be carried without hampering free movement on rough country. At the lower end of this receptacle is attached a flexible spiral metal tube similar in make to the tubes of an ordinary grain-drill. This tube terminates in a mouthpiece designed with the idea of causing a spray and more even distribution. Within the tube a small agitator is automatically worked as the tube is swung from side to side by hand. The manure gravitates from the container into the upper end of the tube, and the continuous outward throw of the opposite end, which is held low at arm's length, causes the manure to flow out in an even shower.

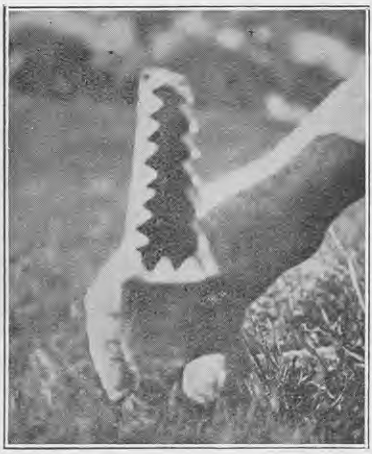


FIG. 3. MOUTHPIECE OF HILDRES DISTRIBUTOR.

After witnessing a demonstration on hill-country pasture the writer was given an opportunity to measure the width of cast possible on a ploughed field, and found an even distribution up to 18 ft. wide, although some of the manure could be observed up to 24 ft. in width. Two slides are so arranged at the entrance to the tube that the flow of manure can be controlled, and, together with regulation of pace of the operator, the rate per acre can be fairly well gauged. Careful timing showed that 12 acres per day could be covered by one machine, if the width of the cast was 12 ft., at 2 cwt. per acre.

It is also claimed that grain or grass-seed can be very successfully sown with this distributor in the same manner; likewise the manuring of potatoes before the sets are covered in the rows. The apparatus is substantially built, and, apart from its use on hill country, should prove valuable on small farms where the outlay on a more expensive machine is not justified.

Howell's Manure Distributor is of very simple construction, being a specially shaped canvas bag, at the lower narrow end of which about 2 ft. 6 in. of rubber hose is attached; about 3 in. of the butt of the hose is inside the bag and acts as an agitator. This tube is swung from side to side as in the case of the "Hildres," but no mouthpiece is attached to the end of the rubber hose. The top end of the bag is continued as a broad strap over one shoulder, and is easily adjusted by a spring hook. No slides are used to regulate the flow of manure, this being obtained by using various-sized rubber hose, the latter being easily and quickly detached at will. To replenish with manure, the container bag is unstrapped and laid on the ground, the mouth of the manure-sack inserted, and the required quantity tipped in—the whole operation being speedy and simple. This distributor can also be used for applying manure along drills, &c.

HOWELL'S MANURE DISTRIBUTOR.

Fig. 4. Side view.

Fig. 5. Rear view.

Fig. 6. Showing attachment across shoulder.

The great advantage of both devices is the cheapening of the actual distribution of manure on hill country by the increased acreage per day per man, freedom of the operator from inhaling dust—as under ordinary conditions this does not rise above the knees—and a continuous flow of manure, ensuring a much more even distribution than could possibly be obtained by the hand alone.

The accompanying photographs will give readers a good idea of the two distributors and their manipulation.

BUTTER-BOX TESTS.

THE "COOMBS" BOX.

W. C. WARD, New Zealand State Forest Service, Wellington.

THE results of a comprehensive series of tests upon butter-boxes in common use at the time were originally published in this *Journal* for May, 1926, and later reprinted as Circular No. 23 of the State Forest Service. As indicated in the previous article, the scope of the work was to be extended to allow of a later study of other types of butter-containers which might appear to promise improvement upon existing packages.

The first type of box to be so studied is known as the "Coombs" Patented Butter-box (N.Z. patent No. 56302), invented by Mr. H. Coombs, and manufactured by Messrs. Ellis and Burnand (Limited), of Hamilton. This box was thought to be worthy of close study, since its construction was theoretically sound, at the same time offering considerable economy both in the quantity and in the sizes of timber required, and in ease of handling. The results of the tests fully confirm these judgments, and the Coombs box can be recommended to shippers as a suitable package for the export trade.

BOXES TESTED.

The construction of the Coombs box is clearly shown in Fig. 1. The sides, top, and bottom form the unique feature of the box. Each piece consists of an inner coating of white-pine (*Podocarpus dacrydioides*) veneer, $\frac{1}{8}$ in. thick, glued to and strengthened by four narrow battens, $1\frac{3}{4}$ in. wide by $\frac{3}{8}$ in. thick. The grains of the wood in the veneer and in the battens are disposed at right angles. Thus splitting of the sides, top, and bottom, which commonly causes the failure of the ordinary style 1 box, as shown in Fig. 2, is largely eliminated. In this respect it would resemble a box constructed of plywood. Furthermore, as the battens may be made from any timber with fairly good nailing-qualities, and are of narrow width, it follows that the Coombs box will assist to economize the supplies of non-tainting woods.

The inside dimensions of the boxes tested were $15\frac{1}{8}$ in. by $10\frac{1}{4}$ in. by 11 in., with a capacity of 1,706 cub. in. This is somewhat less than the capacity of the style 1 box (1,750 cub. in.) tested in the previous study, but is quite sufficient for packing the standard 56 lb. block during many months of the year.

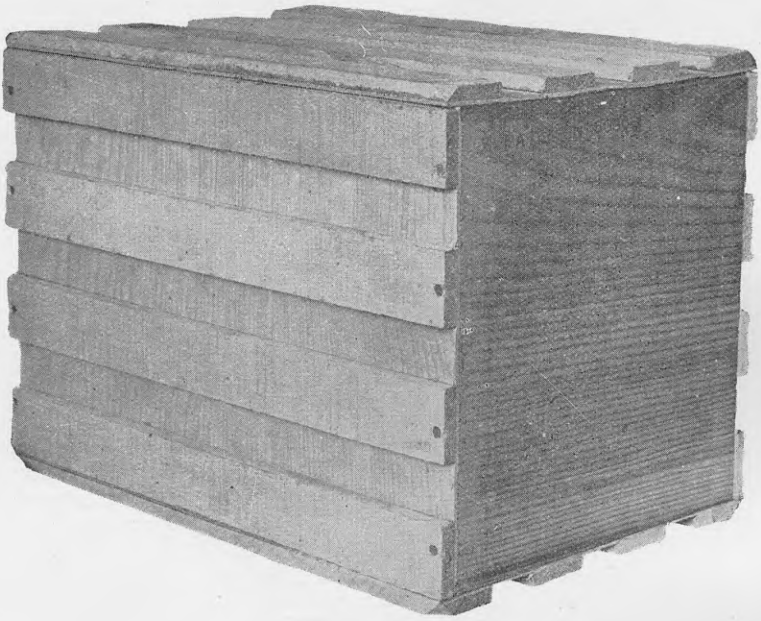


FIG. 1. COOMBS BOX UNBROKEN.

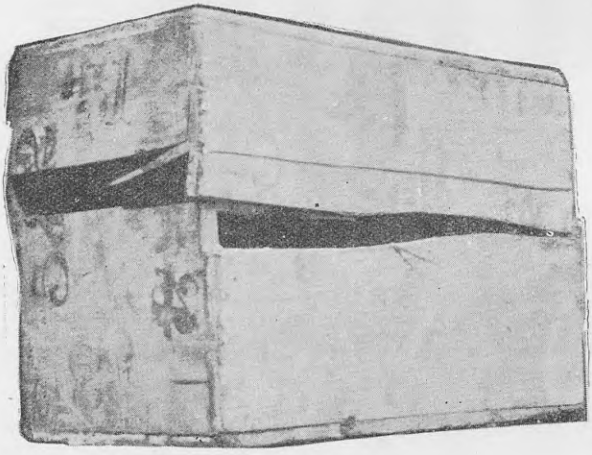


FIG. 2. TYPICAL FAILURE OF STYLE I BOX (UNSTRAPPED).
Splitting of sides has occurred early, causing box to collapse.

Two series of boxes were tested, one series of twelve being nailed up at the manufacturers' factory, the other of eight boxes at the Timber-testing Station, School of Engineering, Canterbury University College, Christchurch, where the tests were performed. Boxes fastened with ordinary and with cement-coated nails, and with and without Acme flat metal strapping centrally applied, were tested.

METHOD OF TEST.

The test used was the same as that employed in the previous study. The boxes were packed with 56 lb. of butter, as in commercial service, and placed in a hexagon-sided machine revolving slowly at a rate of $1\frac{5}{6}$ revolutions per minute. In the drum is arranged a series of hazards which cause the box to follow a regular cycle of drops, falling upon sides, top, bottom, ends, edges, corners, and flatwise upon a projection similar to the corner of another box. These drops simulate the usual hazards of transportation. Each face of the drum is counted as one drop. An illustration of the drum was printed on page 23 of last month's *Journal* in connection with the article on cheese-crate tests.

Results of Tests.

The results of the tests are shown in Table 1. The table also includes, for purposes of comparison, the results of tests upon the style 1 strapped box, with $\frac{3}{8}$ in. sides, top, and bottom, which was recommended to shippers as a result of the previous study. Both types of package have ends $\frac{5}{8}$ in. in thickness.

Table 1.

Type of Box.	Number of Tests.	Nails.		Straps.	Number of Drops required to spill Contents.
		Kind.	Number per Edge.		
Coombs—nailed at factory	2	Ordinary ..	4	Nil	42
	2	,, ..	4	1	87
	4	Cement-coated	4	Nil	102
	4	,,	4	1	138
Coombs—nailed at testing-station	3	,,	4	Nil	564
	3	,,	6	1	538
Style 1—$\frac{3}{8}$ in. sides ..	5	,,	5	1	342

When the boxes for the first series of tests were received it was clear that poor results would be obtained. Not only had the boxes been nailed up when the battens were partially dry, but the nails had been seriously overdriven, in cases by as much as $\frac{1}{8}$ in., as shown in Fig. 3. The tests, however, confirmed the results of the previous study, the superiority of the boxes fastened with cement-coated nails and reinforced with Acme flat metal strapping being clearly proved.

Typical failures of the strapped and unstrapped boxes are shown in Figs. 4 and 5. The weak feature in both types was the poor

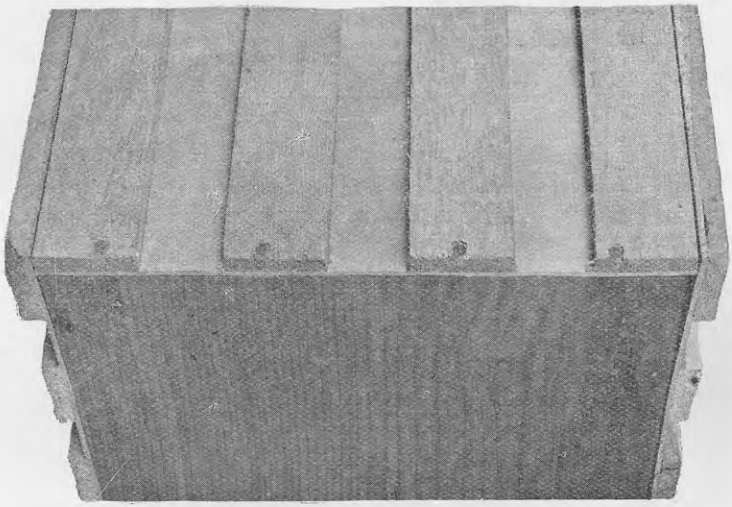


FIG. 3. SHOWING SERIOUS OVERDRIVING OF NAILS IN FACTORY-NAILED COOMBS BOX.

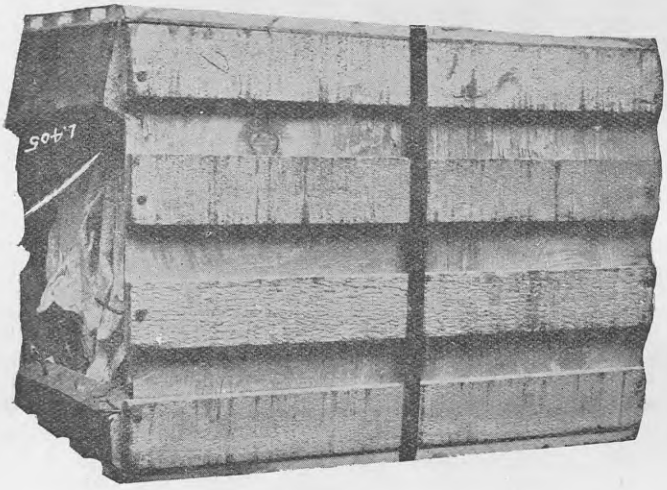


FIG. 4. TYPICAL FAILURE OF STRAPPED COOMBS BOX.

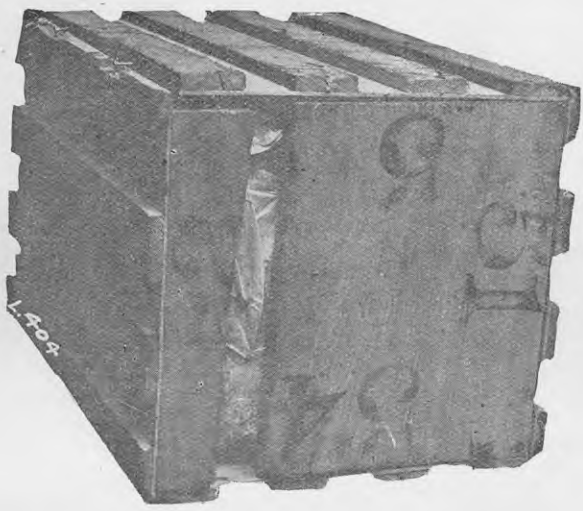


FIG. 5. TYPICAL FAILURE OF UNSTRAPPED COOMBS BOX.

nailing. Immediately the nails loosened and pulled from the ends these latter failed by splitting and bursting, either allowing the box to come in two or exposing the contents to damage.

In the second series of tests the faults arising from the use of only partially air-dry timber and of the overdriving of nails were largely eliminated by careful inspection and assembly at the Timber-testing Station. Mr. Coombs, the patentee, was present throughout this series of experiments.

The first group of tests was made upon strapped boxes in which the two centre battens of each side, top, and bottom were attached at each end by two cement-coated nails, and the two outer battens by one cement-coated nail. The results indicated that the extra nailing was unnecessary, and that the strapping might be dispensed with. The second group of tests confirmed this conclusion.

The outstanding feature of the study was, indeed, the high strength developed by the unstrapped Coombs box fastened with cement-coated nails. This was considerably greater than that of the strapped style 1 box with sides, top, and bottom $\frac{3}{8}$ in. thick as shown in Fig. 2. Since practical experience, however, has proved that the strapped style 1 box with sides, top, and bottom only $\frac{5}{16}$ in. thick is of sufficient strength for the export trade, it would appear that the Coombs box might be made of a lighter construction. One difficulty in this connection would be the driving of space nails attaching the top and bottom to the sides. It exists even in the present Coombs package, having been reported as a weakness in an experimental shipment of Coombs boxes forwarded to London at the beginning of the present season. The results of the tests augur well for the development of a butter-box having plywood sides, top, and bottom.

The study also demonstrated the importance of avoiding the use of only partially dry timber and the overdriving of nails. The unstrapped boxes of partially dry timber and with overdriven cement-coated nails of the first series exhibited less than one-fifth the strength of the same type of box constructed of well air-dried timber and properly nailed as in the second series.

SPECIFICATION.

Users of the Coombs box are recommended to adopt the following specification in the purchase of their supplies :—

Section A : General.

(1.) Definition : The box as herein specified shall be known as the "Coombs Butter-box," as covered by New Zealand patent No. 56302.

(2.) Dimensions : (*a.*) The inside dimensions of the box shall be 15⅛ in. long by 10¼ in. wide by 11¼ in. deep. (*b.*) The width of ends, sides, top, and bottom shall be 11¼ in.

Section B : Manufacture.

(3.) Construction : (*a.*) The sides, top, and bottom shall each consist of an inner coating of a non-tainting wood (see clause 7 (*a*)) ⅛ in. thick, glued to and strengthened by four battens, 1¾ in. wide by ⅜ in. thick. (*b.*) The ends shall be of single-piece material ⅝ in. thick if of white-pine or tawa, or ½ in. thick if of silver-beech. (*c.*) The grain of the wood in the inner coating shall be disposed at right angles to that in the battens.

(4.) Manufacture : (*a.*) The ends, sides, top, and bottom of the box shall be well manufactured, and shall be cut true to size. All defects in the timber which materially lessen the strength of the part, or expose contents to damage, or interfere with proper nailing, shall be prohibited. (*b.*) The wood shall be thoroughly seasoned, and shall have a moisture content of not less than 10 per cent. nor more than 18 per cent., based on the weight of the wood after oven-drying to a constant weight. (*c.*) The variation in thickness of the boards below the thickness specified shall be not more than 1/32 in., and this variation below the specified thickness shall not extend over more than 10 per cent. of the face of that particular board.

(5.) Jointing : Matched and glued or lock-jointed boards fastened with two galvanized corrugated fasteners, 1 in. by ⅜ in., will be regarded as single-piece ends.

(6.) Surfacing : (*a.*) The outside surfaces of the sides, top, and bottom may be fine band-saw or veneered finish ; otherwise they shall be smooth-planed. (*b.*) The ends shall be veneered or smooth-planed.

(7.) Timber : (*a.*) The following timbers will be admitted under this specification for use as ends and for the inner coating of sides, top, and bottom : White-pine (*Podocarpus dacrydioides*), silver-beech (*Nothofagus Menziesii*), tawa (*Beilschmiedia tawa*). (*b.*) Any timber with good nailing-qualities may be used for battens in the construction of sides, top, and bottom. A clear, whitish timber is preferable.

Section C : Nailing.

(8.) Nailing schedule : (*a.*) 1⅝ in. cement-coated nails (*i.e.*, nails coated with a resinous solution) shall be used when driving into white-pine ends, and 1⅜ in. cement-coated nails when driving into beech or tawa ends. (*b.*) Nails shall be driven flush. (*c.*) The sides, top, and bottom shall be attached to the ends by not less than four nails per edge (*i.e.*, one nail per batten at each end), and two spacing-nails per nailing edge of tops and bottoms.

Noxious-weeds Orders. — The Waikato County Council has declared foxglove, gorse, hakea, broom, and winged thistle to be noxious weeds within that county. The Waitaki County Council has declared gorse and broom *not* to be noxious weeds within the Ahuriri Riding of that county, except as to the county roads.

SEASONAL NOTES.

THE FARM.

LAYING DOWN PERMANENT PASTURE.

UNDER average conditions of land, locality, and climate March may be regarded as the best all-round period for laying down permanent pasture. Needless to say, the importance of this our dominant crop demands the greatest care in selection of the seed mixture and in the technique of sowing. Standard mixtures have frequently been formulated in the *Journal*, but these should be varied to suit the individual farm and accord with definite local experience.

When preparing the seed-bed care should be taken to secure a fine surface, so that the seed may be properly covered; also to make sure that the soil is firm underneath, in order to prevent the seed being buried too deeply. Grasses, moreover, root much better on a firm seed-bed. Where the land has been ploughed consolidation should be effected by plenty of rolling, the Cambridge roller being the best for this purpose. Where a rape, kale, or turnip crop has been fed off, and the land is reasonably clean, all that is necessary is to give a light disking to provide sufficient mould to cover the seed, preserving the consolidation that was brought about by the stock.

Various implements are used to cover grass-seed, but if the seed-bed is firm a light set of tine harrows will generally give best results. Chain harrows are frequently used, but they have a tendency to roll the seed into patches. The question of rolling after seeding must be decided on the condition of the land and local experience. Generally, if the land is dry and free it pays to roll; on the other hand, if it has a tendency to be wet and pack on the surface it is best left unrolled. Again, if the district or the season is subject to sudden heavy downpours of rain it is advisable to finish with the harrows rather than the roller.

Generally, grass sown in March does best without a companion crop, but there are occasions when it is desirable to add something to provide a quick bite for stock or to shelter the young grass in very exposed positions. A bushel per acre of either Black Skinless or Cape barley or Algerian oats will be found suitable for these purposes.

FORAGE CROPS.

The sowing of forage crops for winter and spring feed should be pushed forward during the coming month. If the crop is to be cut and fed out in the early spring, Ruakura, or one of the white oats such as Gartons, will generally give the heaviest weight of material. March is usually a good month for sowing oats and tares or similar crops for spring feeding—later cutting them for ensilage or hay. Peas are at times used instead of tares, but they do not stand the feeding and the winter so well.

In the North the hardier varieties of soft turnip, such as Devonshire Greystone, may still be sown during March, and it is a good

plan to utilize land that has been fallowed by sowing a late turnip crop. Crops of maize and millet that have not been used should be fed off before April or else converted into ensilage. The stack method is quite suitable for the latter purpose. The combination of paspalum with these cereal crops in the ensilage stack is an improvement, and also affords an excellent means of keeping down the coarse rank growth on paspalum areas so often seen in autumn.

IMPROVEMENT OF POTATO STRAINS.

In most districts the main potato crop is lifted towards the end of March, and careful growers will be taking steps before then to improve their strains of seed. The following methods are commonly practised in Canterbury and other South Island districts, and have been found to give great satisfaction :—

(1.) Going through the crop and digging normal healthy shaws, the tubers of which are retained if the yield and type are also satisfactory. The tubers so produced are next season cut (all small ones being discarded) and planted in a seed plot or increase plot of a size to produce sufficient seed for planting the main crop in the following season.

(2.) Thoroughly roguing a definite area, thus eliminating all diseased and off-type plants. The tubers from this area are cut in due course (all small ones being discarded), and planted either as the main crop or in an increase plot as under the first method.

LUCERNE.

Spring-sown crops will generally be ready for a second cut about the end of March. This cutting should be followed by two or three strokes of the tine harrows or a light cultivator. After this cleaning process the practice may be recommended of drilling in 1½ bushels of Algerian oats with 1 cwt. to 2 cwt. of super per acre. The oats will shelter the young lucerne, and help to control undesirable growths of grass and weeds.

Established stands that have not already had attention should be thoroughly cleaned up, and a filler may also be subsequently drilled in, using 1 bushel Algerian oats or 20 lb. Italian rye-grass, together with 2 cwt. basic super, per acre. If it is intended to take another cut from the lucerne after the end of March the sowing of the oats or rye-grass should be delayed until after this cut. Oats may generally be sown any time between the end of March and beginning of June, but up to the end of April for preference. The lucerne should always be cultivated just before the oats are sown.

BLUE LUPINS FOR GREEN MANURE AND SHEEP-FEED.

Blue lupins make an excellent crop for restoring land exhausted by continued cropping, at the same time providing useful winter forage for sheep. The lupins may be sown during the present month at the rate of 1½ bushels per acre. If fed off the paddock may be ploughed about August, in preparation for spring-sown crops. Blue-lupin stubble rots very quickly in the ground, so that a long fallow is not necessary. If the whole green crop is ploughed in it is best to use a single-furrow plough with a drag-chain attached to the neck. As

green manure in light soil blue lupins serve as an excellent preparation for potatoes. In connection with feeding off, the sheep — ewes in particular—should be placed on at first for only a few hours at a time, and the crop fed off in breaks. After they have once become accustomed to the lupins, neither danger nor difficulty is commonly experienced.

AUXILIARY FEEDING OF DAIRY COWS.

On farms where supplementary forages are grown feeding will now be in full swing. If different fodders are available it is advisable to mix the ration as far as possible—say, soft turnips in the daytime and lucerne or maize at night, or lucerne in the morning and maize at night—so as to secure a proper balance. As far as possible all auxiliary feeding should be done immediately after milking. The farmer who feeds turnips, kale, or green lucerne just prior to milking is a menace to the factory output. Turnips should be pulled at least six hours before being fed. It is good practice to pull and put out in the afternoon for the following morning's feeding. If any grass is available, 60 lb. of turnips per cow per day should be the maximum. If larger quantities are fed the cow cannot digest them properly, and this is sure to be reflected in the milk-supply.

—*Fields Division.*

THE ORCHARD.

SPRAYING.

FOR the control of the codlin-moth and leaf-roller caterpillar in mid-season and late varieties of fruit it will still be necessary in many localities to continue spraying with arsenate of lead. Pick and destroy regularly all codlin-infected fruits. At this period of the year conditions are frequently favourable for the development of black-spot, and therefore a careful watch should be kept in clean orchards to detect the first indications of this disease. In some localities this late infection often appears between the middle of February and the third week in March. Apply either lime-sulphur or bordeaux, according to the programme being followed. For powdery mildew cut off affected portions of twigs and shoots, and spray the trees with precipitated sulphur at 10 lb. to 12 lb. per 100 gallons. When red mite and apple-leaf hopper are in evidence apply lime-sulphur, 1 in 120, or Black Leaf 40, 1 in 800. Stone-fruits affected with any fungous disease should be sprayed, as soon as the fruit is gathered, with bordeaux, 3–4–50. Brown-rot infected fruits should not be allowed to lie about the ground, but be gathered up and destroyed.

DRAINAGE.

When opportunity offers the drainage of heavy retentive soils should be attended to, as badly-drained soil is not profitable orchard land. In well-drained land the soil is more congenial for the roots of the trees in the spring and during wet seasons than is the case in wet, cold, undrained land. Drainage allows of the land being worked

earlier in the spring, makes it easier to work down to a fine tilth, and also prevents the souring of the soil. Tile drains, though more expensive, are the most permanent type of drain, and give the best results in the orchard. The diameter of tiles for main drains should be at least 4 in. Soft boggy places in an orchard are often caused through seepage of water from a higher level, and in such cases a cross-drain of sufficient depth made above the orchard will usually cut off the seepage. After draining the land it should be well limed in the late autumn or early winter. Existing open drains should be cleaned out, and the outlets to pipe drains cleared so as to let the water pass freely away. Broken pipes should be replaced with new ones.

HARVESTING.

At this season of the year harvesting of the fruit crop will be engaging the attention of all orchardists. Mid-season varieties of pip-fruits will be ready or nearing the stage of maturity when they will be in a fit condition for picking for the respective markets or for storage. Picking and handling of fruit is a phase of orchard-work which requires a high degree of skill. The high percentage of loss and wastage due to bruises and skin-punctures caused at picking and in the subsequent handlings is much greater than it should be, and is striking evidence of the need of greater care in handling our fruit. A fact that should not be lost sight of is that the product of the year's work is being handled from which the return for the labour expended in the upkeep of the orchard is to be derived. A satisfactory realization is largely dependent on the condition in which the fruit reaches the market. Damaged fruit frequently opens up in a very unsatisfactory condition, with dark ugly bruises, with skin-punctures, and frequently badly decayed. Damaged fruit should be disposed of with as little delay as possible, and should not be placed in storage.

GRADING AND PACKING.

There is a good demand for well-graded and well-packed fruit. Fruit merchants, retailers, and consumers all want the best fruit, and there is an ever-increasing inquiry for this quality of fruit put up in a uniform manner. During the period of gluts in the markets well graded and packed consignments have always been disposed of at a satisfactory figure, while alongside, less carefully graded and packed consignments would not draw buyers when offered at very low prices.

Even grading is the basis of rapid packing, while uniformity in size, colour, and condition is the basis on which the buyer mainly decides the price he will give for the fruit. As to the best time to grade the fruit, some growers prefer to do most of it while picking, others do it in the orchard from the picking-buckets, while the majority grade in the packing-shed. Sizing would be greatly simplified if growers made three pickings, and on each occasion picked only mature fruit of nearly even size. In the larger orchards various types of graders are in use to obtain uniform sizing. Quality and colour grading should be combined with that of sizing.

In grading, no fruit with bruises, skin-punctures, skin broken at stem, disease, or other blemishes detrimental to the quality and appearance of the fruit, nor fruit which is too small, should be included. All fruits should be graded before being stored, so that fruit of any particular size and quality may be got at when required quickly and with a minimum of inconvenience.

The pack must be firm, so that the fruit is prevented from moving in the case. There should be little variation in the sizes of fruit used in the case, as the use of different sizes would cause the size and position of the pockets to vary and thus cause the loss of alignment, and even a change in the pack, which is most undesirable.

The first essential step in the improvement of the existing conditions in the industry is for all growers to pack to the standard set, and to keep the low grade and any small fruit they may have off the market. Growers who have not packed to this standard are urged to do so. The Orchard Instructor for the district will gladly advise and help in this matter.

MISCELLANEOUS.

Land intended to be planted out to fruit-trees in the autumn or spring should now be ploughed and left exposed to the weather in order to condition it for the reception of the trees.

Remove any superfluous shoots from trunks and limbs, so as to conserve the energy of the trees and direct the sap to other parts for the purpose of maturing shoots and buds necessary to the welfare of the tree.

Where the ties on trees grafted in the spring have not already been cut this should be done at once, so as to avoid any restriction of the sap and to prevent the tie cutting into and weakening it. The new growths should be protected to prevent them from being broken or blown off by the wind, &c.

—*W. K. Dallas, Orchard Instructor, Dunedin.*

Citrus-culture.

Work for the coming month will mainly consist in maintaining a clean state of cultivation, free from weeds, with the surface soil constantly worked to keep a depth of 3 in. or 4 in. of earth mulch.

Young shoots which become extended in growth beyond 18 in. should be pinched back to encourage side lateral growth; left to mature, these shoots often grow 3 ft. or more long before subdivision takes place, and then side laterals grow only on the extremity, leaving an undue length of wood unfurnished. By pinching out the point of these shoots as suggested, laterals are forced nearer the base, and growth encouraged where it is most useful, not where it is naturally disposed to grow.

Should young scales, thrip, or black aphis show up during this period an insecticidal spray of oil, 1–40, should be applied.

Where extended flowering of lemons has resulted in fruits which so far have not been sprayed, these should be sprayed with bordeaux, 3–4–40.

—*W. H. Rice, Orchard Instructor, Auckland.*

POULTRY-KEEPING.

DEVELOPING THE PULLETS.

PULLETS should now be placed in their winter quarters without delay. Changing the young birds from house to house just when they are on the point of laying, or even shortly afterwards, is only inviting the moulting process, with its concomitant loss of high-priced eggs.

It is essential that pullets should receive a plentiful supply of good nourishing food, with green material in abundance. The meat ration should, where possible, be given by itself at a regular time—say, at midday. When boiled meat is not available and meat substitutes have to be fed, these can be supplied sparingly with the morning mash. They may also be provided in a separate receptacle and left for the birds to consume at leisure as they desire. When including meat substitutes in the morning mash great care is necessary to guard against possible ill effects consequent upon over-indulgence in highly concentrated nitrogenous material. Ovarian troubles are almost sure to follow if the birds are overfed with meat-meal. Of course, when eggs are at a maximum price later on the pullets should be encouraged to give every egg they can, provided they are well developed and not unduly forced. Where pullets are showing signs of coming too rapidly to maturity, and promise to commence laying before they are sufficiently developed to enable them to lay a decent-sized egg and to last out a long profitable season, forcing diet such as meat should be withheld from the ration.

On no account should any sudden drastic change be made in the ration. There is no better way of forcing the pullets to moult now than by changing their food. Giving a feast one day and starvation diet another will have a similar effect. Regular and uniform attention is imperative if winter eggs are to be secured. In this connection I would advise those poultry-keepers who have a supply of last season's wheat on hand to conserve this for the pullets, as the changing from old wheat to new often has the effect of giving them a severe setback.

REGULAR CULLING ESSENTIAL.

Because the supply of eggs has been somewhat scarce of late, and likely to be for some time to come, a correspondent suggests that in order to prevent a further decline in production during the coming year I should, by medium of my *Journal* notes, and lectures both by myself and assistants, advise producers to retain all hens in their flocks, even although they have passed their second season of production. This I cannot see my way clear to do. It is well known that success in poultry-keeping depends mainly upon the manner in which its many details are attended to, but there is one essential detail which must be always kept in view before all others, and that is the weeding-out of unprofitable stock. The efficient poultryman who is really anxious to secure the greatest profit from his undertaking will not even leave culling to the end of the first laying season: he will cull all the time. He realizes that every poor layer retained in the flock means a drain on his profits. It

is not the number of birds kept that determines success, but the profit secured over the cost of production. Obviously, therefore, every drone, and the bird which has passed its best period of production, reduce the profits being made by those laying up to the mark.

It is now generally recognized—in fact, it has become an established maxim of the industry—that eggs must be produced in the dear season if the business is to be made really profitable. It also is recognized that the winter layers must be pullets bred at the right time and managed in the right way. Artificial incubation and brooding have passed the experimental stage, and no difficulty is now presented in securing sufficient pullets to replace at least a good part of the old stock each year. Even with the best of laying flocks only a few birds among the older stock will lay in winter. After the second laying season a bird will not only produce less eggs than formerly, but she will give these when the cheapest markets rule. Obviously, at the end of a bird's second laying-period sentiment should not be allowed to interfere with the work of culling. It is true that where only high-type layers are kept individual birds will be found which will pay to retain for a third laying season, especially a noted layer or a desirable breeding specimen. In a general way, however, these are few and far between. In any case, unless the poulty-keeper possesses the necessary keenness of eye to sort out the likely future producers from those having passed their normal profitable period, the suggestion to even restrict culling operations may easily prove a costly experiment.

Culling may even commence during the first few months of maturity, for it is useless to expect a weakly-constitutioned bird to make a profitable layer. Then again, there are always freaks or throw-backs from the best matings which will never develop into satisfactory stock. The point to remember is that it is a losing proposition to keep any bird which does not promise to return a good net profit. It may be said that the price of eggs suggests that even a medium layer will return a good profit over its keep, but it must be remembered that the prices of foodstuffs are correspondingly high. Thus regular culling is as essential to-day as ever before if maximum profits are to be made.

POINTS IN CULLING.

In a general way the main culling of laying flocks should be attended to in the coming month. Efficient culling is one of the chief secrets of successful poultry-keeping, and is one of the most difficult matters connected with poultry to teach the novice by printed matter. It is a work that can be successfully carried out only by a person possessing a cultivated eye for laying-type, and capable of making due allowances for the condition of the bird at the particular time the weeding-out process is taking place.

The time of moulting affords one of the best guides to constitutional vigour and laying-capacity. For a bird to give a high egg-yield she must necessarily be a long-season layer, and, obviously, to be a long-season layer she must be a late moulter, for it is only in exceptional cases that a bird will renew its feathers and at the same time continue laying. Thus with birds hatched at the same time, and which have been subjected to similar treatment in all

respects, the early moulter is the bird that should be culled, and the late moulter retained in the flock. It may be mentioned that in a mixed flock of first- and second-year layers (when the latter were selected the previous season because they were later moulters) the second-year birds will usually, owing to their shorter season of production, moult later than those in their pullet year. In such cases, where the moulting-period is taken as a guide, due allowance for age must be made, otherwise many of the young birds which it would be profitable to keep are apt to be disposed of, and the older but less profitable members of the flock retained on the plant.

On all well-managed plants a mark or ring should be placed on every bird for age-determination and as a guide to culling unprofitable stock.

In addition to being a late moulter, the high-type layer and the one likely to produce well in the future will present the following signs: A clean face free from feathers (it is not uncommon for the head and face to become quite bare—a sign seldom or never found in a low egg-producer); close feathering; a bright-red comb (which should be retained more or less throughout the moulting process); and an alert, vigorous appearance. Further, yellow-legged varieties will now present a bleached or, in fact, a white appearance. This sign will not be so pronounced where runs in long grass are available as when the ground is more or less bare, or when the birds are confined under cover. It must be noted that this leg sign only applies towards the end of a bird's productive season, for after it has moulted the legs will regain their yellow appearance, as is the case during the early pullet stage. The plumage of the heavy layer will also exhibit a worse-for-wear or rather shabby appearance, while the bird itself will be in a more or less lean condition.

All things being equal as to the time of hatching, &c., the birds that should be culled are those that are moulting, those with bright-yellow legs, those above the normal weight of their breed, those with feathered face and dull eyes, those with a specially well-kept plumage, and any which show the slightest weakness in constitutional vigour.

SELECTION OF THE BREEDING-HENS.

After the culls have been removed from the flock the remaining birds should be carefully gone through and a selection of hens made for next season's breeding-pens. It is specially important that this work be carried out now, as even with the best layers the points outlined as indicative to laying-power will not stand out prominently again for several months after the birds have undergone the moulting process. Birds selected for the breeding-pen should not only possess striking points indicative of laying-capacity and constitutional vigour, but in addition they should conform to standard weight requirements, and be at least a fair specimen of the breed they represent. Small diminutive specimens should not be bred from, no matter how well they may have laid.

The selected birds should be placed by themselves and given a plain ration, with the object of discouraging them from laying in the meantime. Where every egg is forced out of the late moulters and intended breeders it is safe to assume that trouble is being laid in store, and will be met with later in the hatching and rearing of the

progeny. Where possible the proposed breeders should be given a free range, and, above all, care should be taken that they are prevented from getting overfat between now and when they are to be called upon to lay eggs for reproductive purposes. Breeding from overfat hens is a common cause of poor hatches and the production of chicks that are difficult to rear.

—F. C. Brown, Chief Poultry Instructor.

THE APIARY.

BEE-ESCAPES.

FOR removing honey late in the season the beekeeper may find it necessary to bring into use bee-escapes. These escapes enable the honey to be removed without causing any disturbance. By the employment of the Hodgson escape device there is less likelihood of causing robbing, with its attendant evils. More especially will the escapes be found advantageous when removing section honey from the hive. There is far more risk in removing sections from the hive than extraction-combs. When the colony is disturbed the bees will at once start to fill their sacs, and often the cappings of the sections are punctured in order to secure a supply of honey. The damage to the cappings of sections is unsightly, and causes the honey to leak after removal from the hive. The special advantage of the Hodgson escape is that, being constructed of wire gauze, the heat from the brood-chamber is not shut off from the super after the bees have escaped. Thus the honey in the super is kept warm, and the drips of honey from the burr combs are cleaned up by the bees.

When inserting the Hodgson escape the super should be gently prized up from the brood-chamber and the escape placed in position. A puff of smoke will suffice to control the bees while the operation is being performed. If this is done late in the afternoon the bees will pass through the escape during the night to the brood-nest, and will be unable to return. In the morning the supers may be removed, when practically no bees will be left in the super.

A word of caution to those who have not formerly used the escapes: Should there be brood in the super combs the bees will not leave, and the escapes will not prove effective in ridding the supers. Over and over again many beginners complain that they cannot get the bees to leave the supers when using escapes, but the reason lies in the fact that no examination had been made to ascertain beforehand whether the super contained honey only.

UNITING COLONIES.

Among the autumn work to be attended to is the examination of the colonies for the purpose of ascertaining if each possesses a laying queen, and to note those that are too weak to survive the winter. In the negative in either case it is advisable to unite with a stronger colony so as to save the bees. On no account should an attempt be made to winter weak hives, as they are likely to get robbed out, and this may cause the bees to start robbing when everything in the apiary should be quiet. A simple method of uniting may be practised by placing the weaker hive on top of a stronger one, and placing a

sheet of newspaper between the two hive-bodies. In the course of a few days the bees of the weaker colony will make their way through the paper and unite peaceably with the bees in the stronger hive. The surplus combs may subsequently be removed and reserved for spring feeding if required. It is advantageous to destroy the queen in the weak hive prior to uniting.

ROBBING.

At the close of the honey-flow the beekeeper must persistently guard against robbing. Robbing is the result of carelessness, and once it has started is exceedingly hard to check. As previously mentioned, neither honey, sugar-syrup, nor anything that the bees can rob should be exposed. In case wet combs have to be returned to the hives for the bees to clean up, postpone this operation until late in the day, when robbing is not likely to start. See that the honey-house is bee-proof, and that all combs and vessels containing honey are removed to a place of safety. Contract all hive-entrances, and especially guard against hives being open in such a way that they can be attacked by robbers. All operations must be carried out quickly. If robbing has started, it is better to postpone all outside work until the apiary is quiet again than to risk extending the trouble by opening the hives. Should a colony be attacked, contract the entrance and pile wet grass in front of the hive. This will usually cure mild cases of robbing; but where a colony has been overpowered by the robbers it should be closed altogether.

—E. A. Earp, Senior Apiary Instructor.

HORTICULTURE.

SYSTEM IN TOMATO-CULTURE.

CONSIDERABLE losses have been incurred in the tomato crop this season through black-stripe disease, early blight (*Altenaria*), and sclerotinia. The main cause in many instances has been due to unnecessary checks in growth which the plants have received in the frames and when first planted out, the debility thus caused resulting in the plants falling an easy prey to any disease to which they were exposed. Too much stress can hardly be given to this cause, as besides the losses from disease another result is the small and late crop produced.

An unprepared potting-soil for the seed-boxes and pricking out, and an overdose of nitrogenous manures on the land before planting out, are probably the other main causes of these losses. A suitable potting-soil is best obtained by at this period placing in a stack the top spit of a piece of good grassland on which tomatoes have not been grown for some years. In twelve months this can be turned and some basic slag or other manures added, and it will be in good condition for the following season—that is, about eighteen months from the present date. This procedure may sound rather tedious, but it is one of the fundamentals of successful tomato-culture, and in large-scale production it is unsafe to do otherwise. It follows that such potting-soil as may be in hand should now have any further manures

that may be required mixed in, and the compost placed under cover to mature ready for the new season commencing in June next.

SMALL FRUITS.

Where strawberries and other small fruits are to be planted the preparation of the land should now be completed, and a heavy dressing of bonemeal or other well-decayed organic manures ploughed in deep in time for it to be well incorporated before planting takes place. Although the land for this class of crop requires to be moist and deep, it is important that there should be no standing water at any time on or near the surface. The heavy dressings of fertilizers which are customary do more harm than good where drainage is insufficient. For this reason hedges in the vicinity should now be trimmed well back and the open drains cleaned out.

Where the old canes of loganberries and raspberries have not yet been cut out they should now be removed and burnt. They are usually diseased to some extent, and, if left, communicate the disease to the young canes and make successful spraying difficult. An observance of these precautions will reduce cane-wilt, anthracnose, and leaf-spot disease.

THE VEGETABLE GARDEN.

In the colder Southern districts the cabbage crop for cutting in early spring may be planted out towards the end of this month, but the operation is best deferred for a while in the warmer localities, as if the plants are too forward before winter they are then inclined to bolt as soon as the ensuing spring commences. The celery crop must not be allowed to dry out, but should be irrigated where necessary, and suitable fertilizers applied to induce steady growth; blanching should be commenced when the plants are three-parts grown. Lettuce-seeds may be sown now for winter crops. Seed of white onions, also the main onion crop where the system of planting out the bulbs in spring is adopted, should also be sown.

This season's onion crop will now be approaching maturity, and when the falling tops indicate that stage as having been reached they should be lifted. To defer the operation is to depreciate the appearance and keeping-qualities of the bulbs. After being allowed to dry for a while they are turned by drawing a number of rows together with wooden rakes into one row, and when drying is completed they are trimmed, graded, and bagged into cental bags. During this process they are easily bruised, and so require careful handling. No attempt should be made to store for a long period anything but medium-sized, firm, well-ripened bulbs, and these must not be piled to cause heating, but be placed in a dry, airy shed. Bulbs of this quality may be very profitable if properly stored. Keen judgment of condition and careful grading are required for profitable marketing.

HARVESTING POTATOES.

The main potato crop also will be approaching maturity, and when the drying shaws readily leave the tubers when pulled they should be promptly lifted. As this crop has to stand long storage and transport, it is advisable for the tubers to be ripe before lifting; to leave them longer in the ground is detrimental. Each day's digging should be bagged and stored as lifted, the pickers being carefully supervised in grading for size and the elimination of the least sign of

disease. Whether the tubers are stored in a pit, shed, or the shelter of a plantation, the requirements are dark, cool, humid, and airy conditions. Under dry conditions they lose weight and quality; too much light will green them; and frost will readily cause injury. Every care taken in the selection of seed tubers is well repaid. Without careful selection the strain rapidly deteriorates. It is important that the shaws be immediately raked up and burnt, and preparation made for the following crop.

THE TOBACCO CROP.

The later-planted tobacco crop will now commence to ripen, and it is desirable, if possible, to harvest the leaf when in good condition, during a period of bright, fine weather; the leaves are then very different from the thin, limp foliage during warm rains, when heavy transpiration is taking place and the desirable properties in the leaf are at a discount. Cut the plants when the dew has dried off them, and arrange for such transport to the curing-shed as will avoid any of the leaves being torn and bruised.

The curing of the early crop will be nearing completion, and when that is attained it may be stripped. The early execution of this operation will provide more accommodation in the curing-sheds, which is usually badly needed. Cured tobacco-leaf is very sensitive to temperature and moisture. When dry it is exceedingly brittle, and to handle it then is to cause wholesale damage and loss. In a humid atmosphere, however, it absorbs moisture rapidly and becomes soft and pliable, and may be freely handled. This may be brought about by introducing steam, or opening ventilators and admitting a humid atmosphere, which may be further assisted by sprinkling the floors. *When the desired condition is obtained,* the sticks with the cured plants on them may be taken down and the leaves carefully stripped from the stalks, graded, and tied into hands of about a dozen leaves, and rehung in the shed. The terms "stemming" and "stripping" are sometimes used for another operation, which should be noted, as the confusion of terms is the cause of a great deal of misunderstanding. The operation is one sometimes done by the shipper, but more often now in the factory, and consists of the removal of the midrib of the leaf itself, leaf so treated being commonly known as "strips."

The class of grading adopted will depend on the variety of tobacco and the market in view, but nothing will establish that confidence which is the foundation of good business quicker than a steady observance of the grades laid down. If priming has not been done in the field—that is, the bottom leaves removed—these should be discarded now, as they are invariably thin, torn, and useless. The top leaves also are in some varieties and circumstances small and immature, and are best discarded into the waste, which may be used for making insecticide sprays. This avoids a lot of unnecessary handling and freights, which are a consideration nowadays.

The hands of tobacco when rehung must be kept dry and reasonably warm, or moulds will become troublesome and cause depreciation, for which reason open sheds or unlined iron sheds are unsatisfactory at this stage. If suitable accommodation cannot be given, the goods should be despatched as soon as the butts of the leaf-stems have thoroughly dried out.

SOWING OF LAWNS.

Where lawns are to be sown the land should now be clean and in good tilth. Present work is to rake and roll the ground till a firm smooth seed-bed is obtained. If the land has had time to settle this will be more easily accomplished, otherwise there is some difficulty in getting rid of the small potholes in the surface, but levelling should proceed until this is accomplished. A smooth, well-graded grass surface is by no means the least attractive feature in the garden. In the process of levelling and filling-in it often happens that the depth and quality of the soil are variable. At a casual glance this may not be obvious now, but when the sward is established it becomes conspicuous and is very disfiguring. Filling depressions with rich soil and suchlike methods should be avoided.

When the surface is satisfactory, and the bed even and firm, rake up a fine shallow tilth and sow the seed; 1 oz. to 2 square yards will generally be a good dressing of an average mixture of lawn-grass seed. The seed should then be well raked in, and the job is completed. Needless to say, none of this work should be done when the soil is at all wet and sticky.

—*W. C. Hyde, Horticulturist.*

TESTING OF PUREBRED DAIRY COWS.

JANUARY CERTIFICATE-OF-RECORD LIST.

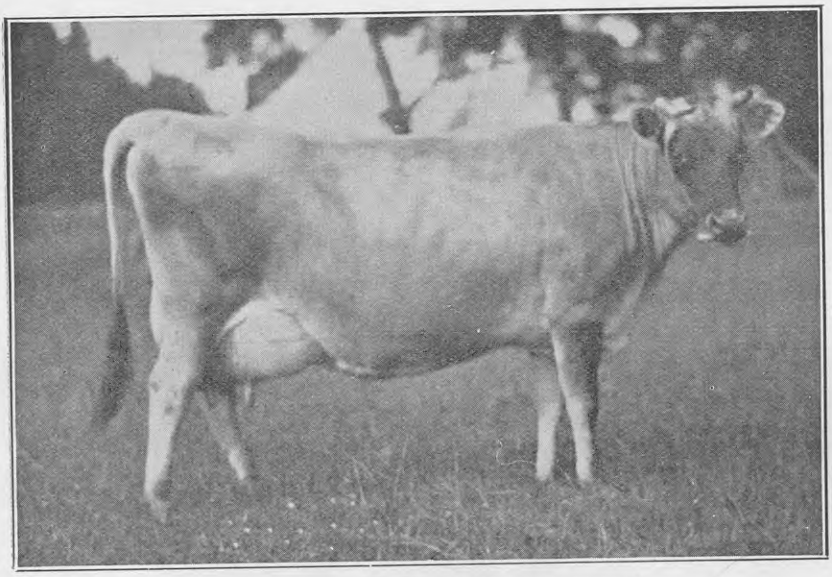
Dairy Division.

THE appended list gives particulars of certificates issued in January—all pertaining to records gained in 1926. Owing to delays on the part of breeders in completing formalities, a considerable number of 1925 records are still outstanding, but it is expected to publish a closing list of these in next month's *Journal*.

LIST OF RECORDS.

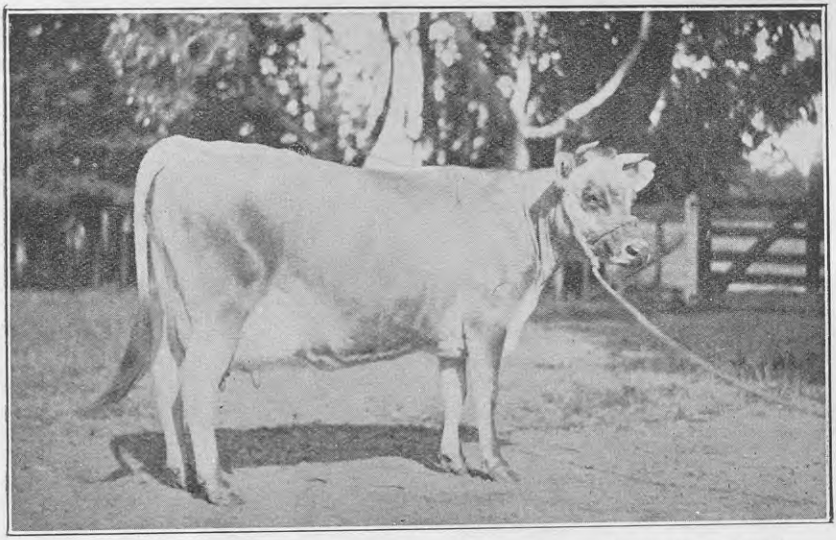
* Cow milked three times daily during whole lactation period. † Milked three times daily during part of period.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
JERSEYS.						
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Lady Ailsa ..	J. Murray, Woodville ..	2 56	246·1	365	9,764·8	588·56
So Ladylike ..	F. V. Bryant, Ruawhata ..	2 12	241·7	365	10,762·9	550·65
Waipiko Caution ..	S. H. Wearing, Richmond ..	2 35	244·0	365	9,795·2	540·84
Sybil Aldin ..	F. V. Bryant, Ruawhata ..	2 1	240·6	365	10,421·9	534·04
Riverswood Gem ..	J. Nicolson, Kaupokonui ..	2 11	241·6	365	9,414·8	528·01
Rosy Creek Queen Twylish	J. Murray, Woodville ..	2 52	245·7	365	10,816·4	510·52
Perfection of Glenmore	A. C. Lovelock, Woodville ..	2 16	242·1	365	9,805·7	484·41
Riverswood Peggy ..	J. Nicolson, Kaupokonui ..	1 215	240·5	365	7,085·5	436·92
Uruti Brown Heath ..	W. Oxenham, Uruti ..	2 14	241·9	365	7,883·9	434·91
Erinview Bonnie Lass	J. Murray, Woodville ..	2 21	242·6	365	9,365·5	427·35
Glenmore Delight ..	A. C. Lovelock, Woodville ..	2 26	243·1	365	7,639·8	423·19
Kelvin Veronica ..	G. Buchanan, Paeroa ..	1 265	240·5	365	6,227·5	321·55
Kelvin Plush ..	G. Buchanan, Paeroa ..	2 13	241·8	365	6,432·5	316·87
Orange Dale Sylvia ..	W. J. Hall and Son, Matatoki	2 53	245·8	314	5,704·5	307·18



TIKITERE (F. S. McRAE, PALMERSTON NORTH).

C.O.R. in Jersey mature class: 12,054·2 lb. milk, 746·94 lb. butterfat.



PUKATERE (DAUGHTER OF TIKITERE, AND ALSO TESTED BY MR. McRAE).

C.O.R. in senior two-year-old Jersey class: 8,181·6 lb. milk, 523·71 lb. butterfat.

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS—*continued.*	Yrs. dys.	lb.		lb.	lb.
Senior Two-year-old.						
Proud Duchess ..	G. Hodgson, Whakapara ..	2 349	275·4	250	5,797·0	318·27
Three-year-old.						
Beresford Belle ..	T. Brownlee, Pukekohe ..	3 50	282·0	321	6,617·4	429·35
Glyndyfrdwy Goldie..	W. J. Hall and Son, Matatoki	3 324	309·4	332	6,264·0	343·57
Lady Pansy Dudley..	G. Walker, Maunu ..	3 121	289·1	354	4,962·0	331·80
Four-year-old.						
Briar's Gift ..	F. Phillips, Otorohanga ..	4 40	317·0	365	11,940·8	683·69
Pear Jam	G. Hodgson, Whakapara ..	4 345	348·0	365	8,219·2	443·96
Silverdale Golden Hope	G. Hodgson, Whakapara ..	4 352	348·7	296	7,457·0	414·07
Mature.						
Abberley Naomi ..	G. Walker, Maunu ..	6 38	350·0	365	11,868·3	603·23
Crofton's Nancy ..	A. J. Luxton, Omata ..	7 76	350·0	333	8,954·9	511·60
Rewa Maycan ..	G. Walker, Maunu ..	7 10	350·0	365	8,535·1	509·61
Orange Dale's Olga ..	W. J. Hall and Son, Matatoki	6 21	350·0	343	9,119·3	503·96
Fair View Light ..	G. Walker, Maunu ..	5 70	350·0	327	6,936·1	380·51
	FRIESIANS.					
Junior Two-year-old.						
Omaha Tui Burke Paxton	A. Migounoff, Matakana ..	2 94	249·9	339	12,966·4	452·84
Totara K.P. Rosona..	Piri Land Co., Auckland ..	2 136	254·1	204	10,160·2	420·80
Omaha Hilda Nobeltje	A. Migounoff, Matakana ..	2 35	244·0	339	10,832·9	418·99
Lichfield 23† ..	W. J. Polson, Fordell ..	2 7	241·2	363	10,217·6	340·52
Lichfield 25† ..	W. J. Polson, Fordell ..	2 35	244·0	351	10,531·2	319·48
Senior Two-year-old.						
Omaha Nobeltje Paxton	A. Migounoff, Matakana ..	2 359	276·4	276	11,419·3	441·35
Junior Three-year-old.						
Omaha Tamara Rex	A. Migounoff, Matakana ..	3 178	294·8	342	13,881·3	496·31
Lichfield Violet† ..	W. J. Polson, Fordell ..	3 181	295·1	365	11,981·1	397·91
Senior Four-year-old.						
Omaha Van Vola 2nd	A. Migounoff, Matakana ..	4 324	345·9	356	12,971·1	539·01
Mature.						
Cloverlands Mary† ..	W. J. Polson, Fordell ..	6 345	350·0	365	14,988·0	564·85
Meadow Lily de Kol of Ashlynn†	W. J. Polson, Fordell ..	11 346	350·0	365	14,888·6	519·04
Maud Corona Beets ..	W. H. Madill, Auckland ..	5 86	350·0	274	16,996·1	501·96
Brookfield Abbekerk Jessie	A. Migounoff, Matakana ..	5 295	350·0	272	9,708·7	404·77
	Second-class Certificates.					
	Jerseys.					
Junior Two-year-old.						
Ku Ku Snowdrop ..	R. L. Horn, sen., Ohau ..	2 0	240·5	365	9,092·6	437·34
Beaulieu Exile's Lilac	G. Walker, Maunu ..	1 313	240·5	365	4,397·7	267·21
	Friesians.					
Junior Two-year-old.						
Lichfield 27 ..	W. J. Polson, Fordell ..	1 364	240·5	365	14,126·7	484·47

THE NEW DAIRY-PRODUCE REGULATIONS.

MANUFACTURE AND EXPORT.

(Continued from January.)

Grading of Cream supplied to Creameries or Whey-butter Factories.

18. (1.) As soon as practicable, but in no case more than three hours, after the arrival at any creamery of any whole-milk cream supplied thereto the owner of such creamery shall grade such cream, or cause it to be graded, in accordance with the standards set out in clause 25, into one or other of three classes to be known as finest, first grade, and second grade respectively.

(2.) Where two or more lots of cream arrive at a creamery mixed together, the grading of such lots may be based on examination of samples, provided the following provisions are complied with: (*a.*) Each sample shall be of not less than half a pint. (*b.*) The sample shall be taken from a lot before it is mixed with any other lot. (*c.*) Each sample shall be taken by a responsible agent appointed in that behalf by the owner of the creamery. (*d.*) Each sample shall be left until grading in a separate bottle so marked as to indicate the particular lot from which it was taken.

(3.) In all other cases the grading shall be based on examination of the cream as delivered.

(4.) Notwithstanding the provisions of subclause (1) of this clause the owner of any such creamery may, in lieu of grading any lot or lots of cream at the creamery, grade such lot or lots at any dairy registered as a cream-receiving depot, provided the provisions of this clause are complied with in all other respects.

19. Payment to each supplier of such whole-milk cream shall be so made that the rate shall be at least one halfpenny per pound of butterfat more for cream graded as finest than for that graded as first grade, and at least one penny per pound of butterfat less for cream graded as second grade than for that graded as first grade.

20. As soon as practicable, but in no case more than three hours, after the arrival at any whey-butter factory of any whey cream supplied thereto the owner of such factory shall grade such cream, or cause it to be graded, in accordance with the standards set out in clause 26, into one or other of two classes to be known as first grade and second grade respectively.

21. Payment to each supplier of such whey cream shall be so made that the rate shall be at least one penny per pound of butterfat less for whey cream graded as second grade than for that graded as first grade.

22. All such whole-milk cream or whey cream containing less than thirty-five per centum, by weight, of butterfat shall be paid for at a rate one halfpenny per pound of butterfat less than the rate that would otherwise have been payable for it according to its grade.

23. In every case where payment for such whole-milk cream or whey cream is made by way of more than one part-payment, any adjustment in the rate of payment required to be made under clauses 19, 21, or 22 hereof shall, in connection with each lot of such cream, be made on the first part-payment made in respect of such lot.

24. All relevant books and records of the owner of every creamery or whey-butter factory shall be kept available for examination by any Inspector, or by any officer of the Department of Agriculture authorized by the Director in that behalf, for the purpose of ascertaining all particulars of payments made for such cream; and any Inspector or any officer so authorized may at any time make such examination after giving written or oral notice to the owner of his intention so to do.

25. The following shall be the standards for grading whole-milk cream supplied to any creamery:—

"Finest" shall be cream that is clean in flavour, of uniform consistency, and free from appreciable defects in all other respects.

"First grade" shall be cream that is almost clean in flavour, is of uniform consistency, and is free from serious defects in all other respects.

"Second grade" shall be cream that is below first-grade quality but suitable for the manufacture of butter for human consumption.

26. The following shall be the standards for grading whey cream supplied to any whey-butter factory :—

"First grade" shall be whey cream of that quality which in the opinion of the cream-grader would, if manufactured separately by the method usual in the Dominion, yield "first-grade" whey butter.

"Second grade" shall be whey cream of that quality which in the opinion of the cream-grader would, if manufactured separately by the method usual in the Dominion, yield whey butter below "first grade."

27. Should any cream-grader allot to any whole-milk cream or whey cream any points intended to indicate its quality, he shall so allot the same points as would, in his opinion, be allotted by a Grader to butter made from the said cream if manufactured separately by the method usual in the Dominion, allowing in respect of matters not dependent on the quality of the cream the number of points that might reasonably be expected to be allotted by a Grader to such butter.

28. (1.) After the expiration of two months (or such longer period as the Minister shall by notice in the *Gazette* appoint in that behalf) from the commencement of these regulations every person who grades any cream in compliance with clauses 18 or 20 shall hold a cream-grader's certificate.

(2.) Every person desiring to obtain a cream-grader's certificate shall make application therefor in writing to the Director.

(3.) Such application shall be accompanied by a certificate of character from the applicant's present or last employer or some other reputable person.

(4.) Such application shall set out the following particulars with relation to the applicant: (*a*) His full name; (*b*) his postal address; (*c*) the date of his birth; (*d*) his educational attainments; (*e*) his experience in dairying; and (*f*) the name of the creamery or whey-butter factory at which he intends to grade.

(5.) If such certificate is desired for use immediately on the expiration of the period referred to in subclause (1) of this regulation, the application shall be made within one month after the coming into operation of these regulations.

(6.) In every other case the application shall be made at least fourteen days before the applicant proposes to commence grading.

(7.) The Director, on being satisfied that the applicant has passed such examination as the Director considers necessary, and is otherwise a fit and proper person to grade cream, shall, as soon as practicable, issue to him a cream-grader's certificate as required by this clause.

(8.) Every such certificate shall be signed by the Director, and shall be in the form No. 4 in the Schedule hereto, and shall remain the property of the Department, and shall be surrendered forthwith to the Director by the holder on written notice in that behalf.

(9.) Whenever any cream-grader has failed to grade any cream on behalf of the owner of a creamery or whey-butter factory during six consecutive months his certificate shall thereupon cease to be in force, and the holder shall forthwith return it to the Director.

(10.) If at any time the Director is satisfied that the holder of any cream-grader's certificate is no longer a fit and proper person to grade cream, the Director may give him written notice to surrender his certificate. Upon receipt of such notice such certificate shall cease to be in force.

(11.) The Director shall cause a register to be kept of the names of all persons to whom cream-graders' certificates have been granted and are from time to time in force, and entries shall be made therein of any matter whereby a certificate ceases to remain in force.

(12.) A copy certified by the Director of any entry in the register shall be *prima facie* evidence of such entry and of the facts appearing therein, and a certificate under the hand of the Director of the absence of an entry in the register shall be *prima facie* evidence of the facts stated in such certificate.

(13.) No person who is not registered as the holder of a cream-grader's certificate for the time being in force, or who is the holder of any such certificate that ought to have been returned to the Director, shall, after the expiration of the time specified in subclause (1) of clause 28, grade any cream supplied to a creamery or whey-butter factory.

(14.) Every cream-grader shall produce on request at any reasonable time his cream-grader's certificate for inspection by an Inspector or by any supplier of cream to the manufacturing dairy at which he grades cream.

29. Every cream-grader shall, at the close of each week or part-monthly testing-period in which he has graded any cream, forward to the Director, or to the officer of the Department of Agriculture appointed by the Director in that behalf, a signed and dated return showing, with respect to all cream graded by

him as second grade during the week or part-monthly testing-period, the name of the creamery or whey-butter factory, the name and address of the supplier of the cream, the date of grading, the weight in pounds of second-grade cream received from each supplier, and the percentage graded as second grade of the total weight of cream graded at such respective creamery or whey-butter factory during the period to which the return relates. It shall be sufficient compliance with the requirement in regard to the percentage mentioned if the cream-grader attaches to his return a statement of the said percentage signed by or on behalf of the owner of the creamery or whey-butter factory.

30. No cream-grader shall knowingly assign to any cream any grade other than its true grade according to the standards set out in clauses 25 and 26; and no person shall falsify any record of the grading of, or of the payment for, any cream supplied to any creamery or whey-butter factory.

Contaminated or Decomposing Milk or Cream.

31. (1.) No person shall deliver, or send for delivery, to any manufacturing dairy, and no owner of any dairy shall accept delivery of or use for manufacture, any milk or cream which contains or has contained any animal, bird, maggot, or other thing making it unfit for the manufacture of a product for human consumption, or any milk or cream affected by putrefactive decomposition.

(2.) Should any such milk or cream as aforesaid be delivered to any manufacturing dairy, the owner of such dairy shall forthwith add to such milk or cream a sufficient quantity of methyl violet to effectively colour the whole of it.

(3.) Any Inspector may in like manner and in any place wheresoever add methyl violet to any such milk or cream as aforesaid which in his opinion is intended or likely to be used or manufactured for human consumption.

Manufacture of Cheese.

32. (1.) No person shall incorporate in any cheese during its manufacture any inferior curd or cheese.

(2.) No person shall deliver, or send for delivery, to any factory or private dairy for manufacture into cheese any milk to which any cream has been added, unless with the previous consent in writing of the owner of such factory or private dairy.

(3.) The shape and size of any kind of modified-milk cheese shall be as approved from time to time, and no person shall manufacture any kind of modified-milk cheese in a shape or size not so approved.

Maturity of Cheddar Cheese.

33. Every owner of a registered dairy in which Cheddar cheese is manufactured shall keep all such cheese on shelves for at least fourteen days before packing it, or allowing it to be packed, for sale or export, and during such period shall turn each cheese upside down once a day.

Protection of Whey from Contamination.

34. (1.) No whey for use in the manufacture of food for human consumption, or from which cream is to be separated for such use, shall be brought into direct contact with any pipe, channel, tank, or other conveying or holding appliance made of wood, of concrete, or of iron, whether galvanized or not.

(2.) No such whey shall be conveyed or held except in conveyers or holders having a smooth and hard surface impervious to moisture.

Manufacture of Whey Butter.

35. If any owner of a dairy mixes or allows to be mixed cream or butterfat recovered from whey with cream or butterfat separated from milk for the purpose of manufacturing butter therewith, the resulting product shall be deemed to be whey butter for the purposes of these regulations.

36. Immediately after being separated whey cream shall be heated to a minimum temperature of 176 degrees Fahrenheit, and shall thereafter be forthwith cooled to a temperature not exceeding 65 degrees Fahrenheit, and after being so cooled shall be kept at a temperature not exceeding 65 degrees Fahrenheit until churned or delivered from the factory as whey cream.

37. No matter from cheese-presses, whether white whey, washings, butterfat, or other matter, shall be used in the manufacture of whey butter.

38. All piping used for the conveyance of whey for separating for the purpose of manufacturing whey butter shall be erected in easily handled lengths, suitably joined together with such couplings as will facilitate expeditious dismantling.

39. The internal parts of all pumps used for the pumping of whey prior to its being separated for the purpose of manufacturing whey butter shall be of some metal other than iron, and all such pumps shall be so constructed as to be readily dismantled.

40. (1.) Every owner of a whey-butter factory shall comply with the requirements of clauses numbered consecutively from 36 to 39 hereof (inclusive) so far as they relate to such whey-butter factory.

(2.) Every owner of a manufacturing dairy shall keep, exhibit to any Inspector on demand, and supply to the Director whenever he so requests, accurate daily records of the number of pounds of each of the following dealt with in such dairy: (*a*) Butterfat in cream separated or recovered from whey; (*b*) butterfat purchased in the form of whey cream; (*c*) butterfat in cream which has been separated from milk and added in making whey butter; (*d*) butterfat contained in milk added to whey cream; and (*e*) whey butter manufactured from such butterfat as is referred to in subparagraphs (*a*), (*b*), (*c*), and (*d*) of this clause.

Branding and Marking.

41. (1.) Before sending or allowing to be sent any butter other than milled butter to an appointed grading-store the owner of the butter shall plainly mark with stencil or rubber stamp on every package a number to indicate whether the butter was included in the first, second, third, or other specified churning (as the case may have been) of the day of its manufacture, also a number to indicate the day of the month on which the butter was manufactured. The said numbers shall be in plain figures not less than $\frac{3}{4}$ in. nor more than 1 in. in height.

(2.) Before sending or allowing to be sent any milled butter to an appointed grading-store the owner of the butter shall plainly mark with stencil or rubber stamp on every package a number to indicate whether the butter was included in the first, second, third, or other specified milling (as the case may have been) of the day on which it was milled, also a number to indicate the day of the month on which the butter was milled. The said numbers shall be in plain figures not less than $\frac{3}{4}$ in. nor more than 1 in. in height.

(3.) Before sending or allowing to be sent any cheese to an appointed grading-store the owner of the cheese shall plainly mark with stencil or rubber stamp on every package the word "white" or "coloured," as the case may require; the consecutive number of the package; a number to indicate whether the cheese was included in the first, second, third, or other specified vat (as the case may have been) of the day of its manufacture; and a number to indicate the day of the month on which the cheese was manufactured. The word "white" or "coloured" shall be in block letters $1\frac{1}{4}$ in. in height and $\frac{1}{4}$ in. in thickness of line, and all the said numbers shall be in plain figures not less than $\frac{3}{4}$ in. nor more than 1 in. in height.

42. (1.) Before sending or allowing to be sent from his manufacturing dairy any butter or cheese, the owner of the dairy shall cause every package to be clearly and indelibly branded with his brand as registered by the Director, and with respect to such brand the following provisions shall apply: (*a.*) The brand shall consist of a die-impression, or of some other kind of approved brand, coloured as hereinafter provided. (*b.*) Such die-impression or brand shall, according to the class of dairy and the kind of produce, be in such one of the forms 5 to 10 in the Schedule hereto as is applicable: Provided that the form may be varied in such manner as is approved, but so nevertheless that the particulars specified in the form in the Schedule are clearly set out. (*c.*) The owner of every factory or private dairy shall cause each cheese manufactured therein to be, within twenty-four hours of its first removal from the cheese-hoop, clearly and indelibly branded with—(i) his registered brand by means of a stencil or rubber-stamp; and (ii) the vat-number of the cheese and the number of the day of the month on which the cheese was manufactured.

(2.) The owner of a manufacturing dairy shall in every case where branding is required by this clause use the appropriate brand so as correctly to indicate the class of dairy-produce to which it refers.

43. No person shall export, or attempt to export, or be concerned in exporting, any butter or cheese that is in packages which do not bear in clear and indelible figures the true net weight of the contents at the time of grading.

44. All branding and marking in the case of milled butter, whey butter, dairy butter, dairy cheese, or modified-milk cheese (except actual shipping-marks) shall be in red colour, and all branding in the case of other classes of dairy-produce shall be in some dark colour other than red.

National Brand.

45. Upon each end of every package containing creamery butter or full-cream factory cheese for export graded as finest or first grade shall be placed the national brand described in clause 49.

46. No person shall export or cause or permit to be exported in a package bearing the national brand any butter or cheese other than creamery butter or full-cream factory cheese graded as finest or first grade unless the national brand has been first cancelled by means of an indelible stamp-impression approximately 6 in. long and 2 in. wide and consisting of seven red bars each approximately 6 in. long and $\frac{3}{16}$ in. wide.

47. The national brand shall be used in conjunction with the marks and brands provided for in subclause (1) or (3) of clause 41, subparagraphs (*a*) and (*b*) of subclause (1) of clause 42, and clause 43.

48. The national brand shall be so placed on any package by means of an impressed die, or by some other approved means, and shall be coloured in the same manner as the brands provided for in clause 44.

49. The national brand shall consist of a design of a fernleaf, bearing the words "New Zealand," substantially in the manner shown in the form numbered 11 in the Schedule hereto.

General Prohibitions as to Branding and Marking.

50. (1.) For the purpose of this clause the branding or marking of dairy-produce shall be deemed to extend to and include the branding or marking of any package containing dairy-produce.

(2.) It shall not be lawful—(*a*) For the owner of a registered dairy to allow his registered brand to be used for the purpose of branding any dairy-produce that has been manufactured elsewhere than in his registered dairy: (*b*) for any person other than the owner of a registered dairy to use such owner's registered brand for the purpose of branding any dairy-produce that has been manufactured elsewhere than in such registered owner's dairy: (*c*) except in the case of the owner of a registered dairy, and in accordance with these regulations, for any person to brand any dairy-produce with the words, or any combination or abbreviation of the words, "New Zealand," "Creamery," "Factory," "Dairy," or "Whey": (*d*) for the owner of a registered dairy to include in his registered brand, or for any person to stamp or mark on dairy-produce for export, any words indicative of high quality, such as "Choicest," "Choice," "Superfine," or "Superior": (*e*) except as provided for in these regulations, for any person to use or cause or permit to be used any words, figures, characters, design, or other marks whatever within the outermost limits of the space occupied by the brands, words, figures, and marks other than date, vat, and churning numbers, required by these regulations to be placed upon any package containing or intended to contain dairy-produce for export.

Standard Export Butter-boxes.

51. No person, whether as principal or agent, shall, excepting with the prior written consent of the Minister, export, or pack for export, beyond New Zealand any butter except in standard boxes—that is to say, rectangular boxes complying with the following requirements: (*a*.) The inside dimensions shall be $15\frac{1}{8}$ in. long, $10\frac{1}{4}$ in. wide, and $11\frac{1}{4}$ in. deep, and the sides, tops, and bottoms shall be of timber $\frac{1}{2}$ in. in thickness; or (*b*) the inside dimensions shall be $15\frac{1}{8}$ in. long, $10\frac{5}{8}$ in. wide, and $10\frac{7}{8}$ in. deep, and the sides, tops, and bottoms shall be of timber less than $\frac{1}{2}$ in. in thickness. (*c*.) The minimum thickness of the ends of all boxes other than those of the Saranac type shall be (i) $\frac{1}{2}$ in. if of silver-beech, or (ii) $\frac{5}{8}$ in. if of timber other than silver-beech. (*d*.) The outside measurements and the binding shall be as approved. (*e*.) The ends, sides, tops, and bottoms shall be single pieces of timber; provided that matched boards, glued or lock-jointed together, shall be regarded as single pieces. (*f*.) The ends shall be planed smooth on the outside, or of veneer finish. The outer surfaces of the sides, tops, and bottoms, and the inner surfaces of the ends, shall be planed smooth, cut with a fine band-saw, or of veneer finish. (*g*.) The timber shall all be well seasoned, and free from cracks, loose knots, pockets of resin, and other defects capable of allowing the contents to suffer damage. (*h*.) No nails other than cement-coated nails shall be used. (*i*.) The outsides shall be clean.

(For Butter.)

(For Cheese.)

FORM II (REG. 49) : THE NATIONAL BRAND.

Standard Export Cheese-crates.

52. No person, whether as principal or agent, shall, excepting with the prior written consent of the Minister, export, or pack for export, beyond New Zealand any Cheddar cheese except in standard crates—that is to say, crates which (*a*) are suitable to contain two full-cream cheeses of approximately eighty pounds weight each; (*b*) have twelve sides of which each contiguous pair forms a similar angle; and (*c*) comply with the following requirements: (i.) The ends shall be of timber planed smooth on the outside, and shall, after dressing, be not less than $\frac{7}{8}$ in. thick. Each crate shall have a centre board, which shall be not less than $\frac{3}{4}$ in. thick. The ends and centre boards shall measure not less than 15 in. between each opposite pair of sides. (ii.) The sides shall be made of battens, which shall be $27\frac{1}{2}$ in. long, not less than 3 in. nor more than $3\frac{1}{4}$ in. wide, and not less than $\frac{3}{8}$ in. nor more than $\frac{1}{2}$ in. thick; the outer edges of the battens shall be chamfered. The height of the cheese shall be such as will allow of an air-space $\frac{1}{2}$ in. deep at one end of each cheese; and all cheese shall be so crated that each shall have over the whole of one of its ends an air-space of at least the aforementioned depth. Each batten shall be secured to each end board and to the centre board with cement-coated nails. (iii.) The crates shall be bound at each end and at the centre either with non-rusting wire secured with staples or with other approved binding. (iv.) The timber shall all be well seasoned, and free from cracks, loose knots, pockets of resin, and other defects capable of allowing the contents to suffer damage. (v.) One or more scale-boards shall be placed at each end of each cheese. (vi.) The outsides shall be clean.

Wrapping Butter for Export.

53. No person, whether as principal or agent, shall, excepting with the prior written consent of the Minister, export, or pack for export, beyond New Zealand any butter unless it is wrapped with two thicknesses of vegetable-parchment paper of the best quality and weighing not less than twenty-eight pounds per ream. Such parchment paper shall be free from loading with glucose or other soluble matter.

(To be continued.)

OCCUPATION AND UTILIZATION OF LAND.

THE following table summarizes the condition of occupied land in New Zealand for 1925 and 1926:—

—	1925.	1926.
	Acres.	Acres.
Orchards, market gardens, vineyards, nurseries, and seed-gardens	32,747	32,433
Crops	1,768,303	1,645,719
Area occupied by residences, outbuildings, gardens, &c.	63,206	64,872
Fallow land	124,459	135,355
Sown grasses	16,450,625	16,615,960
Phormium tenax (New Zealand flax)	54,814	57,780
Tussock and other native grasses	14,470,990	14,298,618
Fern, scrub, &c.	4,054,760	4,165,576
Plantation	71,218	88,656
Standing virgin bush	4,331,333	4,176,569
Barren and unproductive land	2,209,917	2,325,291
Totals	43,632,372	43,606,829

In this table "barren" land is defined as that which is incapable of being put to profitable use, and not merely that which is barren because unused. Types of this land are mountain-tops, cliff-faces, shingle-beds, &c. It must be recalled that this table does not profess to give the condition of all land, as the total area of the Dominion is 66,390,262 acres, whilst the area occupied in 1925 was returned as 43,632,372 acres—a difference of 22,757,890 acres.

—*Census and Statistics Office.*

LICENSED MEAT-EXPORT WORKS IN NEW ZEALAND, SEASON 1926-27.

Name and Address of Company. *Land District.*	Name and/or Location of Works	Beef-killing Capacity per Day.	Sheep-killing Capacity per Day.	Storage Capacity, in 60 lb. Carcases Mutton.
North Auckland and Auckland.				
Auckland Farmers' Freezing Company, Ltd., Auckland	Moerewa ..	200	2,000	100,000
" " "	Southdown ..	200	3,000	202,000
" " "	Horotiu* ..	200	3,000	218,000
Westfield Freezing Company, Ltd., Auckland	Westfield ..	250	3,000	205,000
R. and W. Hellaby, Ltd., Auckland	Westfield ..	120	500	3,000
Hawke's Bay.				
Thomas Borthwick and Sons (Aus.), Ltd., Christchurch ..	Pakipaki ..	30	1,800	70,000
Nelsons (N.Z.), Ltd., Tomoana	Tomoana ..	150	5,000	180,000
Hawke's Bay Farmers' Meat Company, Ltd., Hastings ..	Whakatu ..	80	4,000	80,000
Wairoa Farmers' Co-operative Meat Co., Ltd., Wairoa ..	Wairoa ..	100	3,000	165,000
Gisborne.				
Nelsons (N.Z.), Ltd., Gisborne	Waipaoa ..	150	3,500	270,000
Gisborne Sheep-farmers' Frozen Meat and Mercantile Company, Ltd., Gisborne	Kaiti ..	150	4,000	422,000
Ditto	Tokomaru Bay	60	3,000	140,000
"	Hicks Bay* ..	75	1,500	60,000
Taranaki.				
Thomas Borthwick and Sons (Aus.), Ltd.. Waitara ..	Waitara ..	200	2,000	80,000
J. A. Hutton (N.Z.), Ltd., Wellington	Eltham ..	60	..	25,000
Patea Farmers' Co-op. Freezing Company, Ltd., Patea	Patea ..	150	2,000	180,000
Wellington.				
New Zealand Refrigerating Company, Ltd., Christchurch	Imlay ..	200	6,000	271,000
Otaihape Farmers' Meat and Produce Co., Ltd., Taihape	Winiata* ..	50	1,200	90,000
Feilding Farmers' Freezing Company, Ltd., Feilding ..	Aorangi ..	100	4,000	153,500
National Mortgage and Agency Company of New Zealand, Ltd. (Head Office, Dunedin)	Longburn ..	60	2,000	100,000
Wairarapa Frozen Meat Company, Ltd., Masterton ..	Waingawa ..	120	5,000	150,000
Gear Meat Preserving and Freezing Company of New Zealand, Ltd., Wellington	Petone ..	100	10,000	300,000
J. A. Hutton (N.Z.), Ltd., Wellington	Ngahauranga ..	120	3,000	120,000
Wellington Meat Export Company, Ltd., Wellington ..	Ngahauranga ..	120	8,000	240,000
" " " ..	Kakariki* ..	100	2,000	90,000
Marlborough and Nelson.				
New Zealand Refrigerating Company, Ltd., Christchurch	Picton ..	30	2,000	30,000
Nelson Freezing Company, Ltd., Nelson	Stoke ..	30	500	50,000
Canterbury.				
Canterbury Frozen Meat and Dairy Produce Export Company, Ltd., Christchurch	Belfast ..	120	6,000	252,000
Ditto	Fairfield ..	..	4,000	100,000
"	Pareora ..	25	4,500	233,000
New Zealand Refrigerating Company, Ltd., Christchurch	Islington ..	50	7,000	375,000
" " "	Smithfield ..	50	6,000	304,000
North Canterbury Sheep-farmers' Co-operative Freezing Company, Ltd., Christchurch	Kaiapoi ..	100	4,000	222,000
Thomas Borthwick and Sons (Aus.), Ltd., Christchurch ..	Belfast ..	..	5,000	120,000
Otago.				
Waitaki Farmers' Freezing Company, Ltd., Oamaru ..	Pukeuri ..	..	3,500	230,000
New Zealand Refrigerating Company, Ltd., Christchurch	Burnside ..	50	3,500	216,000
South Otago Freezing Company, Ltd., Balclutha ..	Finegand ..	50	2,500	200,000
Southland.				
Ocean Beach Freezing-works (J. G. Ward and Co., Ltd., Managing Agents), Invercargill	Ocean Beach ..	50	2,500	110,000
Southland Frozen Meat and Produce Export Company, Ltd., Invercargill	Mataura ..	50	2,500	104,000
Ditto	Makarewa ..	120	2,500	75,000
Tait's Woodlands Meat Company, Ltd., Invercargill ..	Woodlands† ..	..	..	..
Totals	..	3,870	138,500	6,515,500

* Not operating, season 1926–27. † Canning only.

—*Live-stock Division.*

WEATHER RECORDS: JANUARY, 1927.

Dominion Meteorological Office.

GENERAL SUMMARY.

THE outstanding feature of January's weather was the heat-wave that obtained in the latter half of the month. This long, dry spell caused most parts of the Dominion to show rainfall totals well below the average for the month. The exceptions were principally owing to minor disturbances chiefly affecting certain localities. For instance, in the first week of January there were thunderstorms in parts on the 2nd and 6th, accompanied by heavy downpours; and in the same period a cyclonic disturbance passed off East Cape, bringing highly beneficial rainfall to the east coast of the North Island.

A widespread disturbance ruled between the 10th and 16th, but it was of small intensity, and accounted for more general rainfalls, especially in the west-coast and southern districts of the South Island.

The early part of the month was good for crops and growth of grass; but the warm and dry period in the latter half affected the pasturage, particularly on light land.

RAINFALL FOR JANUARY, 1927, AT REPRESENTATIVE STATIONS.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average January Rainfall.
North Island.				
	Inches.		Inches.	Inches.
Kaitaia	4·24	11	1·10	3·36
Russell	4·81	9	2·00	4·54
Whangarei	3·34	10	0·98	3·63
Auckland	1·46	9	0·36	2·66
Hamilton	1·83	9	1·06	3·94
Kawhia	1·70	7	0·62	3·37
New Plymouth	2·63	11	1·24	4·40
Riversdale, Inglewood	5·47	11	1·81	7·43
Whangamomona	3·91	9	1·24	5·82
Tairua	4·26	10	0·90	4·12
Tauranga	4·18	14	1·78	4·34
Maraehako Station, Opotiki ..	2·10	10	1·12	2·87
Gisborne	0·50	7	0·31	2·97
Taupo	0·50	3	0·27	3·46
Napier	1·54	6	0·54	3·18
Maraekakaho Station, Hastings ..	2·74	9	0·85	2·29
Taihape	3·01	10	1·21	3·28
Masterton	1·16	7	0·58	2·69
Patea	2·15	7	1·09	3·38
Wanganui	3·68	5	2·36	2·84
Foxton	1·20	9	0·42	2·30
Wellington	0·68	9	0·22	3·30
South Island.				
Westport	6·84	14	2·33	6·80
Greymouth	9·28	16	3·50	9·04
Hokitika	10·30	14	2·73	9·87
Ross	15·72	12	4·95	12·04
Arthur's Pass	15·45	10	3·66	6·75
Okuru, Westland	13·79	17	2·33	12·86
Collingwood	4·07	8	1·53	6·95
Nelson	2·18	6	1·39	2·82
Spring Creek, Blenheim	0·68	2	0·46	2·22
Tophouse	3·42	9	1·95	5·14
Hanmer Springs	2·23	8	0·80	3·77

RAINFALL FOR JANUARY, 1927—*continued.*

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average January Rainfall.
South Island—continued.				
	Inches.		Inches.	Inches.
Highfield, Waiau	1·40	4	1·08	2·84
Gore Bay	..	..	..	2·47
Christchurch	0·62	7	0·25	2·21
Timaru	0·92	7	0·40	2·30
Lambrook Station, Fairlie ..	1·28	5	0·64	2·34
Benmore Station, Clearburn ..	0·95	7	0·23	2·66
Oamaru	0·85	8	0·52	2·11
Queenstown	3·94	7	1·40	2·71
Clyde	1·29	5	0·74	1·72
Dunedin	3·18	15	1·26	3·36
Wendon	2·68	10	1·60	3·52
Gore	4·04	16	1·69	3·28
Invercargill	3·29	20	0·58	4·01
Puysegur Point	7·08	18	2·74	7·22

—*D. C. Bates, Director.*

ESTIMATED YIELDS OF WHEAT AND OATS.

THE following estimated average yields per acre of wheat and oats for the season 1926–27 have been compiled by the Government Statistician from reports furnished by Inspectors of the Department of Agriculture throughout the Dominion, and issued under date 8th February, 1927:—

District.	Wheat. Bushels per Acre.	Oats. Bushels per Acre.
North Island	32·40	38·91
Nelson	28·91	33·00
Marlborough	29·56	29·73
Canterbury	33·85	43·76
Otago	34·08	42·89
Southland	36·71	45·83
Average (estimated) for the Dominion, season 1926–27	33·92	43·86
Average (actual) for the Dominion, season 1925–26	30·44	40·14

In accordance with the above estimates, the total yield of wheat for the Dominion should be approximately 7,500,000 bushels, as against an actual yield of 4,617,041 bushels for the season 1925–26.

The percentage of oats threshed for the five seasons ending with 1925–26 was 27·40 of the total area under that crop. Assuming that a similar proportion is threshed this year, the total yield of grain should be approximately 4,900,000 bushels, as against an actual yield of 4,115,606 bushels for the season 1925–26.

CENSUS OF POULTRY, 1926.

THE usual census of poultry taken synchronously with the census of population in April, 1926, gave the following results (the figures for the preceding census of 1921 being added in parentheses for purposes of comparison): Fowls, 3,308,000 (3,492,000); ducks, 352,000 (380,000); geese, 44,000 (46,000); turkeys, 77,000 (73,000); total poultry, 3,781,000 (3,991,000). It will be seen that all classes except turkeys have decreased since 1921.

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

AGE FOR CASTRATION OF COLTS.

J. K., Te Poi :—

Would you please inform me if it makes any difference at what age a colt is castrated—say, for instance, at three to five months old or fourteen or fifteen months old? Those who advocate the latter age say it allows the animal to develop more shoulder. Is that so?

The Live-stock Division :—

The advocates for castration at the age of a year or fifteen months are correct in their view that the animal will develop more male characteristics—such as thick shoulders and a high, coarse crest—than if done as foals. Where colts are found to be ewe-necked, or otherwise badly developed, castration may be delayed for one or even two years for the purpose of allowing them to furnish up. The usual age for the operation is round about a year, this having been found to be the most practical for all purposes.

HOME-MADE BUTTER FOR LONG KEEPING.

E. QUINN, Upper Hutt :—

Would you please give me a recipe for preserving butter?

The Dairy Division :—

When home-made butter is required to be kept for a considerable time special care should be taken in the making. The cream should be fresh and sweet, or only very slightly sour. The butter should be churned to small granules, and the latter washed quite clear of buttermilk. Salt should be added at the rate of not less than ½ oz. per pound of butter. More can be added if desired, but the keeping-quality of the butter will not be enhanced by the additional salt. The butter should be stored in a cool place. The lower the temperature of the storage the longer the butter is likely to keep good.

THE GREEN CHAFER AND PASTURE.

"TANGATAROA," Ashburton :—

I would be glad to know whether the green beetles, slightly smaller than the grass-grub beetle, that abound on manuka-trees in the daytime are harmful to pastures. I have not previously seen them so numerous.

The Fields Division :—

The green beetle (*Pyronota festiva*) is a chafer, and belongs to the same group as the common grass-grub (*Odontria zealandica*). The green-beetle larvæ certainly do a considerable amount of localized damage to pasture both in wet and dry ground.

DERANGEMENT IN FILLY.

F. B., Wakanui :—

I have a well-grown two-year-old filly in good condition. About five weeks ago she began to lose control of her hind legs when walking or galloping—wobbling them sideways and very uneven. Later her front ones have gone likewise. She otherwise appears to be in good health, and has been grazing in good paddocks with plenty of clover and grass. Can you recommend any treatment?

The Live-stock Division :—

The symptoms mentioned point to a nervous derangement, the actual cause of which is difficult to indicate without seeing the filly. A practical examination is an essential factor in most such cases. The following treatment is suggested : (1) Take the filly off the paddock she is now running in ; (2) administer 1 pint of raw linseed-oil ; (3) feed 3 lb. crushed oats daily (1½ lb. each feed), adding to this a tablespoonful of salt daily ; (4) run her in another paddock—a poorer one for preference.

GRASS-SEED MIXTURE FOR THAMES DISTRICT HIGH BUSH COUNTRY.

A. F. R., Thames :—

Would you kindly suggest a grass-seed mixture for the following class of country in the Thames district : It is 2,500 ft. above sea-level, very dense bush, rather broken, and very wet all through the year, and second growth comes away very quickly. We get very poor burns, and the only grass that seems to hold at all is brown-top.

The Fields Division :—

The following mixture is advised for the country and situation stated : Perennial rye-grass, 6 lb. ; brown-top, 2 lb. ; paspalum, 3 lb. ; Danthonia pilosa, 2 lb. ; Poa pratensis, ½ lb. ; crested dogstail, 4 lb. ; Lotus major, 1 lb. ; white clover, 1 lb. ; subterranean clover, ½ lb. ; yarrow, 1 oz. : total, 20 lb. 1 oz. per acre.

FOWL-MANURE.

F. L. Foster, Lyttelton :—

Will you kindly give me some information on fowl-manure ? I am drying it, and then putting it through a bone-crusher and grinding it up fine. Would it be good for vegetables and flowers ?

The Horticulture Division :—

Fowl-manure contains a very high percentage of nitrogen and phosphates. It is a concentrate of great value in the garden, and may be used at the rate of 5 cwt. to 10 cwt. per acre (2 oz. to 4 oz. per square yard) when preparing the land ; or light dressings may be given to growing crops as required. Your method of treating it is quite correct.

COW WITH CRACKED HOOFS.

H. L. McDonald, Marton :—

I should be glad if you would give me information as to the best treatment for cracking in the hoofs of a cow. The animal has been on dry country, but the cracks seem to be spreading. No matter is being discharged.

The Live-stock Division :—

This condition usually arises through faulty secretion of the horn, resulting in brittleness of the hoof. We would advise you to apply a little of the following dressing to the feet twice a week : Mutton-fat, one part ; Burgundy pitch, one part ; tar, two parts. Melt the fat and pitch over a slow fire, then add the tar, and mix thoroughly.

Share System in Dairying.—The share system in New Zealand (states the Census and Statistics Office) is practically analogous to the system of *metayage*, which is common in some countries. Holdings worked on the share system are treated in the agricultural and pastoral statistics as if leased by the share worker. In New Zealand the owner provides land, stock, and implements, the share worker supplying the labour and receiving a definite proportion of the product of his labour.

FAIR PACKING OF FRUIT AND VEGETABLES.

THE regulations relating to the packing of strawberries, loganberries, raspberries, and cherries for sale, gazetted, on 12th September, 1924, were revoked, and the following more comprehensive regulations issued in their place, by Order in Council gazetted on 20th January, 1927—on which date they came into force :—

1. For the purposes of these regulations, unless the context otherwise requires, " fruit " means the unmanufactured edible product of any orchard or garden plant, and includes potatoes, onions, tomatoes, and all other vegetables.

2. All fruit sold, or offered or exposed for sale, whether wholesale or retail, in a container shall be packed in such a manner that any fruit exposed to view, or that would be exposed to view if the container were opened in the normal manner, fairly represents in size, maturity, and condition the whole contents of the container.

3. All strawberries, loganberries, raspberries, or cherries sold, or offered or exposed for sale, in containers of a capacity not exceeding 3 lb. net weight of the fruit contained therein shall be so packed that the container is full of fruit.

4. Nothing in these regulations shall be held to prohibit " facing "—that is to say, the methodical arrangement of the individual fruits that are exposed to view in a container—provided the requirements of clause 2 hereof are complied with.

5. Every person commits an offence against the Orchard and Garden Diseases Act, 1908, who directly or indirectly, by himself, his servant, or agent, fails faithfully to observe and perform any duty or obligation imposed on him by this Order in Council, and is liable to a fine not exceeding £20.

FORESTRY LEAGUE COMPETITION FOR JUVENILES.

THE New Zealand Forestry League is again offering prizes for collections of the foliage, flowers, and fruit of native trees, for boys and girls (1) over twelve and under sixteen years, (2) under twelve years : three prizes in each class. Specimens are to be of not less than twelve different trees and twenty different shrubs, and must have been collected since July, 1926. All collections of merit will be exhibited at the annual meeting of the League. Collections must reach the Secretary, New Zealand Forestry League, Dominion Farmers' Institute, Wellington, on or before 11th June next. All particulars of prizes, conditions, &c., may be obtained from the Secretary.

BOOKS RECEIVED.

AGRICULTURAL RESEARCH IN 1925. Published by the Royal Agricultural Society of England, 16 Bedford Square, London W.C. 1. 2s. 6d.

PLANT NUTRITION AND CROP PRODUCTION. By Sir John Russell. University of California Press, Berkeley, U.S.A. $ 2·50.

THE INDIVIDUALITY OF THE PIG. By Robert Morrison. John Murray, Albemarle Street, London W. 1. 7s. 6d.

NEW ZEALAND OFFICIAL YEAR-BOOK, 1927. Compiled in the Census and Statistics Office. Government Printer, Wellington. 7s. 6d.

NATIVE DIET. By Ettie A. Rout ; with preface by Sir W. Arbuthnot Lane, President of the New Health Society. Wm. Heinemann (Medical Books), Ltd., 20 Bedford Street, London W.C. 2. 6s.

Rabbit Districts.—An Order in Council gazetted on 13th January declared Part III of the Rabbit Nuisance Act to be no longer in operation in the Kahuwera Rabbit District.

Honey-grading Ports.—New Plymouth has been substituted for Wanganui on the list of export honey-grading ports.

CONTROL OF DOWNY MILDEW AND PHYLLOXERA IN VINES.

THE following regulations under the Orchard and Garden Diseases Act were gazetted on 13th January, 1927, and came into force on that date:—

1. For the purposes of these regulations, unless inconsistent with the context, "Inspector" means any Inspector appointed under the Orchard and Garden Diseases Act, 1908; "prescribed area" means all that portion of New Zealand comprising the counties of Eden, Waitemata, Rodney, Otamatea, Hobson, Whangarei, Bay of Islands, Hokianga, Whangaroa, and Mongonui, and all boroughs and town districts enclosed by or adjacent to the said counties, or any of them; "vine" means any vine of the genus *vitis*, and any portion thereof excepting the fruit; "fungus" means the fungus known as downy mildew; "insect" means the insect known as phylloxera vastatrix.

2. No person shall remove any vine, fungus, or insect from any portion of the prescribed area to any other portion of New Zealand.

3. No person shall remove any vine bearing fruit, leaves, or immature wood, or which has earth adhering to its roots, or any fungus or insect, from any portion of the prescribed area to any other portion thereof: Provided that the provisions of this clause shall not be held to prohibit the removal of vines within the boundaries of the property on which they are growing.

4. No person shall remove any vine from that portion of the prescribed area comprising Waitemata County to any other portion of the prescribed area, unless accompanied by a certificate signed by an Inspector declaring that such vine has been disinfected as directed by him and to his satisfaction.

5. Nothing in these regulations shall be deemed to apply to an Inspector in respect to his sending any vine, fungus, or insect beyond the boundaries of the prescribed area for the purpose of the identification of disease.

6. Every person commits an offence against the above-mentioned Act who directly or indirectly, by himself, his servant, or agent, fails faithfully to observe and perform any duty or obligation imposed on him by this Order in Council, and is liable to a fine not exceeding twenty pounds.

APPLE-PACKS FOR CANADIAN STANDARD CASE.

THE Canadian type of standard bushel case having been adopted under this season's Fruit-export Regulations, the following apple-packing specifications are printed for the guidance of packers:—

Style of Pack (cross-wise).	Number in Rows (length-wise).	Number of Layers (Depth).	Size or Count.	Approximate Sizes.	Style of Pack (cross-wise).	Number in Rows (length-wise).	Number of Layers (Depth).	Size or Count.	Approximate Sizes.
2—1	4—4	3	36	4″	3—2	5—4	5	113	2 7/8″
2—1	5—4	3	41	4″	3—2	5—5	5	125	2 3/4″
2—2	3—3	4	48	3 7/8″	3—2	6—5	5	138	2 3/4″
2—2	4—3	4	56	3 3/4″	3—2	6—6	5	150	2 5/8″
2—2	4—4	4	64	3 5/8″	3—2	7—6	5	163	2 5/8″
2—2	5—4	4	72	3 1/2″	3—2	7—7	*c*5	175	2 1/2″
2—2	5—5	4	80	3 3/8″	3—3	5—5	*d*6	180	2 1/2″
2—2	6—5	*a*4	88	3 1/2″	3—3	6—5	6	198	2 3/8″
3—2	4—3	*b*5	88	3 1/4″	3—3	6—6	6	216	2 1/8″
2—2	6—6	*a*4	96	3″	3—3	7—6	6	234	2 1/4″
3—2	4—4	5	100	3″	3—3	7—7	6	252	2 1/4″

a, for flat apples; *b*, for long apples; *c*, flat apples only; *d*, all apples.

—*Horticulture Division.*

COLLECTION OF AGRICULTURAL STATISTICS IN NEW ZEALAND.

THE method of collection of agricultural statistics in the Dominion is described by the Census and Statistics Office as under :—

The system used for the collection of the primary data exists in the police organization, the number of constables or other officers employed being over 270. Sub-enumerators are required to make personal visits to all holdings in their respective districts, except where a whole day or a considerable part thereof would be occupied in visiting a single holding : in this case a schedule may be posted to the farmer, and the information obtained in that way. When, on the visit of the sub-enumerator, the occupier is absent, a schedule may be left, and either called for later or posted to the sub-enumerator. Considerably fewer than 20 per cent. of the holdings are enumerated on schedules.

The complete service of statistical information on agricultural and pastoral matters made available through the Census and Statistics Office is briefly outlined as follows :—

In the spring (September) information regarding wheat, oats, and potatoes sown or intended to be sown in the season then commencing is obtained from all farmers who grew wheat, oats, or potatoes during the previous season. This information is published in the *New Zealand Gazette* about the end of October.

The carry-over of wheat and oats, as at the end of November, is ascertained by a postal inquiry from millers, merchants, and farmers. This information is also gazetted.

At the end of January estimated average yields per acre are obtained from Stock Inspectors of the Department of Agriculture, and on this basis an estimated total yield of wheat and oats is compiled and published in the *New Zealand Gazette* early in February. For potatoes no actual estimate is obtained, the yield per acre being assessed at the average for the five preceding seasons.

Commencing in February, a complete canvass of farmers is made by the police throughout the Dominion, and as soon as the collection has advanced to a reasonable stage some brief abstract of the information collected is published either in the *New Zealand Gazette* or in the "Monthly Abstract of Statistics," estimates being made for portions of districts outstanding. The final figures are published in the Annual Statistical Report on Agricultural and Pastoral Production.

In the case of potatoes and linseed, which are largely unharvested at the time of the sub-enumerator's visit, a system of post-harvest verification is employed.

As regards wheat and oats, the progress of the harvest can be followed by means of information collected from threshing-mill owners throughout the Dominion, results being published each month in the "Monthly Abstract of Statistics." The final figures obtained in this way are, however, always slightly below the total yields of wheat and oats disclosed by the personal canvass referred to above.

FORTHCOMING AGRICULTURAL SHOWS.

Marton A. and P. Association : Marton, 23rd February.
Waiapu P. and I. Association : Ruatorea, 23rd February (Pastoral Show).
North Kaipara Agricultural Association : Paparoa, 25th February.
Franklin A. and P. Association : Pukekohe, 25th and 26th February.
Waikato Central Agricultural Association : Cambridge, 2nd and 3rd March.
Mongonui County A. and P. Association : Kaitaia, 5th March.
Opotiki A. and P. Association : Opotiki, 8th March.
Morrinsville A., P., and H. Society : Morrinsville, 9th March.
Amuri A. and P. Association : Waiau, 9th March.
Taranaki Metropolitan Agricultural Society : New Plymouth, 9th March.
King Country Central A. and P. Association : Te Kuiti, 10th March.
Mayfield A. and P. Association : Mayfield, 19th March.
Rotorua A. and P. Association : Rotorua, 23rd March.
Methven A. and P. Association : Methven, 25th March.
Temuka and Geraldine A. and P. Association : Geraldine, 31st March.
Mackenzie County A. and P. Society : Fairlie, 18th April.