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MINERAL CONTENT OF PASTURES.

PROGRESS OF THE NEW ZEALAND INVESTIGATION.

(Continued.)

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THE first article of this series gave the results of analyses of certain red-clover samples taken from differing types of pumice sands and loams in Rotorua County (see last month's *Journal*, p. 22). In the present article the samples of white clovers and cocksfoots taken from the same lands are given. In order to save space and to enable the results to be seen at a glance the figures have been averaged, and the averages given in the first article for red clovers are assembled and repeated.

WHITE CLOVERS.

In white clover there is no tendency to produce a woody stem, and one would expect in this species less variation in the chemical composition due to the stage of growth than would occur in the other species (red clover) or in the grass (cocksfoot). There is, however, greater difficulty in securing samples of white clover free from earthy contamination, due to the lower-growing habit of the plant, than is the case with the taller-growing red clover. Some analyses of samples from external soil provinces are inserted for comparison.

The analyses do not show that there is any considerable increase in the phosphoric-acid content due to artificial manuring with phosphates, but this may be owing to the meagre amount of manuring practised in the district under review. In the case of calcium oxide (lime) there appear to be important differences. In the samples from external loams (Gisborne) the lime content is higher than is usually found in the Rotorua lands, and in the case of the Himitangi land, which is very low in phosphoric acid and high in calcium carbonate, the white clover shows a similar correspondence in its content of those constituents. The Gisborne and Otago Central (Ranfurly) lands may be reckoned as naturally among the richest in New Zealand, and the samples from these districts are high in phosphoric acid and calcium.

As shown in the previous article, the amount of iron found in the samples from the coarser types of soil—the fine gravelly sand of Kaharoa and the coarse sand of Ngongotaha—is much lower than in

the samples collected from the finer soils—the sandy loam of Oturoa and the calcareous sandy loam of Te Ngae. Generally speaking, the amounts of phosphoric acid are similar in samples from all types of soils, but the calcium content varies more widely. The results of analyses have again been classified under the headings of "contaminated" and "uncontaminated" samples.

There appears to be this anomaly in the analysis of pasture plants from the Rotorua and adjoining counties: that although the lakeside paddocks at Ngongotaha, which are a recognized sanatorium for bush-sick stock, are composed of coarse sandy soils, they are looked upon as absolutely healthy for stock, and there is no reason to doubt this local tradition. The iron, phosphoric acid, and calcium contents of the pasture plants are apparently little different from those of the most unhealthy country. There is one element, however, which appears to be present in abnormally high amount in the lakeside pastures, and that is manganese. The writer drew attention to the possible influence of manganese compounds on plant-life in 1912 (this *Journal*, Vol. 5, p. 123), and wrote: "The effect of manganese compounds on plant-life is one of the puzzles of agricultural chemistry. Analyses of the affected soils and grass from them have shown that manganese is present in amounts greater than in ordinary soils and grasses. It may be detected in aqueous extract of the soil filtered through porcelain and in citric-acid extracts ('available plant food') of pumice soils in very variable amounts." Manganese—there is ample evidence from other countries—may be either injurious or beneficial to the growth of plants. In the case of the unhealthy pumice lands it may be positively beneficial.

Thus in the white-clover and cocksfoot samples analysed the averages for manganese and iron are as follows:—

White Clovers.

	Mn_3O_4.	Fe_2O_3.		Mn_3O_4.	Fe_2O_3.
Ngongotaha (lakeside only)	0·020	0·010	Oturoa	0·015	0·017
Te Ngae	0·009	0·017	Kapakapa	0·011	0·012

NOTE.—Of these, the Te Ngae, Oturoa, and Ngongotaha lakeside lands are undoubtedly free from the trouble, and Kapakapa is the most "bush sick" of all lands.

Cocksfoots.

	Mn_3O_4.	Fe_2O_3.		Mn_3O_4.	Fe_2O_3.
Ngongotaha (lakeside only)	0·057	0·014	Oturoa	0·028	0·017
Te Ngae	0·021	0·017	Kaharoa	0·048	0·014
External lands—			Mamaku	0·034	0·014
Karori	0·015	0·029	Kapakapa	0·030	0·013
Te Kauwhata ..	0·027	0·034			

NOTE.—Te Kauwhata soil contains much maganese.

In the red clovers from the lakeside there are only contaminated samples, but an inspection of the figures will show that they tend in the same directions as do those of the uncontaminated samples of white clover and cocksfoot. It therefore appears that the manganese by its action in the digestive tract may be enabling the small amount of iron in the pasture to be economized by the animal. With this exception, it would appear that, as with the red clovers, the healthier the land the more iron there is to be found in the white clover growing upon it.

Table 3.—Analyses of Red Clovers (averaged).

The figures are percentages on the material dried to constant weight on water bath.

Number of Samples averaged.	Ash.	CO_2.	SiO_2.	Fe_2O_3.	P_2O_5.	CaO.	MgO.	Mn_3O_4.	N.	Al_2O_3.	Type of Soil.	Locality.
						Uncontaminated and Unmanured.						
7	9·40	1·97	0·11	0·011	0·63	1·92	0·70	0·012	3·43	0·020	Sandy silt and coarser	Mamaku, Kaharoa, Ngongotaha Mountain.
3	8·90	1·77	0·18	0·016	0·73	1·99	0·75	0·008	3·98	0·025	Coarse sand ..	Ngongotaha streamside.
1	10·69	1·84	0·21	0·021	0·88	2·01	0·70	0·012	4·74	0·030	Calcareous sandy loam	Te Ngae Road.
4	9·68	1·66	0·15	0·014	0·74	1·76	0·59	0·015	2·96	0·022	Sandy loam ..	Oturoa.
						Uncontaminated and Manured.						
3	10·21	..	0·13	0·024	0·81	2·62	0·82	0·014	4·56	0·033	Sandy silt	Mamaku.
2	..	..	0·16	0·013	0·83	1·97	..	0·016	..	..	..	Reporoa.
1	10·09	..	0·16	0·017	0·79	2·06	..	0·009	..	0·029	Silt loam	Turakina.
						Contaminated and Unmanured.						
3	9·22	1·21	0·51	0·024	0·79	1·37	0·93	0·016	..	0·042	Fine gravelly sand ..	Kaharoa and Kapakapa.
7	9·56	1·63	0·25	0·016	0·81	1·76	0·57	0·015	4·23	0·051	Sandy silt	Mamaku.
3	10·31	..	0·42	0·019	0·87	1·71	0·80	0·033	..	0·036	Coarse sand ..	Ngongotaha lakeside.
3	10·49	1·85	0·52	0·027	0·77	2·05	0·67	0·015	..	..	Calcareous sandy loam	Te Ngae Road.
2	12·08	2·69	0·18	0·019	0·68	2·35	0·74	0·017	..	0·044	Sandy loam ..	Oturoa.

Table 4.—Analyses of White Clovers (averaged).

The figures are percentages on the material dried to constant weight on water bath.

Number of Samples averaged.	Ash.	CO_2.	SiO_2.	Fe_2O_3.	P_2O_5.	CaO.	MgO.	Mn_3O_4.	N.	Fusion Al_2O_3.	Al_2O_3.	Type of Soil.	Locality.
							Uncontaminated and Unmanured.						
3	8·78	1·50	0·16	0·012	0·78	1·98	0·54	0·011	4·26	0·017	..	Fine gravelly sand ..	Kapakapa Road, Kaharoa.
4	10·94	1·99	0·21	0·017	0·69	1·66	0·60	0·009	4·15	..	0·021	Calcareous sandy loam	Te Ngae.
5	10·19	1·79	0·23	0·017	0·85	1·75	0·50	0·015	..	..	0·021	Sandy loam ..	Oturoa.
2	8·72	1·28	0·19	0·010	0·80	1·30	0·62	0·020	..	..	..	Coarse sand ..	Ngongotaha lakeside.
							Uncontaminated and Manured.						
4	9·49	1·29	0·15	0·018	1·09	2·06	0·52	0·019	..	0·013	0·026	Sandy silt	Mamaku Demonstration Farm.
3	9·75	..	0·22	0·021	0·85	1·77	0·66	0·013	..	0·013	..	Sandy silt	Rotorua and Ngongotaha.
							Contaminated and Manured.						
7	9·97	1·25	0·37	0·026	0·93	1·80	0·51	0·010	..	0·045	..	Various pumice types	Oturoa, Rotoma, Mamaku, Rotorua, Kaingaroa Plains, Ngongotaha.
3	9·48	1·01	0·36	0·028	1·10	1·50	0·67	0·014	..	..	0·046	Sandy	Omanawa.
3	11·38	1·70	0·39	0·033	0·77	1·86	0·60	..	..	0·045	..	Calcareous sandy loam	Te Ngae.
4	11·08	1·47	0·41	0·034	0·86	1·52	0·73	0·009	..	0·034	..	..	Pahiatua and Turakina (external samples).
							Contaminated and Unmanured.						
8	10·76	1·77	0·31	0·028	0·84	1·88	0·64	0·030	4·25	0·028	0·051	Coarse sand ..	Ngongotaha.
3	9·38	1·49	0·29	0·020	0·76	1·71	0·50	0·016	..	0·051	..	Sandy loam ..	Oturoa.
6	11·01	1·56	0·27	0·029	1·01	1·90	0·57	0·018	..	0·036	..	Sandy silt	Mamaku.
4	10·15	1·41	0·45	0·027	0·96	1·57	0·67	0·009	..	..	0·057	..	Te Ngae and Wairoa.
6	9·98	1·43	0·30	0·019	0·91	1·90	0·61	0·011	..	0·025	..	Fine gravelly sand ..	Kapakapa Road, Kaharoa, and Te Pu.
2	12·18	1·65	0·43	0·028	1·05	2·26	0·52	0·020	..	0·033	..	Loam	Gisborne.
2	..	..	0·86	0·032	1·03	2·01	..	..	..	..	0·072	Silt	Ranfurly.
8	10·98	1·55	0·53	0·057	0·91	1·68	0·61	0·006	3·36	0·072	0·133	Loam	Karori.
1	12·15	1·88	0·33	0·037	0·89	1·64	0·59	0·009	4·29	..	0·034	Sandy loam ..	Ohakune.
1	9·22	1·54	0·19	0·020	0·61	2·20	0·58	0·012	..	0·005	0·041	Dune coarse sand ..	Himitangi.*

External samples.

* Uncontaminated sample.

The small amount of improvement in the phosphate content of the white clover manured with phosphate is a matter which calls for attention. It may be that the grasses are the pasture components which are more extensively altered in their mineral content by manuring, and that the clovers are always of fairly uniform composition in this respect. The matter will be more suitably discussed when the analyses of the cocksfoot samples are considered.

It will be observed that as yet no attempt has been made to lay down definite standards to distinguish contaminated from uncontaminated samples, and the writer considers it unwise to fix such standards until the results of a larger number of samples have been accumulated over more than one season, and, if possible, from a series of soil types and soil provinces. At present each sample is judged on its merits.

The amount of silica will certainly need to be determined separately for the grasses and for the clovers, as there is no doubt that this constituent is taken up in greatly differing amounts under normal conditions by the two families *Gramineæ* and *Leguminosæ*. With regard to alumina, this may also be taken up in very different amounts by these two families. In water cultures McLean and Gilbert (*Soil Science*, Sept., 1927, Vol. 24, p. 163) found that rye-plants absorbed 0·05 per cent. aluminium, which is equivalent to 0·95 per cent. aluminium oxide (Al_2O_3). This is possibly higher than usual, as the cocksfoots grown in soil (not water), which are considered uncontaminated in these articles, have not a higher alumina content than 0·05 per cent. Al_2O_3 approximately. Stoklasa considers that plants in moist places absorb aluminium more freely than do plants ordinarily. This authority found 0·01 per cent. Al_2O_3 in the above-ground portion of cocksfoot in dry situations and 0·016 per cent. in wet situations (*Jour. Agric. Science*, Vol. 16, p. 337).

Some work of McCarrison (*Ind. Jour. Med. Research*, No. 14, 1927, p. 641) opens up a new field for investigation. It appears that rats fed on rice and wheat, when an *ad libitum* basal diet was also given, showed differences which were in part attributed to the greater manganese content of the wheat, which contained an amount four times greater than that of the rice. This was tested by adding manganese to the rations. The conclusion appears to be justified that concentrations of manganese of the higher order (1 in 12,600 of food) were harmful to the animal organism, while concentrations of the lower order (1 in 617,700) were beneficial; and since a diet containing a fair proportion of whole wheat provides a concentration of the lower order, it may be concluded that the growth-promoting properties of whole wheat are in part due to the content of manganese in this cereal.*

There are now several biochemists studying the influence of manganese in the diet on animal-growth, and it affords a most fascinating field for study.

COCKSFOOTS.

The great difference in the chemical composition of the ash of grasses compared with clovers is now seen to be the silica content, which is very high in the grasses, and almost absent in the clovers,

* A possible explanation of the fact that in the feeding of penned fowls wheat cannot be substituted by many other obtainable foods may be the beneficial influence of manganese in the wheat.

Table 5.—Analyses of Cocksfoots (averaged).

The figures are percentages on the material dried to constant weight on water bath.

Number of Samples averaged.	Ash.	SiO_2.	Fe_2O_3.	P_2O_5.	CaO.	MgO.	Mn_3O_4.	N.	Fusion Al_2O_3.	Al_2O_3.	Type of Soil.	Locality.
						Uncontaminated and Unmanured.						
8	10·72	2·55	0·014	0·46	0·50	0·43	0·034	..	..	0·043	Fine gravelly sand ..	Te Pu, Kaharoa, Kapakapa.
11	10·27	2·26	0·014	0·50	0·46	0·40	0·034	..	..	..	Sandy silt	Mamaku.
3	10·90	2·36	0·014	0·65	0·44	0·41	0·042	..	..	..	Coarse sand ..	Ngongotaha lakeside and stream-side.
7	11·30	2·91	0·019	0·61	0·52	0·53	0·028	..	..	..	Sandy loam ..	Oturoa.
6	10·83	3·42	0·017	0·53	0·43	..	0·021	..	0·030	0·019	Calcareous sandy loam	Te Ngae Road.
1	10·88	3·00	0·034	..	0·38	0·42	0·027	..	..	..	Clay loam ..	Te Kauwhata } External dis-
3	10·74	1·82	0·029	0·70	0·40	0·48	0·015	..	0·028	0·034	Loam	Karori } tricts.
						Uncontaminated and Manured.						
10	11·12	2·59	0·020	0·87	0·64	0·46	0·031	..	..	..	Various pumice soils	Omanawa, Kaharoa, Rotorua.
						Contaminated and Unmanured.						
1	13·16	5·30	0·042	0·44	0·46	..	0·016	..	0·027	0·061	Calcareous sandy loam	Te Ngae (washed).
1	13·54	5·40	0·046	0·47	0·41	..	0·017	..	0·145	0·095	Calcareous sandy loam	Te Ngae (same sample as above, but not washed).
4	10·39	2·94	0·012	0·50	0·33	..	0·026	..	..	..	Sandy silt	Tauranga and Omanawa.
2	12·15	2·53	0·021	0·87	0·73	0·46	0·023	..	0·052	0·082	Sandy silt and coarser	Mamaku and Kapakapa Road.
5	10·90	3·26	0·017	0·62	0·62	0·41	0·027	..	..	..	Coarse sand ..	Ngongotaha lakeside and Mokoia Island.
4	12·90	3·16	0·017	0·50	0·80	0·44	..	..	..	..	Calcareous sandy loam	Te Ngae.
1	14·50	3·04	0·074	1·13	0·47	..	0·023	..	0·045	0·122	Loam	Karori (external district).

NOTE.—In the case of the cocksfoots the residue of the ash, insoluble in hydrochloric acid, has been fused with sodic carbonate to obtain the silica in the pure state.

—Analyses by B. C. Aston and I. Cunningham.

except when present as an earthy contamination. There is also the difference that there is much less phosphoric acid and lime in a grass than in a clover. This refers to the immature plant as eaten by stock from unmanured land. The average phosphoric acid in the cocksfoot samples from the pumice soil-province unmanured lands is from 0·46 to 0·65 per cent., whereas in paddocks top-dressed with phosphate the average phosphoric acid content of the samples is 0·87 per cent.

This seems to indicate that greater change in the composition of the grass than in that of the clover of a pasture is effected by manuring. As with the clovers, the iron content of the samples is always greater, with one exception, on the healthy than on the unhealthy land.

The outstanding results of the analyses of fodder plants from the pumice lands is that the percentage of iron in the plants is always much lower on the unmanured lands than on similar lands from the external districts, where the plants are not growing on soils recently derived from rhyolite. In the case of silica, uncontaminated samples seem to be higher in this constituent than plants growing in non-pumice soils.

SUMMARY.

There seems to be a very large area of country producing in the untreated pasture red and white clover and cocksfoot-grass having a very low iron content compared with outside country on soil not recently derived from rhyolite. This information is gained from practical experience of samples collected and analysed from the respective districts. The literature which is available, and which gives analyses of the plant staples mentioned grown in other countries, also supports the contention of abnormally low iron content of the pumice-land pasture staples. In comparing the analyses of the samples from healthy and unhealthy country in Rotorua County from land not artificially dressed with fertilizers, only one exception is found to the rule that the high iron content is found in healthier country and low iron content in unhealthier country. In regard to this exception it

Table 6.—Pasture Staples in Order of Freedom from Deficiency Disease.

Type of Soil.	Red Clovers.		White Clovers.		Cooksfoots.	
	Number of Samples.	Fe_2O_3 (P.p.M.).	Number of Samples.	Fe_2O_3 (P.p.M.).	Number of Samples.	Fe_2O_3 (P.p.M.).
Fine gravelly sand, unhealthy for all ruminant stock	7	110	3	120	8	140
Sandy silt, unhealthy for all ruminant stock	..	..	..	..	11	140
Sandy loam, healthy for cattle after top-dressing	4	140	5	170	7	190
Coarse sand, healthy without top-dressing*	3	160	2	100	3	140
Calcareous sandy loam, perfectly healthy for sheep and cattle	1	210	4	170	6	170
External district loams, quite healthy	..	..	1	200	3	290
External district loams, quite healthy	..	..	..	..	1	340

* Position anomalous, see explanation.

is suggested that some secondary influence, probably manganese, is rendering the herbage healthy.

In Table 6 the three staples are arranged according to the localities whence they came, in the order of relative freedom from deficiency disease (iron-starvation), beginning with the least healthy and ending with the most healthy. In order to avoid decimals the results (averages) are stated in parts per million. In the cases both of the white clovers and the cocksfoots there is ample evidence that from artificial manuring with phosphate alone, and with phosphate and iron, the iron content of the plants has been greatly increased.

(To be continued.)

THE FEEDING OF LIVE-STOCK.

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II. UTILIZATION OF NUTRIENTS.

A GREAT number of complex processes are involved in the nutrition of stock during the assimilation of the foodstuffs digested by the animal. These processes will be dealt with here under two heads—maintenance and production. By maintenance is meant the keeping of an animal on a constant plane—neither gaining nor losing, but simply replacing tissues which have been used or depleted. By production, on the other hand, is meant work, fattening, growth of frame, milk-yield, wool, and so on. These definitions may not be scientifically accurate, but from the practical standpoint of animal-feeding they define the two heads completely.

FATTENING.

Fattening is an easily recognized process, being merely the conversion of farm food-products into fat. So far as the dairy-farmer is concerned, this process applies more to pigs than to the dairy stock. But the dairy stock should be brought up into good condition before calving. If this is done the cow has every chance of doing well, and if she should be of a deep-milking strain she will utilize her condition and even more, for she will even draw on her body reserves. This is a peculiarity of the dairy cow which cannot be overlooked—the fact that she will produce milk although she is not being fed sufficiently, doing so at the expense of her own body.

Fattening may take place at any age, especially if the foods be of a fattening nature and fed in liberal amounts. It goes on most rapidly after maturity, when there is a greater surplus of food materials available after the maintenance requirements of the body have been met. Fattening, therefore, in the main is determined by the amount of food which the animal can digest in excess of that required for growth and production, such as milk or wool.

GROWTH.

The importance of growth is not always well realized. It is one of the most essential points in animal husbandry to feed the young stock well, and allow them to develop. Too many failures in the dairy herd can be attributed to this cause, the young animals being poorly fed while in their youth—say, up to the end of their first lactation. In the case of pigs this often occurs after weaning until fattening commences. Heifers in calf especially must be well fed, for they are growing themselves and developing a fœtus at the same time, and when the calf is born they are milking. These functions cause a very severe strain, and must therefore be supported by liberal feeding. It is impossible for heifers and young cows to grow and produce milk on a small food-supply, and it is no economy to stint them at this age. Certainly one sometimes finds very good milkers which were not well fed in their youth, but their output is at the expense of growth. If they had been properly developed they would have been deeper and more economical producers. An inherent ability to milk will always show.

Growth takes place from birth to maturity, and consists essentially in an increase in the protein tissues of the body and the bone-structure. Developing at the same time is an accumulation of body-fat, which will vary according to the type of food eaten. Flesh-production may be modified by food to a limited extent, but it appears to be mainly a function of the animal, being determined by breed and individuality. Growth is most active in the young, and diminishes as the animal grows older, until at maturity it practically ceases.

FŒTAL DEVELOPMENT.

The exact food requirements of pregnant stock are not known. But if the mother is not well fed she will nourish the fœtus at the expense of her own body. This will reflect adversely, of course, on her milk-supply—resulting, with pigs, in a poor litter at weaning-time, and, with the dairy cow, in poor production.

MILK-PRODUCTION.

By this is meant the production of the dairy cow for the food supplied to her. It is not sufficient to merely maintain her; it is from the extra food eaten that the returns of the farm are going to come. Specially important is it that food be given in accordance with production. There is no more efficient converter of food into milk than a deep-milking cow. Milk-production gives the greatest returns in value from an economical point of view. Why it should be so—the physiological reason—is not yet known, but the fact remains. It is easy to understand why nature makes milk-production an economical process, but it is difficult to know how it is done.

The principal factors which influence the amount and quality of a cow's milk are breed, individuality, age, frequency of milking, condition, excitement, climatic conditions, and the amount and kind of food. Only a few remarks are required to explain these factors, but two will be taken—namely, condition, and the amount and kind of food. The physical conditions as mentioned influence the

quality and quantity of the secretion of cow's milk. An animal in good condition will give more milk, and of better quality, than an animal in poor condition. It has been shown that cows in good condition after parturition will give richer milk throughout the lactation than those which are in poor condition at its commencement.

Influence of Food on Quality of Milk.

Until quite recently the general opinion of the majority of dairy-farmers was that the feed influenced the quality of the secretion. This is not so. Provided the cow receives sufficient food to maintain her weight, no increase of food will influence the quality of her milk. No single food or combination of foods can alter quality if, to start with, the animal is receiving sufficient to meet her requirements. Certainly, if underfed cows are given a liberal ration they will respond to such treatment; the ration, if carrying a liberal supply of protein, will stimulate any cow to the maximum of productivity. But no amount of feeding, however rich and liberal, will alter the composition of, say, Friesian-breed milk to that of Jersey milk in test. This, of course, does not mean total butterfat, but butterfat percentage.

Influence on Quantity of Milk.

The food consumed influences very markedly the quantity of milk secreted by a cow. The food is the all-important factor in the management of the dairy cow, and it is the dairy-farmer's business to provide her with the quantity and quality she requires so that he will receive her maximum production. Heavy eaters of dairy type are those which give the largest yields most economically. In a test which was made the heavy producers returned 52 per cent. over cost of production, while the poor producers returned only 20 per cent.

Great variations, it will be realized, arise in individuals in the matter of economical use of food, but the phenomenon previously alluded to holds good. Any cow, of no matter what dairy breed, will produce milk even although she is not being supplied with the necessary food. This point has already been stressed and is here repeated, for it would seem to be ignored, or possibly not sufficiently recognized, by farmers who do not pay sufficient attention to subsidiary feeding during the periods of poor grazing. If a cow produces at the expense of her own body, this loss must be replaced at once if possible, but the endeavour should be never to let the loss occur at all. If the cow does suffer in condition through a heavy lactation and it is not possible to guard against it at the time, then judicious and heavy feeding should be practised when supplementary crops are available.

Experience is going to show that these depletions, due to deep milking, are a very important causative factor in the many ailments now affecting our dairy herds. The necessary feeding does not mean only those substances already described as the protein, carbohydrates, and fats, but also the minerals, such as calcium, phosphorus, and potash. Just as these are essential to the pasture—as experience has taught—so are they essential to live-stock. Investigators, for instance, now find that as the calcium content of the blood is reduced the incidence of milk-fever increases, and *vice versa*. The heavy-milking dairy cow must have complete and sufficient feeding.

Again, how often is it told that a certain sow is an extremely fine mother because her litter pulls her down extremely in condition. But if this can be regarded as proof of her quality it certainly can be taken as proof of the owner's inability to realize his duty to such a sow. Where litters are taken off the breeding-sow once a year the damage done by such management will not be so readily detected, but where the breeding is done twice yearly it very soon results in small litters, too high a percentage of deaths before weaning, and sterility in the sow. If strong healthy piglings are to be weaned regularly, then the sow must be well treated and kept in good breeding condition, neither too fat nor too thin. This means liberal feeding and a plentiful supply of good drinking-water, together with room for plenty of exercise.

VALUE OF NUTRIENTS.

It is essential, before proceeding further, to discuss some standard whereby the values of the nutritive materials in a food may be compared.

Digestibility: It is common knowledge that all the food consumed by stock is not utilized by them for sustenance and production. As the food passes through the digestive tract a certain portion of it is prepared by the animal for assimilation. That is known as the digestible portion, and is chiefly composed of digestible protein, carbohydrate, and fat. It is this portion which is of feeding and producing value to the animal fed; and when considering the food eaten by an animal it is the digestible portion which most concerns the farmer. Each type of food used is generally digested in similar quantities within close limits. For convenience this quantity digested for each particular food is referred to as the "coefficient of digestibility." So far as average farm crops are concerned, no great differences exist in the digestibility of the respective foods.

Digestible carbohydrate equivalent: The energy-giving portion of a ration has been described already as the carbohydrates and the fats. For convenience these two substances have been grouped together, and allowance made for the fat to contain two to three times as much energy as a similar quantity of starchy matter. This is calculated, of course, on the digestibility of the carbohydrates.

Total digestible nutrients: The meaning of this term should be obvious. It is the value of the digestible protein when added to the digestible carbohydrate equivalent.

Nutritive ratio: At one time this term held great significance. When rations were being compiled of concentrated foods it was regarded as essential for proper nutrition that the nutritive ratio should be a definite thing. This nutritive ratio means the knowledge of the relation of the digestible crude protein to the digestible non-protein constituents in the diet (digestible carbohydrate equivalent). As the quantity of digestible non-protein becomes greater in proportion to the digestible protein the ration is said to become "wider," and as it lessens the ration becomes "narrower." This is really suitable for the classification of feeding-stuffs; but otherwise, as an index as to the suitability of a ration being adequate to the needs of an animal for a specific purpose, experience has emphasized what was originally felt to be a weakness. At the present day the nutritive ratio of a diet

does not hold the significance which at first it was expected to hold. Better and more suitable guides have been adopted through a better knowledge and understanding of animal nutrition.

REQUIREMENTS OF STOCK.

It is important to know the composition of a food and how much of that food is digestible, but it is just as essential to know what the live-stock require for milk, beef, or pork production. In those countries where natural conditions compel the stock to be fed on substances other than grass, hay, and grain and root crops this knowledge of the composition of foods becomes very necessary, for the subsidiary foods used are generally very expensive, and economy must be practised. But, again, in countries like New Zealand, where it may be said that stock depend wholly on the foods grown on the farm, such knowledge is also very essential from another point of view. Dairy cows require foods which will supply them with an adequate amount of protein if they are to produce their maximum. Heavy production means that greater quantities of mineral matter must be supplied, or the cow will suffer in health. As for the carbohydrate portion, there is little fear of the cow fed on home-grown foods not receiving enough; but this, unfortunately, cannot be said with regard to the amount of protein fed and also the amount of mineral supplied. Further, there is an important fact also to be contended with. If the amount of carbohydrates fed should be too much in comparison with the amount of protein (a very likely thing with home-grown crops), then the value of the protein is reduced because it is not digested to the same extent. In other words, excess of starchy foods reduces the digestibility of the protein portion of the diet. The converse—a liberal supply of protein—increases digestibility of all the diet. This factor is referred to as the "balance of nutrients." It not only includes the digestible protein and digestible carbohydrate equivalent, but also the ash or mineral portion, the vitamins, and what is described as the "quality" of the protein. Quality in this connection refers to the suitability of a protein for maintaining health.

Although the different organic constituents can to a very great extent be substituted one for another, protein is absolutely essential for the development of the fœtus and milk-production. For such purposes an average amount of protein is shown experimentally to be required. But the figures to be given for the purpose of the ration must be regarded as an average, and do not represent the maximum to be supplied. With milk-production especially it should be, if anything, exceeded, for protein has the effect of stimulating metabolism generally and milk-production especially. As the substance increases the cost of a food, it must be used with care and not fed too lavishly, or the cost of feeding would defeat the object.

All the known feeding-standards in use at the present day only take into account the two chief types of organic food, and no attention is paid to the mineral constituents and other accessory factors. The real reason for this is that our knowledge of these other requirements is still at the investigation stage, and not sufficient is known of them yet to permit of detailed requirements being stated. What is known is that the dairy cow must receive a full

supply of nutrients if a prolonged and heavy production is required. If this is not supplied, it results in depletion of her own body, resulting in her milking only for a comparatively short period after calving. With pigs it results in their not thriving at the necessary rate consistent with economy in production. A pig of slowly attained maturity is an economic loss. Time must be reduced to a minimum in the production of pork and bacon. What these necessary requirements are for the different kinds of animals, especially milking-cows, is hard to define, because they vary with age, size, production, &c.

It will be quite readily understood why the ration for a milking-heifer will vary from that for an adult cow. The milking-heifer is not only producing milk but she is still growing, therefore she will require a more liberal protein and mineral supply.

The influence of size of the animal on the ration is difficult to explain, but experiment has shown that relatively the smaller animal requires more protein than the larger one.

The effect of condition on the maintenance ration of a cow does not require much explanation. If two animals are compared—one in good and the other in poor condition—more nutriment for a given weight will be required for the animal in good condition than for the poor one, especially as regards protein. The poor animal can be maintained on a cheaper diet on a maintenance ration.

At the present day it does not pay to keep animals in poor condition, for their production suffers too severely. Such dairy cows cannot keep up production, and if pigs are allowed to remain poor they cannot be economically fattened. Under present conditions pigs must be kept advancing every day from birth till the time they are killed. Failure in this respect is probably the greatest source of lack of success in swine husbandry.

NEW ZEALAND NATURAL CONDITIONS.

The New Zealand farmer is fortunate in one very important respect so far as dairy cows are concerned, and that is in the possession of natural conditions making normally for a great supply of succulent food. These foods have a very good effect on dairy cows, and are essential to economic production. They are a very palatable type of food, laxative in nature, have bulk, and provide water, which is so necessary to dairy cows of deep-milking qualities.

Good pasture-grass is the best succulent food for dairy cows, and in late spring and early summer will provide all such feeding they require. For the later part of summer and in autumn it may be necessary in certain areas to grow auxiliary forage crops or use silage, while in winter-time roots and silage provide the requirement. This type of food should always form part of a dairy cow's ration, for she always does better when the ration is laxative in nature. Here, again, is why hay when used should contain a plentiful proportion of clover.

When feeding green foods care must be taken with turnips, kale, silage, and the like, otherwise the milk will be tainted. It is much easier to taint the milk than to remove such flavours from it. Such foods should only be allowed after milking.

(To be continued.)

FLESH-COLLAPSE IN STURMER APPLES.

COOL-STORAGE EXPERIMENTS, 1927.

R. WATERS, Plant Pathologist, Biological Laboratory, Wellington.

AMONG the fruit-storage problems presented from various parts of New Zealand is a trouble occurring in Sturmer Pippins and certain other apple varieties. Here and abroad it is recognized as a functional disease —one liable to occasion much damage to the stored fruit. Here it is more prevalent in certain lines and stores, and is commonly diagnosed as flesh-collapse or internal breakdown. The study of the disease commenced in Nelson in 1920, and last year was pursued in Hawke's Bay and Auckland, using fruit from three selected orchards. These orchards represented a group, the Sturmers from which—in certain stores—had previously developed flesh-collapse abundantly. The three lines were studied in six different cool stores under usual and under modified commercial conditions. While this procedure has special merits, it may not make for the same scientific accuracy and proof as that obtainable in a laboratory equipped for fundamental research, with smaller quantities at stake and with more precisely controlled and recorded conditions.

INFLUENCE OF DIFFERENT STORAGE CONDITIONS.

Last year's work showed how one set of storage conditions compared with another may influence the onset and intensity of flesh-collapse. In three of the stores traces of the disease were found as early as August—that is, after four months' storage. In the three unaffected stores, moreover, there was still no appearance of flesh-collapse in October—after six months' storage. The position is set out in the following table:—

Table 1.—Comparison of the Three Experimental Lines in respect to Damage suffered from Flesh-collapse after Six Months' Storage.

Store.	Line.	Number of Apples examined.	Unaffected.	Intensity of Flesh-collapse.				Total damaged.
				Barely damaged.	Slightly damaged.	Badly damaged.	Very badly damaged.	
			Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
F ..	RX	50	100	..	..	..	..	..
	RB	51	100	..	..	..	..	..
E ..	BX	100	100	..	..	..	..	..
B ..	RX	100	49	31	12	7	1	51
	BX	100	90	10	..	..	..	10
	RB	100	90	7	2	1	..	10
C ..	RX	108	100	..	..	..	..	..
	BX	126	100	..	..	..	..	..
	RB	100	100	..	..	..	..	..
A ..	RX	100	97	3	..	..	..	3
	BX	100	95	5	..	..	..	5
	RB	100	99	1	..	..	..	1
D .	RX	0	..	..	..	..	..	..
	RB	0	..	..	..	..	..	..

These results, coupled with the examinations made from time to time of the stocks of the unaffected stores, demonstrate in a general manner a matter of the first importance in this investigation—namely, that the prevention of extensive damage from collapse to relatively "susceptible" lines in cool stores is possible and practicable for at least six months.

The next examination was made in October—after about eight months' storage. The bulk of stored apples in New Zealand is unloaded by this time, and there remains a comparatively small proportion consisting of long-storage varieties—among which are Sturmers—that may require to be held a few weeks longer. Table 2 shows that these selected Sturmer lines were all affected to some extent in all the stores after eight months, the intensity of the disease being much greater in one store than in another.

Table 2.—Comparison of the Three Experimental Lines in respect to Damage suffered from Flesh-collapse after Eight Months' Storage.

Store.	Line.	Number of Apples examined.	Unaffected.	Intensity of Flesh-collapse.				Total damaged.
				Barely damaged.	Slightly damaged.	Badly damaged.	Very badly damaged.	
			Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
F ..	RX	500	91	9	..	..	..	9
	RB	461	59	41	..	..	..	41
E ..	BX	433	70	29	1	..	..	30
B ..	RX	366	78	20	1	1	..	22
	BX	266	54	40	4	2	..	46
	RB	416	53	35	9	2	1	47
C ..	RX	244	92	8	..	..	..	8
	BX	186	38	54	8	..	..	62
	RB	332	35	65	..	..	..	65
A ..	RX	231	71	26	3	..	..	29
	BX	287	41	29	15	14	1	59
	RB	384	48	33	17	2	..	52
D ..	RX	233	66	15	13	4	2	34
	RB	385	37	32	28	3	..	63

The figures in this table are liable to convey a worse impression of the condition of each line than is justified. The slightest trace of collapse was recorded. The percentage under the heading "Barely damaged" is that of apples which had suffered little or no commercial damage from collapse. Further remarks on the intensity of the disease are made later.

"SUSCEPTIBILITY" OF DIFFERENT LINES OF THE SAME VARIETY.

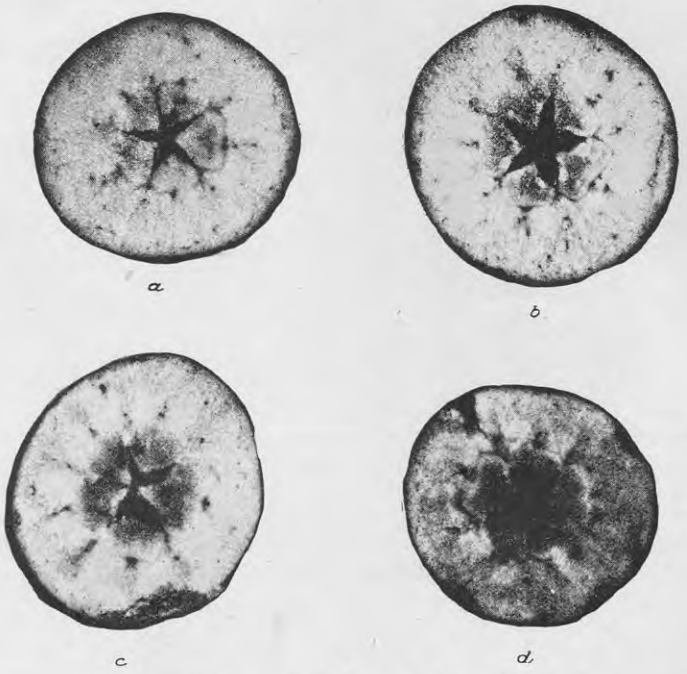
Table 2, which is based on larger counts than Table 1, indicates that while all experimental lines had some collapse by October, two of them —"BX" and "RB"—suffered at least twice as badly as "RX" in all the stores. A marked difference in the "resistance" to collapse of one line compared with others of the same variety is here indicated,

a feature that has been well brought out in former experiments. An analysis is being made of the results to elicit more specific reasons for this difference.

THE IMMEDIATE PROBLEM.

Where flesh-collapse has occurred freely the immediate problem is to provide such storage conditions as will enable lines of moderate "susceptibility" to be held satisfactorily with those more "resistant" of the same varieties. In one store "susceptible" varieties totalling some 17,000 cases were so grouped last year that the prescribed treatment could be given them without interfering with those varieties storing well under customary conditions. The initial separation of the fruit in this way enabled a great improvement to be made in the condition of long-storage varieties, more particularly Sturmers.

The separation of the pip-fruits generally into groups, so that each may subsequently be treated according to its requirements, is a means of improving the health and lengthening the life of the fruit in certain cool stores in New Zealand. Having provided the storage conditions most suitable for each group of fruit, the next problem is to discover the factors which make for "susceptibility." The figures obtained from last year's work promise to add some useful evidence to that already obtained in this direction.



FLESH COLLAPSE IN STURMERS, 1927 EXPERIMENTS.

Showing intensity of the disease—prominently about the core—as it commonly occurred after eight months' cool storage. About half natural size.

(*a*) Barely damaged, (*b*) slightly damaged, (*c*) badly damaged, (*d*) very badly damaged.

[*Photo by H. Drake, Biological Laboratory.*

INTENSITY OF THE DISEASE.

The experimental fruit was brought out of store and held for a week or more before being cut for examination. The disease when present was commonly localized in the pith, a portion of the tissue confined to a small region about the core. Here it frequently occurred merely as a slight discoloration—one to five pinkish or light-brown flushes or patches. Sometimes, however, the colour was darker. Apples externally healthy in appearance and internally showing no discoloration of the cortex or main body of the flesh but only a slight discoloration about the core were classified as "Barely damaged" (Fig. 1*a*). They were such as would be auctioned, retailed, and thereafter consumed without any serious cause for complaint. The term "Slightly damaged" was used when the pith was darkly discoloured, or when the disease was lightly diffused through the flesh (Fig. 1*b*). "Slightly damaged" apples would invariably escape detection until they reached the consumer. The "Badly damaged" and "Very badly damaged" would sometimes show injury externally, and, where repacking is not practised, would be of still greater detriment on the market (Fig. 1 *c* and *d*).

GENERAL.

The 1927 experiments were to some extent duplications or extensions of previous work at Motueka. They disclose further problems of importance in fruit cool storage. The figures obtained are now being examined, and a further presentation of results, supported by such evidence as is available, will later be made in the *Journal*.

Thanks are due to Messrs. N. J. Adamson and W. H. Rice, Orchard Instructors of the Horticulture Division at Hastings and Auckland respectively, for their hearty co-operation—the former more particularly in the work of securing uniformity among the fruit picked and packed for experimental purposes, and the latter in the final examination and classification of the fruit.

(To be continued.)

LOOSE SMUT OF WHEAT ("BLACK-HEADS").

THE fungus which causes this disease is carried over from one crop to the next entirely *within* the seed, so that pickling the seed with bluestones or formalin, which fairly effectively controls stinking-smut (or "ball-smut"), has no effect on loose smut. The only practical way of avoiding loose smut is to use seed which has been harvested from a crop entirely free from "black-heads." Since the spore masses of the fungus (which constitute the "black-heads") appear at flowering-time of the wheat-plant and are all blown away by harvest-time, it is impossible to tell from a sample of threshed grain whether it is infected or not. Until a system of seed-crop certification under proper supervision is instituted in New Zealand a grower is helpless in regard to this disease unless he has personally inspected the crop from which he obtains his seed, soon after it emerges from the shot-blade.—*J. C. Neill, Field Mycologist.*

Mueller Medal for Research.—The General Council of the Australasian Association for the Advancement of Science, meeting this year, has awarded the Mueller Medal to Dr. L. Cockayne, F.R.S., of Wellington, for his researches in New Zealand botany extending over a period of twenty-five years.

REPLACING THE HAWTHORN HEDGE.

W. C. HYDE, Horticulturist, Horticulture Division, Wellington.

HORTICULTURAL industries have for some time past suffered severely from the many diseases harboured by the hawthorn and its related species. The genial climate of New Zealand seems to have had the effect of increasing these difficulties, judging from comparisons with the experience in colder countries. With the advent of the bacterial disease known as fireblight—of which the hawthorn is a common and natural host—the problem has become so serious that the commercial production of apples and pears is impracticable in localities where this disease has become established in the hawthorn. From these conditions has arisen the necessity of getting rid of hawthorn in districts where the production of pome fruits is an industry of sufficient extent to warrant its protection. The extent of hawthorn hedges makes it impossible to cut out all the fireblight cankers with which the plant may be infested—the only means of controlling this disease—and hence its control in the orchard is impossible with annual reinfection, as it is easily and extensively redistributed by birds and insects.

In some instances a wire fence will make a suitable replacement for the hawthorn hedge, but in other cases a shelter-hedge is also required. In response to inquiry on this point the suggestions which follow are made.

Under most farm conditions barberry is no doubt the best stock-proof substitute, particularly if the evergreen seedless variety grown in the Waikato is used. It is well to remember that there are a number of varieties of *Berberis vulgaris,* brought about by the method of propagation by seedlings. Where this method of propagation is adopted great care should be taken to obtain seed from plants of a strong evergreen type. Better still is it to put out plants grown from cuttings of the seedless variety.

Where a tall shelter is required this may be obtained on most alluvial soils by interplanting the barberry with Lombardy poplars at intervals of 2 ft. to 3 ft. Such a shelter is quick-growing and requires a minimum of attention once it is established.

In the warmer districts osage orange (*Maclura aurantiaca*) would doubtless do well. It is a popular stock-proof farm-hedge plant in the middle United States of America. It is a deciduous tree of about the same size and habit as the hawthorn, and requires similar treatment to establish it as a hedge. The leaf is much like that of the pear-tree. It has been grown to some extent in Hawke's Bay, and is not a host of any serious pest, the worst probably being a slight infection of San Jose scale. It will thrive on poor country—in fact, it is rather intractable on good heavy land owing to the vigour of its growth. It is grown from seed, and if the plants are planted close—say, 6 in. apart—and cut back hard for the first two or three seasons to cause branching at the base, it makes a good stock-proof hedge.

For an evergreen one-line shelter on fair to good land Lawson's cypress (*Cupressus Lawsoniana*) is becoming deservedly popular. It is naturally well clothed with foliage at the base, and when planted 3 ft.

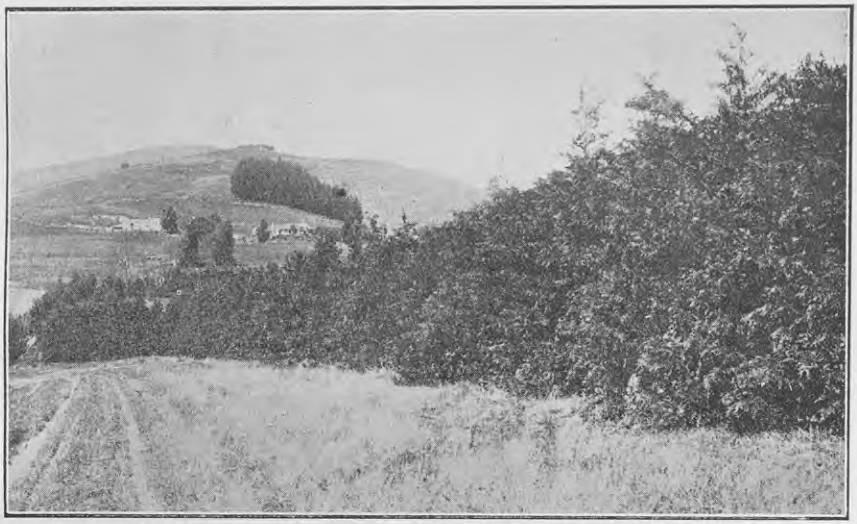


FIG. 1. LAWSON CYPRESS SHELTER-HEDGE IN ORCHARD OF W. MONOPOLI, STOKE, NELSON.
Height, 20 ft. to 25 ft.; age, 25 years.

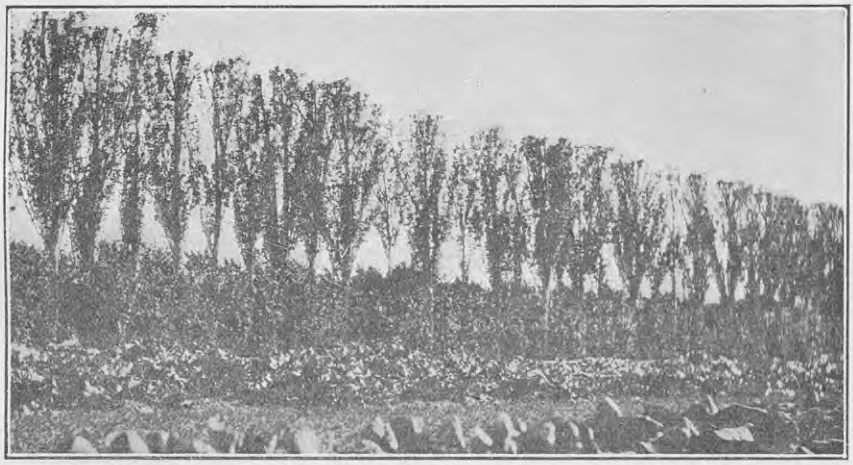


FIG. 2. SHELTER-BELT OF LOMBARDY POPLAR UNDERPLANTED WITH BARBERRY ON FARM OF J. TILBURY, LOWER HUTT.

apart usually runs up to about 10 ft. high, with a tapering top that dispenses with the need of frequent trimming. Of a somewhat similar type is the Douglas fir or Oregon pine (*Pseudotsuga Douglasii*). Both Lawson's cypress and Douglas fir are unusually free from disease, and may be grown on hilly country. On alluvial soils they are sometimes interplanted with Lombardy poplars, which extends the height of the shelter; this extension is, of course, leafless in winter.

On lighter land in rather dry localities the Himalayan cypress (*Cupressus torulosa*) makes a good evergreen shelter-belt. While similar in foliage to the macrocarpa and Roman cypresses, it is more compact than the former, and more vigorous and stouter than the latter. Planted 3 ft. apart, its compact upright growth would take up little room, and require little or no attention in the way of trimming.

On heavy land macrocarpa cypress and pines are usually too vigorous to be recommended for shelter-hedge purposes generally. Under such conditions they are inclined to grow large and coarse, with

FIG. 3. REDUCING 40-FT.-HIGH HAWTHORN HEDGE ON FARM OF M. STAPLES, MOTUEKA.

FIG. 4. REMOVING HAWTHORN HEDGE WITH STUMPING APPLIANCE ON PROPERTY OF S. RAWLINGS, RIWAKA.

bare trunks and an absence of shelter where it is most needed. Such shelter-trees, however, still deserve consideration where a one-line shelter is required on light land or on some classes of hill country. Under such conditions macrocarpa cypress and *Pinus muricata* are rendering efficient service. But in the case of all these conifers it is to be noted they are not stock-proof, and to maintain their efficiency—not merely as shade-trees but as shelter-belts—it is necessary to fence them from stock, otherwise they lose the lower-foliaged branches which form their chief value.

BARLEYS IN MARLBOROUGH.

THE malting barleys of Marlborough afford a very fine practical demonstration of the value of seed-selection as a means of controlling crop disease. Practically the whole of the malting barley grown in the province is under contract to New Zealand Breweries, Ltd., whose Marlborough representative, Mr. H. S. Hewlett, very carefully selects the crops to be used the next season for distribution as seed to the contract growers. The effect of this policy on the incidence of covered-smut of barley—one of the most destructive diseases of barley if left unchecked—can be judged from the following facts. Out of forty-three crops of malting barley examined in the 1926–27 season, twenty-three were smut-infected. This season, out of twenty-one crops sufficiently advanced for its detection, not one showed even a trace of smut. Cape barley, which is not controlled, showed an average of 10 per cent. of covered-smut.

There is another disease of barley, however, for the checking of which, in the present state of our knowledge, little can be done. This is stripe disease. Stripe is difficult to detect unless the attack is severe, and, as severe infection appears only to occur when the crop has been subjected to some unfavourable set of soil or weather conditions, its effects are usually ascribed to this latter cause. Stripe was observed in thirty-four out of forty-five crops examined last season and in seventeen out of twenty-one crops this season. Although until we know more about this disease it is impossible to estimate the loss due to it there can be little doubt that, as it is caused by a seed-borne parasitic fungus, it must be the cause of a certain reduction in quality and yield. Experiments are now in progress to determine the best practical method for its control.

—*J. C. Neill, Field Mycologist.*

Export Butter Weights.—Referring in a recent address to certain complaints from overseas, the Director of the Dairy Division, Mr. W. M. Singleton, stated: "We have been going into this matter of late, and find that when the parchment is stripped from the block of butter it may weigh up to 5 oz. or 6 oz. instead of the original weight of the paper at, say, 4 oz. It would appear reasonable that a retailer should expect a block of butter to weigh at least 56 lb. when stripped. We must have a minimum of 56 lb. 6 oz. to ensure this; and 56 lb. 8 oz., including paper, would probably be the safer weight to aim at placing in the boxes."

Fruit Export Levy.—This season's levy under the Fruit Control Act has been fixed at 1½d. per case.

LIMING AND MANURING OF PASTURE AT WINTON EXPERIMENTAL FARM.

BLOCK 3 RESULTS FOR 1927.

R. McGILLIVRAY, F.L.S., Instructor in Agriculture, Invercargill.

THE fourth year's weighing of plots and general examination of the pasture on Block 3 at Winton Experimental Farm were carried out on 5th December last. The block had been closed up for thirty-three days, and there was a good growth of grass; the weighing was carried out most expeditiously. The pasture was kept under observation throughout the year, and, as far as could be seen, the sheep this season did not differentiate between the basic-slag and Nauru-rock-phosphate plots like they did in previous years; moreover, the Nauru plots were grazed quite as closely as those dressed with slag.

	A. 1·8 Tons Carbonate of Lime.	B. 3·6 Tons Carbonate of Lime.	C. No Lime.	D. 2 Tons Burnt Lime.	E. 1 Ton Burnt Lime.	Totals.	
	lb.	lb.	lb.	lb.	lb.	lb.	
Plot 1..	42½	41½	34	42	42	409	Basic slag.
	45	46	35	44	37		
Plot 2..	34	33¾	33	33	33	332	Control (no manure).
	31¼	34	35	34	31		
Plot 3..	42	44	40	45	37	409	Basic slag.
	43½	46	36	40	35½		
Plot 4..	33½	35½	37	39	30	344	Control.
	32½	33	38	36½	29		
Plot 5..	46	50	41	46	35	453	Basic slag.
	42	56	55	45	37		
Plot 6..	43	50	45	44	37	447	Nauru phosphate.
	43	52	52	44	37		
Plot 7..	37	40	36	34	27	347	Control.
	35	33	35	36	34		
Plot 8..	43	41	44	47	36	426	Nauru phosphate.
	47	46	40	46	36		
Plot 9..	32	38	33½	38½	36½	360	Control.
	33	36½	36	37	39		
Plot 10..	43	40½	43	43½	41	407	Nauru phosphate.
	40	41	40	38	37		

LAY-OUT OF BLOCK 3, WITH GREEN WEIGHTS OF PLOT CUTTINGS.

The various plots were top-dressed in 1924, 1925, and 1926 at the rate of 3 cwt. per acre, but no top-dressing was done in 1927. The stocking during the year under review was heavy, and the block was considerably enriched with animal-droppings, but the pasture was kept wonderfully clean and made rapid growth during any short period in which it was not stocked. The weighing of plots was done in a similar manner to that recorded in earlier reports, and green weights were taken immediately after the various plots were cut.

The accompanying lay-out diagram of the block gives the green weights of herbage for the plot cuttings in December.

The following table shows the average green weights of the manured and control subdivisions under various lime treatments :—

Table 1.

		lb.
Subdivision	A : 1·8 tons carbonate of lime plus 3 cwt. basic slag	87·0
,,	B : 3·6 tons carbonate of lime plus 3 cwt. basic slag	94·5
,,	C : No lime ; 3 cwt. basic slag	80·3
,,	D : 2 tons burnt lime plus 3 cwt. basic slag	87·3
,,	E : 1 ton burnt lime plus 3 cwt. basic slag	74·5
Subdivision	A : 1·8 tons carbonate of lime plus 3 cwt. Nauru phosphate	86·3
,,	B : 3·6 tons carbonate of lime plus 3 cwt. Nauru phosphate	90·1
,,	C : No lime ; 3 cwt. Nauru phosphate	88·0
,,	D : 2 tons burnt lime plus 3 cwt. Nauru phosphate	87·5
,,	E : 1 ton burnt lime plus 3 cwt. Nauru phosphate	74·6
Subdivision	A : 1·8 tons carbonate of lime—control	67·0
,,	B : 3·6 tons carbonate of lime—control	70·9
,,	C : No lime—control	70·8
,,	D : 2 tons burnt lime—control	72·0
,,	E : 1 ton burnt lime—control	64·8

The weights per plot under the manurial scheme are shown in the following table :—

Table 2.

	Totals. lb.	Average. lb.
Basic slag—		
Plot 1	409	423·6
Plot 3	409	
Plot 5	453	
Nauru phosphate		
Plot 6	447	426·6
Plot 8	426	
Plot 10	407	
Controls—		
Plot 2	332	345·7
Plot 4	344	
Plot 7	347	
Plot 9	360	

BOTANICAL ANALYSIS.

Representative samples of pasturage were taken from each plot. These were examined while green, and divided into three sections—grasses, clovers, and weeds. These samples were then weighed and dried under cover, and again weighed to ascertain loss in drying. Results of the botanical analysis are given in Table 3 (next page).

The analysis is of considerable interest and importance. It will be noticed that the clover content of the Nauru-phosphate plots is this year (1927) equal to that of the basic-slag plots. In the three preceding yearly examinations the Nauru plots were inferior to the

basic-slag plots both in weight and clover content. It was noticed throughout the past season that the growth of clover in the Nauru plots had improved considerably, and at time of cutting no difference was noticeable in the two sets of plots. In control plots 2, 4, 7, and 9, however, the absence of vigour in the growth of the clover-plants was discernible without any very close examination, and the botanical examination showed that in the controls (no-manure plots) generally the clovers were approximately 50 per cent. less than in the basic-slag and Nauru plots.

Table 3.—Botanical Analysis.

Subdivisions and Plots.	Grasses.	Clovers.	Weeds.	Subdivisions and Plots.	Grasses.	Clovers.	Weeds.
	Per Cent.	Per Cent.	Per Cent.		Per Cent.	Per Cent.	Per Cent.
A, 1, 3, 5	76·75	16·00	7·25	B, 6, 8, 10	75·70	17·20	7·10
B, 1, 3, 5	75·24	17·81	6·95	C, 6, 8, 10	78·50	12·40	9·10
C, 1, 3, 5	78·80	12·25	8·95	D, 6, 8, 10	75·85	15·15	8·00
D, 1, 3, 5	75·85	16·00	8·15	E, 6, 8, 10	77·01	14·09	8·90
E, 1, 3, 5	76·88	15·20	7·92	C, 2, 4, 7, 9	80·71	9·88	9·41
A, 6, 8, 10	75·75	16·25	8·00				

In previous reports it has been mentioned that the clover content of the pasturage from the burnt-lime plots was not so great as that from the carbonate-of-lime plots. The average clover content this season, as ascertained by analysis, is as follows:—

	Carbonate of Lime. Per Cent.	Burnt Lime. Per Cent.
Basic slag	16·90	15·60
Nauru phosphate	16·72	14·62

When dry weights were compared with green weights it was found that the loss amounted to 34 per cent. in the basic-slag and Nauru plots, while in subdivision C, plots 2, 4, 7, and 9, where neither lime nor phosphate had been applied, the loss in drying amounted to almost 45 per cent. The growth on these plots was not so far advanced as in the other plots, and the greater loss in drying can no doubt be put down to the immature condition of the herbage at time of cutting.

Four years' results are now available from the manurial experiments conducted on Block 3. In the first and second seasons good results were obtained from the use of basic slag, with negligible results from Nauru phosphate. In the third season there was an appreciable improvement generally in the condition of the Nauru plots, and, as will be seen by this report, the Nauru plots have shown a most marked improvement in the fourth year. Thus the indications are that under Southland conditions finely ground Nauru rock phosphate may be considered an efficient factor in pasture-improvement.

Fireblight Regulations.—Amending regulations under the Fireblight Act, 1922, were gazetted on 12th January, and took effect as from that date. They make certain alterations regarding the commercial fruitgrowing districts—Thames and Whangarei in particular.

CONTROL OF TOMATO MILDEW.

TRIALS IN AUCKLAND DISTRICT, SEASON 1927–28.

Introduction.

AT the beginning of the present season a request was received by the Horticulture Division from the Auckland Tomato-growers' Association for a demonstration in the control of mildew on tomato-plants grown under glass in that district. It was stated that the trouble commenced about the month of October, and was so severe as to prevent the full crop being brought to maturity. This demonstration was carried out under the supervision of Mr. W. H. Rice, Orchard Instructor for the district, who furnishes the report which follows these introductory notes.

In the Department's bulletin "Tomato-culture," by W. H. Taylor, it is stated, "This disease is caused by a humid atmosphere and high temperature; the remedy is better ventilation." A survey of the glasshouses for tomato crops in the Auckland District showed a strange deficiency in ventilators in these buildings, and obviously without them adequate ventilation cannot be given. The ventilator equipment for a house 14 ft. wide in a cold climate is totally inadequate in a warm climate, especially when the house is widened to 30 ft. or more, and planted close with a tomato crop which in the month of October is more than half full of dense vegetation. Those were found to be the usual conditions in this locality. In a few instances the ventilator equipment was less, and in one instance observed a large house had been built for this purpose without ventilators of any kind. Obviously under such conditions some growers are making unreasonable demands from science in these days, and the sooner the position is realized the better.

Suitable ventilation depends on the number and size of properly placed ventilators. The requirements of this kind to be built into a house depend on the crop which is to be grown, the climate of the locality, and the size of the house. Cucumber-houses built 12 ft. to 14 ft. wide are often erected without any ventilators and work satisfactorily, although even they would be more easily operated with some available ventilation occasionally. The tomato crop, however, requires a dry, buoyant atmosphere especially, which makes the problem of ventilation quite a different one.

The warm humid climate normally prevalent in Auckland is naturally an important factor in the problem also. If in the South Island it is found necessary to have continuous ventilation along *both* sides of the ridge of the tomato glasshouse, in the northern districts one would expect the same, *only wider*. In addition to this the houses generally in the northern districts are wider and often larger in other ways. This may very probably be an economy, but in extending the measurements it should be remembered that the proportion of ventilator area must be correspondingly increased.

Suitable manures and culture, as Mr. Rice shows, increase the resistance of the plants to mildew in some degree, but relief in the main

depends no doubt in reducing the humidity and temperature during the warmer periods in summer by means of a large increase in the ventilator areas available.

—*W. C. Hyde, Horticulturist, Horticulture Division.*

REPORT BY W. H. RICE.

Throughout the Auckland District *Cladosporium fulvum* is much more prevalent on tomatoes under glass than in the colder parts of the Dominion. The disease makes an appearance on the plants towards the middle of October, and from then onward it is a race between the maturing of the larger part of the crop and the disease. Orthodox sprays have been tried in vain, and at present there seems no hope of control in that direction; therefore endeavour is made to have the plants as forward as possible so that the greater part of the crop may be harvested.

In this respect variable results have been obtained, and therefore experiments were undertaken this season and general observations specially made to determine, if possible, what factors in culture disposed the plants to susceptibility or resistance.

The season has been a particularly bad one for Cladosporium. Continual wet weather and overcast conditions during the period of plant-growth (not very favourable for good ventilation) caused a tender growth of plants. As the fruits were swelling and ripening, continued open sunny weather conditions were general, with high day and low night temperatures, causing the disease to rapidly destroy the tender plants, even though well forward. Extra-tender plants harvested a much lesser crop than might have been expected, and the fruit from such plants was soft in texture owing to the absence of foliage. All the plants suffered more or less, but it has been outstanding that not only should the plants be well forward, but they should be well and hardily grown to afford maximum resistance to the disease.

VENTILATION.

The majority of the glasshouses in the Auckland District are poorly ventilated. This causes more tender growth than advisable for tomatoes, and wherever possible it should be remedied. Observations show that the better the ventilation provided and the more freely it is used during the growing-period, the better the plants will resist Cladosporium.

DUSTING.

Comparisons were made with dry flowers of sulphur, Sulpho, and Cloud Form tomato-dust, as against undusted. Cladosporium was prevalent in each instance. Dusting with either of these materials cannot be considered as in any way beneficial. No variation in time of attack or severity could be noticed on any dusted section, which were all as bad as the undusted. The plants were fully defoliated by the disease by the time the crop was ready for picking.

DEFOLIATION AND PINCHING.

The regular practice is to stop plants beyond five bunches, all side shoots having been kept pinched out prior to this. About the time plants are stopped Cladosporium may be expected. To reduce infection

the lower leaves are pruned off as the lower fruits are picked. Observations show that the plants which fail to finish most of their fruits are those on which all top-side laterals are suppressed, while those which are allowed to freely vegetate side shoots after the plants are stopped benefit greatly by this in growth, and more nearly perfect the whole of the crop.

WHITE ISLAND MINERAL PRODUCT.

Used as a soil-dressing prior to planting (300 lb. per acre) and with repeated surface applications after each watering or hoeing (100 lb. per acre) White Island "No. 1 Product" gave promising results as a soil insecticide. No plants were lost from the ravages of insects during establishment, as against a loss of 12 per cent. in untreated land. Slugs, snails, cutworms, grass-grubs, and wood-lice were all controlled. The plants made good establishment, and throughout the whole period of growth were more robust than were those where this product was not used. The favourable growth was characterized by stouter stems, larger leaves, broader and denser foliage with an absence of crinkle at the edge, and firm and more uniform fruits. This favourable growth continued to resist Cladosporium some time after other plants were attacked. Though Cladosporium did finally develop, the crop was better all round and the season extended.

In a section where the White Island product was not applied until some two weeks after planting, the plants did not show any better than the untreated until about 3 ft. high. From then onwards they began to show advantageously, and finally made far better plants than the untreated. So marked was the better development that several growers decided to make late applications general. Some improvement was no doubt due to this, but it is very evident that early applications, at least two weeks prior to planting, give best results, though continued light dressings are favourable and advantageous. Many growers express their intention to continue the use of the product in future, both when the soil is prepared and in combination with fertilizers throughout the season.

At the time of the emergence of white-fly houses treated were apparently free from infestation, indicating good control due to this product.

During the period of Cladosporium development it was thought that the fumes liberated from the product were having a cleansing effect on the plants. In order to test this an extra liberal surface dressing was given to a whole house, but it was found that this method of using the product does not control Cladosporium. Its chief benefit appears to be in assisting to build up a robust plant to resist the disease for a longer period, and as a soil-insect controllant.

WATERING AND ATMOSPHERIC MOISTURE.

Though Cladosporium is not usually prevalent until the warmer, dry weather, there is ample evidence to show that plants reared in a close humid atmosphere, causing tender growth, are more readily attacked and suffer more rapidly than hardier plants reared under dry conditions. Where plants are put out in dry or nearly dry land, and watered liberally periodically during growth, soft conditions are produced, and excess moisture is generally condensed on the glass.

In order to test the effect of this moisture on Cladosporium a house was so arranged that while an adequate amount of root-moisture was

available the relative humidity of the atmosphere was as dry as possible. This was done by opening up furrows in the ground and well watering several times prior to planting. As the ground was levelled for planting, the surface soil was reasonably dry. The plants made very good establishment in growth, requiring very little watering during the bad-weather period. As the weather became more settled and warmer, more abundant water was supplied at regular intervals. Under this programme the house had a much drier atmosphere, and there was no condensation on the glass when the house was closed—a desirable state of affairs, but one not readily attained when all water is applied during growth. The plants were well grown, of a hardy type, short-jointed, and resisted Cladosporium far better than more tender plants.

FERTILIZERS.

Complete fertilizers are necessary prior to or at planting, regardless of what it is intended to apply later, though at the earlier stage nitrogen should not be in the readily available forms.

Young plants set out with dried blood alone were very stunted, hard-wooded, with copper-coloured foliage, and very backward six weeks after planting, showing no sign of flower-buds. With sulphate of potash alone the plants were hard-wooded, short-jointed, more natural in colour, but not luxuriant, and showing bud development of flower. Superphosphate alone gave good growth and colour, with the plants showing open trusses of flower, but Cladosporium was present on most plants. Good, strong plants, very thrifty at the open-flower stage, resulted from complete fertilizers.

With regard to further dressings of fertilizers, generally super as a dominant has a pronounced effect in encouraging Cladosporium. Potash retards the trouble, but under its dominant influence plants do not come forward with sufficient vigour to be well established in the race against mildew. Nitrogen in dominance rushes the plants forward, and also has a retarding influence on the disease when applied, as the plants are at a susceptible period.

SUMMARY.

With present-known control measures Cladosporium may be expected in the district about mid-October. Endeavour should be made to have the plants forward and hardily grown prior to this. Dry atmospheric conditions should be maintained during winter, the majority of the water required being applied prior to planting, and good ventilation also maintained. The use of White Island product prior to planting, and soil-surface dressings during the season, appear to control soil insects and result in more robust plants capable of considerable resistance. Super in excess disposes the plants to Cladosporium. Complete fertilizers are advisable when the land is prepared for planting, together with nitrogen in a not immediately available form. Nitrogen should be freely used when the disease first appears. Top vegetation should be encouraged after stopping, so as to provide foliage to carry the plants through the attack.

NOTE.—The writer desires to record appreciation and thanks for the valuable assistance given in connection with these experiments by Mrs. A. Angus, Messrs. A. Currie, J. E. Fleet, G. Johnston, R. Lean, and White Island Products, Ltd.

TOP-DRESSING OF NORTH AUCKLAND HILL LANDS.

SOME EXPERIMENTAL RESULTS ON SANDSTONE COUNTRY.

C. J. HAMBLYN, B.Ag., Instructor in Agriculture, Whangarei.

DURING the past two seasons manurial top-dressing trials have been carried out under the direction of the writer on an area of more or less deteriorated hill land on the property of Mr. R. F. Ellis, near Kaipara Flats. The experiment was designed somewhat on the lines set out in an article in the *Journal* for November, 1926, dealing with the top-dressing of King-country hill lands. Accurate records were kept of the cost of application of the fertilizer and of the stocking of each paddock top-dressed, as well as of an area adjoining which was not treated in the first season.

The area selected for the trials consists of some 90 acres of typical sandstone hill land representative of large areas of similar country throughout the North Auckland Peninsula. Originally carrying good mixed bush, and sown to English grasses from twenty to forty and more years ago, the deterioration has varied according to the management and the type of stock carried, until at the present time there is a wide variation in the type of pasture and second growth on these lands. However, whether brown-top, danthonia, or paspalum have come in to form a sward and prevent a covering of bracken fern, hard fern, or manuka, or whether the reversion has been to these forms of secondary growth, the results as far as the stock carried is concerned have been the same —a replacement of breeding-ewes by mature cattle and sheep, and a considerable reduction in the number of stock carried.

In the case in question the carrying-capacity, as shown by the records of a 50-acre block with a general southerly and westerly aspect, was not more than one-third of a sheep and one-sixth of a cattle beast per acre, and the owner found it extremely difficult to make any impression on the heavy growth of bracken fern without severely punishing the cattle.

The top-dressing was carried out on two adjoining paddocks, each of 20 acres, No. 1 being treated with superphosphate and No. 2 with basic slag.

PADDOCK NO. 1.

This area slopes generally to the north and west, and the pasture consists mainly of danthonia, with cocksfoot still persisting among the growth of bracken fern which covered about half the paddock. Blackberry was also bad in places.

In the first season this area was top-dressed at the end of September, 1925, with 3 cwt. of superphosphate per acre, and stocked alternately with sheep and cattle throughout the year. The total cost, including freight, cartage to the farm and paddock, and application by hand, worked out at £1 4s. 10d. per acre. The carrying-capacity of the paddock for the year ending 30th September, 1926, as shown by the records of stocking, was four-fifths of a sheep and two-fifths of a cattle beast per acre.

The paddock was again top-dressed at the end of June, 1926, with 1½ cwt. super per acre, and the records of stocking were kept until the end of September, 1927, when the carrying-capacity for the year worked out at two sheep and one-eighth of a cattle beast per acre. The considerable decrease in the proportion of cattle was due partly to difficulty in securing sufficient stock, and to the fact that the combination of top-dressing and heavier stocking in the previous season had cleaned up the paddock sufficiently to allow of the cattle on the farm being used on new areas. However, there is no doubt that the proportion of cattle to sheep could have been increased with benefit to the paddock and little reduction in the number of sheep carried.

In addition to the increased carrying-capacity, the benefits of the top-dressing were most marked in improvement of the pasture sward, the better wintering of the stock, and (it was held) the increased wool

GENERAL VIEW OF THE COUNTRY EXPERIMENTED ON.

return per sheep. Moreover, most of the sheep-stocking during the spring and summer was done with ewes and lambs. Perhaps one of the most interesting items noted towards the end of the second year was the manner in which the blackberry had been prevented from seeding through being kept closely grazed by the sheep, and by the choking effect of the stronger growth of paspalum and danthonia around the crowns.

PADDOCK NO. 2.

This area, also of 20 acres, slopes generally to the south and west, and the pasture consists mainly of brown-top, with paspalum and danthonia on the drier slopes. A considerable portion of the paddock was covered with a dense growth of bracken, together with patches of hard fern and manuka. Strong blackberry had taken charge in some

of the steeper gullies. This was cut and burned, and grass-seed sown before the paddock was top-dressed. The fire got away in places, and an area of several acres on the ridges was also burnt off.

The paddock was top-dressed with 3 cwt. per acre of basic slag in August, 1925, and the carrying-capacity for the year worked out at nine-tenths of a sheep and one-fifth of a cattle beast per acre. The ground was again top-dressed at the rate of 1½ cwt. of slag in June, 1926, and the carrying-capacity increased for the year ending 31st August, 1927, to two sheep per acre, while the number of cattle carried was reduced to only one-twenty-fourth of a beast. Here again shortage of cattle affected the good results, which would have been much better as far as the pasture was concerned had more cattle been used. Though the fern-growth was reduced to scattered patches during the winter of 1926, the reduction of the cattle carried allowed it to get away somewhat during the following spring, but the improvement in the grass sward prevented anything like the spring growth of previous seasons, and Mr. Ellis is confident that he can deal with it without detriment to the stock.

50-ACRE BLOCK.

The 50-acre block already mentioned was top-dressed in June, 1926, with 1½ cwt. of fertilizer per acre, half being treated with superphosphate and half with basic slag. Little improvement was noted in the pasture until the following autumn, but the carrying-capacity was improved from one-third of a sheep and one-sixth of a cattle beast to 1$\frac{1}{10}$ sheep and one-ninth of a cattle beast, while the stock dealt more effectively with the growth of fern than they had previously been able to.

GENERAL.

The cost of applying the fertilizer per acre in 1925, using 3 cwt., worked out at £1 4s. 10d. in the case of the superphosphate, and £1 4s. 6d. for the slag. With the reduction in freight on the railway, and a reduction in the cost in Auckland of £1 10s. per ton for super and of £1 per ton for slag, the top-dressing with 1½ cwt. in 1926 cost 10s. 7d. and 11s. 2d. per acre respectively. This makes an average of between 17s. and 18s. per acre for the two seasons.

Though the foregoing results may not appear to be altogether encouraging, there is no doubt that considerable interest in the trials has been created in the district, and those farmers who have attended field-days on the area or visited it at different times are confident that top-dressing combined with better stocking is infinitely better than the old system of continually burning off or depending on cattle alone in the endeavour to get rid of or control the bracken fern.

Both the 20-acre paddocks have again been top-dressed at the rate of 3 cwt. per acre, making a total of 7½ cwt. in three years, or an average top-dressing of 2½ cwt. per year. The idea of this last dressing is to see if a still further increase in the carrying-capacity can be made; it is also an endeavour to clean up the paddocks so that they can be easily maintained in good order. Records will be kept of the stocking for the next two or three years—when probably no top-dressing will be done—in order to observe the after or residual effects of the fertilizers and the rate of deterioration in the two paddocks.

From general observations made during the last two seasons the writer is of the opinion that at least 2 cwt. per acre is necessary for obtaining immediate results; that where fern is at all bad 3 cwt. per acre in the first year, followed by 1½ cwt. in the second, is better than 2 cwt. to 2½ cwt. each year; and that it is more economical to top-dress one area in two successive seasons than to proceed from one paddock to another each year.

NOTE.—The fertilizers for these trials were supplied by the Auckland Fertilizer Manufacturers' Association and Auckland Manure Merchants' Association, who provided the superphosphate and basic slag respectively, and the assistance thereby rendered is duly acknowledged. Thanks are also due Mr. Ellis for the efficient manner in which he kept the records, and for the interest taken by him in organizing field-days and showing visitors over the area.

GRAPE-VINES FOR NEW ZEALAND CONDITIONS.

RECENT TRIAL IMPORTATION OF EUROPEAN VARIETIES.

J. C. WOODFIN, Vine and Wine Instructor, Horticulture Division.

WITH a view to extending its experiments in the selection of suitable grape-vines, and to keep abreast of the increasing interest taken in the culture of outdoor grapes throughout New Zealand, from Central Otago to the north of Auckland, the Horticulture Division imported last year a number of European varieties of vines from France, particulars of which are given in the accompanying list. The vines have been selected for qualities which are most likely to render them suitable for the needs and conditions of the Dominion, and from them it is hoped to reselect a number which can be added to those that have already proved their worth under the numerous local conditions of both Islands. An important feature in the choice made is the selection of vines from a point of view of early ripening, which is an essential condition for their successful adaptation to climatic conditions in the cooler parts of the Dominion.

The vines were treated before despatch from France with a fungicide and insecticide, and received a similar treatment on arrival here. They were then grown in quarantine for one growing season, and after being passed as sound and healthy have now been planted in the State experimental vineyard at Te Kauwhata, whence they will eventually be made available for viticulturists after having been given a thorough trial under the supervision of officers of the Horticulture Division.

Besides some of the best varieties of pure European vines, the collection includes a number of American × European hybrids known as "direct producers." The object of the hybridizers has been to produce fruit having the finer qualities of European vines on vines having the disease-resistant qualities of the American varieties. Many thousands of these hybrids have been produced and tested in France during the last forty years, but few have given satisfaction. It is from among these that a choice has been made. Some of the vines are said to give the best results on their

own roots, while others do better grafted on resistant stocks, particularly on the hybrid Baco No. 1 stock and the Riparia × Rupestris 3309. Some of these hybrids require no spraying in France, while others require from one to three treatments against downy mildew.

The quality of the fruit, and the wine which is made from it, are the subject of much discussion in the European viticultural world. Taking a mean course through the conflicting opinions expressed, the best of the direct producers are heavy producers of good fruit and wine without attaining to the higher qualities of the aristocrats of ampelography, the leaders of which—the Cabernets, Pinots, and Rieslings—are now well established in New Zealand. The direct producers should prove valuable for cultivation in the districts where humid climatic conditions are favourable to the development of fungous diseases, and where the cost of spraying is a considerable item in growing the finer varieties.

Included in the recent importation are also a few additions to our collection of resistant stocks.

LIST OF VINES IMPORTED IN 1927.

Abbreviations indicating approximate ripening periods: 1, Late February and early March; E, a week later than 1; V E, a fortnight earlier; 1 L, a week later; 2, a fortnight later.

No.	Variety.	Colour.	Ripening Period.	Remarks.
1	Alphonse Lavallée ..	Black	2	Belgian under-glass table grape, suitable for outdoor culture also.
2	Chaouch	White	2	Turkish table grape; one of best grown.
3	Chasselas Doré Salomon	White	1	Selected Golden Chasselas, universal table and wine grape.
4	Chasselas Rose Salomon	Rose	1	Selected Chasselas Rose; table.
5	Gradiska	White	2	One of handsomest grapes grown; outdoor and under glass.
6	Lignan	White	1	Excellent table grape; also used for wine. To obtain best results growth should not be restricted too much.
7	Madeleine Alice Salomon	White	V E	Table grape; seedling of Madeleine Angevine, but sets its fruit better.
8	Madeleine Royale ..	White	E	One of best early table varieties.
9	Muscat Salomon ..	White	1	Table grape with fine Muscat flavour.
10	Aligoté	White	1–2	Makes excellent wine in Burgundy district.
11	Chenin Blanc ..	White	2	Celebrated wines of Saumur and Vouvray.
12	Chenin Noir ..	Black	2	Makes a good wine on clay soils.
13	Cinsaut	Black	2	Excellent table grape, and produces one of best wines of Southern France.
14	Gamay Gloriod ..	White	1	Wine. Vigorous and fertile vine.
15	Gamay de Beaujolais	Black	1	Gives abundance of good ordinary wine on most soils, and high-class wine in Beaujolais district of France.

LIST OF VINES—*continued.*

No.	Variety.	Colour.	Ripening Period.	Remarks.
16	Gamay Hâtif des Vosges	Black	V E	Table and wine. Fertility and quality of wine equal to any of the Gamays. Well-known "Vin Gris des Vosges" is made from it. Should ripen its fruit in coldest parts of New Zealand.
17	Gamay Teinturier ..	Black	1	Wine. Has dark-red juice. Should be blended in proportion of one-fifth with other black Gamays; increases colour without detracting from quality of wine.
18	Lasca	Black	1	Makes good wine. Resists rot and accommodates itself to most soils. Should be allowed to extend freely—pruned light.
19	Limberger ..	Black	1 L	Table and wine. Heavy bearer. Good ordinary wine.
20	Malvoisie Rose ..	Rose	1	Excellent table grape, which produces high-quality white wine. Gives optimum results with light pruning.
21	Melon (Muscadet) ..	White	1 L	Produces high-class wine of Chablis type on stiff clays.
22	Merlot	Black	2	Makes a smooth wine, and when blended with Cabernet and Malbeck helps to produce finest Bordeaux wines. Good cropper.
23	Mondeuse	Black	2–3	Wine similar to Syrah (Hermitage), but vine a heavier bearer. Favourite in frosty regions of Savoy.
24	Muscadelle ..	White	2	Vigorous and fertile. Produces celebrated wine of Montbazillac, and is blended with Semillon Blanc in making Sauterne wine. Does well on clay.
25	Noir Hâtif de Marseille	Black	V E	Produces good table and wine grapes at extreme northern limit of the European viticultural region.
26	Pinot Blanc de Bronner	White	1 E	Selected Weisser Kloevner (see below), produces high-class wine.
27	Pinot Blanc Hâtif (gros)	White	1	Same character as Pinot Blanc Chardonnay, the Chablis grape, but has larger bunches and berries.
28	Pinot Noir Comte Odart	Black	1	Selection of well-known Champagne and Burgundy variety, Pinot Noir, which it surpasses in fertility.
29	Pinot Noir Oberlin ..	Black	E	Produces remarkably fine wine.
30	Pinot Noir Reveney ..	Black	1	Selection of Pinot Noir, of which it has the same characters added to a greater fertility.
31	Pinot Noir St. Laurent	Black	1 E	Is recorded as producing crop of grapes equal to double that of best selected Pinots, and makes an excellent wine. Will be interesting to compare this variety with Pinot Meunier under New Zealand conditions.

LIST OF VINES—*continued.*

No.	Variety.	Colour.	Ripening Period.	Remarks.
32	Portugais Bleu ..	Black	1	Fine table grape, very vigorous and fertile; largely grown for Paris market. Makes a good red wine blended half-and-half with Pinot Noir St. Laurent, and good ordinary white wine blended with one-third Early Malingre or Madeleine Royale.
33	Poulsart Blanc ..	White	2	Good table and wine grape. Is very productive on level ground, and makes good wine on clay hills.
34	Poulsart Noir ..	Black	2	Good table and wine grape.
35	Sauvignon Blanc ..	White	2	Is blended with Semillon to make renowned Sauterne wines.
36	Semillon (gros) ..	White	2	Leading white grape of Bordeaux district. Famous Chateau-Yquem Sauterne wine is made from this variety.
37	Tannat	Black	2	Produces excellent, very deep-coloured red wine. Does well on clay soils.
38	Weisser Kloevner ..	White	1	White Pinot, largely grown in Alsace. Good all-round wine variety, making an excellent wine, bears well, and is resistant to fungous diseases. Recommended as a main crop for production of white wine.
58	Agostenga ..	White	E	One of best early table grapes, but too delicate to stand transport and marketing conditions.
59	Goldriesling Blanc (Riesling × Courtiller Musque Précoce)	White	1 E	Table and wine grape, producing heavy crop of handsome golden berries.
60	Rousette	White	2	Produces renowned sparkling wines of Saint Perry (Rhône).
	Hybrid Direct Producers.			
39	Baco No. 1 (24–23) ..	Black	E	In addition to other qualities, has proved to be good stock for other direct producers.
40	Baco 2–16 (Totmur)	White	V E	Table and wine.
41	Baco 30-12 (Estallat)	Black	1 L	Table and wine.
42	Bertille Seyre 893 ..	Black	1 E	Wine.
43	Castel 19637 ..	Black	1 E	Wine.
44	Couderc 7120 ..	Black	2	Table and wine.
45	Gaillard-Girard, 157	Black	1 L	Table and wine.
46	Oberlin 595 ..	Black	V E	Wine.
47	Oberlin 782 ..	White	E	Table and wine.
48	Siebel 880 ..	White	1	Wine.
49	Siebel 1000 ..	Black	1	Table and wine.
50	Siebel 2003 ..	Black	1	Table and wine.
51	Siebel 2007 ..	Black	1 L	Wine.
52	Siebel 4643 ..	Black	1 L	Table and wine.
53	Siebel 4986 ..	White	1 E	Wine.
54	Siebel 5279 ..	White	E	Table and wine.
55	Siebel 5409 ..	White	1	Table and wine.
56	Siebel 5455 ..	Black	1	Table and wine.

LIST OF VINES—*continued.*

No.	Variety.	Colour.	Ripening Period.	Remarks.
	Resistant Stocks.			
39	Baco No. 1 ..	..	..	..
57	Solonis × Riparia 1616	..	..	..
61	31 Richter ..	..	..	..

Visitors to the Te Kauwhata Horticultural Station (lower Waikato district), where the experimental vineyard is situated, can on working-days, in addition to the numerous varieties of previously introduced vines, inspect the following American table and grape-juice vines imported from the eastern United States and Canada in 1922. These varieties ripen their grapes from the middle of February to the middle of March in normal seasons.

Variety.	Colour.	Ripening Period.
Diamond	White ..	.. Early.
Eclipse	Black ..	.. Very early.
Brighton	Red ..	.. Mid-season.
Herbert	Black ..	.. ,,
Lucile	Red ..	.. Early.
Niagara	White ..	.. Mid-season.
Lutie	Red ..	.. Early.
Campbell's Early ..	Black ..	.. ,,
Hicks	,, ..	.. Mid-season.
Moore's Early ..	,, ..	.. Early.
Worden	,, ..	.. ,,
Philip	,, ..	.. ,,
Concord	,, ..	.. Mid-season.
King	,, ..	.. ,,
Stark's Delicious ..	Red ..	.. ,,
Barry	Black ..	.. ,,

A collection of choice varieties of Italian table-grape vines is expected to arrive about June of this year.

Shearers' Accommodation.—The administration of the Shearers' Accommodation Act has continued to be carried out by the Live-stock Division, and it is satisfactory to report that a gradual improvement in the accommodation provided generally is being effected. Consequent on complaints to the Minister of Labour regarding the conditions of the accommodation provided on the East Coast and Hawke's Bay districts more particularly, arrangements were made for a comprehensive inspection of the sheds in these districts by a responsible officer. Generally the accommodation was found to be satisfactory. In all cases when the contrary was found instructions were issued and arrangements made to enforce compliance. In a number of cases bunks and mattresses were not in evidence, and these were ordered to be supplied. It is usually asserted that the Native shearers, who are largely employed on the East Coast, do not use the bunks when provided; but, on the other hand, complaints were made by representatives of the Maoris that they are not provided, and in the circumstances it is not unreasonable to require that they be available for use.—*Annual Report of Live-stock Division, 1926–27.*

INCIDENCE OF CONTAGIOUS MAMMITIS.

DANGER OF CHRONIC CASES IN DAIRY HERDS.

C. S. M. HOPKIRK, B.V.Sc., Officer in Charge, Wallaceville Veterinary Laboratory.

AN excellent example of the danger of cases of chronic contagious (streptococcic) mammitis was met with recently during experiments carried out at the Wallaceville Veterinary Laboratory.

The ordinary milk-souring organism (*Streptococcus lactis*) causes an acute inflammation of the udder when injected through the teat-canal, but this passes off in a day or two, leaving the quarter none the worse. An experiment was being carried out to ascertain whether by setting up mammitis in this way, and then passing it on from one cow to another, the power of the sour-milk streptococcus to cause mammitis would be increased. An old cow "A" was inoculated with a sour-milk organism, and, as usual, developed well-marked inflammation of the quarter. Milk from this quarter was then injected up the teat into the quarter of another beast, "B"—a first calver which had always had a normal udder. Mammitis resulted, and some days later it was found that the condition in this second animal was not due to the milk-souring organism but to the usual organism causing streptococcic mammitis in cows (*Streptococcus mastitidis*).

From this the question arose whether the comparatively harmless milk-souring organism had, in passing from "A" to "B," changed its nature and developed into the markedly harmful *Strep. mastitidis* (a phenomenon which some eminent research workers have thought might occur).

The experiment was then repeated, using two first calvers with normal udders, "C" and "D." In neither of these, however, did *Strep. mastitidis* develop, but only the brief, passing inflammation due to *Strep. lactis* being brought on.

Then on looking up the past record of the cow "A" it was found that two years ago she had been infected with *Strep. mastitidis* in the same quarter as was now used. She had, apparently, overcome the infection, and the milk had since that time remained quite normal in appearance, though with the microscope a few inflammatory cells could always be found. In spite of her apparent recovery, however, she was still harbouring the *Strep. mastitidis* in her quarter, and this caused infection in "B."

It is felt that this case is worth bringing to the notice of farmers, as very many cows which have a similar history to that of "A"—namely, an attack of mammitis and apparent recovery—exist in dairy herds and are regarded as normal by the owner, who therefore takes no precautions with them. Doubtless, as shown in the experiment, they are in many cases still harbouring the organism that originally caused them to show acute mammitis, and are consequently reservoirs of infection for their herd-mates. Cows affected in this way are always liable to have a recurrence of the disease, and should be very carefully watched so that they may be isolated at the very commencement.

It is felt, also, that the presence of such a cow in a herd is often the explanation of sudden inexplicable or recurring outbreaks of the disease.

IMPROVEMENT OF PHORMIUM TENAX.

RESEARCH ON BREEDING AND CULTIVATION OF THE PLANT.

DURING the past few months Dr. J. S. Yeates, of Wellington, has been conducting an investigation into the improvement of *Phormium tenax* (New Zealand flax) under the auspices of the Council of Scientific and Industrial Research. Progress reports by Dr. Yeates, dated 5th and 12th December respectively, have been made available as under :—

The following is a summary of the work done in the last three months on the cytology and genetics of phormium. It will be recollected that my task was primarily to find the chromosome numbers of phormium species and varieties, with a view to hybridizing. There are two species, and many of the varieties are supposed to be hybrids between these two species. If the chromosome number is not the same in all species and varieties, then hybridizing will lead to irregular results. Such difficulty has been found in crossing some kinds of wheat.

I have made preparations and counted the chromosomes of over thirty varieties of flax, including representatives of both species. The chromosome number in all these is the same—namely, 16—and the behaviour of the chromosomes is regular throughout. From the breeder's point of view this result is extremely satisfactory. It means that cross-fertilization between any two varieties should give normal Mendelian results.

By using a new rapid method the above work was done in a small part of the time ; the remaining time has been spent in studying (1) the courses of the fibre-strands through the leaf ; (2) the differences between varieties, commerical and otherwise ; (3) the question of whether or not the varieties breed true from seed.

The general conclusions are as follows : (*a*) That it should be possible to cross successfully any two varieties of flax which flower at about the same time. (*b*) That, in general, varieties do not come true from seed. (*c*) That in the near future planting will be done chiefly with hybrid seedlings which will be the first generation from crosses between suitable parent varieties. The parent varieties will be selected for resistance to disease, quality of fibre, and yield per acre. The hybrid offspring should grow more vigorously and combine the desirable qualities of two or more natural varieties.

It has already been stated in a preliminary report that the chromosome numbers of flax varieties have been found very favourable for breeding-work. This aspect requires no further mention here.

The brief reference made in the report concerning the failure of flax to come true from seed needs some qualification. It would be presumptuous to say at the present time that no flax breeds true. It is highly probable that pure breeding strains do exist in some isolated localities where cross-pollination is difficult. My view that most

varieties do not breed true is based on examination of several batches of nursery-grown seedlings, each batch nominally being of one variety. In every case it was found that there were seedlings obviously of different varieties. The differences are sometimes so marked that certain kinds of seedlings are "weeded" out from the rows of young flax-plants.

Two separate aspects of this failure to breed true need consideration here. First, there can be no doubt that a fairly large proportion of the seedlings resemble the seed parent. It is therefore possible to select from the seedlings plants which resemble the parent. The main objection to this is the great amount of extra expense involved in selecting the right seedlings and in growing the rejected plants until they are old enough to be distinguished.

The second objection is concerned with a loss of hybrid vigour in the plants. A self-pollinated flax-plant produces mixed seedlings because the plant itself is already a hybrid. The seedlings, however, will show the effects of hybrid vigour much less than does the original hybrid. In America, for instance, it has been found that crossing two varieties of plants may give a hybrid with 50 to 100 per cent. more vigour of growth than either parent. The seed from these hybrids, however, grew into plants with about one-half of this hybrid vigour. This loss of vigour appears to be the same as the effect of close "inbreeding" of animals. From this it should be plain why hybrid flax-seedlings are considered best. If seedlings are to be planted they should be as vigorous as possible; in other words, they should be the original hybrids. A single pod or capsule of flax produces about a hundred seeds, and this number of plants would result from a single cross-pollination. About 1,500 seedlings are required to plant 1 acre, so that the task of raising hundreds of acres of seedlings from artificial pollination should be quite possible and profitable.

It is hardly necessary to add that hybrid vigour is a secondary aim in crossing. The combination of desirable qualities is the main object. In the short time at my disposal I have paid some attention to the characters which are most desirable in flax. The most outstanding of these are (1) resistance to disease—especially yellow-leaf; (2) strength of fibre; (3) percentage of fibre; (4) vigour of growth; (5) colour of leaf-butt—white or otherwise; (6) shape of leaf-tip.

Resistance to yellow-leaf is one of the most important problems. So little is known about the disease that only careful examination of affected areas can show what varieties, if any, are immune.

Strength of fibre is a matter which needs a great deal of attention. Flax-fibre sells for its strength, and failure to maintain a good standard in this respect will create a prejudice against the fibre which would be very difficult to overcome. There are varieties of flax which produce fibre stronger than manilla, and there is no reason why, in time, our fibre should not approach that standard. Strength is estimated at present by breaking in the hand. Strength of fibre no doubt varies from plant to plant, from leaf to leaf, from one part of the leaf to another, and even from fibre to fibre in one part of the leaf. There is great need here for accurate strength tests made by suitable machines so that results can be given in actual figures.

The question of fibre percentage is a difficult one. When flax-cultivation becomes further developed the yield of fibre per acre will be of more significance. Yield per acre will depend partly on percentage of fibre, but also on the manner and rate of growth of leaves and roots of the plant.

That white-butted varieties produce fibre of better colour cannot be questioned. Such plants are comparatively rare, and it is doubtful if they are the best fibre-plants from other points of view. Crossing to combine white-butt with other required qualities is the obvious remedy.

The shape of the leaf has a close bearing on uniformity of length in the fibre. I have definite information of one variety at Shannon the leaf-tips of which are almost square. This character should give a leaf which has many fewer short fibres "running out" along the margin owing to taper of the leaf.

Besides these characters, there are others which must be kept in mind with a view to changing conditions in the industry. For example, cultivation of flax in rows will create a demand for types especially suited to these conditions. An exceedingly rigid, moderately tall, and close-growing plant should allow closer planting, or more easy access for cultivation, and would be much more suitable than drooping types for cutting by machinery.

A good plan of work for flax-improvement should be as follows:—

There should be a central experimental nursery in which varieties of phormium could be collected for comparison and breeding. The flax areas throughout the country should be carefully examined and selected plants sent to the central nursery. A survey of this kind would aim at finding and describing all varieties, determining by their associations any possible relationships between the varieties, the effect of environment on growth, and, in yellow-leaf areas, much should be found as to immune varieties.

Hybridizing should begin at once, but from five to eight years would be required before any improved varieties could be ready for planting. For more immediate planting, seed should be collected from the best flax-types and either the seed or the seedlings supplied to flax-growers.

Experimental work should be undertaken in conjunction with growers to decide several questions which are most urgent. The chief one of these problems is that of the effect on flax of changed conditions and cultivation. For instance, one grower has found on the high country around Mount Ruapehu flax which produces good leaf there. Seed of this flax has been grown near sea-level. The question is, Will the plant produce the same quality and quantity of fibre under the new conditions? The same doubt exists concerning changes from sand-dune to swamp, and *vice versa*. Only careful work can be trusted in things of this kind. Fans of one large bush, which would all be the same, should be planted in different localities and careful records kept of their growth and production of fibre.

Experiments on manuring and cultivation should be treated in the same way. The fundamental principle should be that comparison should always be between sets of plants of one variety. It is hoped that growers may be induced, when planting, to set aside small test areas in which only one selected variety would be planted.

In conclusion, it may be emphasized that the time is overdue when flax-growing should be placed on a scientific basis. Keen competition in the world's markets demands both an improvement in quality and in uniformity, and a reduction of labour costs, the latter being one of the largest items in the production of phormium fibre. Everything seems to indicate systematic cultivation and mechanical handling of flax as the chief remedy.

It is only to be expected that repeated cutting of heavy crops off uncultivated swamps would lead to deterioration both in quality and quantity—an expectation which appears to be fully borne out by the experience of millers. In addition, the swamp has the disadvantages of expensive cutting and carrying, and of mixed varieties. Cultivated flax would almost certainly be cut by mechanical means, and the same tractor used for cutting would be available for hauling.

The preliminary work on selection, breeding, and cultivation should be done before planting begins on an extensive scale. That it is really worth doing is shown by the fact that much has been done already by individual millers. Messrs. A. and L. Seifert, B. B. Wood, A. Wall, and G. Seifert may be mentioned especially. Valuable as work by individual concerns may be, there can be no doubt that combined work by all interested has everything in its favour. It is waste for several men each to spend time and money on the same problem ; nor can one man, or a company, often afford to look far enough ahead in its programme of research. The industry in New Zealand is small ; it must stand or fall as a unit. The pooling of experience already gained, and co-ordination in future research, appear to offer the most hopeful lines of advance.

CHECKING OF MILK AND CREAM TESTS AND CREAM-GRADING.

AN officer of the Dairy Division (Mr. G. R. B. Boswell) has been recently appointed to systematically undertake the checking of milk and cream tests among the dairy factories, and to assist in the work of co-ordinating cream-grading.

Check testing can be carried out for some days after the expiry of each testing-period, and will probably be applied primarily to dairy companies evidencing seasonal yields which are considered to be too high. Despite publicity respecting yields, some are undoubtedly higher than should be the case.

The Instructors in buttermaking have been giving much attention to keeping the cream-grading standards uniform as between the various factories. Part of the new officer's time will be utilized to assist in this work. It is very satisfactory to note that the great majority of dairy companies have co-operated splendidly in regard to cream-grading. Every possible attention has been given by Instructors to complaints respecting inaccurate grading. Some of these complaints have been justified, but the majority were probably founded only on rumour, and were of no consequence.

—W. M. Singleton, Director of the Dairy Division.

CALF-MARKING.

THE MOVEMENT IN NEW ZEALAND.

"CALF-MARKING" is the term applied to a system of ear-tattooing which provides permanent identification of heifer calves sired by registered purebred bulls from cows tested for yield and proved profitable butterfat producers.

In this country the system was inaugurated by the New Zealand Co-operative Herd Testing Association, operating in the Auckland District, 305 calves having been marked in 1925–26, the first year of operation. Besides this organization, the system is now being carried out by at least seven other herd-testing associations, as follows: Bay of Plenty Group Herd Testing Association, Wairarapa Herd Testing Association, Northern Wairoa Herd Testing Association, Te Aroha Herd Testing Association, Taranaki Co-operative Herd Testing Association, Bush-Horowhenua Herd Testing Association, Bay of Islands Herd Testing Association. Possibly there are others of which the Department has no advice, but the list given serves to indicate that the movement is developing rapidly in the North Island. Several more associations are arranging to take up the work next season.

Statistics showing the total number of calves marked in the Dominion last spring are not available, but the New Zealand Co-operative Herd Testing Association advises that it registered some four thousand calves.

As already indicated, the marking is carried out by means of a perforated stained tattoo in the ear, and is confined to heifer calves. The calf must have been sired by a registered purebred bull, and the dam must have produced, in a lactation period of not more than 305 days, a certain minimum butterfat requirement according to age. For a first-calver the standard is set at 250 lb., for a second-calver 275 lb., and for a third-calver or older animal 300 lb. In addition, the dam must be branded or otherwise identifiable under the rules of and in a manner satisfactory to the association. For purposes of calf-marking only heifer calves from dams that have actually been tested by certain herd-testing groups are registered. Particulars of calves qualifying under the rules of the association are entered in a register and a certificate is issued.

The actual system of marking may be outlined as follows: A general index letter—"T"—is the registered mark of the Dominion Group Herd Testing Federation. This index mark, of course, remains permanent. The index mark is followed by a letter which indicates the dairying season in which the calf was born, thus providing a key to age. This age or year letter is followed by the registration number of the calf in the Heifer Calf Register. Thus, for instance, "T B 555" would indicate that the calf so marked was number 555 in the register of the Dominion Group Herd Testing Federation for the year 1926–27.

The influence of calf-marking properly carried out should ultimately be far-reaching and of great assistance to the dairy industry. It provides a means of identifying calves with more or less proved butterfat backing, and, in districts where calf-marking is in operation,

distinguishes what should be a profitable producer and useful herd-builder from the lower-yielding animal. In this way it should steadily, but surely and automatically, tend to solve the cull-cow problem which has exercised the minds of dairymen for many years. Most of the earlier suggested methods for solving this problem were along the line of branding the cull cow. It would seem, however, that the marking of the good cow is a much more satisfactory process than the branding of the poor one. An unbranded beast may be accepted as an unknown quantity, but a heifer marked under the calf-marking system carries the mark of potential quality, identifying its bearer as the product of a purebred sire and a dam which has proved herself a capable butterfat producer.

In any such system as this there are sure to be many examples of undesirable atavism—throw-backs to inferior types and inferior producers—but, as the result of calf-marking, our average dairy cow should normally improve with each succeeding generation.

RANGITIKEI SAND-DUNE EXPERIMENTAL STATION.

RECENT work at this station, which is operated by the State Forest Service, is referred to in the annual report of the Service for 1926–27 as under:—

The knowledge and experience gained from the experimental work which has been carried out at the station since May, 1921, has enabled larger areas to be treated during the year with better results and at a lower cost per acre. Marram-grass was planted on 372 acres, and, although winds of high velocity were frequent and the rainfall low during the planting season, a very successful establishment was obtained. The area of sand-dunes now planted with marram-grass is 1,045 acres. The planting of exotic pines on the stabilized marram-covered dunes was continued, and 88,650 trees were planted on 130 acres, bringing the total area planted to 315 acres. Between the dunes there is a large area of low-lying rush country which cannot be drained sufficiently for tree-growing owing to the lack of fall. As it is desirable to put this land to profitable use, two experimental plots of flax (*Phormium tenax*) were formed. The result to date is most promising, but it is yet too early to decide whether it will be a profitable undertaking to plant the whole of the wet area, which amounts to over 1,000 acres. Experimental plots of flax and toetoe were also established immediately to the rear of the fore-dune, to ascertain if these species will afford the shelter necessary before trees can be planted successfully in such an exposed position. An experimental planting of kikuyu-grass was also made, and where the sand is less than 1 ft. deep it is growing well and is forming a dense mat. Elsewhere it failed to strike. The tree nursery at Tangimoana supplied 100,300 transplants, which were used in the 1926 planting and to fill the blanks in the work of previous years. Seedlings to the number of 140,000 were transplanted for use in the 1927 planting season.

Noxious-weeds Orders.—The Mangonui County Council has declared winged thistle to be a noxious weed within that county. Gorse has been similarly declared in Kairanga County.

Registration of Orchards.—Regulations under the Orchard and Garden Diseases Act, gazetted on 19th January, prescribe that applications for registration of orchards shall be made to the Director of the Horticulture Division, Department of Agriculture, in the month of January each year (instead of September as hitherto). Forms of application may be obtained from the Director, or from any district office or Orchard Instructor of the Department. "Orchard" is defined as "any land used for the growing of fruit-trees and the production of fruit for sale," and includes areas carrying fruit-trees that may not have come into bearing.

PREVENTION OF SAP-STAIN IN WHITE-PINE.

TESTS BY STATE FOREST SERVICE.

C. E. DIXON, Forest Assistant, State Forest Service, Wellington.

THIS article presents the results of a series of tests made by the State Forest Service with the object of preventing the sap-staining which occurs in the sapwood of New Zealand white-pine (*Podocarpus dacrydioides*) during seasoning. The work was carried out under the direction of Mr. A. R. Entrican, Engineer in Forest Products.

The sapwood of most softwoods and of some hardwoods becomes discoloured under certain conditions. This discoloration—which may be blue, green, brown, or red, depending on the species, method of formation, and duration of the discoloration—is known generally by the term "sap-stain." The causes of this sap-stain are many, but are all included under the headings of (1) chemical action, and (2) fungal attack.

Sap-stain caused by chemical action is in the main due to the enzymes in the wood, and produces discoloration both in the sapwood and heartwood. Such stains give more or less permanent discoloration to the wood, causing degrading, and often resulting in financial losses.

Sap-stain caused by fungal attack, however, is the most common one, and that affecting white-pine is known as "blue-stain," due to the blue discoloration occurring in the timber, and is caused by several genera of fungi, mainly Penicillium and Cladosporium, which feed on the soluble sugars present in the sapwood. These fungi do not confine their attention to the surface, but penetrate the sapwood, and may, if conditions are suitable, completely permeate it.

A large economic loss is apparent every year as a result of degrade in the timber caused by these sap-staining fungi. It is estimated that an average depreciation in value of 5 per cent. results in white-pine alone from sap-stain losses, and this is equivalent to some £15,000 per annum. As white-pine is the staple wood used for the construction of butter-boxes in New Zealand, the close bearing of this matter on the dairy industry becomes evident.

Laboratory investigations by Dr. J. S. Yeates indicated that borax was the best and most suitable fungicide for sap-stain. As a result the present commercial tests were instituted, using a borax dip as the sap-stain preventive. In addition, methods of piling were also incorporated in the study to determine their effect as control measures. The commercial experiments proved very satisfactory, and it was demonstrated that the borax-dipped timber, stacked in approved fashion, is almost entirely free from the attack of sap-stain fungi. Correct open piling of even untreated timber was also proved to minimize the sap-stain considerably. The cost of treatment is estimated to vary from 2d. to 3d. per 100 ft. B.M., depending on the size of the mill and methods of treating the timber.

Conditions suitable for Growth of Sap-stain.

The development of sap-stain fungi depends on four factors—a supply of air containing the essential element, oxygen; the requisite amount of moisture; a favourable temperature; and the necessary

food substances. Fungi require oxygen for their growth, and even under storage conditions the supply from the air is ample for their propagation. Stagnant air containing a considerable amount of moisture is favourable to the growth of fungi, in that it prevents the drying of the wood. The extent of growth of sap-stain and mould fungi is largely dependent upon the amount of moisture present in the wood. Tests already carried out in New Zealand by the Forest Service have proved that the moisture content of green sapwood of all softwoods is considerably more than 100 per cent. (based on the oven-dry weight of the wood). Thus while drying under normal conditions it is possible for the timber to retain for a considerable time the amount of moisture suitable for the development of fungi. If, however, the timber can be surface-dried by sufficient air-currents the growth of fungi on it can be rendered almost impossible. It has also been clearly established that the fungi grow most rapidly between certain limiting temperatures, which, however, appear to include normal air-temperatures. Food is essential for the growth of the fungi, and this is obtained from the starches, oils, and sugars occurring in the green sapwood. When supplied with these essentials for growth fungi develop rapidly, and often reproduce abundantly. Deprived, however, of any or all of these factors, the fungi will cease to grow and will eventually die. Under normal air-seasoning conditions it is impossible to interfere with the factors temperature, air, and food. Moisture, however, can be regulated to a certain degree by varying the method of piling the timber and thus altering the air-circulation throughout the stacks. Under these conditions growth of the fungi, which, as stated, depends on the moisture present, can be made partially dependent on the methods adopted in stacking the timber.

In addition, therefore, to treating the timber in order to kill the fungi, experiments were also carried out by altering the conditions of piling, in the hope that the conditions suitable for the growth of the fungi might be modified and the attack rendered impossible.

Material tested.

In carrying out the study it was decided to test as far as possible the type of timber most badly affected by sap-stain fungi. With this purpose in view, white-pine sapwood, 1 in. thick, in random widths and lengths, was used throughout. In all 10,000 ft. B.M. was used.

As it had also been proved previously that boards in open-piled stacks become most seriously affected immediately under the fillets, all of the latter used throughout the tests were first treated with the borax dip to remove this factor from the study.

Tests to prevent Sap-stain.

Two types of tests were carried out. The first, which consisted of a chemical treatment, was accomplished by dipping the timber in a saturated solution of borax in water (2 per cent. at normal temperature). The green timber on sawing was completely immersed in the treating-bath, immediately taken out again, drained, and stacked as shown in Fig. 1. The treatment thus given consisted of a surface wetting of the timber only. There was no penetration of the solution into the timber.

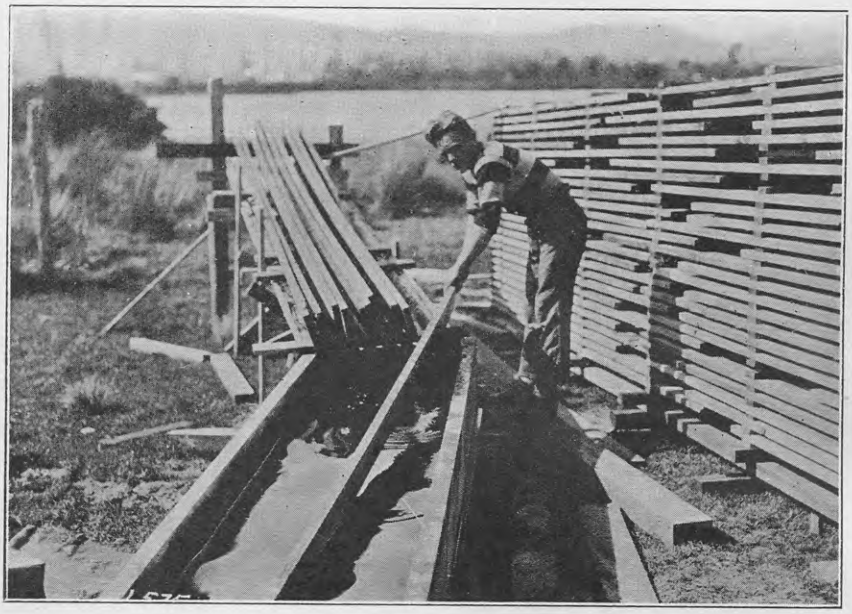


FIG. 1. METHOD OF DIPPING AND DRAINING TIMBER TO PREVENT SAP-STAIN.

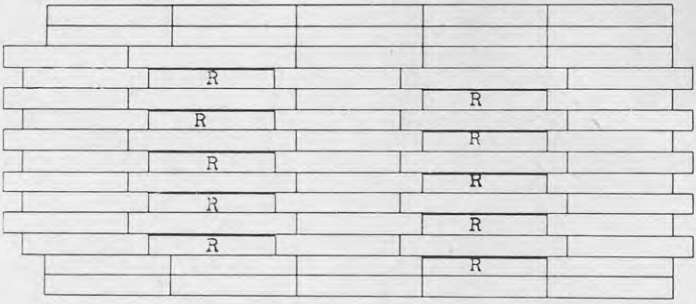


FIG. 2. DIAGRAMMATIC SECTION OF BLOCK-STACKED PILES.

All boards are in contact. Boards used for inspections are denoted by letter R.

The second type, which consisted of a physical test, was carried out by varying the method of stacking, by which means the physical conditions most suited to the development of the fungi can be modified or removed. Two types of piling were accordingly adopted. In one the timber was block-stacked—that is, the boards were piled directly in contact and no air-spaces left anywhere in the piles. The width

of the piles was 30 in., the height 16 in., and the average length 11 ft., although the latter varied, due to the boards supplied being in random lengths, the stacks thus having overhanging ends. A diagrammatic sketch of this type of pile is shown in Fig. 2.

In the other type of piling adopted the timber was open-box-piled —that is, each layer of boards was separated from the layer immediately above and below it by means of fillets. The latter consisted of 3 in. by 1 in. borax-dipped white-pine sapwood, placed on the flat and spaced 4 ft. apart down the length of the stack. The front fillets were placed flush with the ends of the stacked timber, but each succeeding fillet in the height of the stack was placed at a distance of $\frac{1}{2}$ in. forward or in front of the fillet immediately beneath it, thus giving the stack a decided forward lean. These stacks had no overhanging ends, the pile being built up, as its name implies, in the form of a box. To accomplish this the stack was formed from both ends, two boards always lying in the length of the stack, thus allowing the free ends of the boards to occur in the centre of the pile. This minimizes the staining which occurs on overhanging ends, as illustrated in Fig. 7. Additional air-spaces were provided when, due to their length being too short, boards forming the length of the stack did not quite meet. In addition, air-chimneys 6 in. wide, running throughout the length of the piles, were also provided. The finished stack, which is shown in Fig. 4, was 7 ft. wide, 6 ft. 6 in. high, and 22 ft. long, and contained approximately 4,000 ft. B.M. A section of the pile is shown in Fig. 3, and photographically in Fig. 4.

To facilitate inspection each of the boards in all stacks formed was marked with a consecutive number (commencing from the bottom of the stack), and also designated according to the stack to which it belonged. Thus "C.U." represents boards from the close-stacked untreated pile, "C.T." represents boards from the close-stacked treated pile, "O.U." represents boards from the open-stacked untreated pile, and "O.T." represents boards from the open-stacked treated pile.

Representative boards from each stack were examined every week for the first two months, and every month thereafter, for the purpose of determining the extent of stain occurring in each stack. Five representative boards were used for each close-stacked pile, and ten for each open-stacked pile, and were chosen, as illustrated in Figs. 2 and 3, so as to be representative of all parts of each stack. These boards were sawn $\frac{1}{16}$ in. less in thickness, and were of less width than boards directly above them, in order that they might be removed and examined when required. They were further each designated with the letter "R." At the end of eight months the stacks were dismantled and every board examined in detail for signs of sap-stain.

A further series of experiments has also been instituted to determine the effect of the treated timber on butter packed in boxes manufactured from it and exported overseas. As this test will not be finalized until a grading report has been received from London, it will be some time yet before the results will be available. It is confidently anticipated, however, that, as the treatment is only a surface one and butter-box material has to be planed before use, no damage will arise from the use of the treated material.

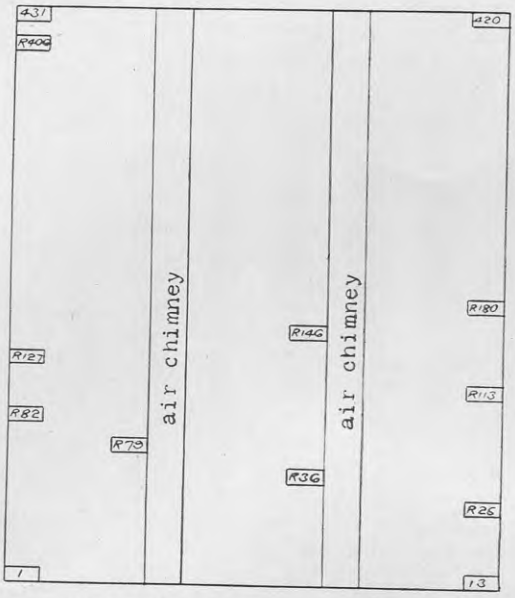


FIG. 3. DIAGRAMMATIC SECTION OF OPEN-FILLETED PILES.
Boards used for inspections are denoted by letter R.

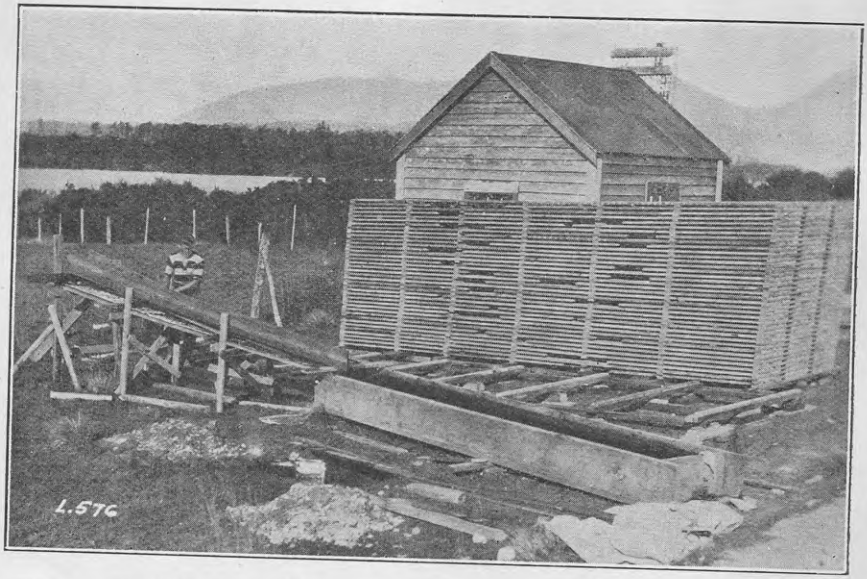


FIG. 4. FINISHED OPEN-FILLETED PILES, SHOWING METHOD OF FORMATION OF PILE.

Analysis of Results.

When the working-plan was drawn up for the study it was laid down that the extent of the stain should be judged on an area basis, and measurements taken accordingly. In the test, however, due to the stain appearing in scattered spots and streaks, &c., as shown in Figs. 5 and 6, this was found impossible, and it was necessary to resort to descriptive methods and photography to obtain an idea of the extent of the stain. The nature of the stain was accordingly described as "streaked," "spotted," or "blotched." Stain occurring in the form of an area in which the length was greater than four times the width was described as "streaked stain"; that occurring in the form of an area more or less circular in shape but under ½ in. in diameter was denoted as "spotted stain"; while that occurring in the form of an area over ½ in. in diameter was described as "blotched stain." The degree of the stain was also recorded, and was described as "light," "moderate," or "heavy," depending purely on its appearance—that is, whether it was light, medium-coloured, or dark. On some boards a combination was found to occur, and in such cases was described accordingly.

Table 1 presents the results obtained from the closely stacked untreated pile. The staining in this pile commenced almost immediately on stacking, and by the end of a fortnight all boards examined had been lightly stained. During the succeeding seven weeks the staining became more intense and darker in colour, indicating that the stain was penetrating the timber. During the next four months, until the dismantling of the stack, there was little increase in the staining. The results of the final inspection are tabulated in Table 5. Blotched stain,

Table 1.—Occurrence of Sap-stain in Close-stacked Untreated Pile.
(Five boards examined.)

Date.	Sap-stain Occurrence.
1927.	
25th March ..	Stack formed.
2nd April ..	Staining, nil.
9th April ..	Scattered, uneven, light-brown spotting, all boards.
16th April ..	Spotting become larger and darker.
23rd April ..	,, ,,
30th April ..	,, ,,
7th May ..	Spotting now covering both sides of all boards.
14th May ..	Staining increased considerably; all boards in stack becoming very dark in colour.
21st May ..	Spots going darker, but not increasing appreciably in extent.
28th May ..	No further increase of stain.
2nd July ..	No increase in stain; two boards turning yellow in places.
30th July ..	No increase in stain.
27th August ..	,,
24th September	,,
27th October ..	Slight increase in stain.

NOTE.—Stack badly sap-stained.

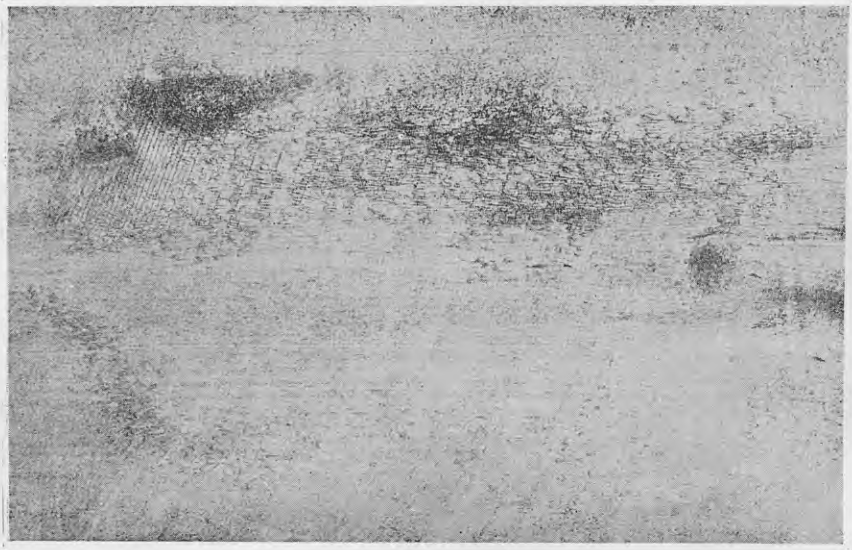


FIG. 5. TYPICAL BLOTCHED STAINING OCCURRING IN CLOSE-PILED UNTREATED STACK.

which represents the largest and deepest type of stain, occurred on 68·6 per cent. of the boards, and is shown in Fig. 5. The stain in these cases was often ½ in. in depth, and the timber was practically useless. Only 0·7 per cent. of the boards were free from stain.

(To be concluded.)

FOOT-AND-MOUTH DISEASE IN BRITAIN.

THE High Commissioner for New Zealand in London cabled under date 3rd February: During January there were 55 outbreaks of foot-and-mouth disease in eleven counties as follows: Leicester, 12; Derby, 11; Lincs, 10; Staffs, 7; Lancs, 4; Warwick, 3; Yorks, Notts, and Glamorgan, 2 each; Surrey and Hunts, 1 each.

EXTERNAL TRADE OF NEW ZEALAND, 1927.

PRELIMINARY figures issued by the Census and Statistics Office show that exports for the calendar year 1927 amounted to £48,496,354, and imports to £44,782,946, leaving an excess of exports of £3,714,408. Corresponding figures for 1926 were —exports, £45,275,575; imports, £49,889,563; balance in favour of imports, £4,613,988. The result for 1927 is therefore £8,328,396 more favourable to the Dominion than that of the preceding year.

Exports show an advance of £3,220,779, a position due mainly to increases of £2,220,193 in butter and £1,131,556 in wool. Other items showing an appreciable advance over the previous year's figures are: Frozen beef, £71,875; frozen lamb, £418,576; calf-skins, £47,194; hides, £120,094. The most noteworthy decreases occurred in cheese, £356,763; rabbit-skins, £146,507; phormium fibre, £52,470; kauri-gum, £54,133; timber, £50,292.

SEASONAL NOTES.

THE FARM.

SUMMER SUPPLEMENTARY FEEDING OF DAIRY COWS.

THE prolonged spell of dry weather experienced this summer has demonstrated the extreme value of ensilage for the summer supplementary feeding of dairy cows. In the Auckland Province permanent pastures, except on the best swamp-land, generally ceased growth early in December, and have since remained in a burnt and dormant condition. Annual forage crops for summer feeding have done badly, and in many cases have failed altogether. Lucerne and paspalum have proved a good stand-by, but for various reasons lucerne is not an important crop in Auckland Province generally, while paspalum, although it has grown well on the heavier and moister soils, has not thrown a great deal of feed where the soil-conditions are very dry. The great advantage of grass ensilage for summer supplementary feeding is that it can be saved in years of good rainfall and abundant grass-growth and kept for dry years. A stack of grass ensilage is the safest insurance policy a dairy-farmer can hold against drought.

The failure of ordinary permanent pastures during the dry weather has naturally turned the attention of dairy-farmers to the desirability of establishing fields of paspalum and lucerne for providing summer feed. There is no doubt that paspalum could be more widely grown in the southern part of Auckland Province than it is at present. The common idea that once paspalum is sown it will eventually spread all over the farm, smother out all the other grasses, and leave the farmer with no winter or early spring feed is quite wrong. Experience has shown that where regular top-dressing is carried out and proper pasture-management methods are adopted mixed pastures of rye-grass, cocksfoot, and paspalum can be maintained. Paspalum will not spread into an ordinary rye-grass, cocksfoot, and clover pasture as long as the pasture has a close sward. Paspalum usually establishes itself in a mixed pasture when the turf is opening up, and really occupies spaces that would otherwise be growing weeds. The best way to establish paspalum is to sow 5 lb. to 6 lb. of seed with the ordinary permanent-pasture mixture used in the district.

Lucerne cannot be so widely cultivated in Auckland Province as paspalum, since it does badly on low-lying soils where the permanent water-level during winter is near the surface. Lucerne naturally does best in a warm, dry climate and a deep alluvial soil well supplied with moisture in the deeper layers. In a wet climate the crop has to contend against the competition of grass and clover, which in many parts of the North Island take possession of the land during the winter and early spring when the lucerne is dormant. The sowing of lucerne should be attempted only on land that is well drained in the winter and that is in a high state of fertility. Over a very large part of Auckland Province summer supplementary feed can be more economically provided by means of grass ensilage and paspalum than by lucerne.

AUTUMN SOWING OF PASTURES.

March is usually the best month for sowing permanent and temporary pastures on ploughed land. Sowing in February is often unsatisfactory owing to the uncertain rainfall; in years of good rainfall, however, February sowings do remarkably well. The seed-bed for sowing grass should be fine and firm from top to bottom. The cultivation operations should be finished with a rolling, and the seed and fertilizer broadcast on the rolled surface. The seed can then be covered with a stroke of the brush or chain harrows and the land finally rolled again. The mixtures used for permanent pasture naturally vary with the soil-conditions and climate. Standard mixtures suitable for various conditions are to be found in the Department's Bulletin No. 107, "Grasslands of New Zealand." Advice required about grass mixtures for particular conditions should be sought from the district Instructors in Agriculture.

On good ploughable land in the humid parts of New Zealand the ultimate sward of a pasture probably depends more on management than on the original mixture of grass-seed sown. Cocksfoot and rye-grass form the basis of all mixtures sown on good ploughable land, and the final establishment of a good permanent rye-grass, cocksfoot, and clover pasture depends very largely on the methods followed in top-dressing, stocking, chain-harrowing, and mowing. A permanent grass mixture that has been used for a considerable time on the Ruakura Farm of Instruction, and one that has given excellent results and should prove useful for most Waikato district land, is as follows: Italian rye-grass, 4 lb.; perennial rye-grass, 8 lb.; cocksfoot, 12 lb.; crested dogstail, 2 lb.; timothy, 2½ lb.; meadow-foxtail, 1 lb.; white clover, 1 lb.; red clover, 4 lb.; Lotus major, ½ lb.: total, 35 lb.

This mixture is not so heavy as many that are used locally for sowing permanent pastures, but the comparatively light rye-grass seeding that is used enables all the other species sown to become well established. Good subsequent management causes the rye-grass to stool out and grow vigorously and take a prominent place in the pasture sward. A heavy rye-grass seeding is liable to check the early establishment and growth of cocksfoot, dogstail, and timothy, and may not finally give as good a rye-grass sward as a lighter seeding. The seeds of cocksfoot, paspalum, and meadow-foxtail vary considerably in germination, and only first-class lines of seed should be purchased. Good cocksfoot-seed should germinate over 80 per cent.; the average germination is about 65 per cent., and lines will be found that germinate below 40 per cent. Meadow-foxtail seed varies considerably in germination, and 35 to 50 per cent. can be considered good. The germination of paspalum-seed is generally low, and 35 per cent. can be looked on as satisfactory.

HARVESTING OF RED CLOVER AND LINSEED.

Red clover is usually cut for seed about three months after the hay crop. When the clover-seed can be rubbed out from the majority of the heads, and the stalks begin to lie at an angle of 45 degrees, it is time to cut. The crop is cut either with a side-delivery mower or with an ordinary mower fitted with a temporary platform behind the cutter-bar. In the latter case steel bands are fitted to trail behind the mower; the driver of the mower uses an improvised seat—half a sack of chaff

being a handy method. The mower-seat should be turned back to front. A second man sits on this and guides the clover cut into heaps, which lie clear of the wheel in the course of the next cut. By this system the clover may be left in windrows without any trouble. If the material is exceedingly dry it may often be threshed immediately after stacking, before the stack begins to sweat. However, it is frequently the case when the clover is stacked that many of the heads are somewhat immature, and hence a certain amount of curing in the stack is essential. Once a stack starts to sweat it should be left for a month to six weeks before threshing is attempted.

The linseed crop will be ready for harvesting early in March. The crop is ready to cut when the cobs, if rubbed between the hands, open easily and shed the seed. The crop should be allowed to remain in the stook till sufficiently dry; this will take from two to three weeks. The crop is most conveniently threshed from the stook.

—*P. W. Smallfield, B.Ag., Instructor in Agriculture, Ruakura.*

THE ORCHARD.

SPRAYING OPERATIONS.

ATTENTION must still be given to the later varieties of apples that will not be picked for some time. The hot, dry weather experienced will be conducive to various pests in the orchard, and red mite will probably be on the increase. If nothing is done for its control this pest multiplies very rapidly — not only detrimentally to the fruit in the current season, but to the production of strong healthy buds for the next season. Lime-sulphur sprayed at strength of about 1–120 will help to keep red mite in check, although Black Leaf 40, 1–800 or 1–1,000, has been proved to give better results. Owing to the high cost of Black Leaf, some growers have been using red oil, strength 1–160, or a 2-per-cent. kerosene emulsion, both sprays having been found satisfactory for the control of red mite and leaf-hopper. When spraying for these pests it is advisable to direct attention to the under-surfaces of the foliage as much as possible, using considerable force to drive the spray to every part.

Stone-fruit growers are advised to give their trees a good application of bordeaux as soon as possible after the fruit has been picked. This will act as a preventive against the overwintering of spores, and thus reduce the trouble from fungous diseases next spring. Any fruits affected with brown-rot left on the trees or lying on the ground should be gathered up and destroyed.

MARKETING.

The importance of care in the marketing of fruit, whether for local or overseas markets, cannot be too strongly emphasized. The placing of the rejects from export on the local market is detrimental, and causes dissatisfaction among the buying public. These fruits have not reached the proper stage of maturity for local consumption, and very rarely fetch satisfactory prices. If more discrimination were shown when picking, much of this trouble would be eliminated. Where it is intended to cater for the local market it would be preferable to reserve certain trees in the orchard for that purpose, picking the fruit at the

proper stage of maturity and placing it on the market in the very best of condition. The fact that apple-trees should be picked over two or three times is not always realized, with the result that many fruits picked in the early stages are much below the minimum size allowed for that variety. These are put on the local market, with the result as stated above. If left on the tree for a second picking they would size up to the requirements for export, and if too mature for export would be in proper condition for the local market.

The handling of fruit for the local market leaves much to be desired. It should be remembered that there is always a good demand for the best, and the grower who sets a standard and consistently keeps to that standard will soon become known to the buyers, who in turn will always be prepared to give a satisfactory price for the fruit. No fruit with bruises, disease, broken skin, or other blemishes detrimental to its quality should be included. The cases should be well packed with good, sound fruit of uniform size, and neatly stencilled, giving all necessary details. It is only by attention to these several points that the local market can be successfully fostered.

—G. Stratford, Orchard Instructor, Motueka.

Citrus-culture.

Owing to the extremely dry weather experienced this summer trees are backward in development, and little could be done to assist them except where irrigation was possible. In order to minimize as much as possible the ill effects of this drought it will be well to put into action all possible cultural practices during the coming autumn. After the first rainfall the soil should be cultivated to break the surface, otherwise the full benefit of the succeeding rains will be lost, as much will run away.

The trees may be expected to make more vigorous autumn growth than usual, and this should be attended to by pinching and spacing, in order to ensure that the growth may be reasonably hard to withstand the frosts to be expected later. It is in winters following such seasons as the present one that winter-kill of tips is most damaging, mainly because the growth is soft.

Autumn manuring also has a bearing on the texture of the growth, and highly nitrogenous fertilizers should be sparingly used. Most trees will, of course, require an autumn dressing, but the most suitable this year should be phosphates and potash, with slower-acting nitrogen such as blood-and-bone.

This is a good season of the year for examining and trimming all trees, removing old and worn-out parts and branches which have a tendency to sweep the ground.

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

POULTRY-KEEPING.

CULLING.

THE coming month marks an important period in the poultry-keeping year. It is then that the culling of undesirable stock should be carried out. Having regard to the high prices now ruling for wheat and other foodstuffs, there should be no delay in weeding out all birds of the

drone type which give signs of not being future profit-makers. It will seldom pay to keep a bird for a third laying season unless, of course, it is known to be a noted layer of standard-weight eggs (2 oz.), and at the same time possesses strong points indicative of breeding-power. Not only should the birds that are terminating their second laying season be heavily culled, but the first season's layers also should be carefully gone through, as many of these may usually be removed with distinct advantage.

The rule has already been stated in these notes that the early moulting bird is the first one to cull. As is the case, however, with most rules pertaining to the management of poultry, this one is not capable of universal application. The fact of a bird moulting early is not always an indication that it has passed its profitable period of production. A premature moult is often the result of a sudden change of food, or failure to provide a palatable diet and sufficient of it—a factor essential to heavy egg-production at this period of the year. Individual birds may also be forced into a premature moult by being allowed to sit on the nest for days and weeks at a time in a state of broodiness. In such circumstances the early-moulting rule is of little value. The same may be said where first-, second-, and third-year layers are allowed to run together, and the common mistake made of neglecting to have the birds specially marked as a guide to age determination. In such cases it will usually be found that the first-season layer moults first, especially when hatched in the early season, and where the older birds have been maintained on the plant merely because they were late moulters.

It will thus be seen that efficient culling can only be carried out where the whole of the local circumstances are closely observed and taken fully into account when the work of classifying the stock is taking place. Of course, on well-managed plants, and where the owner has a trained eye, he can tell with a great degree of certainty (by certain signs in combination with the moulting-period) the hens that have laid well and that are likely to lay well in the future. This enables him to weed out the low producers and thereby keep only profitable stock.

All things being equal in regard to the time of hatching, and where the birds have received a uniform class of food and attention, the good layer and the one which possesses strong constitutional vigour will usually, in addition to being a late moulter, present the following desirable signs: Face large and free from feathers (it is not uncommon for the head to become quite bare—a sign seldom or never found in a low producer); a bold, bright eye; close feathering; a bright red comb (which should be retained more or less throughout the moulting-period); well-developed crop; and an alert, vigorous appearance.

In yellow-skinned breeds such as Leghorns, Wyandottes, Plymouth Rocks, &c., the legs as well as the beak of the good layers will mostly exhibit at this period of the year a bleached or even a white appearance. It must be noted that this sign only applies towards the end of the bird's productive period, for after it has moulted the legs will regain their yellow appearance as in the early pullet stage. The heavy layer will also have a more or less shabby appearance and a lean condition. On the contrary, the poor layers and others which 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 eye, and any which show the slightest weakness in constitution.

SELECTION OF THE BREEDING-HENS.

After the weak types have been weeded out, the remaining birds should be carefully gone through and the best specimens selected for the breeding-pens next season. It is important that this work be carried out before the birds moult, as even with the best layers the points outlined as indicative of producing power and constitutional vigour will rapidly vanish as the moulting process advances; furthermore, these points will not stand out prominently again for several months later. In selecting prospective breeding-hens laying and constitutional points should be given first consideration, but these should be combined with good size of body and breed type—that is to say, if desirable utility characters are to be maintained. However well a bird may lay, it should not be bred from if it is an undersized specimen of its breed, or one which is practically devoid of standard breed-requirements.

When the best breeding specimens have been chosen they should be specially marked and kept by themselves, preferably on a free range. Then by providing a plain ration the birds will be discouraged from laying. This will give them an opportunity to recoup and get into a condition to produce early spring eggs, and at the same time retain strong breeding-power. The fact cannot be emphasized too strongly that the greater the demand made on a bird for egg-yield the greater the care that must be exercised not to impair its vigour in the process. It stands to reason that when every egg is forced out of the late moulter and intended breeder everything is against vigorous progeny being produced. Constitution is the base of all successful breeding operations.

COLDS AMONG THE STOCK.

Usually at this time of year many birds contract colds, especially the young stock which have been hatched late. Therefore a careful watch must be kept in order to detect any of the birds showing the first symptoms, such as sneezing, running at the nostrils, or eyes watering. If any of these symptoms are observed the affected birds should be isolated at once, and an endeavour made to find the cause and have it removed. It is next to useless trying to stamp out colds by curative methods unless the cause is first discovered and removed.

Draughty houses are no doubt the most common cause of colds. If there are cracks in the sides or back wall, and the birds are compelled to sleep in a draught, colds are simply invited. In this connection, and where long houses are in use, the necessity of having the partitions, especially near by the roosts, absolutely draught-proof cannot be too strongly urged. Colds may also be brought about by ill-ventilated, damp, or overcrowded quarters. If trouble is to be prevented these and other such weaknesses should be corrected at the earliest possible time. It must be remembered that colds are the forerunner of roup, and if this once obtains a foothold there is no telling when it is going to be stamped out.

—F. C. Brown, Chief Poultry Instructor, Wellington.

THE APIARY.

REQUEENING.

ATTENTION must be given in the autumn to replacing queens which are found to cease breeding early in colonies in normal condition with ample food. In all probability they are too old or have been injured in some way. In any case they require to be superseded as soon as possible by young queens. It is a good plan to rear as many queens as possible and have them cared for in nucleus colonies, later to be introduced to full colonies where needed. It is in the spring that young queens reared in the autumn prove so valuable. Their laying-powers are at their best, consequently the colonies build up rapidly; moreover, there is less tendency for the bees to swarm.

AUTUMN FEEDING.

In some districts after the main honey-flow is over a fair amount of nectar is gathered, sufficient to keep the bees breeding and for them to store a little surplus. However, where weather conditions are not favourable the colonies' needs may require to be supplemented in order to promote late breeding. Too often beekeepers are tempted to extract too close when making the final extraction; consequently the sudden curtailment in the food-supply checks breeding, and the colony goes into winter weak in young bees. The amount of stores in the hives is of paramount importance, and the first thought of the beekeeper in the autumn should be that of food-supply. There should be at least 30 lb. to 40 lb. of honey in each hive; and where there is this quantity or more and it appears to be diminishing rapidly the colonies should be additionally fed. It must be remembered that it is in the autumn that the beekeeper lays down the foundation for his next season's crop; consequently he must concentrate on wintering his bees in the best condition possible.

ROBBING.

During the next month or so, with very little or no honey-flow, bees are likely to rob the weaker hives. Do not encourage this by exposing combs, honey, syrup, &c. Contract the entrances of the weaker hives, as this gives the inmates a better chance to protect themselves. All operations with the hives should be performed expeditiously, and if feeding is necessary carry out this operation late in the afternoon, and then with every precaution to keep the bees quiet. If robbing should start, all operations in the apiary had better cease. Contract the entrances of the hives being robbed, and throw wet grass or weeds loosely on the alighting-boards so as to prevent the entrance of the robbers. If robbing cannot be checked in this way it may be advisable to shift the colony to another situation in the apiary.

UNITING WEAK COLONIES.

It is well to make a note of any weak colonies and any that are not doing well, as these are likely to succumb during the winter and early spring. It is by far the better plan to unite them with others rather than winter them, as they frequently become a prey to robbers, and are in that case a danger. 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 in the weaker hive will eat their way through the paper and unite peaceably with the bees in the stronger colony.

—E. A. Earp, Senior Apiary Instructor, Wellington.

HORTICULTURE.

THE TOBACCO CROP.

BRIGHT tobacco as it comes from the flue barn requires careful and experienced handling, or it quickly depreciates in quality. The proper method after curing is to condition the leaf—that is, to bring it to a soft pliable state in which it may be handled without breaking, and to approximately grade the leaves for colour. On a platform a foot or so above the floor in the bulking or grading room the leaves are then carefully stacked ("bulked" is the usual term) with the butts outwards, any convenient length and width, and 5 ft. to 6 ft. high. The natural result is for the stack to heat, and during the process a careful watch is kept to make sure the temperature does not rise too high. Should it rise much above 80° F. the material is taken down and rebulked, the leaf from the inside being placed towards the outside of the new bulk. After the completion of this process the leaves are carefully graded into classes of bright, medium, and dark colour, tied into hands, and packed for the market.

This is a general outline of the processes often adopted in the handling of flue-cured leaf; but for commercial purposes the judgment necessary for determining the right condition of the leaf, proper grades, and suitable humidity and temperatures can only be acquired by practical experience under the personal tuition of an instructor with a properly equipped plant.

In the case of air-cured tobacco the process is simpler. Instead of one week, some six weeks are necessary to complete the cure. As the cooler weather arrives, care is necessary to prevent the leaf being chilled by cold and damp, which are apt to set up mildew. For this reason harvesting should proceed with as little delay as possible.

TOMATOES.

The weather, so unpropitious for the outdoor tomato crop at the beginning of the season, has since been better for this crop, and those who nursed their plants successfully through the bleak conditions of early summer should now be receiving their well-earned reward.

Potting-soil for next season should now be stacked and matured. In some instances it will have been already twelve months in the stack. If it has not already been prepared, this should be done at once, or trouble in the seed-boxes is inevitable. Better still, increase the quantity and lay in a stock for 1929 also. Such methods are the easiest and cheapest way of overcoming most of the diseases to which young seedling plants are liable.

SMALL-FRUITS.

The demand for Cape gooseberries and passion-fruit is steadily increasing, and the crops now being gathered should find a ready

market. Both of these useful plants are from Peru or thereabouts, as are so many others of our most useful economic plants.

If the old canes of raspberry and loganberry brakes have not yet been cut out and burnt, this should be done now. Also crowded young growth in red and white currants and gooseberries should be thinned, the idea being to ripen the remaining wood and spurs in readiness for the next season's crop. This is also the best time to deal with most diseases which affect these crops. Spraying will be the best method, although the advantage of turning in a flock of poultry for a period now and again at this season is worth consideration in many instances. The destruction of many insects and larvæ is only one of the economic benefits derived from this practice. Where organic manures are not available in sufficient quantity, a good dressing of bonedust down the alleys and a sowing of a quick, hardy, green cover-crop would now be of great benefit.

Where new plantations of bush fruits are to be made, the preparation of the land should be given every consideration, as results chiefly depend on a rich, deep, clean tilth ; once the plants are established only shallow ploughing can be given. It is best to give this early attention, so that the land may settle down in time for planting in early winter.

VEGETABLE CROPS.

The winter crop of savoy, cauliflower, broccoli, celery, and leeks should now be well established. It should be remembered that the last two especially require generous feeding in order to produce the best results. As celery takes about six weeks to blanch, and this operation should be completed before hard frosts commence, a commencement may be made now by moulding the crop up slightly. The work should be completed in about three operations with intervals of a week or fortnight in between.

The seed-beds of spring cabbage and cauliflower should be watched, so that good plants may be ready for planting out next month. Complete the preparation of the land for them now by frequent hoeing to kill all seedling weeds.

In districts where it is necessary to sow main crop and white onions in the autumn for transplanting in early spring, the beds should now be prepared and sown down. Select a piece of clean land in a good open position. If manures are required, apply a moderate dressing of bonedust, wood ashes, and soot, and turn this in before firming the ground for sowing.

THE HOME GARDEN.

The month of March is the best time for sowing down lawns and greens, especially in the drier localities. Before doing so care must be taken to see that the land is clean and firm with an even surface. As the success of the work depends chiefly on this preparation it should not be hurried, but completed with the greatest care. A moderate tilth should then be made by raking the surface, and the seed sown when no wind is blowing. If it is then raked in evenly the job will be finished until the grass is ready for cutting in six to eight weeks' time.

Where planting has to be done the selection of trees and shrubs should now be completed, and the order given to the nurseryman for

delivery in the month of May. As before stated, planting of this kind is often unsuitable and too varied. If careful study is given to plans—and the permanent character of the work demands it—there is no reason why it should not be harmonious and original. Nowhere else in the world is nature more kind in helping the gardener to make gardens of taste and beauty.

In gardens where native plants predominate the association of hydrangeas and fuchsias in the excellent varieties now available have been admirably demonstrated lately. They are effective in providing suitable summer bloom in the partly shaded sections of the garden which the native plants do not provide. Among a few natives too rare in our gardens is kaiku (*Parsonsia heterophylla*), the New Zealand jasmine, a hardy climber that is found growing at the foot of the ramarama (*Myrtus bullata*) or other small tree, up which it twines and displays its scented flowers in spring among the foliage of its host. It appears to be a happy combination that is mutually satisfactory.

We are inclined to be rather apologetic about our native orchids, but here are two that deserve high praise in any company: Raupeka (*Earina suaveolens*) is a hardy winter-flowering species sometimes found on steep clay hills partly shaded by bush, growing in a little soil and leaf mould that has formed a drift in the fine network of the roots of some ground fern. Wet or dry it seems quite happy, as in summer often its roots appear so dry that most plants would wither up. In a similar position, and sometimes together, will be found *Dendrobium Cunninghamii*, a summer-flowering orchid, its curved wiry stems and small foliage having all the grace of the popular asparagus grown in hanging-baskets; but to these attractions it adds its much larger and curious flowers. These two orchids are admirably adapted for hanging-baskets on the veranda, the walls of a fernery, or a place in a partially shaded rock-garden.

—*W. C. Hyde, Horticulturist, Wellington.*

AGRICULTURAL SHOWS, SEASON 1927-28.

THE following show-dates, for the remainder of the current season, have been notified by agricultural and pastoral associations:—

Franklin A. and P. Association: Pukekohe, 24th and 25th February.
Waiapu P. and I. Association: Pastoral Show, Ruatoria, 25th February.
Tauranga A. and P. Association: Tauranga, 29th February.
Hukerenui Agricultural Association: Hukerenui, 1st March.
Mongonui County A. and P. Association: Kaitaia, 3rd March.
Opotiki A. and P. Association: Opotiki, 6th March.
Morrinsville A. and P. Society: Morrinsville, 7th March.
Taranaki Agricultural Society: New Plymouth, 7th and 8th March.
Matamata A. and P. Association: Matamata, 13th March.
Hawke's Bay A. and P. Society: Autumn Show, Tomoana, 14th March.
King-country Central A. and P. Association: Te Kuiti, 15th March.
Kaikoura A. and P. Association: Kaikoura, 16th March.
Mayfield A. and P. Association: Mayfield, 17th March.
Hawarden A. and P. Association: Hawarden, 23rd March.
Temuka and Geraldine A. and P. Association: Geraldine, 27th March.
Methven A. and P. Association: Methven, 29th March.
Oxford A. and P. Association: Oxford, 5th April.
Flaxbourne A. and P. Association: Ward, 19th April.

TESTING OF PUREBRED DAIRY COWS.

JANUARY CERTIFICATE-OF-RECORD LIST.

Dairy Division.

THE January C.O.R. list is a comparatively small one; by that period the majority of the cows on test in the previous season have calved and qualified for their certificates.

While the appended details of performance include particulars of a number of good yields, the most interesting feature of the list is the production of the Milking Shorthorn cow Rangataiki 2nd, owned and tested by Mr. G. N. Bell, of Karere, Longburn. According to her owner this remarkable animal was born in 1902, and was some 24 years 248 days old at commencement of test. Mr. Bell advises that she dropped her twenty-fourth calf on 5th November last, and is giving over 4 gallons of milk per day. In view of her age her last year's authenticated production of 10,688·1 lb. milk containing 376·72 lb. butterfat, in 335 days, is a distinct achievement.

Rangataiki 2nd is stated to be a representative of the good old type of English Milking Shorthorn, and, accepting the definition of constitution as "the ability to continue to the end within the line and limitation of purpose," this cow surely evidences good constitution to a marked degree.

LIST OF CERTIFICATES ISSUED, JANUARY, 1928.

* 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.
Waiuku Dawn ..	W. Craig, Waiuku ..	2 92	249·7	365	10,023·7	630·68
Waipiko Lovebird ..	C. G. C. Dermer, Waipiko ..	2 44	244·9	365	9,908·9	557·49
Ngahiwi's Grand Queen	W. J. Freeth, Waitara ..	2 5	241·0	364	9,197·8	525·08
Takapau Peggy ..	R. C. Jury, Tikorangi ..	2 14	241·9	365	8,371·4	487·76
Wattle Grove Pansy ..	W. Robinson, Patumahoe ..	1 138	240·5	365	6,703·4	429·13
Oaklands Colleen ..	C. G. Aickin, Auckland ..	2 33	243·8	365	5,334·7	351·30
Holly Oak Osier ..	C. G. Aickin, Auckland ..	1 299	240·5	365	5,035·1	316·76
Senior Two-year-old.						
Gowanlea Silent Lass	J. Campbell, Katikati ..	2 363	276·8	365	8,124·4	509·47
Ku Ku Primula ..	W. Devine, Palmerston N.	2 333	273·8	365	8,281·0	373·38
Three-year-old.						
Waipiko Jewel ..	C. G. C. Dermer, Waipiko ..	3 207	297·7	311	9,393·2	520·73
Four-year-old.						
Waikari Silver Queen	L. A. Higgins, Belgrove ..	4 16	315·1	365	11,020·7	513·42
Holly Oak Kewpie ..	A. J. Hale, Hillsborough ..	4 55	319·0	365	8,883·4	502·89
Mature.						
Crofton Countess ..	R. C. Jury, Tikorangi ..	5 356	350·0	365	13,077·4	812·34
Alfalfa Pansy* ..	F. P. King, Hautapu ..	6 93	350·0	365	12,606·0	736·12
Lady Lily Warrigal ..	J. T. Belcher, Cardiff ..	5 57	350·0	365	12,549·3	727·73
Tinsel's Lady Twylish	E. Hofmann, Matatoki ..	5 336	350·0	365	10,820·3	613·07

LIST OF CERTIFICATES—*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.*					
Mature—continued.		Yrs. dys.	lb.		lb.	lb.
Springdale Fidel ..	J. A. Blake, Waipawa ..	5 98	350·0	365	9,592·5	563·63
Tinsel's Lady Clarabelle	E. Hofmann, Matatoki ..	5 27	350·0	365	11,608·1	526·50
Yankee Pet ..	R. C. Jury, Tikorangi ..	6 335	350·0	365	9,089·5	520·87
Fernaig Emily ..	C. G. Aickin, Auckland ..	7 86	350·0	365	8,851·1	512·39
Onaero Waif ..	J. T. Belcher, Cardiff ..	5 98	350·0	365	8,244·2	477·06
	FRIESIANS.					
Junior Two-year-old.						
Rosevale Queen Daphne Triumph*	North and Sons, Omimi ..	2 142	254·7	365	15,887·5	593·48
Willowburn Daisy Pietertje*	R. J. Potter, Pukerau ..	2 92	249·7	365	15,224·5	519·27
Ryvington Pontiac Mercedes†	Hodgson Estate, Tamahere	2 16	242·1	365	12,594·4	422·84
Ryvington Pontiac Pietje†	Hodgson Estate, Tamahere	2 45	245·0	296	10,096·8	359·30
Senior Two-year-old.						
Rosevale May Echo Beets*	North and Sons, Omimi ..	2 358	276·3	365	17,070·1	614·46
Bloomfield Elgin Mabel*	Bloomfield Farm Co., Wellington	2 350	275·5	365	13,580·8	458·79
Anawhata Hilda Minto Pietertje	P. F. Boucher, Kumeu ..	2 318	272·3	231	8,242·9	318·93
Junior Three-year-old.						
Bainfield Princess Daisy Bell*	Piri Land Co., Auckland ..	3 105	287·5	365	15,161·7	617·46
Senior Four-year-old.						
Cornucopia Pontiac Paxton†	Hodgson Estate, Tamahere	4 272	340·7	291	15,132·0	455·74
Mature.						
Rosevale Sylvia Triumph*	North and Sons, Omimi ..	5 88	350·0	365	20,568·7	625·74
Rosevale Burkeyje Sylvia*	North and Sons, Omimi ..	9 66	350·0	365	17,248·1	617·69
Rosevale Topsy Abbekirk*	North and Sons, Omimi ..	6 294	350·0	365	17,479·8	594·21
Rosevale Cora Posch*	North and Sons, Omimi ..	5 314	350·0	365	17,326·9	577·31
Rosevale Model Sylvia*	North and Sons, Omimi ..	6 40	350·0	342	14,791·1	494·43
Hauraki Ideal ..	W. A. Kyle, Palmerston N.	8 115	350·0	312	11,314·6	419·02
	MILKING SHORTHORNS.					
Two-year-old.						
Mereside Sweet Pea ..	W. Bowis, Doyleston ..	2 40	244·5	318	5,662·2	246·96
Senior Three-year-old.						
Brae Bank Lady† ..	W. J. Holmes, Tuhimata ..	3 274	304·4	328	9,929·6	368·55
Senior Four-year-old.						
Willowbank Tangi's Sunshine 2nd†	W. J. Holmes, Tuhimata ..	4 317	345·2	349	11,402·2	440·11
Birkland Babs ..	G. N. Bell, Karere ..	4 285	342·0	298	10,454·0	412·47
Willowbank Tangi's Dolly†	W. J. Holmes, Tuhimata ..	4 303	343·8	343	8,814·1	402·51

LIST OF CERTIFICATES—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
MILKING SHORTHORNS—*continued.*						
		Yrs. dys.	lb.		lb.	lb.
Mature.						
Homestead Model ..	G. N. Bell, Karere ..	17 34	350·0	365	14,475·0	613·29
Greenfields Strawberry 2nd*	W. J. Holmes, Tuhimata ..	6 168	350·0	365	12,998·3	605·70
Dominion Lucilla of Ruakura†	R. S. Allan, Hatuma ..	6 0	350·0	353	12,668·3	505·93
Braeside Lady Wallace 2nd†	W. J. Holmes, Tuhimata ..	7 112	350·0	344	12,242·1	444·70
Rangataiki 2nd ..	G. N. Bell, Karere ..	24 248	350·0	335	10,688·1	376·72
AYRSHIRES.						
Two-year-old.						
Glengyle Snowflake ..	McAdam Bros., Queenstown	1 338	240·5	365	7,389·5	349·60

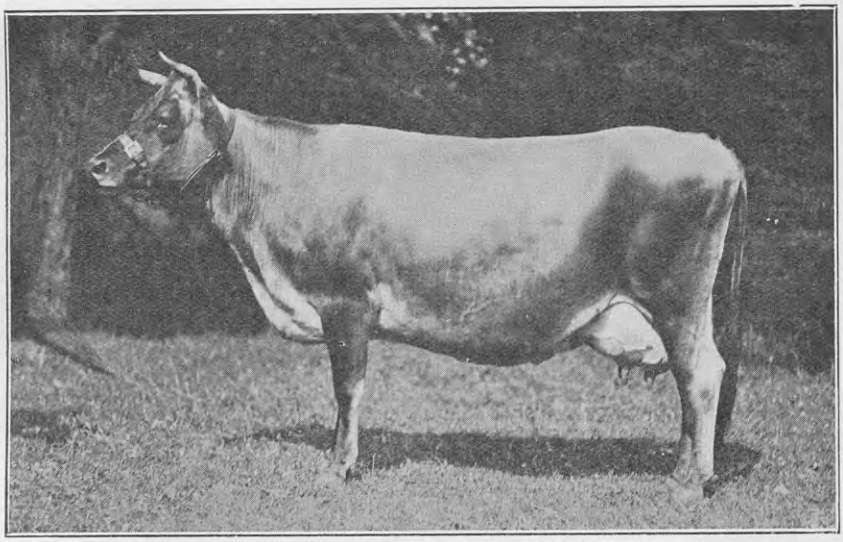
Second-class Certificates.

Jerseys.

Junior Two-year-old.						
Ku Ku All Gold ..	R. L. Horn, sen., Ohau ..	1 361	240·5	365	9,843·9	486·21
Mature.						
Parakau Gem ..	G. E. Yelchich, Waiuku ..	7 34	350·0	365	12,439·1	754·51
Dulciphone ..	A. J. Hale, Hillsborough ..	6 347	350·0	365	14,005·7	725·73

Friesians.

Mature.						
Dominion Mierlo Mercedes	Central Development Farm, Weraroa	6 26	350·0	365	17,514·2	560·03



LADY LILY WARRIGALL (J. T. BELCHER, CARDIFF).

C.O.R., 1927, in Jersey mature class: 12,549·3 lb. milk, 727·73 lb. butterfat.

EXPORT OF APPLES AND PEARS, 1928 SEASON.

1. CONDITIONS OF GOVERNMENT GUARANTEE.

CONDITIONS for the Government guarantee on shipments of apples and pears made from New Zealand during the 1928 export season are as follows:—

1. The guarantee shall be limited to approved varieties and classes of apples and pears packed in compliance with the requirements of "Extra Fancy" and "Fancy" grades.

2. The Government guarantees to the grower a gross market price of eleven shillings (11s.) per case on all cases of such apples and pears exported by him in accordance with the conditions set out herein. (With respect to South American markets the gross price shall be considered to be the c.i.f. price, plus 1s. 6d. per case selling-charges.)

3. The guarantee shall be limited to apples and pears grown and shipped (otherwise than under an f.o.b. contract), by *bona fide* fruitgrowers or fruitgrowers' co-operative societies, through the New Zealand Fruit-export Control Board or other channels approved by the Minister of Agriculture.

4. Any grower who exports any portion of his fruit crop outside the guarantee shall be deemed to have forfeited his right to participate in the guarantee with respect to all fruit exported during the season by him or on his behalf, save that any grower, if he so desires, may ship the whole of his pears outside the guarantee without prejudice to his apple shipments under the guarantee, and *vice versa*.

5. All apples and pears to qualify for the guarantee must be passed by an Inspector of the Department, and must be packed in accordance with the Export Regulations, subject to the modifications and directions set out in the appended statement entitled "Export Regulations."

6. Payment of claims under the guarantee shall be calculated on the basis of the average gross price per case received by the claimant for the whole of the apples and pears approved under the guarantee and exported on his account during the season to all markets, and only the deficiency between the average gross price realized for such fruit and 11s. shall be payable under the guarantee.

7. Where, however, apples or pears of more than one variety and supplied by more than one grower are exported by a joint packing company or group in its own name, the guarantee shall be calculated separately in respect of the whole of the fruit supplied for export by each grower, on the basis of the pool price received for each variety supplied by him; provided that the joint packing company or group shall have, not later than seven days after the fruit has been shipped from New Zealand, notified to the Director of the Horticulture Division full particulars of each grower's fruit included in each shipment.

8. The Government reserves to itself the right (*a*) to withhold the guarantee from any grower who, in the opinion of the Director of the Horticulture Division, is not satisfactorily grading out, and exporting separately, his "Extra Fancy" and "Fancy" grade fruit; (*b*) to withhold from any grower the guarantee with respect to any variety of "Fancy" grade fruit in the event of the Director of the Horticulture Division being satisfied that such grower is not shipping a reasonable proportion of his "Extra Fancy" grade fruit of that variety; (*c*) to withhold the guarantee from any grower who sells, except for consumption within New Zealand, any portion of his fruit crop without the approval of the Director of the Horticulture Division; (*d*) to limit the quantity of fruit shipped to any particular port should freight rates or market conditions, &c., be deemed unsatisfactory; (*e*) to insist on fruit being precooled prior to shipment if deemed necessary; (*f*) to withhold the privileges of the guarantee from all fruit shipped in vessels the storage facilities of which are held by the Department to be unsatisfactory; (*g*) to withhold the privileges of the guarantee with respect to any market in connection with which the New Zealand Fruit-export Control Board is of the opinion that satisfactory f.o.b. or c.i.f. trade is or can be established; (*h*) to withhold the guarantee with respect to any fruit packed contrary to such instructions as may be issued by the Department of Agriculture, after discussion with the accredited representative of the Fruit Control Board and the shipping agents of the fruitgrowers concerned, calling for a cessation of packing during any specified period, owing to the lack of shipping facilities or other causes.

9. The Government reserves the right to re-examine and to withdraw any fruit from export in the event of such re-examination indicating that by reason of overmaturity or other cause inimical to the keeping-qualities of the fruit it would be inadvisable to allow such fruit to be exported. All fruit so withdrawn may be disposed of in New Zealand by the owner without reference to the guarantee, or by the Government on behalf of the owner. In the latter event the proceeds will be credited to the owner, and the transaction dealt with generally as though the fruit had been actually exported under the guarantee. But should such re-examination reveal the fact that any line of fruit, through careless or faulty packing, is decidedly below the standard required, it will be deemed not to be covered by the guarantee, and the owner of such fruit may, at the option of the Minister, be held to have forfeited all right to participate in the guarantee for the remainder of the season.

(N.B.—No apples or pears carrying more than one hundredth part of a grain of arsenic per pound shall be approved for export under the guarantee or otherwise.)

2. EXPORT REGULATIONS.

The regulations which follow shall apply to all apples and/or pears intended for export.

APPLE GRADES AND VARIETIES.

The standard grades shall be as under :—

"Extra Fancy," "Fancy," and "Good" grades: Apples of these grades shall be mature, sound, smooth, clean, well formed, hand-picked, true to name, and free from disease, visible bitter-pit, skin-puncture, or skin broken at stem, and other defects. Individual apples of either grade shall carry not less than the percentage of colour, and not more than the percentage of blemish and unnatural russet indicated in the appended general list with respect to each variety in the respective grades.

XF = Extra fancy; F = Fancy; G = Good; GCC = Good characteristic colour; CC = Characteristic colour.

Varieties.	Sizes.			Colour.			Blemish.			Russet.		
	Max.	Min.	Min.									
Solid Red.	XF, F, G.	XF, F	G.	XF. %	F. %	G. %	XF. %	F. %	G. %	XF. %	F. %	G. %
Hoover	100	234	252	65	30	30	5	5	5	5	10	20
McIntosh Red ..	113	234	252	65	30	30	5	5	5	5	10	20
Rokewood	113	234	252	65	30	30	5	5	5	5	10	20
Tasma	100	234	252	65	30	30	5	5	5	5	10	20
Partial Red.												
Brighton	113	234	252	40	15	15	5	5	5	5	10	20
Delicious	113	234	252	40	15	15	5	5	5	5	10	20
Dougherty	113	234	252	40	15	15	5	5	5	5	10	20
Edward Lippiatt ..	113	234	252	40	15	15	5	5	5	5	10	20
Frimley Beauty ..	113	234	252	40	15	15	5	5	5	5	10	20
Jonathan	113	234	252	40	15	15	5	5	5	5	10	20
King David ..	113	234	252	40	15	15	5	5	5	5	10	20
Rome Beauty ..	113	234	252	40	15	15	5	5	5	5	10	20
Salome	113	234	252	40	15	15	5	5	5	5	10	20
Scarlet Nonpareil ..	113	234	252	40	15	15	5	5	5	5	10	20
Scarlet Pearmain ..	113	234	252	40	15	15	5	5	5	5	10	20
Shepherd's Perfection	113	234	252	40	15	15	5	5	5	5	10	20
Shorland Queen ..	113	234	252	40	15	15	5	5	5	5	10	20
Spitzenberg	100	234	252	40	15	15	5	5	5	5	10	20
Stark	113	234	252	40	15	15	5	5	5	5	10	20
Worcester Pearmain ..	125	234	252	40	15	15	5	5	5	5	10	20
Yate's	113	234	252	40	15	15	5	5	5	5	10	20

Varieties.	Sizes.			Colour.			Blemish.			Russet.		
	Max.	Min.	Min.									
	XF, F, G.	XF, F.	G.	XF. %	F. %	G. %	XF. %	F. %	G. %	XF. %	F. %	G. %
Striped.												
Adam's Pearmain ..	113	234	252	25	10	10	5	5	5	5	10	20
Cox's Orange ..	125	252	252	25	10	10	5	5	5	5	15	50
Premier	100	234	234	25	10	10	5	5	5	5	10	20
Ribston Pippin ..	125	234	252	25	10	10	5	5	5	5	10	20
Senator	113	234	252	25	10	10	5	5	5	5	10	20
Simmond's Winter ..	113	234	252	25	10	10	5	5	5	5	10	20
Statesman	113	234	252	25	10	10	5	5	5	5	10	20
Stayman's Winesap ..	113	234	252	25	10	10	5	5	5	5	10	20
Yellow or Green.												
Alfriston	88	198	198	GCC	GCC	CC	3	5	5	2	10	15
Ballarat	88	198	198	GCC	GCC	CC	3	5	5	2	10	15
Boston Russet ..	100	234	252	GCC	GCC	CC	3	5	5	2	10	15
Brownlee's Russet ..	113	234	252	GCC	GCC	CC	3	5	5	2	10	15
Cleopatra	113	234	252	GCC	GCC	CC	3	5	5	2	10	15
Celo	113	234	252	GCC	GCC	CC	3	5	5	2	10	15
Dunn's	96	216	234	GCC	GCC	CC	3	5	5	2	10	15
Golden Pippin ..	113	234	252	GCC	GCC	CC	3	5	5	2	10	15
Granny Smith ..	96	234	252	GCC	GCC	CC	3	5	5	2	10	15
Gravenstein ..	113	234	252	GCC	GCC	CC	3	5	5	2	10	15
London Pippin ..	100	216	234	GCC	GCC	CC	3	5	5	2	10	15
Lord Wolseley ..	100	198	216	GCC	GCC	CC	3	5	5	2	10	15
McMahon's White ..	113	234	252	GCC	GCC	CC	3	5	5	2	10	15
Newtown Pippin ..	113	234	252	GCC	GCC	CC	3	5	5	2	10	15
Parlin's Beauty ..	96	198	216	GCC	GCC	CC	3	5	5	2	10	15
Pioneer	113	234	252	GCC	GCC	CC	3	5	5	2	10	15
Stone Pippin ..	113	234	234	GCC	GCC	CC	3	5	5	2	10	15
Sturmer Pippin ..	100	234	252	GCC	GCC	CC	3	5	5	25	50	75
Willie Sharp ..	100	216	234	GCC	GCC	CC	3	5	5	2	10	15

APPROVED FOR EXPORT TO SOUTH AMERICA.

"Extra Fancy" grade apples only shall be approved for South American markets as follows:—

Max. Size.	Variety.	Min. Size.	Max. Size.	Variety.	Min. Size.
	Solid Red Varieties.				
96	Rokewood	125	72	Tasma	125
	Partial Red Varieties.				
72	Delicious	125	96	King David	125
80	Dougherty	125	72	Rome Beauty ..	125
72	Frimley Beauty ..	125	88	Salome	125
96	Jonathan	125	88	Scarlet Nonpareil ..	125
	Striped Varieties.				
80	Premier	125	80	Stayman's Winesap ..	125
96	Statesman	125			

REGISTERED EXPORT NUMBER.

The registered number issued to all growers under the Local-market Regulations will be declared to be the grower's registered export number also. The registered number of each grower must be branded on each case of fruit

exported by him, provided that in the event of any group of growers pooling their fruit for export such group may designate its fruit by using any pool number allotted by the New Zealand Fruit-export Control Board. Likewise any packing organization to which a registered number has been allotted may use such registered number only, provided that in either instance each individual grower's fruit is shown separately on the advice-note for examination and stacked in separate lots, so that the Inspector may have no difficulty in identifying the particular lot under examination.

Should unavoidable circumstances prevent the adoption of this procedure, resulting in a line comprising a large number of cases being submitted as one line, it must be definitely understood that the examination of same will be solely at the grower's risk, and in the event of any fruit forming a portion of the line being found to be unsatisfactory the whole line will be liable to rejection.

PACKING.

Plain or corrugated strawboard or wood-wool shall be used on top and bottom of cases.

WRAPPING-PAPER.

Apples of the various sizes as set out below shall be wrapped in paper of the size indicated opposite each respectively:—

Sizes 64's to 80's (both inclusive), paper 11 in. by 11 in.

Sizes 88's to 113's (both inclusive), paper 10 in. by 10 in.

Sizes 125's to 198's (both inclusive), paper 9 in. by 9 in.

Sizes 216's to 234's (both inclusive), paper 8 in. by 8 in.

In the event of the size of the paper used being smaller than that specified above for any respective size of apples, such apples shall be double-wrapped by overlapping two papers.

SPECIFICATION OF APPLE EXPORT CASE.

Inside measurements: 10½ in. by 11½ in. by 18 in.

Ends: 10½ in. by 11½ in. by ¾ in., two pieces (each planed on the outer side).

Sides: 10 in. by 19½ in. by $\frac{5}{16}$ in., two pieces (one board for each side).

Tops and bottoms: 5½ in. by 19½ in. by $\frac{3}{16}$ in., four pieces (two each for top and bottom.

Cleats: 11½ in. by ¾ in. by $\frac{5}{16}$ in., four pieces (one across each end both top and bottom).

Cases made of two-piece sides and two-piece ends will be accepted provided the side boards are of equal width and are cut or planed to an equal thickness, and that the grain of the end boards is across the end corresponding with the greatest measurement, and that the two pieces are properly secured by means of corrugated fasteners, one close to each edge on the one side, and one midway between on the reverse side.

Local timber recommended for the construction of export cases is white-pine of good quality; but *Pinus insignis*, rimu, and beech timber, if well and evenly cut and used with flexible tops and bottoms not exceeding $\frac{3}{16}$ in., will be accepted.

Nailing: Nails used to be not less than 1½ in. long, 14 gauge. Nails to be spaced not more than 3 in. to 3½ in. apart, and the outer nails of each board to be not more than 1 in. from the edge of board.

Strapping: All cases to be strapped with a wire or steel band, such strapping to be tightly applied and to be not more than 1 in. from end of case.

LABELLING AND MARKING.

Each end of each case of fruit intended for export must bear a label of one or other of the designs adopted by the New Zealand Fruit-export Control Board for the purpose of designating "Extra Fancy," "Fancy," and "Good" grades.

The marking of cases shall be in accordance with the previous season's requirements.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NEW ZEALAND
PEARS
FANCY
397

FIG. 1.


NEW ZEALAND
PEARS
FANCY
397
NEW ZEALAND
PEARS
FANCY

FIG. 2.

APPLES PACKED IN TRAYS.

Apples may be packed in trays in a manner similar to that prescribed for the packing of pears, provided that apples ranging in size from 100 to 163 per case of "Extra Fancy" grade only shall be so packed.

PEARS.

The following varieties of pears are approved for export to Europe :—

Max. Size.	Variety.	Min. Size.	Max. Size.	Variety.	Min. Size.
In.		In.	In.		In.
2¾	Elizabeth Cole ..	2¼	2¾	P. Barry	2¼
2¾	Glou Morceau ..	2¼	2¾	Packman's Triumph ..	2¼
2¾	Josephine de Malines ..	2¼	2¾	Winter Cole	2¼
2¾	Keiffer	2¼	2¾	Winter Nelis	2¼
2¾	L'Inconnue	2¼	2¾	Vicar of Winkfield ..	2¼

PEAR PACKAGES.

Pears for export shall be packed in wooden trays having an inside measurement of 11½ in. by 18 in., with depth from 2½ in. to 3 in. Each tray to be complete with lid and label. Three trays to be securely wired together, forming one package. Binding-wires to be placed within 1 in. of each end of the package.

It is essential to the safe carriage of pears that the tray in all cases should be at least ¼ in. to ½ in. deeper than the greatest width of the fruit. Abundance of soft wood-wool should be used above and below the fruit. A cleat may be placed under the lid at each end when it is found necessary to increase the depth of a pear-tray.

Specifications of Trays in Sets of Three.

Ends : 11½ in. by 3 in. (or 2½ in.) by ¾ in., six pieces.

Sides : 19½ in. by 2¼ in. by 5/16 in., six pieces.

Tops and bottoms : 19½ in. by 5½ in. by 5/16 in., four pieces.

Tops and bottoms : 19½ in. by 5½ in. by 3/16 in., eight pieces.

Cleats : 11½ in. by ¾ in. by 5/16 in., four pieces.

In the construction of trays on the basis of sets of three to the package the following is recommended : Bottom of bottom tray and top of top tray to be of two pieces, each 5½ in. by 5/16 in. Tops and bottoms in all other instances to be of two pieces, each 5½ in. by 3/16 in. Middle tray to have cleats across each end both top and bottom, thus requiring four cleats ¾ in. by 5/16 in. by 11½ in. Constructed in this way any bulge that takes place is inward, owing to the timber being lighter than the outer tops and bottoms. At the same time any such bulge is protected by the cleats, which also keep the trays apart, thus allowing for free ventilation.

LABELLING PEAR-TRAYS.

The same type of label will be used as was used last season (1927), but one end only of each tray will be required to bear a label, the other end to have the shipping number stencilled thereon.

After being packed and labelled, three trays will be wired together as one package of three trays, the centre tray to be turned the reverse end to the other two, thereby ensuring that the shipping number and other details will be shown on both ends of the package. (See Figs. 1 and 2.)

MINIMUM CONSIGNMENT.

Twenty cases of any one variety of either apples or pears shall be the minimum consignment accepted for export.

WEATHER RECORDS: JANUARY, 1928.

THE Director of the Dominion Meteorological Office (Dr. E. Kidson) reports as follows:—

GENERAL NOTES.

The past month of January has been notable for the exceptionally dry conditions experienced over the whole of the Dominion. The deficiency of rainfall is most serious in districts with a westerly aspect, following as it does on a dry December.

No vigorous low-pressure disturbance affected any part of the New Zealand region during the course of the month. On several occasions storms developed in Australia which would normally have brought general rains to this country. In each instance, however, although some slight effect was felt, the pressure changes were reduced to shallow waves by the time the disturbance crossed the Dominion. The most important of these waves passed on the 1st–2nd and the 26th January respectively. Each produced moderate rains in parts of the west coast districts, with scattered showers elsewhere.

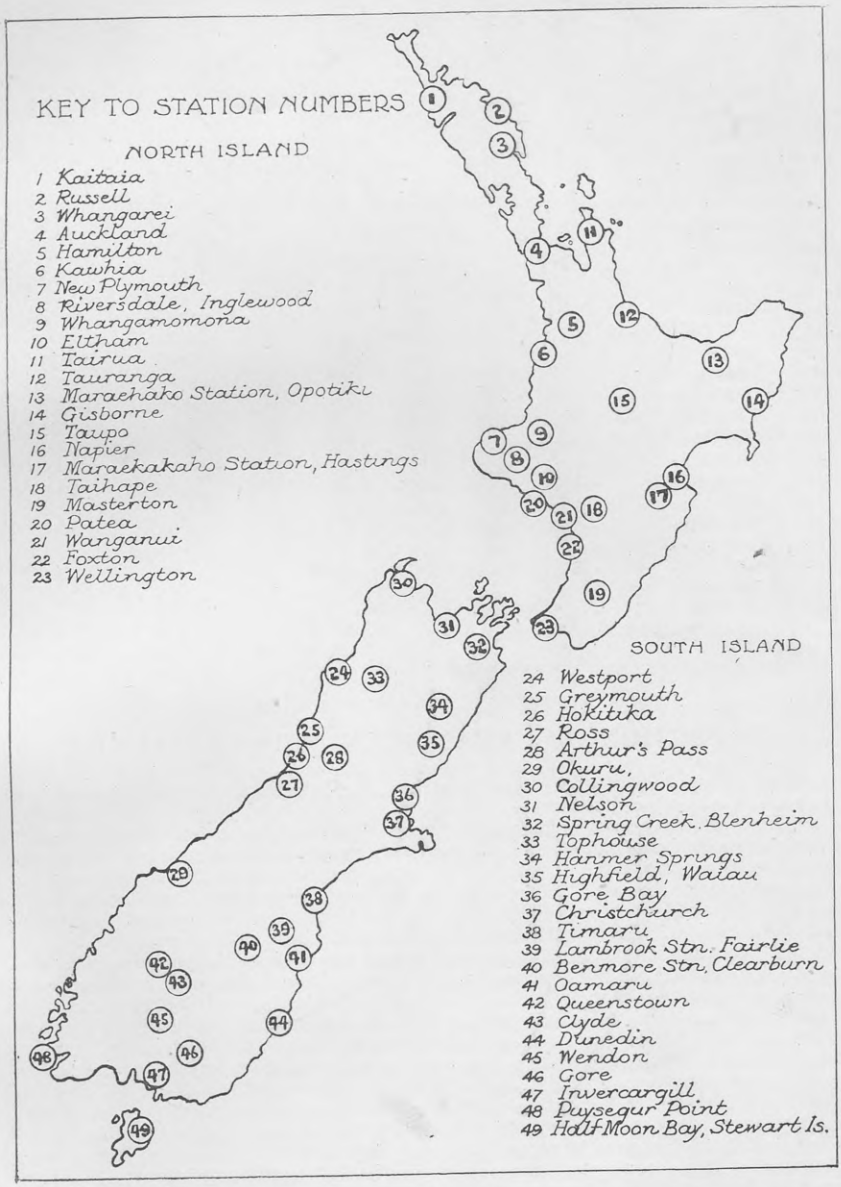
The dominant feature of the pressure distribution has been the persistence of high pressure, especially in the North. Anticyclones were actually centred over or near New Zealand on 1st–2nd, 4th–6th, 8th–12th, 14th–23rd, and 29th–31st respectively. The dry, warm, sunny, and droughty weather experienced was the direct consequence of these anticyclonic conditions. The mean pressure was the highest recorded for January at Wellington.

On the whole there has been a relative absence of wind, but between the 16th and 19th, while a rather intense anticyclone lay across the South Island, strong easterly winds blew over the North Island, frequently reaching gale force in the far North and causing showery weather in the Auckland Peninsula.

The month has been the driest January on record in southern Auckland, Taranaki, and parts of the Manawatu, Nelson, and Marlborough districts.

RAINFALL FOR JANUARY, 1928, AT REPRESENTATIVE STATIONS.

No.	Station.	Total Fall.	Number of Wet Days.	Maximum Fall	Average January Rainfall.
	North Island.				
		Inches.		Inches.	Inches.
1	Kaitaia	0·22	4	0·10	3·36
2	Russell	1·72	9	0·49	4·11
3	Whangarei	1·52	9	0·66	4·08
4	Auckland	0·20	3	0·13	2·66
5	Hamilton	0·15	..	..	3·94
6	Kawhia	0·11	2	0·09	3·52
7	New Plymouth	Nil	..	..	4·42
8	Riversdale, Inglewood ..	0·03	2	0·02	7·43
9	Whangamomona	Nil	..	..	6·05
10	Eltham	0·01	1	0·01	3·92
11	Tairua	0·30	4	0·10	4·35
12	Tauranga	0·17	4	0·09	4·34
13	Maraehako Station, Opotiki	0·38	2	0·28	4·29
14	Gisborne	1·27	4	1·09	2·97
15	Taupo	0·50	1	0·50	3·71
16	Napier	0·35	5	0·21	3·18
17	Maraekakaho Stn., Hastings	0·47	8	0·24	2·29
18	Taihape	0·32	2	0·26	3·28
19	Masterton	0·57	6	0·47	2·69
20	Patea	0·01	1	0·01	3·79
21	Wanganui	0·01	1	0·01	2·87
22	Foxton	Nil	..	..	2·30
23	Wellington	0·19	5	0·11	3·31



MAP SHOWING NEW ZEALAND RAINFALL STATIONS COMPRISED IN JOURNAL LIST.

RAINFALL FOR JANUARY, 1928—*continued.*

No.	Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average January Rainfall.
		South Island.			
		Inches.		Inches.	Inches.
24	Westport	2·89	6	1·99	6·80
25	Greymouth	2·81	5	0·95	9·03
26	Hokitika	4·98	7	2·18	9·87
27	Ross	5·20	5	2·53	12·04
28	Arthur's Pass	0·90	2	0·82	9·36
29	Okuru, Westland	7·46	5	2·15	12·86
30	Collingwood	0·14	2	0·12	6·95
31	Nelson	Nil	..	..	2·82
32	Spring Creek, Blenheim ..	0·02	1	0·02	2·22
33	Tophouse	0·59	3	0·40	5·14
34	Hanmer Springs	1·31	6	0·47	3·74
35	Highfield, Waiau	0·52	6	0·16	2·95
36	Gore Bay	0·57	4	0·22	2·71
37	Christchurch	0·49	6	0·40	2·21
38	Timaru	1·50	8	0·68	2·30
39	Lambrook Station, Fairlie ..	0·50	3	0·24	2·38
40	Benmore Station, Clearburn	1·26	8	0·66	2·77
41	Oamaru	0·66	6	0·29	2·11
42	Queenstown	0·76	5	0·36	2·72
43	Clyde	0·48	5	0·16	1·72
44	Dunedin	1·58	9	0·50	3·36
45	Wendon	1·17	5	0·73	3·22
46	Gore	1·12	6	0·56	3·09
47	Invercargill	1·72	6	1·13	4·01
48	Puysegur Point	6·02	12	0·84	7·22
49	Half-moon Bay, Stewart Is.	2·17	9	0·95	4·68

INSPECTION OF URBAN MILK-SUPPLY DAIRIES.

THIS matter was dealt with by the Director of the Live-stock Division in his annual report for 1926–27 as follows:—

The work connected with the inspection and registration of dairy premises supplying milk for direct human consumption entails constant and careful supervision on the part of the Inspectors, in order that the desired standard may be achieved and maintained. The work throughout the year has been carried out successfully, and on the whole the dairy premises are being maintained in a satisfactory condition. Some difficulty (financial and otherwise) naturally exists in a number of cases in getting all done that is required to bring the premises up to the required standard, and in these cases we have had to be satisfied with such improvements as could be effected. The amendment to the Dairy Industry Act which was passed and came into force during the year will enable the difficulty which has previously existed in regard to farms held on short tenancy to be overcome, in that the landlord is required to bear a share of the cost of improvements in proportion to the unexpired term of the lease.

In addition to the inspection of dairy premises, where special attention is given to cleanliness, methods of handling, and cooling of the milk, &c., a careful clinical examination of the cows is carried out, and any showing evidence of disease are destroyed; also suspicious cases are subjected to the tuberculin test, and if a reaction is shown they, too, are destroyed. Numbers of composite samples of milk are also collected and subjected to biological examination at the Veterinary Laboratory at Wallaceville and elsewhere, with an exceedingly small number of positive results.

Greater use has been made during the year of the New Zealand patent sediment-tester, further testers having been supplied to officers for use in addition to those previously supplied for the large centres. These testers are of value in affording direct ocular evidence of the condition of the milk in regard to dirt content, and it is proposed to further extend the supply of them to other districts.

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.

LARVÆ OF SHEEP NASAL BOT-FLY.

A. W. M., South Norsewood :—

On splitting open the head of a four-year-old ewe, after killing, I found seven maggots, about ½ in. long, well up the nose and almost into the head. They were similar to the ordinary maggot, only larger and flat on the under-side, with more pronounced rings on the body, and two small black spots on the end of the tail, white and brown in colour. I should be glad to have any information about them, with cause and cure, if any.

The Live-stock Division :—

The maggots were the larvæ of the nasal bot-fly (*Oestrus ovis*). The mature fly deposits its larvæ in the region of the nostrils of sheep during the summer months. The larvæ find their way into the nasal cavities and air-sinuses of the head, and attach themselves to the mucous membrane, where they set up some irritation, depending on the number present. As a result of the irritation there is a chronic nasal discharge and sneezing, but seldom if ever are these parasites the cause of any mortality. The larvæ remain in position during the autumn and winter, and are ejected in the spring, when they develop into the mature fly. Treatment depends on the surgical removal of the larvæ, and where a number of sheep are affected this is therefore out of the question. The application of some dressing to the nostrils to ward off the flies is recommended as a preventive. Stockholm tar is suitable for this purpose, but, as with the flies causing bots in horses, no reliable dressing has so far been found which will permanently prevent their attack.

GRASS MIXTURE FOR SCRUB BURN.

J. D., Okoia :—

Please let me know what would be a good grass-seed mixture for sowing on rather steep country after burning scrub (Wanganui district).

The Fields Division :—

For sunny faces the following is recommended : Italian rye-grass, 3 lb. ; perennial rye-grass, 7 lb. ; crested dogstail, 4 lb. ; Danthonia pilosa, 3 lb. ; paspalum, 1 lb. ; colonial white clover, 1 lb. ; Lotus major, ¼ lb. ; subterranean clover, ¼ lb. : total, 19½ lb. per acre. For dark faces cut out the danthonia and add 1 lb. of brown-top.

AUTUMN-BEARING STRAWBERRIES.

"STRAWBERRY," Whakatane :—

Will you please inform me if there is a genuine autumn-bearing strawberry-plant in existence? I do not mean the varieties that will occasionally bear a second crop of fruit in the fall when probably the spring and summer crops have been rather poor, but a real genuine 100-per-cent. fall-bearing variety that would bear its fruit in March and April. If such a plant is in existence, would the fruit have any value commercially at a period when there are such a lot of other fruits waiting to be eaten?

The Horticulture Division :—

In the long catalogue lists of strawberries there are a number which are stated to be autumn-bearing. In many cases they have their origin with well-known firms of repute, and they are doubtless true to description in the locality of origin. There are also sundry "ever-bearing" and "perpetual" varieties. But, interesting as these types are, they have not generally the cropping-capacity of the summer-bearing plants, and it is doubtful if the crop has an equal commercial value.

CONTROL OF SPURREY OR YARR.

"YARR," Mount Somers :—

I have always been able to grow very good turnips on my homestead paddocks here, but I can see trouble ahead, as yarr is appearing in almost every paddock. I would be obliged for any information as to the best method of dealing with this weed. It disappears entirely as soon as grass is sown down, and reappears with renewed vigour when the paddock is again broken up. All paddocks have been limed.

The Fields Division :—

Spurrey or yarr is an annual free-seeding weed which causes trouble in cultivated paddocks and young grass. Its presence may be taken as a general indication of the need for lime, and the application of about 10 cwt. to 15 cwt. of burnt lime per acre may materially modify the conditions under which spurrey flourishes. Sheep will eat spurrey with relish, and this affords a means of control by sufficiently heavy stocking to prevent seeding. A case, however, came to our notice recently in Canterbury of a farmer who lost about fifty sheep out of two hundred, mostly full-mouthed ewes with lambs; the lambs were not affected. The cause undoubtedly was due to feeding on a ploughed paddock which was growing spurrey and nothing else. Under these conditions spurrey may cause bloat, but it seems quite safe when mixed with grass. Elimination of spurrey is a difficult matter, but the general method adopted in Southland is to work the ground down as fine as possible in spring and make the conditions as favourable as possible to assist the germination of the seed. Thereafter repeated harrowings as soon as the seedlings show up will very largely assist eradication. This early spring fallow should be followed by sowing of green feed, such as oats and vetches, and subsequent heavy stocking.

ESTIMATED YIELDS OF WHEAT, OATS, AND BARLEY.

THE following estimated average yields per acre of wheat, oats, and barley for the season 1927–28 have been compiled by the Census and Statistics Office from reports furnished by Inspectors of the Department of Agriculture throughout the Dominion, and issued under date 8th February :—

District.	Wheat. Bushels per Acre.	Oats. Bushels per Acre.	Barley. Bushels per Acre.
North Island	30·61	38·52	34·34
Nelson	19·00	21·95	23·00
Marlborough	30·20	35·76	34·89
Canterbury	34·52	43·76	39·03
Otago	34·82	41·74	32·97
Southland	34·83	44·26	32·00
Average (estimated) for the Dominion, season 1927–28	34·37	43·12	35·77
Average (actual) for the Dominion, season 1926–27	36·13	42·58	41·60

In accordance with the above estimates, the total yield of wheat for the Dominion should be approximately 9,200,000 bushels, as against an actual yield of 7,952,442 bushels for the season 1926–27.

The percentage of oats threshed for the five seasons ending with 1926–27 was 27·05 of the total area under that crop. Assuming that a similar proportion is threshed this year, the total yield of grain should be approximately 3,650,000 bushels, as against an actual yield of 4,997,535 bushels for the season 1926–27.

Estimated average yields of barley were furnished this year for the first time. The percentage of this crop threshed for the five seasons ending with 1926–27 was 98·16 of the total area under that crop. Assuming that a similar proportion is threshed this year, the total yield of grain should be approximately 750,000 bushels, as against an actual yield of 1,243,333 bushels for the season 1926–27.

Correction.—A misprint occurred in the first paragraph of last month's article on the Northern Wairoa Experimental Farm (page 37) in the stated area of river-flats along the Northern Wairoa River. The figures should have been 120,000 acres, not 20,000 acres as printed.