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DEVELOPMENT OF SWAMP LAND AT RUAKURA.

RECENT EXPERIENCE.

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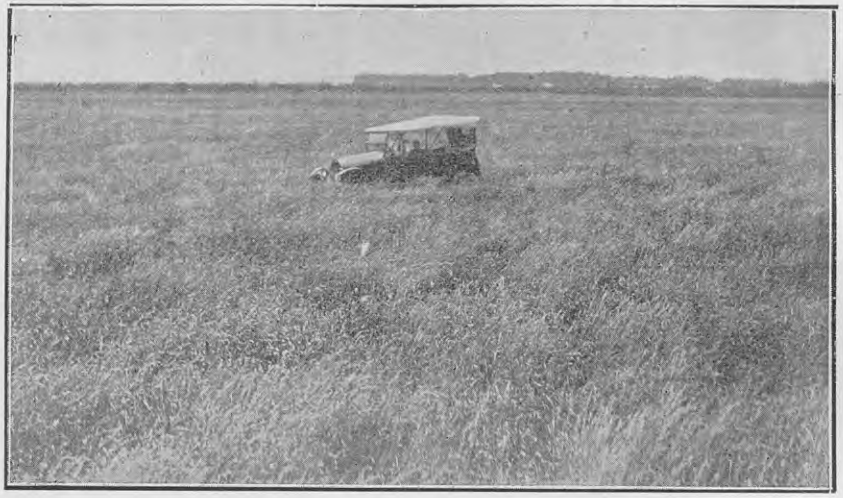
IT is now three years since the last article on the subject of swamp-land development at this station appeared in the *Journal* (January, 1918), and, as the methods then advocated have been further confirmed by practice, it is considered advisable to briefly review the system and place before readers the latest information. In the Waikato alone there are thousands of acres of unproductive peat-swamp lands of a similar nature to that at Ruakura, and the problem of development is practically identical.

No greater proof of the success of the methods advocated could be given than the excellent fields of rye-grass and clovers now to be seen at Ruakura, carrying their flocks and herds on what were only a short time ago waste areas of sorrel and rushes. Moreover, numbers of farmers after visiting Ruakura and seeing for themselves have adopted the same system on their own farms and secured good results.

Those who have had experience with peat-swamp land know that draining and stumping are not the most difficult propositions. To



VIEW ON THE SWAMP AREA AT RUAKURA, SHOWING STRONG GROWTH OF WESTERN WOLTHS RYE-GRASS.

This field was sown in March, 1918.

PART OF SAME FIELD, SHOWING GROWTH OF LOTUS MAJOR ESTABLISHED BY FEEDING OUT HAY CONTAINING LOTUS MAJOR SEED.

The Lotus major may be seen against the near front wheel of the car.

[*S. B. Taylor, photos.*

get anything useful to grow after this preliminary work is completed is undeniably the greatest problem. Sorrel takes possession, and repeated ploughing and cultivation only increases it. Proved sound methods in the development of this type of swamp land may be summarized as follows: (1) Reduce ploughing and cultivation to a minimum right from the commencement; (2) crowd out sorrel and swamp-weeds by sowing Western Wolths rye-grass in March; (3) consolidate and manure by heavy stocking, preferably with cattle; (4) maintain the stock on the rye-grass as long as possible by carting out feed during winter; (5) feed clover hay containing clover-seed, particularly white clover; (6) chain-harrow frequently; (7) surface-sow clovers and Lotus major during the following spring, and during November run the mower over the field to cut down sorrel seed-heads; (8) apply lime as a top-dressing and use alkaline manures.

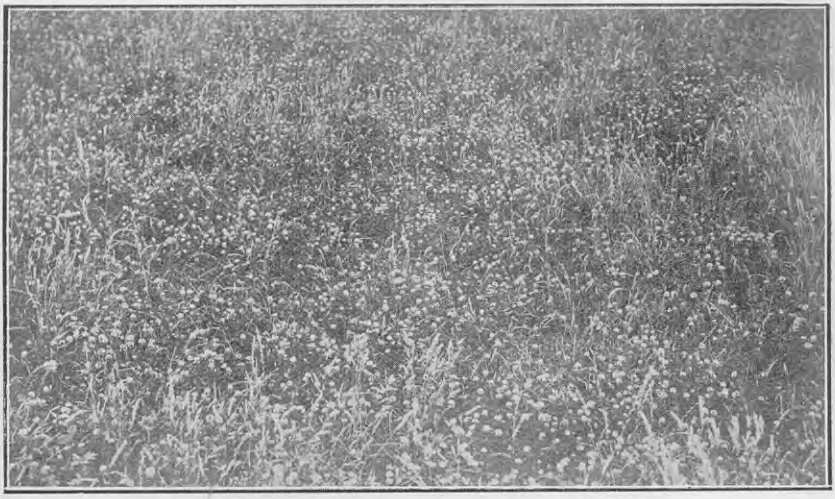
It is presumed that the swamp has been drained, first by deep open drains and then by smaller lateral open drains. Field-tiles should not be laid until the land has been consolidated. It will then be found that after a good sole of clover and rye-grass is secured fewer under-drains will be required than was anticipated. The reason is that the pasture draws heavily on the moisture of the soil, and the land is thus to a great extent naturally drained. It has been estimated that the water passing through the leaves of clover by transpiration in the production of 2 tons of hay during the period of growth amounts to 504 tons per acre. This is equal to nearly 5 in. of rain.

Since the previous article appeared several experiments have been conducted at Ruakura in connection with the preparation of the land for establishing grass—from deep ploughing to harrowing. A study of the present pastures, which have resulted from these trials, will convince any practical farmer that deep ploughing of swamp land gives an excellent crop of sorrel, spurrey, swamp-rush, and cudweeds, and the first growth of grass will be Yorkshire fog. Sound advice is to keep the sweetened surface soil as near the top as possible during the first stages of development, taking advantage of this soil to promote the first growth of rye-grass.

Western Wolths rye-grass has proved the most suitable grass for the first sowing, and should be seeded at the rate of 20 lb. per acre. If the land has been drained for some time and there is a hope of getting a take of red clover, 6 lb. of that seed per acre should be added.

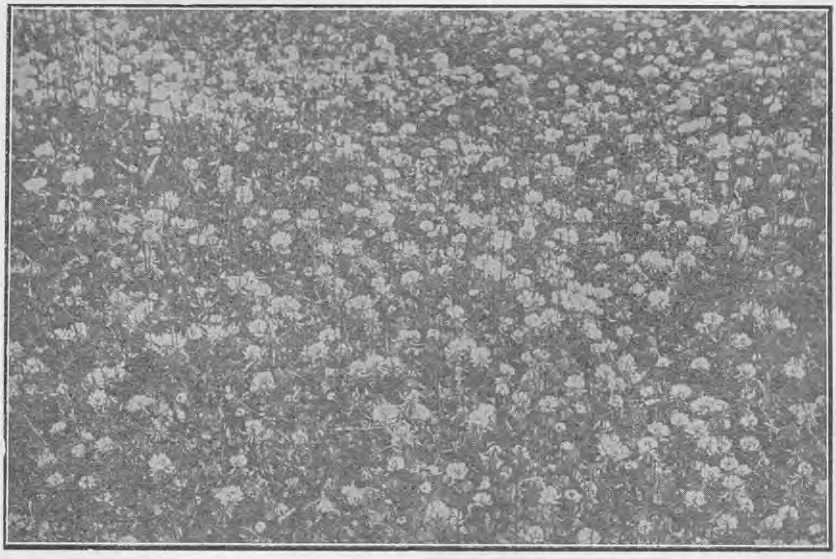
The question has been asked, Why use Western Wolths rye-grass? The reply is that no other grass will make such rapid growth and thrive to the same extent. It forms a mat of surface roots and produces heavy leafage, crowding out and smothering weeds; it grows well into late autumn, providing the necessary feed for winter grazing; by its mass of fibrous roots it prevents the land poaching; it recovers quickly after stocking; it becomes firmly established the first autumn after sowing, and will consequently hold in check all spring weeds; its strong growth is lost after the first season, thus allowing a better take of clovers to follow; lastly, it is most palatable to all classes of stock, and they thrive well on it.

Several points in favour of a combination of Western Wolths rye-grass and red clover are worthy of mention, for in conducting the swamp-land experiments much care has been given to observation and



ANOTHER PART OF THE SAME SWAMP-AREA FIELD, SHOWING WHITE CLOVER ESTABLISHED BY FEEDING OUT HAY CONTAINING WHITE-CLOVER SEED.

[*S. B. Taylor, photo.*



A NEAR VIEW OF WHITE-CLOVER GROWTH ON PART OF THE DEVELOPED SWAMP AREA AT RUAKURA.

[*E. B. Levy, photo.*

investigation. It can be safely claimed that Yorkshire fog is considerably reduced by rye-grass and clover, and when the pasture is chain-harrowed frequently much of the fog is pulled out, whereas rye-grass and clover retain their roothold. Further, Western Wolths and red clover will crowd down red-shank, fat-hen, fireweed, and, in fact, most annual quick-growing weeds. It is the best temporary pasture mixture that we can recommend to clean up weedy land.

Consolidating and manuring by heavy stocking under correct methods are of vital importance in the breaking-in process, as described in the previous article. One must not think that cattle are placed on these areas and fed as though in yards. The rye-grass will provide good feed, but this should be supplemented by hay and roots. Should there be sufficient feed to carry a certain number of stock for, say, three weeks, the system of supplying supplementary feed will enable this stock to be maintained on the area for an extra two or three weeks without removal. The point is to retain the stock on the area as long as the pasture will provide clean feed, and to remove them immediately it becomes dirty. Then if the droppings are chain-harrowed without delay, in a month's time the field will be ready for restocking, but probably for a shorter period. It is interesting to note how rapidly the rye-grass recovers and springs into fresh growth again.

Most meadow hay contains white clover, and it will be observed that when red clover in a pasture is in full flower white clover is in seed. Then is the time to make the hay. Clover-seed passes through stock unharmed, and being fed to cattle during winter this is the method by which the white clover is spread from one area to another. The great advantage of establishing white clover on the poorer swamp areas cannot be effected in a cheaper and more economical manner, and it will perennialize the pasture. It has done so at Ruakura, where there are now many fields of excellent clover established under this method. Some of these have been down five years and are now among the best grazing-areas on the farm.

To win every acre of these unproductive areas by converting them into good pasture should be the aim of the farmer. The value of the swamp pastures with their great store of humus for many years to come is a great asset for our agriculture and the nation.

Sweet-potato Weevil (Cyclas formicarius).—This pest has been declared to be a disease within the meaning of the Orchard and Garden Diseases Act, and has been included in the Second Schedule of that statute.

Fruit-preserving Industry Act.—Societies registered under the Industrial and Provident Societies Act have been added to the category of organizations to which advances may be made by the Government for the purpose of erecting, equipping, or adding to fruit-preserving works (including cool stores).

THE BEET-SUGAR INDUSTRY.

CONSIDERATIONS FOR ITS ESTABLISHMENT IN NEW ZEALAND.

A. H. COCKAYNE, Biologist to the Department.*

THE cardinal factors of successful beet-sugar production appear to be three—namely, (1) an up-to-date manufacturing plant with the necessary labour and material for its optimum running, (2) an adequate daily supply of beets of comparatively high sugar-content to keep the factory at full capacity for approximately 100 days each year, and (3) a market value for refined sugar high enough to enable a price to be paid to the grower of beets which will yield him a per-acre profit in excess of what he can realize for any of his present major crops. The complete fulfilment of all these conditions would assure the establishment of a sugar-beet industry.

DISTRICTS SUITABLE FOR SUGAR-BEET PRODUCTION.

The sugar-beet requires a deep, well-drained, loamy soil; in general, soils on which mangolds can be successfully grown are suitable. An exception should be made with regard to heavy moist soils that are not particularly friable, as although sugar-beets may be grown on them the difficulties of ploughing up, removing the surplus earth from the beets, and cartage off the ground in the winter would greatly increase their cost of production. Intractable and thin soils should always be avoided. In point of fact, however, there are areas in nearly every part of New Zealand where the soil conditions are quite suitable. Climatic conditions are of perhaps greater importance than soil conditions, both in regard to a favourable sugar-content and ease of production and disposal. A comparatively dry period in the latter part of the growing-period and fine weather during the lifting of the crop are of special significance.

Apart from the factors of soil and climate, the type of farming commonly carried out in a district is fundamentally important in deciding in what districts sugar-beet-growing is capable of being developed. It may be laid down as an axiom that it is hopeless to attempt to establish a beet-sugar industry in any part of New Zealand other than where short-rotation pastures and rotation farming are predominant. It might be thought that the type of grassland of a district had nothing in common with successful beet-production, and it is perhaps necessary to explain the reason. In order to be successful financially a comparatively large acreage of beets within a few miles of the factory is essential. The only districts where this can possibly be secured are where the employment of short-rotation pastures render it necessary that a large portion of each farm should be ploughed

* When in Australia last year Mr. Cockayne visited the Maffra beet-sugar factory and investigated the industry generally.—EDITOR.

annually. Again, the district must be one where small rather than medium-sized or large holdings predominate. Where short-rotation pastures are not the rule the area of land likely to be cultivated per farm is generally so small as to render any successful beet establishment impossible without completely changing the farming practice, and this is not likely to be accomplished until at least beet-growing as the main crop of a farm has been proved to be more remunerative than any present type of soil-utilization.

From climatic or soil reasons Southland, South Otago, Westland, and North Auckland can be eliminated as potential beet-sugar districts. The fact that permanent or long-rotation pasture land predominates in the rest of the North Island makes sugar-beet production quite unnecessary for any part of the North Island. Of the rest of the arable land of New Zealand one has only Canterbury, North Otago, Central Otago, and parts of Marlborough and Nelson to consider. There is no doubt that on the better soils of the Waimea and Wairau Plains sugar-beets would do excellently from the soil and climatic standpoints, and the same statement applies to the deep, well-drained soils of Canterbury and North Otago. So far as Central Otago is concerned I consider that from many points of view the irrigation land of Ida Valley offers certain advantages far ahead of those of any other part of New Zealand.

It is thus seen that the districts here ranked as suitable for sugar-beet land correspond closely to the better-class wheat- and particularly barley-growing areas of the South Island. A class of land, in my opinion, splendidly adapted for sugar-beet-growing is such an area as that on the south bank of the Rakaia River, where during the past few years potatoes have been extensively grown. Much of the Southbridge, Leeston, and Ellesmere district is especially good, except those parts that are likely to lie wet in the winter. Again, the sandy loams of the Yaldhurst district seem to be excellently adapted for sugar-beet, and there are also large areas north of the Waimakariri where beets should do well. Personally, I consider that if an effort is to be made to persuade farmers to slightly modify their cropping programme and add sugar-beet to their other crops the main hope of success lies in what may be termed the Christchurch area, including the districts just mentioned. If, on the other hand, the effort is to be in the direction of forming special sugar-beet settlements where virtually no other crop is grown except for rotation pastures, then it does not matter very much where the attempt is made, provided the conditions of soil, climate, and haulage to the factory are suitable.

Some considerations may be here dealt with in regard to securing an adequate supply of beets for a factory in, say, the Ellesmere district, relying on the individual efforts of the farmers in the district rather than attempting the establishment of a definite sugar-beet settlement in order to start the industry. The average holding of the Ellesmere district is not less than 200 acres, and it does not appear to be feasible to get at most more than one-half of the farmers to risk the growing of a crop which is quite a new one to the district and which has the same reputation for labour requirement as has our mangold crop. Then, at the very most an average area of 20 acres for each grower appears to be rather an overestimate. It is generally

stated that in order to be successful the production of not less than 50,000 tons of beet is necessary for the proper running of a modern factory. (The Victorian undertaking at Maffra, however, has shown that less than 20,000 tons, even with an antiquated plant, would easily allow £2 per ton to be paid for beets, with refined sugar at £40 per ton—that is, under the conditions obtaining at Maffra.) If one allows an average yield of washed beets of 15 tons per acre, which is rather higher than is obtained on any non-irrigated sugar-beet area, then a minimum area of approximately 3,500 acres annually is necessary. This would mean that on the estimate given it might be possible to get 3,500 acres of beet grown over an approximate area of 70,000 acres, or, roughly, 100 square miles. This would mean that many of the crops would be grown at distances too far from the factory to make haulage attractive. The difficulty of the wide separation of the crops from the factory might be partly got over by growing them close to a railway station or siding, as has been done at Maffra, but the double handling necessary through railway transport would be a distinct disadvantage.

At Maffra an adequate supply of beets has never been attained, and in this instance only 22,000 tons was required to run the factory at capacity. Numerous reasons are given why they cannot secure an adequate tonnage, but the real one—namely, that only a small proportion of the farmers of the district are desirous of growing beets—is never stressed. If any company relied simply on the farmers of the district to grow the necessary beets it would almost certainly prove a failure in its first years, unless the price of sugar were enormously high and the price offered for beets much above that ever paid before.

It thus appears essential that some other means than merely erecting a factory and offering a certain price for beets be employed. The course open to success appears to lie in the company growing its own beets until such time as was demonstrated that the growing of the crop can be relied on in preference to any other. Even at Maffra, where sugar-beet-growing has paid the growers excellently in the majority of cases, it has not become universal, and on beet-growing land lucerne and maize appear to be crops that appeal to the farmer in preference. What is occurring at Maffra, however, is that many people who during the past few years have gained an insight into the growing and management of the crop by employment in the beet-fields are anxious to rent areas for the purpose of growing crops. In many cases they are quite unsuccessful in securing suitable land, or else are charged a rent in excess of the value of the land. It is this class of person that the Maffra manager particularly desires to encourage, and for that reason he stresses the necessity for a factory having control of a large area of ground that can be let to experienced growers, thus guaranteeing an adequate supply of beets. This idea is no doubt quite sound so far as Maffra is concerned, where the crop has been grown for over a decade. In New Zealand, however, if a company had blocks of land to rent it may be doubted if any one would take them for sugar-beet-growing. This only emphasizes the opinion that in the early years of establishment the major supply of beets must be grown by the factory. Later on, when once the success of the enterprise had been established, without doubt the land could be rented to their employees. The main

objection to the factory having a large block of ground is that beets cannot be grown continuously on the same land, and the company would find itself in the position of having to carry out diversified farming with its many pitfalls.

THE GROWING OF SUGAR-BEET.

For all practical purposes the growing of sugar-beets can be considered to be almost identical with that of mangolds, excepting that the rows can be closer, and must on no account be ridged, as is sometimes the case with mangolds. Owing largely to the fact that unless really properly attended to a mangold crop is generally a failure, mangold-growing has never become popular in New Zealand, less than 10,000 acres being grown throughout the Dominion. The main mangold-growing districts are Canterbury and North Otago, where about 40 per cent. of the total crop is grown. As Canterbury also produces over half the total of potatoes—a crop requiring somewhat similar attention to the sugar-beet—these facts again emphasize the point that sugar-beet-growing is more likely to become established in Canterbury than in any other part of New Zealand.

The sugar-beet, apart from thinning and weeding, must be intertilled. This, combined with the necessity for deep cultivation prior to sowing and the deep-rooting nature of the crop, makes it suitable for districts where the rainfall is comparatively low, as in Canterbury. At Maffra one of the main reasons brought forward to explain the rather poor response that has been secured for the production of beets is that the climate is too dry, and that this will not be remedied until irrigation becomes general. Now, the rainfall at Maffra is not high, the maximum yearly average for ten years being 21 in., which is not so very different from the Lincoln figures in Canterbury. The point as to whether Canterbury is rather too dry has been discussed with many of those interested, but my opinion is that the advantages of a comparatively dry climate outweigh the disadvantages of small yields in seasons of low precipitation. I am inclined to think that even at Maffra, apart from certain seasons when the rainfall was considerably less than 20 in., the dryness of the climate, enabling the crop to be easily intercultivated, lifted, and carted from the fields, has been of distinct advantage.

In the growing of sugar-beet hand-labour could easily become excessive, and proper machinery for drilling, intercultivating, and lifting the roots is essential.

COST OF PRODUCING SUGAR-BEET.

It is difficult to estimate the exact cost of growing beets in New Zealand, as all experimental work in this connection has been conducted on areas too limited to supply satisfactory figures. Nevertheless, from the Victorian experience, coupled with the knowledge of the cost of growing such a crop as mangolds, a very fair idea can be formed. The following statement rather over- than under-estimates so far as present prices are concerned. It has to be remembered, however, that it is held in certain quarters that except in some instances farm labour in New Zealand has not yet kept march with the falling value of money, and that further increases can be expected: Rent or

interest (land £50 per acre), £3; cultivation expenses prior to seeding, £2; seeding, drilling, and manuring, £1 15s.; cultivation expenses after seeding, £3 5s.: total, £10.

This brings the cost to £10 per acre irrespective of what may be the yield per acre. In addition there are topping and cartage charges, which may be put down at 9s. per ton, provided cartage does not exceed three or four miles. From these figures the following table is deduced:—

Cost of Crop delivered to Factory.

	Per Acre.			Per Ton.		
	£	s.	d.	£	s.	d.
A crop of 10 tons costs	14	10	0	1	9	0
,, 11 ,, ...	15	6	0	1	7	10
,, 12 ,, ...	15	8	0	1	5	8
,, 13 ,, ...	15	17	0	1	4	5
,, 14 ,, ...	16	6	0	1	3	3
,, 15 ,, ...	16	15	0	1	2	4
,, 16 ,, ...	17	4	0	1	1	6
,, 17 ,, ...	17	13	0	1	0	9
,, 18 ,, ...	18	2	0	1	0	1
,, 19 ,, ...	18	11	0	0	19	6
,, 20 ,, ...	19	0	0	0	19	0
,, 21 ,, ...	19	7	0	0	18	5
,, 22 ,, ...	19	18	0	0	18	1
,, 23 ,, ...	20	6	0	0	17	8
,, 24 ,, ...	20	16	0	0	17	4

It may be considered that an average of 10 tons per acre can be looked upon as a minimum even during unfavourable seasons, and our experiments indicate that 24 tons is the maximum yield that one can expect. In general, it appears as if sugar-beet yields about 40 per cent. the weight per acre of the mangold crop in New Zealand. This would indicate that yields of as high as 40 tons might occur in extremely rare instances, but in such cases the sugar-content would seriously fall and make the manufacturing charges excessive. Out of a number of small trials held in different years 14 tons per acre has been the lowest yield and 24 tons the maximum. Even in the case of the high tonnage the sugar-content and purity were satisfactory. These trials, however, are likely to be above the yield obtained when the crop is subjected to ordinary field conditions, and their probable error is too great for any definite conclusions to be based on them. An estimated average yield of 15 tons of washed beets is perhaps a little on the high side, but recent Ashburton experience would indicate that such a figure is not excessive.

From the figures given a 15-ton crop would cost £1 2s. 4d. per ton delivered to the factory, giving at a price of £2 per ton a profit of approximately £13 per acre. When this is compared with other crops against which sugar-beet is in competition the comparison is certainly in favour of the beets. The figures for production here given would, however, be quite likely to be exceeded during the first season or so, owing to unsuitable machinery and the dearness of inexperienced labour. Still, from the cost-of-production point of view alone beets at £2 per ton would probably in favoured districts yield a greater per-

acre profit than any of our staple farm crops. It will be noticed that the price to be paid is based at £2 per ton irrespective of what the sugar-content may be. The Maffra payments are made on tonnage and not sugar-content, and this system would naturally be followed in New Zealand. The sugar-content of New-Zealand-grown beets is not dealt with, as the analyses already made indicate that in this respect they are quite as satisfactory for manufacturing purposes as have been the Victorian crops. The figure £2 per ton has been taken partly because a Canterbury concern purposes such a rate of payment, and partly because it is the present price at Maffra, although there is every reason to consider that at a price of over £40 per ton for refined sugar the price paid for Victorian beet should be higher.

THE MANUFACTURE OF BEET-SUGAR.

So far as the manufacturing end of the business is concerned, this is a matter for an expert, but certain phases can be discussed with a fair amount of accuracy. It is currently stated that an up-to-date factory capable of dealing with 500 tons of beets per day during the running-period is essential, and that smaller plants through their less economical running should not be admitted. The contention is that smaller units when tried in America have had to be scrapped and replaced by larger ones. One could well understand the soundness of such reasoning if it could be proved beyond doubt that once a 500-ton-per-day plant was erected in New Zealand the requisite 50,000 tons or more of beets would be available. As already indicated, the Maffra plant, although small, has never yet had a sufficient supply of beets to keep it at full capacity during the season. If the contention that it would be found impossible to get the farmers of any New Zealand district to grow within the first year, or even longer, anything like 50,000 tons of beet is correct, the advantage of having a factory capable of handling far more beets than can possibly be supplied to it is not apparent. If a 500-ton factory is essential (personally, I do not think it is, because at £40 per ton for refined sugar the Maffra factory, dealing with about 13,000 tons of beets, last year showed a profit of over £16,000), then it becomes more than ever necessary that the factory should itself produce the major quantity of the beets required. It would perhaps be possible by expert propaganda and liberal advances for production-expenses to get, say, 1,000 acres sown to beets in the initial season, but to expect more seems to be unduly optimistic. The question as to whether a 50,000-ton factory can be made to pay on a 10,000-ton supply is a matter that requires strict investigation. If it is shown that it will not do so, then no reason for the advocacy of a plant of such dimensions is apparent.

So far as the various incidentals necessary to manufacture—such as machinery, coal, water, and limestone rock—are concerned, there seems no reason why any of these should prove limiting factors in New Zealand. In many of these particulars Maffra is by no means ideally situated, and had a full-capacity load of beets been available since the commencement of operations the venture would have been an assured success from the start.

The location of the factory is extremely important. It should be as near the centre of production as possible, and the necessity for it to be on a railway-line is obvious.

CAPITAL REQUIRED.

For a 50,000-ton factory the following approximate capital would be necessary: Plant, £220,000; working-expenses at £1 15s. per ton of beets handled (working capital), £87,500; 50,000 tons beets at £2, £100,000: total, £407,500.

Allowing 10 per cent. depreciation on plant and 6 per cent. return on all capital invested, the cost of treating 50,000 tons of beets would be approximately £234,000. Allowing 6,000 tons of sugar as being a fair return from 50,000 tons of beet, with sugar at £40 per ton, there would be a profit of £6,000. There would also be additional profit from molasses and other by-products, but these sources of revenue might be expected to be small in the early years of development. It may be that the foregoing estimate of plant is high, and working-expenses are put down at 15s. per ton more than they were at Maffra in 1916–17. It is, however, well to overestimate, and if a profit can be shown the chance of success from the manufacturing end is then certain.

Using the same plant for a 10,000-ton crop we get the following figures: Cost of plant, £220,000; manufacturing at £1 15s. (working capital), £17,250; beets at £2, £20,000: total, £247,250. Depreciation, working-expenses, and interest on capital per year would amount to approximately £74,000, and the sugar return, at £40 per ton, would be £48,000, leaving a loss of £26,000. It can be thus seen that on a 10,000-ton basis, in order to make the enterprise show a 6-per-cent. return on the capital invested, and without taking into consideration any taxation, it would be necessary that the plant cost less than £70,000. Should the price of refined sugar fall below £40 per ton, unless caused by overproduction, it would be a clear indication that the value of money was rising, and in consequence the apparent cost of manufacture would drop in sympathy, so that the industry should pay just as well at £30 a ton or less as it would now at £40, always assuming that the figures stated are correct.

With sugar at £40 per ton £39,000 profit could be made by the grower off 3,000 acres, a fair return obtained on capital invested for manufacture, and over £70,000 distributed in wages and salaries. The great monetary return per acre and the large amount of capital and labour that can be sustained put beet-sugar production on an unique basis, and certainly warrant every consideration being given to the subject, and to any soundly based project.

Dairy Registration.—The annual fee for the registration of dairies supplying milk for domestic consumption in towns and cities has been increased from 5s. to 10s.

Peas for Lamb-fattening.—The best time to turn lambs on to peas is when the first pods are full. As the crop ripens the lambs become accustomed to the hard peas, and later will pick them from the ground when quite ripe.—*T. W. L.*

GRASSING OF BEECH-BUSH HILL COUNTRY.

EXPERIMENTS IN THE MURCHISON DISTRICT.

C. S. DALGLIESH, Fields Instructor.

THE grassing of beech-bush hill country in the Murchison district (Nelson back-country) has been a great source of trouble to the settlers, as the grasses sown last for three or four years only, and then bracken-fern completely takes possession. After the first two or three years the grass-growth is generally too scanty to allow the heavy stocking of the ground when the fern is coming away in the early summer, so that unless a sward can be secured which in itself will serve as an efficient competitor for the occupation of the ground fern is certain to become dominant in a few years.

Where the settler has a considerable area of flat country capable of growing good permanent and temporary pastures he is in the position of dealing with a considerable amount of hill country through his ability, whenever occasion demands, to heavily stock burns that are running into fern, and to recuperate his sheep after they have been kept under less than maintenance conditions on the hill country. In general, however, the owner of good flat ground leaves severely alone his hill-bush country, while the holder of only hill country, by means of burning and sowing down fresh areas, keeps his pasture-supply going until he has dealt with all his area, by which time many of his earlier burns have run into fern, and the ruin of his whole holding is often only a matter of a few years.

From the foregoing it can be seen that the grassing of certain hill country in the Murchison district should not be attempted on a large scale until such time as there is reliable information regarding what kinds of grasses are best to sow and what method of management is best to adopt. The good growth for the first two years that is secured by reason of the temporary fertility of the soil due to the ashes formed through burning off the forest has in the past misled settlers as to the capabilities of the ground in supporting even a fair type of permanent pasture.

The soil of the Murchison hill country in general, as its original plant covering would indicate, is very deficient in lime, and also shows a marked deficiency in phosphates. Whether liming and the application of phosphates is in any way practicable is extremely problematical, but experiments in this direction are much to be desired.

The experience of the settlers has shown that Chewings fescue is by far the most promising of the permanent grasses to sow, but it has rather a bad name owing to its not being relished by stock when the herbage is old. The value of Chewings fescue, however, is undoubted, and especially so on such country as the Murchison hills, where the rainfall is sufficient to keep it growing during a good part of the year. As in other similar country in New Zealand, Danthonia pilosa makes a great effort in certain places to compete with fern in the final

possession of the ground, but in general except on dry sunny faces where the fern is not very vigorous it does not appear to establish readily, and when sown along with the original seedings has often proved very disappointing. Another factor that has a most serious effect on the permanent establishment of grassland is the great prevalence of grass-grubs in certain seasons, both the ordinary grass-grub (*Odontria zealandica*) and the green chafer (*Pyronota festiva*) causing great destruction.

THE GRASSING EXPERIMENTS.

In the spring of 1916 a typical area of 15 acres of this class of country in the Matari Valley, owned by Mr. J. Badcock, was felled, and was burnt in the autumn of 1917. It was then sown down in five grass-mixtures by the Department, with the object of ascertaining what type of grassland might best be produced. The main constituents of the mixtures were cocksfoot, Chewings fescue, fiorin, Poa pratensis, crested dogstail, Yorkshire fog, Danthonia pilosa, and yarrow. A very successful take of the grasses was secured, and excellent growth resulted the first year, the area being only lightly stocked. Since then stocking with sheep has been carried out under similar conditions to those on adjoining lands. With the exception of the portion on which a mixture of fog and Danthonia was sown, the pasture on the area, although not first-rate, is better and healthier in appearance than that of similar surrounding lands, and is improving, a marked improvement having been noticeable in the last twelve months. Fern is not yet causing trouble, only isolated plants being found. This can be attributed partly to the successful burn secured, also to the area being closely grazed. Stock have always shown a preference for grazing on this area, being at all times allowed access to it when put on adjoining lands.

Chewings fescue, fiorin, Poa pratensis, and yarrow have combined to form a very good pasture for this class of country over the greater part of the area. The following notes regarding these and some of the other grasses sown on the area afford useful points:—

Fiorin: This grass has a strong hold on the shady sides of spurs, but is not so prominent on the sunny sides. It has been allowed to go to seed freely where it predominates, but where combined with other grasses it is more closely fed down. It is considerably later in spring growth than other grasses.

Cocksfoot: This has not shown to advantage, and is only moderately fair where liberally seeded. It would appear as if cocksfoot is quite unsuitable for use on this class of country. Even when it becomes established its superior palatability causes it to be overgrazed—even when the ground as a whole is lightly stocked. On this class of ground, unless a highly palatable grass can become dominant, it would appear better to confine the sowings to grasses of medium palatability rather than aim at a proportion of highly palatable grasses that can be killed out readily by overgrazing, such as is the case with cocksfoot.

Poa pratensis: Although slow to start, this grass is now making good headway, and is at its best on the sunny sides of the spurs. On the rocky points of spurs and on sidlings which have a loose surface it forms a binding turf which prevents the loose surface from shifting so readily. Stock have always shown a decided preference to graze on the area on which it is dominant, and during the first season they

had to be removed from the whole area, due to their keeping the Poa pratensis plot too closely fed down. There is every indication that Poa pratensis, although theoretically only suited to soils fairly well provided with lime, is one of the most valuable grasses for the Murchison district.

Chewings fescue: This has done well both on hill-faces and lower lands.

Crested dogstail: This is only sparsely distributed through the hill-faces, but in moist places where the land is inclined to be heavy it has a strong hold, forms a close sole, and is to be found closely fed down.

Yarrow: This plant is freely distributed over all the area, and is kept closely fed down, forming a compact turf in combination with the grasses.

Danthonia pilosa: The seedings with this grass have been more or less unsatisfactory, although when sown in combination with fog its resistance to the attacks of grass-grub was most marked, the fog being completely destroyed and isolated plants of Danthonia alone remaining. Could it be established rapidly Danthonia would certainly prove valuable, but the difficulty of sowing and the high cost of the seed would always be a drawback. Sowing down small areas on the flat ground, allowing the grass to seed, and then stocking with sheep which would carry the seed in their fleeces on to the hill country, according to the practice adopted in certain parts of New Zealand, seems perhaps the only way of inexpensively introducing Danthonia into these pastures.

CONCLUSION.

The future of these experimental seedings will be of great interest, and their development will be watched carefully. At the present time it is fairly safe to say that rye-grass and cocksfoot should be eliminated from mixtures used on such country, and that a combination of Chewings fescue, fiorin, Poa pratensis, yarrow, and perhaps crested dogstail is likely to provide quite fair permanent grassland. It is particularly to be regretted that the sowings did not include tall fescue, a grass that in certain poor hill country is giving promise of being the most valuable dominant grass that should be sown. The great weakness of a combination of the grasses mentioned is the absence of clovers, but the soil with its present deficiency in lime and phosphates does not give any immediate promise of the successful establishment of permanent clovers.

Balled Red-clover Seed. — An interesting specimen of red-clover seed, in which masses of the seed were balled together with some syrupy matter, was submitted recently to the Chemistry Section for examination. The substance dissolved in water, and reduced Fehling's solution without previous inversion. It now appears from information received by the Department's Biologist while in America that the phenomenon is well known there, and is caused by an aphis (*Aphis Bakeri*).

PIG-BREEDING.

SELECTION AND MANAGEMENT OF THE BOAR AND SOW.

K. W. GORRINGE, Instructor in Swine Husbandry.

THE BOAR.

THE choice of the boar is one of the most important matters in the successful breeding and rearing of pigs. It is true that with pigs a false step can be more readily retraced than with other farm-animals, such as horses and cattle, owing to the shorter period of reproduction, but this does not lessen the necessity for the greatest care being taken when starting a herd of pigs, or when purchasing a boar for use in an established herd.

The type of boar to be sought for is one compact in frame, as long and deep in carcase as possible consistent with strength, with a wide, deep capacious chest, legs placed well outside the body, well developed in the hind quarters, ribs well sprung, with deep flank, medium-sized ears, wide between eyes, bone of good quality, standing well upon his feet, good action, and showing strong masculine qualities. Both testicles should be visible and evenly suspended in the scrotum. The embryo teats should not be less than twelve in number, evenly placed, and distinct in development. Further, he should be from a good family showing prepotency, prolificness, constitution, and early maturity.

The selection should be made preferably from a breeder of repute whose stock has stood the test. The safest course is to visit the herd of the breeder and buy after seeing the sire and dam, and, if possible, others of the same strain as the animal selected. In making the final choice preference should be given to a boar from a large even litter, as fecundity is hereditary. The power to produce good litters is an essential in successful pig-breeding, and a good even litter is the best indication one can have. A special qualification is the possession of a gentle, docile, and tractable disposition. A bad temper is almost invariably transmitted.

It is not easy to judge a young boar just weaned. The powers of the digestive functions are practically unknown at that period, and until these are more developed it is difficult to arrive at a safe conclusion. His disposition, ability to put on flesh, and capacity for stock-getting can be estimated only after the birth of his first litter. It is therefore inadvisable for the inexperienced breeder to purchase a boar under six to eight months old. Many breeders, of course, purchase boars when weaners, but to be successful in this way requires a wide experience and sound judgment. It is much safer for a beginner to buy a mature boar than a young untried one.

Some breeders of purebred stock have in the past been too willing to sell for breeding purposes the bad with the good, and amateurs, without knowing better, have used boars which have nothing to recommend them but their pedigree. When allied to quality and size pedigree possesses considerable value, and is more or less of a guarantee

that the produce will be good, but it confers no advantage on a boar with nothing else to recommend him.

It is a great deal better to own a good boar in partnership with one's nearest neighbour, or to have one to be used co-operatively among a certain number, than each to have an inferior animal, which practically means a backward movement in the type of each herd.

The management of the boar is a very important part in the raising of strong, healthy pigs, and one which is sometimes neglected. He should be looked upon as the most valuable animal in the herd, and as such deserves the best of attention. A boar for service should never be fat. In some cases breeding-power is injured by too high condition at some time in the life of the animal. He should be well fed, but not fat, as this has a tendency to make him inactive, a slow breeder, and an uncertain sire.

The young boar should not be put to service until he is at least six months old, or, better still, eight months, and then only to a small number of sows at first. Too much work at this age may permanently ruin him. It should be remembered that one good service is all that is necessary, and it behoves the breeder to conserve the vitality in his boar as much as possible.

During the breeding season it is well to confine the boar to his paddock. As soon as the sows come into heat they can be brought into the boar's pen for service. This is a much better plan than allowing the boar to run with the sows, as a more accurate record can be kept of the time when they will farrow, or come on again in heat. It is during the breeding season that the boar may become unruly, often showing temper, and he should not be trusted too much when attending to him. If it is necessary to chastise him, never use a heavy weapon, or severe injury may be caused. A light stick or cane, giving a smart rap on the snout, is all that is required to keep him in order.

A boar well fed and cared for may be expected to keep in serviceable condition until he is ten years old, although many boars prove prolific and virile long after that age.

The ration of the boar during the breeding season should be abundant. The only index to the amount of feed to be given is his condition, and this should be evenly maintained, if possible, throughout the season. The following feeds provide a suitable assortment: Skim-milk, buttermilk, lucerne, peas, beans, clovers, millets, maize, rape, roots, and other foods in which the necessary elements are prominent. Food should be given at regular intervals and at least twice a day.

The matter of cleanliness should never be overlooked. Pay special attention to the feeding-trough and receptacles for holding the food. Look to the comfort of the boar by supplying good housing, and proper sanitation in his run, plenty of fresh water, and as much exercise as he will take. Under such conditions little trouble should be experienced in getting a boar to produce large litters of strong, healthy pigs.

THE SOW.

The selection of the sow for breeding purposes, whether it be for raising porkers, baconers, or stud stock, demands careful study and good judgment; but it is not essential, as in the case of the boar,

that she be purebred (unless stud pigs be the object) if she is suitable in other respects. It is, however, of great importance to ascertain that she is the progeny of quiet and good-tempered parents, for an irritable, restless sow is frequently the source of disaster at farrowing-time; that she comes from a good milking-strain; and that she is possessed of at least twelve well-developed teats, regularly placed, and extending well forward along the body.

The points and characteristics to be sought for in a sow are early maturity, length and depth of frame, broad and well-let-down hams, and well-formed udders; she should be compact, tough, roomy, with a good girth, straight back, broad loins, standing on good short legs with bone of fine quality, and plenty of good silky hair. She should have a good docile temperament, kindly disposition, and be cleanly in habit. She should come from a family of uniformly good mothers and large litters. Spring litters are to be preferred, because the young sows will as a rule grow and develop better during the summer than the winter, and with proper management they can be put to the boar so as to farrow at about twelve months of age.

As to disposition, the sow should be, above all, motherly, quiet, gentle, and kind. It is as well to reject any that have a tendency to fatten, for a big clumsy sow is unprofitable and disheartening. The same can be said of a fidgety ill-tempered sow; she is not a success in rearing a litter. Sows coming from mature mothers are usually the best breeders. The principle of the milking-strain in a cow applies equally to the sow. It is therefore advisable that this characteristic be preserved, and breeding-stock should be selected from sows which have heavy-milking qualities, for upon this depends the welfare of the progeny.

The young sow should not be less than eight months old before being sent to the boar. If maternity be forced on her under this age it may result in small litters and immature stock, and in many cases it has been the means of permanent injury to the animal. A young sow will show evidence of sexual heat as early as five months. Her pigs are seldom so numerous as those of a mature sow, and they are never so large. If a gilt is used for breeding and her litters are weighed at birth, it will be found that they are lighter than the pigs of a litter produced by a mature sow. In the matter of size the litter follows the dam. No attempt should be made to obtain large pigs from a small sow by using a large boar.

A breeder whose aim is success should not buy or retain a sow which does not comply with the standards set down, and it is better for the amateur to purchase a mature sow with a record than a gilt, however near the latter may be to farrowing.

It may not be always suitable to breed from purebred sows, but for the production of pork the purer the herd the better the results. Good sows from the original Berkshire and Yorkshire breeds are inclined to be a little coarse in character compared with the improved types, but they are prolific, hardy, good mothers, and are noted for converting their food into rich milk.

GENERAL.

In making the selection of either a boar or sow it is of practical importance to recognize two types, which may be called the "pork" and the "bacon" types. Farmers will be guided to some extent by

the requirements of the trade they intend catering for. Skill and judgment should be brought to bear in the matter of mating. When possible select an animal with an extra degree of good qualities that are deficient in the other, so that these may be balanced in the progeny. At best it is almost impossible to choose sows that will always reproduce true to type, but by careful selection of both boar and sow the chances of uniformity will be greatly increased. Some mistakes are bound to be made, but by keeping records of the breeding-stock and their produce it will be possible to dispose of undesirable animals. One ideal of type must always be uppermost in the breeder's mind, and in order to make real progress the stock must be constantly approaching nearer and nearer that ideal.

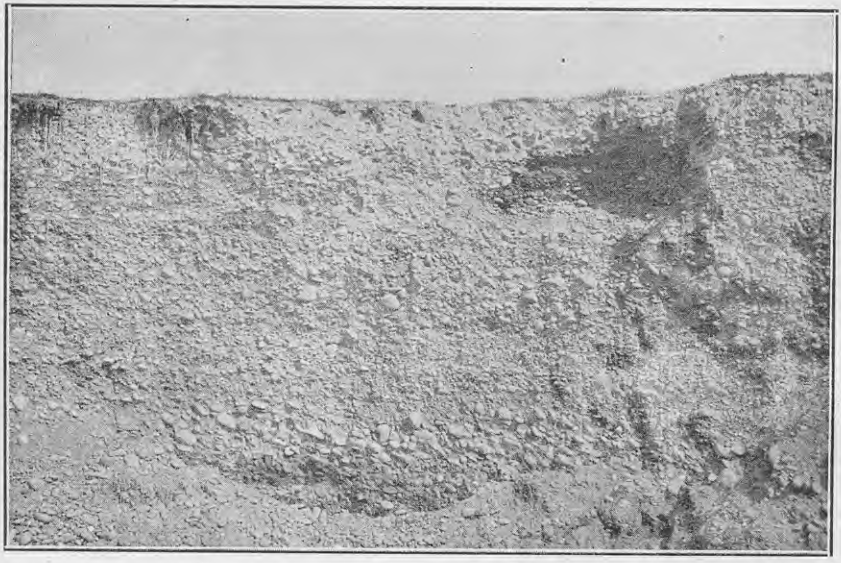
DRY FARMING.

R. McGILLIVRAY, Fields Instructor, Christchurch.

THE fundamental principles of what is termed "dry farming" or "dry culture" concern the storage in the soil of the annual rainfall, its retention there until required, the prevention of direct evaporation, the choice of plants suitable to arid conditions, and the sowing of drought-resisting strains. Dry farming may be further defined as the intensive cultivation of the soil in country of scanty rainfall to conserve moisture. It is not farming without moisture, but saving and making the utmost use of what rain does fall.

Aridity is a condition met with in parts of almost all countries; dry farming is therefore a world-wide problem. Its objects are the profitable production of useful crops without irrigation on lands which receive a rainfall of, say, less than 20 in. per annum, but its methods may be profitably employed where the rainfall is much in excess of that mentioned. In dry regions the conservation of natural moisture for crop-production is of paramount importance, as under such circumstances water is the limiting factor. In Australia there are immense areas that can only be brought under production by dry farming, while in the United States of America there is estimated to be over 1,000,000 square miles, or about ten times the size of New Zealand, that cannot be irrigated, and so must be reclaimed by dry culture. Extensive tracts of country of a similar nature are to be found in Africa, Asia, South America, and also in Europe. More than one-half of the land surface of the globe receives a rainfall of less than 20 in. per annum, and about one-quarter 10 in. or less per annum. It has been estimated that a perfected system of irrigation could affect only about one-tenth of these vast areas, and the reclamation of the remaining nine-tenths could not be done except by dry farming. Where irrigation is impossible dry farming is thus the only key to the settlement of dry country, and as such should receive the cordial support of all those interested in closer settlement. If conditions are suitable and the work is systematically performed, dry culture cannot fail, for the practice is based on thorough tillage—the supreme principle of successful agriculture.

A DEEP SANDY LOAM, SUITABLE FOR DRY FARMING.



A GRAVELLY SOIL FORMATION, NOT WELL ADAPTED FOR DRY FARMING.

[*Photos by B. M. Davis.*

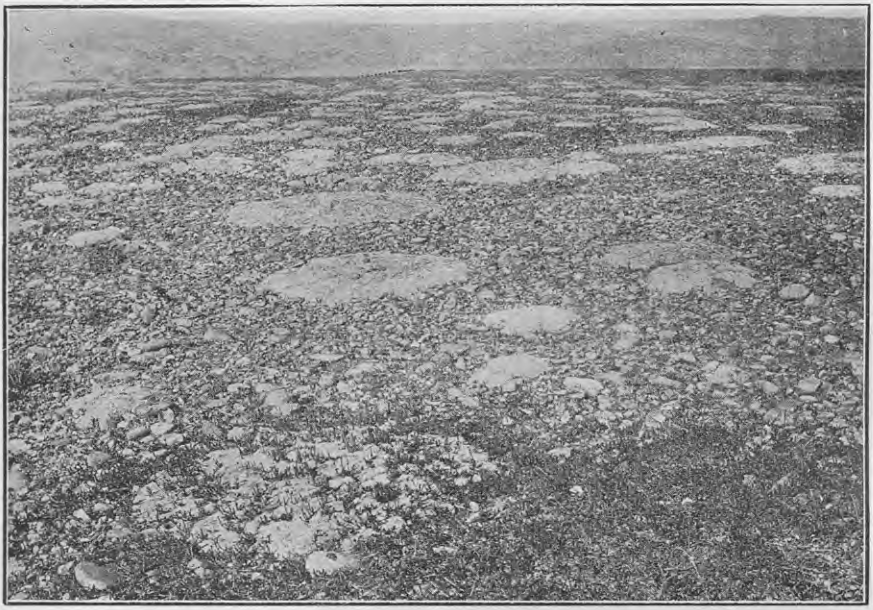
Although there is good evidence that the ancients practised the art of dry culture in various parts of the Old World, it is only in comparatively recent times that the modern agriculturist has given attention to the work. The celebrated agriculturist, Jethro Tull, born in 1674, was the pioneer British dry-farmer. His methods of soil-tillage lie at the foundation of the modern system of dry culture. The honour of having brought prominently to the front the present dry-farm agriculture of the Western World belongs to the people of Utah. In 1847 the pioneers entered Great Salt Lake Valley, and inquiring minds set to work to find out how to grow crops without irrigation. Experiments proved that the project was a feasible one, and from that time on the practice has grown and prospered.

DRY-CULTURE METHODS.

The soil mulch and its management is perhaps the most important point in dry farming. By a "soil mulch" is meant a loose layer of soil of varying depth on the surface of the field, produced by means of cultivation for the purpose of breaking capillary action and so preventing the escape of moisture. The mulch should be renewed as often as required, and its renewal is imperative after every fall of rain. The dry-farmer must beware of weeds. They have no place in dry culture. They are moisture-thieves, and a weedy dry farm, irrespective of soil or situation, is doomed to failure. The fertility of the soil must be maintained by the application of farmyard manure and litter, or the occasional ploughing-under of a leguminous crop. In a soil of high fertility, plants will attain maturity with a minimum supply of water.

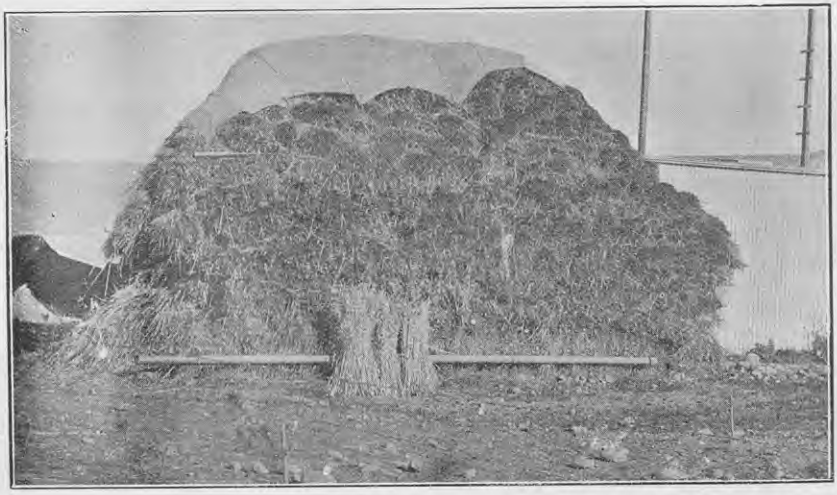
Sowing the seed is an operation that in point of importance is comparable to efficient ploughing and the maintenance of the soil mulch. Broadcasting of seed is quite foreign to the principles of dry farming. The dry-farmer must have control of his soil, and must place the seed at a sufficient depth to enable it to come in contact with moisture. All seed must be sown through the seed-drill, and it must be borne in mind that the amount of seed required in dry culture is about one-half of that required under humid conditions of agriculture. Wheat has from earliest times been the staple crop in arid regions, but oats, rye, and barley are all now grown successfully. Lucerne has proved its worth under dry culture, and potatoes are now known to respond well, and under such conditions are of high quality.

The quantity of water required by plants in dry regions is about one-half more than in humid climates, and the dry-farmer should ascertain the average annual rainfall over the area he intends to farm. Meteorological records are of importance to all farmers, but to the dry-farmer their importance is enhanced. He should also be closely acquainted with his soil and subsoil, so as to know exactly what treatment to adopt to conserve the precious moisture. Deep sandy loams or silty soils well supplied with organic matter are the best for dry-farming practice. Investigations in Utah proved that under a good system of culture it was possible to conserve 95 per cent. of the total precipitation for plant-use. Deep ploughing and the thorough pulverization of the soil, to be followed by rolling and then cultivating



LAND IN NATIVE STATE ON TERRACE ORCHARD COMPANY'S PROPERTY, ALEXANDRA, NOW UTILIZED FOR CROPPING.

The white patches are scab-weed (*Raoulia lutescens*).



STACK OF GARTON OATS GROWN ON TERRACE ORCHARD COMPANY'S LAND.

The crop was sown in April and harvested in December, the area of 15 acres averaging 2 tons of oaten chaff per acre.

[*Photos from Report of Southern Pastoral Lands Commission, 1920.*

to form a surface-soil mulch, are factors which if attended to will enable suitable soil to hold the maximum amount of moisture. The depth of the mulch is important. Investigations have shown that cultivation to form a soil mulch 4 in. deep reduced evaporation by 72 per cent., cultivation 8 in. deep reduced it by 88 per cent., while a mulch 10 in. deep almost wholly stayed the loss of moisture.

The watchword of the dry-farmer should be "Cultivation." The development of dry culture is teaching the old but too-often-forgotten lesson of the value of good tillage and the intercultivation of growing crops.

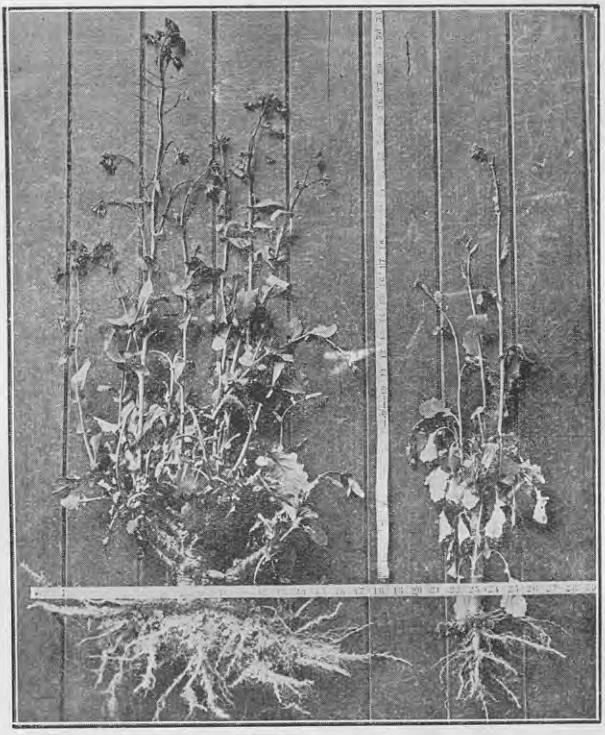
SOME NEW ZEALAND EXPERIENCE IN DRY FARMING.

Extensive areas in New Zealand could be profitably farmed under dry-culture methods. Our rainfall varies from about 11 in. in parts of Central Otago up to about 120 in. in some other parts of the Dominion. A considerable portion of the South Island ranges within the 20–30 in. rainfall, and where soil conditions are at all favourable dry culture would render crop-failures under such a rainfall an impossibility. Dry farming is only in its infancy in the Dominion, but examples of its successful practice may be cited.

Considerable interest has been aroused by the dry farming carried on at the Terrace Orchard Company's property, of some 800 acres, at Alexandra by the manager, Mr. G. H. Barker. As already indicated, Central Otago has a climate of exceptional dryness, while the summer temperature is high. The average number of days per annum on which rain falls may be set down as about sixty. The rainfall for the twelve months ended 31st December last amounted to only about 12 in. Yet on the Terrace property, under such circumstances, remarkable results have been obtained, despite the fact that the land is not eminently adapted for dry culture. The accompanying photographs indicate the evolution of a part of the property from the extremity of depletion to a condition enabling the production of a crop of oats returning 2 tons of chaff per acre. Last season an acre of wheat on this property yielded 60 bushels, and onions gave a most profitable return. Fruit-trees are also flourishing. The experience at the Terrace Orchard is similar to that of many others in like country — namely, the absolute necessity for early and deep ploughing, good cultivation, rolling, and the formation of the soil mulch to the requisite depth so as to save the winter moisture for summer crop-production.

Dry-culture methods were tried last season on the farm of Mr. H. S. McCully, of Waitohi, near Pleasant Point, South Canterbury. A field of approximately 50 acres was sown in rape on 15th November, and manured with rape-fertilizer at the rate of 1 cwt. per acre. Portion of the field was worked under dry methods, being intercultivated by Mr. McCully for the purpose of conserving moisture, allowing aeration of the soil, and destroying weeds. The value of this method was apparent from the earliest stages of the experiment, and at the end of the season was exemplified to a wonderful degree. The plants of rape growing on the dry-culture area were giants in comparison with those on the remainder of the field. The root-system of the former was vigorous, and the plants were not checked in growth during dry spells, as were those growing on the remainder of the field. The advantages of dry farming as shown in this experiment are of outstanding importance.

It has been estimated that the dry-culture area gave a yield of fodder at least 400 per cent. in excess of the portion grown under ordinary farm practice. The field was inspected by Mr. J. T. Smart, Director of the Technical School, Temuka, and he has certified that the experiment and result were as stated. From the photograph here reproduced it will be seen that the estimated increase is quite a conservative estimate. From an inspection of some of the plants by the writer he is of opinion that 600 per cent. would be quite within the mark.



RAPE-PLANTS FROM THE FARM OF MR. H. S. McCULLY, WAITOHI, SOUTH CANTERBURY.

On left, representative plant from part of field worked under dry-farming methods — rows 21 in. apart, intercultivated. On right, representative plant grown under ordinary practice in same field.

[Photo by W. Holwell.

Under dry-farming methods production could thus be enormously increased. On many farms even with a marked decrease of area under crop the results under a system of dry culture would be much greater than at present. The soil conditions would be improved, and each succeeding crop would derive substantial benefit from the intercultivation of the preceding one.

FRUIT COOL STORAGE.

HANDLING EXPERIMENTS IN 1920 SEASON.

W. H. RICE, Orchard Instructor, Hastings.

DURING the season of 1919 the Horticulture Division carried out in Hawke's Bay comprehensive experiments in the picking, handling, and packing of apples and pears for cool storage, concerning which a report was published in the *Journal* for January, 1920. The experiments were continued last year, and the matter which follows should be read as supplementary to the previous report. The 1920 experiments were designed to specially test the following points: (1) The best stage of maturity at which to pick fruit for successful cool storage; (2) the value of wrapping against non-wrapping of fruits prior to storage; (3) the effect of russeting on the value of fruit for storage; (4) methods of handling: grading and packing in the orchard—wrapped and unwrapped—*versus* grading in the orchard, conveying the fruit in orchard cases to the store, and then packing before storage.

STAGE OF MATURITY AT WHICH TO PICK APPLES.

Eight varieties of apples and three varieties of pears were used for this test. As the cases were made with newly cut timber, it was found impracticable to check the loss of weight during storage. All dates apply to 1920.

(1.) *Cox's Orange Pippin.*—Two pickings were made, on 23rd February and 2nd March. The fruit picked on each date was graded into two stages of maturity. The fruit was removed from store and examined on 14th June.

(*a.*) First picking: Had a well-defined yellowish ground colour, with blush and stripe. On removal from store this fruit was in excellent condition, but ripened rapidly and became soft-ripe in ten days. Duplicate cases in each instance showed that wrapped fruit was riper and brighter in appearance.

(*b.*) First picking: Just on change to light yellow in base colour, with light blush. This fruit stored well and ripened up well, with defined yellow; very attractive, though only about 10 per cent. of colour. Ripened more slowly than (*a*) after removal from store; still in good marketable condition twenty-one days after removal.

(*c.*) Second picking: Yellow; stripe and blush dull. Behaved in a similar manner to (*a*) under storage, but became dry and mealy-fleshed seven days out of store.

(*d.*) Second picking: Greenish-dull, little or no colour; firm when removed from store, and only attained low and unattractive colour except wrapped, which was brighter and riper. Shrinkage was rapid and pronounced when held ten days out of store.

The indications are that base colour is the factor which should govern picking—more so than blush—to secure best results. Fruits should be picked when the green base colour is inclined to yellow; if

allowed to remain on trees to colour up, although more attractive at picking-time, the storage period is shortened, and also the period of marketing.

(2.) *Dunn's (Monroe's Favourite).*—Two pickings were made, on 25th February and 5th March, and the fruit graded into two stages of maturity on each date. Removed from store 5th July.

(*a.*) First picking: Well-developed fruits as to size; only very slight change of ground colour, with light blush. When removed from store, firm and greenish, unattractive, inclined to shrink, and became very spongy and wrinkled in skin fourteen days after withdrawal. Wrapped fruits no improvement.

(*b.*) First picking: Though well up to size, no change of ground colour. When removed from store were limp and green; did not ripen, but shrivelled very rapidly. Wrapped fruits similar, except more brilliant green.

(*c.*) Second picking: Well-defined yellowish ground colour, regardless of blush. When removed from store very attractive, firm; ripened well and kept well out of store, conditioning gradually with no shrinkage. Wrapped fruits brighter, cleaner, and more refined skin-texture.

(*d.*) Second picking: Green ground colour, with good blush (high-coloured fruits with basal colour undeveloped). When removed from store there was little or no development of ground colour, which remained green, and though in contrast with a good blush the sample was not nearly so attractive as the yellow and light blush fruits of (*c*). Wrapping in no way improved the condition or affected the skin wrinkle and shrivel, which was pronounced at fourteen days.

The indications are that, whenever picked, ground colour should be present if fruits are to ripen under or after storage in anything like good condition with attractive appearance. Yet if the ground colour is a very pronounced yellowish-white, there is a risk of dryness and mealiness of fruit under storage.

(3.) *Jonathan.*—Two pickings were made, on 4th and 12th March, each picking being divided into two grades of maturity. Removed from store 15th June.

(*a.*) First picking: Well-defined yellowish ground colour, with good blush. Excellent order when checked; firm, nice-conditioned fruit, very attractive, especially when wrapped, which added brilliancy to the skin. Remained in good marketable condition up to twenty-one days.

(*b.*) First picking: Greenish ground colour, with medium blush. When removed, very moderate condition, firm, greenish and dull, inclined to skin-wrinkle ten days after removal. Wrapping no appreciable improvement.

(*c.*) Second picking: Similar fruits to (*a*), but eight days more advanced. When removed, equal in immediate condition to (*a*), except riper and more subject to bruise; inclined to be mealy and dry after fourteen days, particularly wrapped fruits.

(*d.*) Second picking: Similar fruits to (*b*), but eight days riper, and showing pronounced yellow tinge on ground. Conditioned up in good order, yellow and inclined to be mealy; ripened very rapidly on removal, being soft-ripe in fourteen days.

(*e.*) Various grades of maturity and russet: In all cases this fruit shrank under storage. Well-coloured fruits became soft and pliable, while greenish fruits were leathery.

Comparisons indicate that well-coloured fruits should be picked only when ground colour is showing a defined yellowish tinge, otherwise the shrinkage of green parts is bad. Fully developed fruits with apparent change to yellow in base should not be allowed to hang on tree to attain blush if maximum keeping is desired, as such fruits are inclined to be soft and mushy after removal. Russeted fruits should be disposed of before shrinkage, and to facilitate this should be stored in separate cases.

(4.) *Lord Wolseley.*—Two pickings were made, on 15th and 24th March, and each separated according to maturity. Removed from store 14th June.

(*a.*) First picking: Well-developed white to yellow ground colour, and left the spur freely. Removal showed these fruits to be well selected, firm, well conditioned, bright and attractive; conditioning gradually after storage, with no shrinkage up to twenty-one days. Wrapped fruits brighter and riper, but not to mealiness.

(*b.*) First picking: Greenish colour, with only light suffusion of white to yellow. When removed firm, no colour-development, very dull compared to (*a*); no improvement wrapped. Inclined to skin-wrinkle fourteen days out of store; firm up to seven days. Five per cent. of bitter-pit noticed in this section only.

(*c.*) Second picking: Similar to but seven days riper than (*a*); decided yellow. When removed equal to (*a*) in appearance; considerably more liable to bruise, and conditioned rapidly within seven days. Mealy-overripe after fourteen days.

(*d.*) Second picking: Green though full grown. When removed dull green, except wrapped fruits, which were bright green. Did not take on yellow ground colour prior to shrinkage; leathery condition within fourteen days.

The results indicate fruits should be picked with well-developed whitish colour to yellow tinge. When left on trees to advanced riper stage bruise more readily, do not allow such a reasonable marketing-period, and inclined to be mealy. Fruits with undeveloped colour when picked shrink rapidly after storage, thus demonstrating that the varying maturities should be stored separately to get best results. More selection required than with most varieties to get all at correct stage.

(5.) *Delicious.*—Two pickings were made, on 16th and 23rd March, each being divided into two stages of maturity. Removed from store 3rd August.

(*a.*) First picking: Definite change of ground colour to yellow, with good bright blush; picked readily. Removal showed these fruits in good condition, firm, crisp, and bright-coloured; kept well after storage, remaining full-flavoured and in excellent marketing condition up to twenty-one days.

(*b.*) First picking: Only light tinge of yellow in ground colour, with dull blush. When removed, firm, crisp, good condition, but not so attractive as more advanced when picked. Green had taken on a light yellow, but when conditioned was inclined to toughness.

(*c.*) Second picking: Similar, yet seven days riper than (*a*). Decided yellow ground, with full blush. Removed from store as (*a*),

but more advanced ripeness and decidedly more subject to bruise. Conditioned to overripeness within fourteen days from store.

(*d.*) Second picking: Similar to (*b*) but seven days riper. Well-advanced yellow ground, but only light blush. Conditioned rapidly after storage; inclined to be mealy, though bright yellow and crisp when removed. Brighter colour and advanced ripeness due to wrapping.

Results indicate that the fruit should be picked when ground colour is well defined, regardless of blush. Fruits left to advanced maturity on tree do not store so well, are more subject to bruise, and do not allow same latitude of disposal. Uncoloured (blush) fruits should also be picked when ready, and may then be expected to mature gradually in good order, though not high-coloured.

(6.) *Sturmer.*—Two pickings were made, on 30th March and 7th April. Removed from store 23rd September.

(*a.*) First picking: Well-defined light-yellow change of ground colour, with traces of leaf-green. When removed from store proved firm and crisp, and kept well, conditioning very gradually.

(*b.*) First picking: Good bright blush, but basal colour still green. When removed from store, still green and firm, but developed a flexible condition; instead of ripening became limp and tough-fleshed in twenty-one days.

(*c.*) Second picking: Similar fruits but seven days riper than (*a*). Meanwhile had developed a pronounced yellow ground. When removed from store, bright, firm, crisp, and rather dry. Very attractive appearance, but bruised readily, this showing up very distinctly, and rapidly decayed. Limited marketing-period, as most fruits proved mealy in fourteen days.

(*d.*) Second picking: Spray-russeted fruits in various grades of maturity and blush. When removed from store it was found that shrivelling had taken place in all fruits. The worst specimens were those of low maturity, then those of reasonable maturity with confluent russet, and to a much lesser extent, but still sufficient to affect the condition of the fruit, those specimens on which russet was scattered over the surface.

The results indicate that change of ground colour should be present when picked, and that all fruits should be packed separately, according to maturity. 5 per cent. of confluent russet is more damaging to the ultimate condition of the fruit than 10 per cent. scattered.

(7.) *McMahon's White.*—These fruits were graded, packed, and cooled-stored on 20th April from fruits picked on 14th April, and held in the fruit-shed at Arataki Horticultural Station. Removed from store on 7th September.

(*a.*) Well-developed yellow ground colour, with mixed blush. When removed from store, firm but dry and mealy. Examination from time to time in store showed that this fruit was in the best-quality marketing condition in the early part of August.

(*b.*) Light change of ground colour with mixed blush and traces of leaf-green showing. When removed from store this fruit was in excellent condition, and remained so for twenty-one days. Fruits allowed to remain in store attained their maximum fair marketing condition by mid-November.

(*c.*) Mixed maturity with spray russet, and all grades of blush. When removed from store all fruits had shrivelled according to the degree

of russet. Shrinkage was more pronounced where russet was confluent; with specimens well matured it was only such parts that shrivelled; scattered russet up to 10 per cent. caused no material defect.

This variety should fill a place between Delicious and Sturmer, and thus prolong the season for consumers who have a preference for apples of the Delicious flavour.

(8.) *Dougherty.*—Two pickings were made, on 19th and 25th May, and graded for maturity. Removed from store 26th November.

(*a.*) First picking: Well-coloured fruits, with leaf-green replaced by light yellow. When removed from store proved in excellent condition and in no way deteriorated in fourteen days.

(*b.*) First and second picking: Well-coloured fruits, with leaf-green unchanged. When removed from store were firm, crisp, and juicy, but did not ripen well, becoming rather dry and pliable in fourteen days.

(*c.*) Second picking: Well-coloured fruits, with advanced yellow in contrast. When removed from store were firm, crisp, dry, and below full flavour of the variety. Remained firm but dry and mealy, with rapid decay where injured by handling or in transit.

(*d.*) Spray-russeted fruits of various grades of maturity. When removed from store shrivel was only apparent in fruits of low maturity. When compared to (*b*) this would suggest that russet was the cause of more shrinkage than undermaturity, except in the case of very pronounced undermaturity. In the course of fourteen days the ill effects due to russet became very apparent—shrivelling in the instances of heavy and confluent russet, and skin-wrinkle of fruits with moderate scattered russet.

This variety, like others, gave the best results when picked with a distinct change from leaf-green to yellow of the ground colour. The results would also suggest that much of the mealy condition so common in this variety when stored is due to it being allowed to hang on the trees regardless of advancing maturity.

Pears.

(1.) *Beurre Diel.*—Two pickings were made, on 9th and 15th March, and divided into two grades of maturity. Removed from store 9th June.

(*a.*) First picking: Very slight change of ground colour, but picked readily. Proved on removal from store to be bright, well-coloured, firm, crisp fruit. Wrapped fruits brighter but not riper; no inclination to shrivel or mush.

(*b.*) First picking: No change of ground colour, but left spur readily. When removed were bright and greenish, otherwise equal to (*a*). Musty odour in all wrapped fruits, which affected flavour.

(*c.*) Second picking: Picked readily. About equal to (*a*); more advanced not possible, as all fruits left to yellow fall to the ground. When removed from store were nice bright, well-coloured fruits, firm, crisp, and equal to (*a*). Musty when wrapped.

(*d.*) Second picking: Inside fruits not so mature and harder to pick. When removed were greenish and hard, shrinking to leathery condition instead of ripening.

Results indicate that fruits should be picked when easy to sever from tree. Greenish fruits should be avoided for storage. Wrapping gives brighter colour and somewhat retards ripening, but gives musty odour, which was not noticeable with other varieties tested.

(2.) *Winter Cole.*—Two pickings were made, on 18th and 26th March, and each graded to two stages of maturity. Removed from store 21st June.

(*a.*) First picking: Well-defined yellowish colour; picked readily. Removed from store in splendid condition, firm, bright, well coloured, and conditioning gradually after removal. Wrapping delayed ripening but added lustre to the skin.

(*b.*) First picking: Greenish ground, yet picked readily. When removed fruits were firm, crisp, and not so well coloured as (*a*), and took longer to condition; were not full-flavoured, and greener fruits shrunk at the stem end.

(*c.*) Second picking: Similar fruits eight days riper than (*a*). Distinct yellow. At removal equal to (*a*); ripened much more rapidly after, and fruits bruised more readily.

(*d.*) Second picking: Greenish to yellow; picked readily. Stored in splendid order; firm, bright, crisp, and well coloured; same fruit as (*b*) eight days riper. Has well demonstrated the value of leaving to more maturity on tree.

Results indicate uniformity of storage if ground colour is used as a guide. Greener fruits should be allowed to remain to change base colour. Wrapping delayed ripening.

(3.) *Winter Nelis.*—Two pickings were made, on 9th and 16th April, with each graded into two grades of maturity. Removed from store 6th August.

(*a.*) First picking: Changing to yellow, well defined but not advanced. When removed from store were well coloured, firm, crisp, and full-flavoured. Conditioning evenly and slowly with good marketing-period; nice condition up to twenty-one days.

(*b.*) First picking: Greenish, slight tinge of yellow only. When removed from store, greenish and soft; very unattractive, limp and soft after seven days.

(*c.*) Second picking: Well-defined yellow ground; picked very readily. Seven days riper than (*a*). On removal from store were ripe and juicy, being ready to use immediately; bruised badly, indicating ripening on tree and shortening of storage period advisable; should be stored separately and marketed earlier.

(*d.*) Second picking: Greenish; hard to sever from tree. On removal from store were greenish, soft, and pliable; did not mature after storage, but shrunk to a limp condition in fourteen days.

The results indicate that several pickings (selections) are necessary to catch this variety in good order. Fruits must be graded into separate cases according to maturity, prior to storage, if the various classes are to be marketed in proper season.

Summary.

The experiment just detailed indicates that there is a certain stage of maturity which allows the best results to be obtained, that stage being indicated by a distinct change of ground colour towards light yellow from leaf-green. Fruits picked which had no change of ground or basal colour proved not only to shrink under storage, but were unsuitable fruits to condition after removal, being inclined to shrink dry and leathery rather than ripen. On the other hand, fruits which were of an advanced yellowish ground colour proved mealy when stored

for the average period of the variety, and mush-ripe very soon after. The lesson to be learned is that fruit should be picked when there is a distinct change of ground colour, regardless of the high colour or blush.

With the fruits graded according to standard colour requirements when packed it was noticeable that there was no further development in intensity of high colour, but the development of ground colour provided a contrast which improved the appearance of the fruit.

With the yellow or green varieties close observation shows that the leaf-green passes through a whitish shade before turning yellow. The stage when this whitish-yellow is the dominant ground colour proved the best for picking such varieties.

Evidence goes to show that leaving fruit on the trees to attain a high colour or blush after the change of ground colour results in speedy ripening under storage, with a consequent shorter storage period and fruit which lacks that desirable crisp and juicy quality. Such fruit is practically ripe when removed from the trees, and ready for immediate sale in the case of early and mid-season varieties. If in the case of later keeping varieties this condition of ripeness is unavoidable, such advanced fruits should be stored in separate cases to permit withdrawal from the store while still in good condition.

Beurre Diel pear presents a somewhat difficult proposition regarding the best stage at which to pick. Fruits leave the spur readily, and many fall before there is any colour to indicate approaching maturity.

Pip-colour development gave such a wide variation throughout the test that it appears to be of little assistance in selecting the stage at which to pick for storage.

WRAPPING FRUIT PRIOR TO STORAGE.

There were six classes of wrapped fruit, comparable with fruit similar in all respects but not wrapped: (1) Fruits with greenish ground colour packed in orchard; (2) fruits with greenish ground colour packed in store; (3) fruit with leaf-green changed to yellow packed in orchard; (4) fruit with leaf-green changed to yellow packed in store; (5) fruits with well-advanced ground colour packed in orchard; (6) fruits with well-advanced ground colour packed in store. Results were noted as follows:—

Apples.

(1) and (2). Wrapping was no improvement on unwrapped in any way.

(3.) Wrapped fruit had a brighter general appearance, and, though slightly riper, still retained firmness of texture. Though there was some improvement due to wrapping, there was not sufficient to warrant the extra expense for local storage, except with fruits of a special character, such as show fruits.

(4.) Similar to (3), with the added advantage which wrapping gave by confining the spread of decay to specimens injured at picking-time and in transit to the store.

(5.) Wrapping was a disadvantage in so far that it further hastened ripening.

(6.) Similar to (5), except that spread of decay was restricted.

Pears.

(1) and (2). Wrapping caused a still more shrivelled and leathery condition, particularly from the stem end.

(3.) Wrapping gave a brighter skin and somewhat retarded ripening.

(4.) As (3), with spread of decay confined to injured specimens.

(5.) Wrapping was an advantage by delaying ripening, but not sufficient to recommend commercial usage for local market, except perhaps with Winter Cole well advanced when picked.

(6.) As (5), with decay localized by wrapping.

These remarks do not apply to Beurre Diel, as wrapped fruits of this variety in every instance developed a pronounced musty-wine odour, the flavour also being tainted musty.

SPRAY-RUSSETED FRUIT.

Spray-russeted fruits of each maturity were selected and packed separately. Various degrees of russeting were noted, as also was the confluent or scattered nature of the skin-injury. The effect of russet on the storage period was very marked. In all grades of maturity there was a decided shrivelling of the fruit, general with fruits inclined to undermaturity, and confined to the russeted portion in the case of more advanced fruits.

Fruits which were good in every way but for russet exceeding 5 per cent. if confluent and 15 per cent. if scattered shrivelled badly at the russeted portion, while the clear-skin section of the same specimen would be quite firm when subjected to the normal storage period of the variety.

As russeted fruits remain firm a very limited time only when cool-stored, they are best stored in separate cases, so that they may be removed while still of some value.

It was very clear that russeted and clear-skinned fruits of the same variety have two distinct storage periods if each are to be marketed to the best advantage.

HANDLING TEST: PACKING IN ORCHARD VERSUS PACKING IN STORE.

The handling tests consisted of testing the methods (1) and (2) specified below—namely, packing the cases in a compact manner prior to cartage, which gave such good results in the previous experiment —against (3), the usual local practice of carting fruit to the store loosely emptied into cases. The fruits were picked carefully in the usual way into a picking-bag and emptied on to a portable grading-table with canvas bottom, the table being placed in the shade. The fruit was then graded for quality and maturity and treated as under:—

(1.) Wrapped and packed into case on the diagonal or pocket-pack system, with wood-wool top and bottom, and the lid nailed down in the usual manner.

(2.) Same as (1) but not wrapped.

(3.) Graded from table, handled carefully into cases, and lightly shaken down to settle the fruit, the whole being then conveyed to the central packing-shed and cool store in the same conveyance. The section (3) was then divided, and some wrapped and the others packed plain, as (1) and (2) had been treated in the orchard.

All cases were then placed in the precooler on the same day, and from there passed to the cool chamber without unnecessary delay.

Notes taken on the various comparisons show that (1) and (2) gave excellent results, and were a great improvement on (3), which resulted in a bruised and in many instances skin-punctured condition of the fruit before the further handling required in packing at the store.

The results amply demonstrated that serious damage is done to fruit when the cases are irregularly filled at the orchard and shaken down in transit to the store, and that such damage may be eliminated almost entirely by packing the fruit in an orderly manner in the case before carting. The ultimate condition of the fruit well repays the extra trouble, not only where it has to be repacked at the store for a special purpose, such as export, but also for local market. Further, it is in a condition for prompt storage, which is a very important factor in the treatment of fruit intended for cool storage, as shown by the report on last season's experiments.

The results of this experiment again demonstrated the important bearing that proper selection, handling, and transit to the store has on the ultimate successful cool storage of fruit. Unless these points are carefully attended to, even an efficient cool chamber cannot give the best results.

I wish to record my appreciation of the valuable assistance and co-operation rendered by the managers of Messrs. Apsey, White, and Co. (Limited), and the Hawke's Bay Fruitgrowers (Limited), which very materially assisted the experiments.

NOTES ON WOOL-CLASSING.

J. G. COOK, Wool Instructor, Live-stock Division.

IN no other work is one called upon to adapt himself to circumstances more than in wool-classing. It is necessary to vary the procedure according to the clip one is handling, as indicated in the following notes, which are supplementary to the writer's article, "Wool-handling at Shearing-time," published in the *Journal* for November, 1920.

MIXED FLOCKS.

Two leading examples will be given, the first being fairly typical of South Island conditions. This flock is a mixed one of about three thousand sheep, all carrying clean, strong, shafty wool, and consisting of half-breds, three-quarter-breds, crossbreds, and merinos. The majority being half-breds, two classes should be made of that fleece wool. Into the first wool-bin put the finest and best fleeces, and after it is pressed brand the bale "A Combing Half-bred." Into the second bin put the coarser and heavier-conditioned fleeces, branding the bale "B Combing Half-bred." Into the third bin put the finest and best of the three-quarter-bred fleeces, branding the bale "A Combing Three-quarter-bred." Into the fourth bin can be put the coarsest of the

three-quarter-bred and the crossbred fleeces, as it will be found they are of about the same spinning-quality; and as there will be only one line of this, brand the bale "Crossbred Combing." The fifth bin will be used for the merino fleeces, and the bale branded "Merino Combing," as there is only one line.

Farmers could save a great deal of this cutting-up if they would breed and keep to only one or two lines, thus reducing the number of classes to a minimum and enabling the clip to be put up in larger lines, which is more convenient at sale-time.

The other example will be a flock—such as very commonly found in the North Island—comprising Romney, Romney crossbreds, and Lincoln crossbreds. Here we have three distinct lines, and they must be kept separate from each other. These sheep as a rule grow strong shafty combing-wool, and if the lines are in equal proportion A and B combing should be made in each line.

SEEDY CLIPS.

Sometimes the whole clip is seedy, and if there is only one breed of sheep on the place two classes should be made, one containing the fleeces which are slightly seedy and the other those which are carrying the most seed. The former should be entered in the wool-book as "Slightly Seedy" and the latter "Very Seedy." In the event of the flock being a mixed one and all the wool seedy, keep each line separate from the others and enter it according to whichever line it belongs, such as "Seedy Romney Marsh," "Seedy Romney Cross," "Seedy Lincoln Cross," "Seedy Merino," and so on.

DINGY CLIPS.

In some seasons the whole clip is dingy, and if there is only one line of sheep on the farm two classes should be made of the fleece wool. One class will embody all the strong fleeces which will stand the tension of the combing-machine; the other class will take in all the weak tender fleeces. Enter the former line as "Dingy Combing" and the latter as "Dingy Clothing." If the flock is a mixed one and all dingy, keep each line separate from the others and enter it according to whichever it belongs, as follows: "Half-bred Dingy," "Crossbred Dingy," "Merino Dingy," and other lines in the same way.

WOOL-BOOK ENTRIES.

The farmer or person acting for him should remember to enter in the wool-book the description of wool in each bale as soon as possible after the bale is out of the press, thus obviating errors, and the book will always stand as a record for reference purposes.

Departmental Exhibits at Shows.—The Department has decided to revive to a limited extent the practice of making instructional displays at certain agricultural shows, the temporary discontinuance of which was rendered necessary during the war. The exhibits work will be in charge of Mr. A. Macpherson, late Fields Instructor at Christchurch, as in the past.

EXPORT OF FRUIT.

THIS SEASON'S REQUIREMENTS AND CONDITIONS.

J. A. CAMPBELL, Assistant Director of the Horticulture Division.

THERE are necessarily many problems to be overcome in the process of developing an export trade. Many of these are obvious at the outset, and their solution may therefore be attempted straight away, but others not anticipated have the unhappy knack of cropping up in the course of actual practice. Something of the kind has been our experience as a result of our modest shipments of fruit to England last year. As this business is likely to be on a very much larger scale, and the new season is about to commence, a little advice to growers and packers at this stage may be of value.

FRUIT-CASES.

The export case provided by the regulations has an inside measurement of 10 in. by 11¼ in. by 19¾ in. The Canadian standard case, which will also be accepted, has inside measurements of 10½ in. by 11½ in. by 18 in. Except that the tops and bottoms of the Canadian cases are thinner and are used with a cleat, the timber for construction is practically the same as in our own. In fact, the tops and bottoms of the New Zealand standard case should be reduced in thickness and used with cleats also. In shape either case is satisfactory. For local purposes our own case has stood up to its work quite well, giving little or no trouble. Therefore the alarming manner in which many of these cases collapsed when being loaded on to the oversea boats at Wellington last year, and later, it is understood, on the wharves in London, constituted one of the unlooked-for but none the less serious incidents in connection with the success or otherwise of this trade.

It is of course obvious to any one that this cannot be allowed to continue. The first consideration with respect to any package is stability. Whatever size or shape it might be, it is worse than useless if it fails to land its contents successfully at its destination. Unfortunately, the class of timber from which cases are made is usually poor stuff at best. However, bad as it often is, it usually lends itself to a certain amount of selection, and this selection, so far as intending exporters are concerned, should be practised without fail and only the best timber selected for the construction of export cases.

In this connection the following advice is given: (1.) Select the best timber on hand for the construction of export cases, reserving that of poorer quality for local marketing purposes. (2.) Overseasoned timber should not be used. (3.) Six-inch and four-inch side boards should be used, and the order of their use should be reversed on either side of the case; this will tend to strengthen the grain and prevent end-splitting. (4.) Nails stouter and longer than ordinary should be used, and should be driven on the skew and dovetail plan. (5.) Cases or case-timber should be stacked under cover or made up just prior to packing; they should not be exposed to the weather, particularly to

a hot sun. (6.) When packed all projecting ends should be shaved off flush, otherwise the case will be liable to be torn to pieces in the process of handling.

As a further safeguard against damage to cases in transit the adoption of a simple process of wiring recently made available is strongly advocated. Full particulars regarding this process may be had from the general manager of the Fruitgrowers' Federation, or the agent, Mr. H. Hoare, Dixon Street, Wellington.

COLOUR STANDARDS.

The standard of colour required by the regulations has been held responsible by certain English agents for a certain proportion of our fruit arriving on the market in an overmature state. This conclusion is held by the writer to be altogether incorrect, the overmaturity of the fruit having been due to unavoidable delay at this end after the fruit was in the cases, rather than to its being held on the tree too long in order to allow it to assume the required amount of colour. However, certain relaxations in the colour standards have been made with respect to fruit being shipped to European markets during the coming season, as will be seen in the amended export conditions quoted later on.

REGISTERED EXPORT NUMBER.

The absence of a distinguishing mark on fruit-cases submitted for examination has several times in the past placed the Inspector in a difficult position. In these instances a small percentage of the line, possibly the fruit from a single orchard, has been found to be well below the standard required. In such circumstances the Inspector has had either to pass fruit which should not be passed, as there has been no means of distinguishing the cases objected to from the remainder of the stack, or to condemn the whole line of possibly several hundred cases, thereby causing a heavy and unnecessary loss to the association concerned. The branding of the cases with the grower's registered number will overcome this difficulty, and packing associations are likely to be thereby more than well compensated for the little extra trouble involved.

EXPORT REGULATIONS.

With respect to the fruit-export regulations, it has been decided by the Department to allow the following modifications for the season 1921 :—

COMBINED GRADE-MARKS.

Apples conforming to the requirements of "Extra Fancy" and "Fancy" may be packed together in the same case, but in all such instances where the resultant pack runs 50 per cent. and upwards of fruit carrying the colour requirement of "Extra Fancy" the case or cases must be branded with the combined grade-mark abbreviated to "Extra and Fancy Combn."

In all instances where the resultant pack runs less than 50 per cent. of such highly coloured fruits the case or cases must be branded with the lower grade-mark of "Fancy."

CLASSES.

The existing partial red and striped class will be divided and a distinct striped class instituted. The colour requirements of the striped class will be 33⅓ per cent. and 20 per cent. respectively of good typical colour for "Extra Fancy" and "Fancy" grades.

COLOUR STANDARDS.

Notwithstanding the provisions of the regulations, which will not be altered in this respect until further experience has been gained, apples carrying 10 per cent. less colour with respect to "Extra Fancy" and 5 per cent. less colour with respect to "Fancy" than is required by the regulations will be accepted during the 1921 season for export to Europe only.

The above reduction in colour will apply to all the grade classes, including the newly introduced striped class above referred to.

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, whether packed by the grower himself or packed and shipped through a packing association. The characters used in connection with such number shall be not less than $\frac{3}{4}$ in. in the case of stencils.

MINIMUM AND MAXIMUM SIZES OF APPLES FOR EXPORT TO EUROPE.

The minimum size of fruit approved for export for the above purpose will be 210 per case (= $2\frac{1}{4}$ in.) with the exception of those varieties marked * in the appended lists. With respect to the varieties so marked the minimum will be 175 per case (= $2\frac{1}{2}$ in.).

The maximum size with respect to all varieties will be 90 per case (= 3 in.).

MINIMUM AND MAXIMUM SIZES OF APPLES FOR EXPORT TO SOUTH AMERICA AND OTHER MARKETS.

The minimum and maximum sizes of apples approved for export for the above purposes will be 175 per case (= $2\frac{1}{2}$ in.) and 72 (= $3\frac{1}{2}$ in.) respectively.

AGE OF TREES.

The regulations restricting fruit for export to that taken from trees of seven years of age and upwards will still remain in force, but arrangements will be made during the coming season for experimental shipments of fruit to be made from trees of a lesser age than seven years.

STENCILLING AND LABELLING.

Herewith is a facsimile of a stencil reduced in size according to scale, and it is issued for the guidance of growers. The stencil suggests the minimum wording required. "New Zealand Apples" must be in not less than 1 in. lettering; registered export number not less than $\frac{1}{2}$ in. with respect to paper labels and not less than $\frac{3}{4}$ in. with respect to stencils; "Packed for Export" not less than $\frac{3}{4}$ in. "Raroa" takes the place of the packing-shed, orchard, &c., and should not be less than 1 in. lettering. "120" represents the number of apples in the case. This, together with "Fancy" and "Jonathan," will in most instances require to be branded by means of rubber stamps, the lettering of which should be not less than $\frac{3}{16}$ in. Paper labels, apart from any form of ornamental design, must also bear the wording represented by the stencil copy.

Application for export brands or labels, together with facsimile of such brands or labels, must still be made to the Director of the Horticulture Division.

APPLES, PEARS, AND PEACHES APPROVED FOR EXPORT.

Those marked * are limited to a minimum size of 2½ in.; those marked † must be specially good of the variety to secure the Government guarantee.

Apples.

Solid Red Varieties.

Baldwin.	King David.†	Tasma.
Hoover.*†	Spitzenberg.	

Partial Red Varieties.

Crofton.	Rome Beauty.*	Shepherd's Perfection.
Delicious.	Scarlet Nonpareil.	Wealthy.†
Dougherty.	Scarlet Pearmain.	Worcester Pearmain.
John Sharp.†	Sharp's Late Red.*	Yates.
Jonathan.		

Striped Varieties.

Adams Pearmain.	Gravenstein.	Statesman.
Allington Pippin.	Premier.	Stayman.
Cox's Orange.	Ribston Pippin.	

Yellow or Green Varieties.

Boston Russet.†	Golden Pippin.	Reinette du Canada.*†
Brownlee's Russet.†	London Pippin.*†	Sturmer Pippin.
Cleopatra.	Newtown Pippin.	Willie Sharp.
Dunn's Favourite.*	Parlins Beauty.*	

Pears.

Bachelier.	Doyenne du Comice.	L'Inconnue.
Beurre Bosc.	Duchess d' Angouleme.	Marie Louise.
Beurre Capiaumont.	Durondeau.	Packham's Triumph.
Beurré Clairgeau.	Elizabeth Cole.	P. Barry.
Beurre d'Anjou.	Giblin's Nelis.	Twyford's Monarch.
Beurre Diel.	Glou Morceau.	Winter Cole.
Beurre Easter.	Josephine de Malines.	Winter Nelis.
Directeur Hardy.		

Peaches.

Elberta.	Kia Ora.	Sea Eagle.
Golden Queen.	Lippiatt's Late Red.	Sea Eagle Improved.
Hobbs's Late.	Paragon.	Solway.
James' Cling.	Prizetaker.	Wheatland.
Kalamazoo.		

GOVERNMENT GUARANTEE.

The following are the conditions of the Government guarantee of a net return of 1d. per pound on fruit exported during the season 1921:—

The guarantee is to be limited to 200,000 cases of approved varieties and classes of fruit.

The Government liability under the guarantee extends to the same charges for the packing, shipment, &c., of the fruit, as was the case during the last season.

It is a condition of the offer of the guarantee that all fruit exported under it must be covered by an all-risk insurance policy.

The guarantee be limited to fruit grown and shipped on consignment by *bona fide* fruitgrowers, and fruitgrowers' co-operative societies, through the New Zealand Fruitgrowers' Federation, provided that body affords equal shipping-facilities to all.

Notwithstanding that the offer applies to fruit shipped to any market, the Minister reserves the right to limit the quantity of fruit shipped to any particular market, should shipping-accommodation, freight rates, market conditions, &c., be deemed unsatisfactory.

The requirements in regard to the fruit passing the Department's Inspectors, in terms of the export regulations, will, of course, apply.

LUCERNE IN THE WAIRARAPA.

A SUCCESSFUL STAND AT KAHUTARA.

F. E. WARD, Instructor in Agriculture.

ONE of the most successful stands of lucerne in the Wairarapa is that of Mr. J. Carne Bidwill, at Kahutara, on the eastern side of the lake. A few years ago Mr. Bidwill, realizing the great value of lucerne as a green fodder and as hay, set aside a paddock of 20 acres with the intention of getting it ultimately into lucerne. The soil of the paddock is a dark friable loam with a loose subsoil — a typical lucerne soil. Drainage is mainly carried out by means of deep open drains, the water in these being at a depth of about 6 ft. A certain number of tile drains have also been laid in the wettest parts.

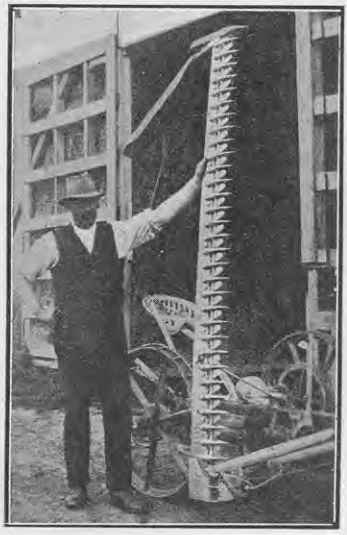
PART OF THE LUCERNE STAND AT KAHUTARA.

Second crop of this season—six weeks' growth—ready for cutting in December.

The paddock was ploughed and cropped with swedes in the first place. A crop of oats was grown, and harvested in January, 1913. The stubble was ploughed in and barley was sown in the early autumn. This barley was fed off with sheep during the winter, and was then allowed to grow till it reached the height of about 9 in., when it was ploughed in for green manure. In September burnt lime was applied at the rate of 1 ton per acre and the ground again ploughed. During the period which elapsed between this ploughing and the sowing of the lucerne the weeds were kept in control by means of the tine harrows, which were put over the ground several times. Just prior to sowing the land was rolled with a Cambridge roller, and inoculated soil was applied at the rate of 1¼ cwt. per acre. This was harrowed in, and the seed-bed finally prepared with the roller. Sowing was carried out in November with the Marlborough variety, at the rate of 15 lb. per acre. The seed was mixed with 2 cwt. of basic slag, and the mixture

sown, practically broadcast, through the manure-box of a drill with the coulters removed. The seed was covered with a cross-stroke of the roller.

Four cuts have been taken from the stand each season since the year of its establishment. After every cut the crop has been harrowed with sharp-pointed tine harrows. Two years ago a Berger lucerne-cultivator was put over the stand twice to eradicate grass and weeds which had established themselves, and it is intended to repeat this operation each year, as it was distinctly beneficial. In the autumn of 1916 the stand was top-dressed with carbonate of lime at the rate of 1 ton per acre. On account of unsettled weather and the presence of weeds, &c., in spring, the first cut is usually made into ensilage, while the subsequent cuts are converted into hay. The yield for twelve months from the 20 acres in 1919–20 was 100 tons of ensilage and 100 tons of hay. The price obtained for the ensilage was £7 per ton and for the hay £9 per ton, this showing a gross return of £1,600 from the 20 acres.



THE 8 FT. ALBION MOWER.

The cutting of the crop is now done with a special Albion mower, which has an 8 ft. cut. Although this is nearly double the cut of an ordinary mower, two horses draw the implement easily, the draught apparently being very little greater than that of a 4 ft. 6 in. mower.

The success of the stand is due in no small degree to the care of Mr. D. K. Cameron, Mr. Bidwill's manager, who has seen to the details of the work and has carried them out in accordance with the Department's advice. Mr. Bidwill was so satisfied with the result of this lucerne stand that he put down elsewhere on the farm another 15 acres, which is now in its second year and doing very well.

LUCERNE-CULTURE DEMONSTRATION TO FARMERS BY INSTRUCTOR, AT KAHUTARA.

SHEEP-MANAGEMENT NOTES.

IV. DIPPING.

F. MACKENZIE, Inspector of Stock, Christchurch.

ONE of the most important operations in the management of sheep is the annual dipping. It is in the interest of every sheepowner to ensure that his flocks are efficiently dipped—that is, dipped so that the sheep will remain clean until the following shearing. In order to obtain satisfactory results it is necessary to use a poisonous dip. The different powder and other poisonous dips now on the market are all satisfactory. Great care should be taken to follow out the instructions on the packet or drum, as probably 50 per cent. of failures in dipping are due to owners neglecting to carry out the manufacturers' instructions.

One of the most common causes of failure is insufficient immersion. Each sheep should be held for at least one minute in the bath. This is absolutely necessary to obtain effective results.

Another cause of failure is dipping in a dirty bath. Nothing reduces the strength of a dip like filth, which also seriously affects the character of the wool. The bath should be cleaned out at intervals. It is impossible to lay down a hard-and-fast rule regarding the number of sheep passing through the bath before it requires cleaning, as this depends entirely on the condition of the animals. It only requires a limited number of sheep that have been travelled long distances, railed or shipped, to make the bath absolutely filthy.

A very serious mistake that has often come under my notice is the practice of making up a dip 75 per cent. poisonous and 25 per cent. non-poisonous. These two classes of dip are composed of entirely different constituents, and the one does not increase the strength of the other. A dip so constituted could be classed only as of 75-per-cent. strength, and I am certain that the condition of numbers of tick- or lice-infested sheep is due to this cause. The poisonous dip should be made full strength, with 25 per cent. liquid carbolic dip added. This is especially beneficial where the water is hard. Water can also be softened by the addition of about 3 lb. of washing-soda to every 100 gallons of water, or soap may be added until the water lathers on stirring.

During the last few years I have had to investigate several mortalities among flocks after dipping, and have found these due to blood-poisoning as a result of pigs or other animals having access to the yards or race leading to the dip. I recommended the addition of 25 per cent. carbolic dip, and although a large number of sheep were afterwards put through the same bath the mortality immediately ceased. Doubtless the non-poisonous dip acted as a very good disinfectant.

The following rules should be strictly observed in dipping: (1) Avoid dipping in wet weather; (2) measure accurately the bath-water; (3) dissolve thoroughly powder dip before using; (4) mix the dip properly; (5) thoroughly stir the bath; (6) immerse sheep for at least one minute; (7) use the dip full strength; (8) never dip in

a dirty bath; (9) if sheep are affected with lice, dip again at a fortnight's interval, as the eggs will hatch in about ten days; (10) on no account should a dog that is inclined to heel the sheep be allowed in the yards when dipping, as this is one of the chief causes of blood-poisoning.

SELECTION OF SEED-POTATOES.

W. H. TAYLOR, Horticulturist.

THE selection and treatment of seed-potatoes has been the subject of a great amount of literature as well as carefully carried-out experimental work. There is fairly general agreement on two points—namely, that immature sets are likely to produce the heaviest crop, and that whole sets about the size of a hen's egg are better than cut sets or tubers of smaller size.

It is not, however, to be concluded that nothing more is necessary than to plant sets of the size mentioned taken from an immature crop. A process of selection is necessary, or specially grown seed-tubers, else it might well happen—probably would, in fact—that such sets would produce a crop inferior to that obtained from sets cut from large tubers. It is well known that potato varieties deteriorate after being grown a certain number of years. The length of time they retain original characteristics varies in different varieties, and is greatly affected by the manner of selection for seed purposes. In a field of potatoes there are always found variations in the produce of the different hills. Some will give a good number of small tubers and a very small proportion of large. Others yield a small number of tubers, large tubers predominating. Both these types are bad, and a sure sign of weakening. Sets taken from such hills might be expected to reproduce themselves in a similar character. The produce would not be quite the same, but almost surely it would be inferior in character.

The life of a variety begins with the first stock of tubers raised from seed. Then commences the increase of the stock from tubers. During this process it is presumed that some selection is carried out, though it may not be much. The process is continued until there is a large stock ready for distribution. The value of this stock will depend on the constitution of the variety—that is, how it behaves under the stress of large production. The whole of this large stock had its origin in one seed, and the enormous reproduction from tubers only must have a weakening effect. A strong constitution, combined with care in selection, will maintain vigour in a variety for a long time; but without this care, no matter what the natural strength of a variety may be, it is bound to run out in a comparatively short time, or at least the produce of a field will be varied with some good hills and some bad ones.

The method of saving seed-tubers that is most common among farmers and others is to retain for planting tubers that are too small for sale or use as table potatoes, these being taken from the bulk. It follows that hills that produced a preponderance of small tubers are

the ones that supply most seed-tubers. Hills that produced a small number of tubers of any kind will also be represented. On the other hand, the hills that produced the best crops of good tubers will supply a very small number of sets. Thus the poor-cropping hills supply the bulk of the sets. It is reasonable to suppose that if large tubers were kept for planting, these being cut to suitable sets, better crops would result, and in most cases it would be so. This, however, depends on several things, the most important perhaps being that a proportion of the large tubers would come from hills of poor production. It is evident that deterioration is hastened by haphazard methods, and there can be no assurance of good crops being obtained in that way.

There are several methods of conserving the desirable characteristics of a variety and enabling the cultivator to reproduce them in his crops. One plan is to use for seed purposes large sets specially selected from good hills, or more roughly from crops that average good. There are several objections to this method, which need not be considered now. Another plan is to plant large uncut tubers specially to produce seed tubers. The sets being uncut, the expectation is to obtain from them a large number of seed-size tubers. The planting is done late, about Christmas-time. This secures tubers that are not overmatured, that are lifted late and consequently easily kept till planting-time, and that are the direct offspring of high-grade tubers. Quite obviously this is a more economical method than planting cut sets. A third method, and the best, is to go through the growing crop and dig the most promising hills, selecting tubers of the right size, and carefully storing them till planting-time. This should be done before the crop is fully matured, but not until the skin of the tubers is fairly firm. If the skin can be easily rubbed off it is too early to dig them.

A disputed point is that regarding the advisability of greening the tubers by exposing them to the sun. Like most things, the greening process can easily be overdone, but if judiciously carried out it has good points. If the tubers are lifted at the proper stage the skin will be somewhat tender, and in that state the tubers are easily bruised. A short exposure, just long enough to green the skin, will render it tougher, and there will then be no danger of rubbing it off or bruising. If, however, the tubers be exposed too long they will be in danger of burning, and corky patches may be formed, which would be injurious. Again, in some places where sun-heat is great and the soil becomes very hot they could not be exposed long without suffering injury. It is a matter for the exercise of common-sense. Where there is available a cool, airy building of some kind, in which the tubers can be placed in a thin layer, exposure to the sun is not necessary.

Probably the best method of treating lice on cattle, horses, and pigs is by applying kerosene emulsion. This is made by adding 1 lb. of soft-soap or good bar soap to 1 gallon of soft water, and allowing to simmer over a slow fire until the soap is dissolved; then remove from fire and add ½ pint of kerosene, stirring until it becomes of creamy consistency. Apply with a stiff brush. Another good dressing is an infusion of stavesacre. This is made by placing 2 oz., 3 oz., or 4 oz. of stavesacre in 1 gallon of boiling water. Let it stand for twelve hours, and apply as above. If a few ounces of soft-soap is added the mixture can be applied more easily. A second dressing may be necessary in eight or ten days in order to kill any lice that may have hatched since the first dressing.—*Live-stock Division.*

VALUE OF CULTIVATION IN ROOT CROPS.

A SOUTHLAND DEMONSTRATION.

W. ALEXANDER, Fields Instructor, Invercargill.

THE time appears opportune for drawing attention to the results of a test carried out last season on the Winton Experimental Area, from which some interesting data were obtained. In the course of the investigation into the cause of dry-rot of swedes certain plots were sown out under different manurial and intercultivation treatments, and running through the entire block were control or no-manure plots. It was not intended that any of the swedes should be sown and then left uncultivated, yet that was what actually happened in the case of one of these control plots, owing to a misunderstanding.

It was evident at a very early stage that the non-cultivated plot was in a bad way and that the yield was going to be low, a promise which was fulfilled. The accompanying photos, taken last August, will go far towards confirming the following particulars of the respective yields.

Fig. 1 is a faithful reproduction of a plot where was sown 18 oz. per acre of Superlative swede. No manure was sown with the seed, which was ridged in 26 in. rows. The land was in fair order at time of sowing, but a good deal of twitch was present, and this being a rather low part of the field the twitch, even though worked considerably, was not by any means eradicated, as can be seen. As previously indicated, owing to mistaken instructions this plot was never further cultivated, and when weighed in August last the crop yielded at the rate of only 7 tons 18 cwt. per acre, tops included.

Fig. 2 shows two rows (marked x x) of Superlative swede grown without manure in a straight-out manurial trial. It will be seen from the photo that a fair amount of twitch had been worked out of this piece of ground also, but that was the result of a thorough system of cultivation which provided for the scuffler going through once a month during the growing-period of the swedes. In spite of the fact that no manure was sown with the seed here, when the crop was weighed (same time as previously mentioned plot) in August last this plot yielded at the rate of 24 tons 9 cwt. to the acre, or 16½ tons more than the non-cultivated plot. As a matter of fact, the average yield in this series of the experiments, wherein slow-acting phosphatic manures were used, was just over 30 tons per acre, so that from all points of view it is evident that systematic cultivation plays an important part in the production of root crops.

On the one hand the gain of 16½ tons over the non-cultivated plot affords an example of labour being well rewarded, and on the other hand the loss of 6 tons per acre as against a manured and cultivated plot seems to just about assess the value of the fertilizer used. There is no doubt that crop-production can be increased enormously, providing a sound system of preparatory cultivation is followed up by as sound a system of subsequent intercultivation.

FIG. 1. SWEDE PLOT AT WINTON EXPERIMENTAL AREA, GROWN WITHOUT MANURE AND NOT INTERCULTIVATED. YIELD, 7 TONS 16 CWT. PER ACRE.

FIG. 2. TWO ROWS—MARKED X X—IN ANOTHER SWEDE PLOT ON THE AREA, ALSO GROWN WITHOUT MANURE, BUT INTERCULTIVATED. YIELD AT RATE OF 24 TONS 9 CWT. PER ACRE.

TESTING OF PUREBRED DAIRY COWS.

CURRENT C.O.R. LIST.

W. M. SINGLETON, Assistant Director of the Dairy Division.

ALTHOUGH not the final C.O.R. list for 1920, the present return shows the records of almost a hundred cows and heifers completed in December. The remaining records of the year are expected to be ready for the next issue of the *Journal*. As this list is so lengthy, comment on individual records is withheld, but it will be noticed that many excellent yields are reported.

RECORDS COMPLETED IN DECEMBER, 1920.

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS.					
Junior Two-year-old.		Yrs.dys.	lb.		lb.	lb.
Flirtation	S. B. Fairbrother, Kiritaki	1 344	240·5	365	9,034·4	492·31
Glenmore Flower ..	A. C. Lovelock, Woodville	2 71	247·6	365	8,070·6	470·17
Diadem	S. B. Fairbrother, Kiritaki	1 356	240·5	365	7,673·3	459·71
Roslyn Sweet Bonnie	James Harris, Bombay	1 360	240·5	362	6,863·4	414·60
Silver Choice ..	J. T. Belcher, Cardiff..	1 352	240·5	365	7,653·3	406·06
Jerseydale's Daphne	John Pettigrew, Pihama	1 331	240·5	365	6,453·5	366·32
Miro Meadows Luna	A. A. Ward, Miro ..	1 232	240·5	365	6,026·4	354·58
Belvedere Lynetta ..	E. B. Eagle, Greytown	1 352	240·5	365	5,607·2	338·93
Lady Polly ..	F. E. Day, Tamahere	2 80	248·5	363	6,483·7	328·11
Ophir	J. Rae, Taneatua ..	2 11	241·6	304	6,678·5	327·57
Rosy Creek Princess..	H. Wells, Hawera ..	2 39	244·4	336	6,274·6	306·87
May of O.K. ..	H. Wells, Hawera ..	2 36	244·1	365	5,323·6	302·35
Oakvale's Hope ..	J. G. Short, Fitzroy ..	1 310	240·5	320	5,282·0	277·48
Senior Two-year-old.						
Roslyn Favourite Flower	J. Harris, Bombay ..	2 110	251·5	365	10,069·6	609·14
Fairfield Dora ..	W. J. Chynoweth, Cambridge	2 351	275·6	365	7,437·6	438·62
Golden Sunlight ..	R. B. Godfrey, Eketahuna	2 329	273·4	335	8,158·2	434·83
Twylish Phantom ..	John Shaw, Clevedon	2 342	274·7	338	7,289·2	383·34
Turtledove ..	E. B. Eagle, Greytown	2 286	269·1	365	5,906·1	341·31
Fairy's Top ..	J. G. Short, Fitzroy ..	2 344	274·9	264	5,434·0	279·54
Three-year-old.						
Duchess of Woodstock	Banks and Son, Kiwitea	3 131	290·1	348	11,199·9	616·21
Cabaletta	H. R. Manning, Maharahara	3 38	280·8	349	10,700·8	566·87
Iona of Bulls ..	R. F. Wilkinson, Pukekohe	3 46	281·6	365	9,177·6	543·46
Beachland's Rose ..	A. C. Lovelock, Woodville	3 362	313·2	365	9,857·3	501·99
Middlewood's Lorna	S. R. Simkin, Karamea	3 20	279·0	365	9,399·7	493·61
Riverside Gem ..	J. T. Belcher, Cardiff..	3 346	311·6	365	8,065·0	492·18
Holly Bank Lady ..	Banks and Son, Kiwitea	3 305	307·5	365	8,442·2	485·25

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS—*continued.*					
Three-year-old—contd.		Yrs. dys.	lb.		lb.	lb.
Waipiko Bronze ..	H. A. Lurman, Otorohanga	3 34	280·4	343	6,720·0	461·68
Miro Meadows Maire	R. W. Southee, Kiwitea	3 319	308·9	365	7,901·7	453·27
Chartreuse ..	H. A. Lurman, Otorohanga	3 78	284·8	329	7,881·0	450·78
Fashionplate of Woodstock	Banks and Son, Kiwitea	3 46	281·6	364	7,974·4	420·23
Waipiko Leola ..	W. J. Chynoweth, Cambridge	3 4	277·4	344	6,253·2	402·22
Renown's Carnation	F. J. B. Ryburn, Paterangi	3 74	284·4	356	8,275·6	388·42
Violet Primrose ..	F. E. Day, Tamahere	3 51	282·1	365	7,905·4	348·52
Orielton Banksia	B. Tripp, Timaru ..	3 1	277·1	299	6,412·1	328·83
Heartsease of Sherwood	E. Hodges, Waimana	3 184	295·4	292	5,558·2	315·02
Four-year-old.						
Woodstock's Fancy Free	Banks and Son, Kiwitea	4 111	324·6	364	15,562·5	770·35
Middlewood's Fame..	S. R. Simkin, Karamea	4 22	315·7	365	9,138·3	468·92
Rose Maitland ..	A. Hazelton, Waihou	4 290	342·5	365	8,956·7	454·67
Mature.						
Sybil See	Banks and Son, Kiwitea	9 27	350·0	362	15,032·0	645·25
Darkie's Bell ..	S. B. Fairbrother, Kiritaki	5 196	350·0	365	12,699·7	632·98
Belmont Flower ..	A. C. Lovelock, Woodville	6 83	350·0	365	11,455·3	613·47
Magnet's Chum ..	V. W. Nowell, Hawera	6 11	350·0	365	9,010·1	568·80
Fox's Dot of Tahua..	P. J. Small, Kairanga	5 2	350·0	353	12,005·0	562·76
Peggy's Mahoe ..	D. P. F. Malone, Kaponga	5 329	350·0	365	8,328·3	544·07
Spec	A. J. Harris, Bombay	7 151	350·0	340	9,945·8	515·78
The Woodland's Belle	R. F. Wilkinson, Pukekohe	5 252	350·0	350	9,229·0	515·23
Miro Meadows Pride	A. A. Ward, Miro ..	5 62	350·0	365	9,172·5	513·82
Leta's Cassie ..	A. H. Guy, Mangatoki	5 86	350·0	330	7,774·8	442·85
Judy	R. W. Southee, Kiwitea	9 211	350·0	365	9,186·7	433·73
Roslyn Bonnie ..	W. G. Reece, Opotiki..	6 81	350·0	302	7,229·9	414·14
	FRIESIANS.					
Junior Two-year-old.						
RosaPosch of Oakview	H. R. Green, Kairanga	2 32	243·7	365	19,515·5	718·83
Monavale Freda de Kol	W. D. Hunt, Invercargill	2 144	254·9	365	12,201·6	543·83
Rosevale Queen Daphne	North and Sons, Omimi	2 104	250·9	365	13,120·7	509·82
Princess Pietertje de Kol II	R. Melvin, jun., Masterton	2 6	241·1	365	13,914·3	459·72
Midnight II ..	F. O. Stack, Kiwitea..	2 23	242·8	365	9,850·8	371·39
Pareora Guyda ..	A. S. Elworthy, Timaru	2 54	245·9	365	9,578·6	344·80
Pareora Alfiva ..	A. S. Elworthy, Timaru	2 1	240·6	365	8,941·8	326·55
Rowena II of Te Aroha	F. O. Stack, Kiwitea..	2 31	243·6	334	6,791·3	324·43
Karamea Duchess ..	D. McLeod, Wellington	1 355	240·5	331	8,556·5	315·51
Ellesmere Butterfly	T. H. Overton, Lakeside	2 47	245·2	210	8,811·7	304·84
Fairview Nellie Segis	Mrs. Hardwick, Kennington	2 65	247·0	326	8,759·3	293·87

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	FRIESIANS—*continued.*					
Senior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Dominion Jocrest ..	Central Development Farm, Levin	2 276	268·1	357	15,294·7	539·00
Dominion Doreen II	Central Development Farm Levin	2 275	268·0	331	12,887·7	474·14
Dominion Marie Kruger	Central Development Farm, Levin	2 333	273·8	365	10,376·7	396·53
Dominion Olivia ..	Central Development Farm, Levin	2 253	265·8	365	10,625·5	345·36
Dominion Sadie Vale	Central Development Farm, Levin	2 298	270·3	330	9,517·7	322·93
Dominion Spot V ..	Central Development Farm, Levin	2 346	275·1	294	7,694·5	302·92
Junior Three-year-old.						
Segis Van Buttercup	R. Melvin, jun., Masterton	3 137	290·7	365	17,009·6	666·02
Dominion Johanna Aaggie	Central Development Farm, Levin	3 5	277·5	342	12,822·2	418·54
Senior Three-year-old.						
Rosevale Holland Lassie	North and Sons, Omimi	3 312	308·2	365	14,295·6	496·46
Duchess Netherland Pietertje	D. McLeod, Wellington	3 328	309·8	365	11,574·0	451·18
Netherland Gem ..	D. McLeod, Wellington	3 216	298·6	365	12,117·5	384·79
Junior Four-year-old.						
Cluny Hengerveld Buttercup	Cluny Farm, Wellington	4 50	318·5	292	14,191·6	508·36
Parthena Alcarta Rose	H. W. Hoskin, Mangatoki	4 23	315·8	365	14,189·8	494·52
Senior Four-year-old.						
Rosevale Holland Queen	North and Sons, Omimi	4 201	333·6	365	14,910·0	560·41
Milkmaid Patch ..	T. H. Overton, Lakeside	4 328	344·1	278	13,225·4	460·83
Mature.						
Segis Galatea ..	H. W. Hoskin, Mangatoki	6 3	350·0	365	18,166·1	647·82
Bainfield Queen ..	W. D. Hunt, Invercargill	5 220	350·0	365	17,128·6	601·89
Helena Plus Girl ..	North and Sons, Omimi	7 156	350·0	357	14,130·7	537·81
Mierlo	Central Development Farm, Levin	11 84	350·0	324	14,911·0	489·61
Woodcrest Daisy ..	Central Development Farm, Levin	8 102	350·0	359	14,872·2	481·89
Dominion Julia de Kol	Central Development Farm, Levin	6 63	350·0	334	12,703·5	401·20
Coldstream Grace ..	G. A. Marchant, Cardiff	10–11	350·0	218	10,460·5	401·05
Dominion Margosa ..	Central Development Farm, Levin	5 319	350·0	321	10,467·7	363·65
	MILKING SHORTHORNS.					
Junior Two-year-old.						
Matangi Ruth I ..	Ranstead Bros., Matangi	1 307	240·5	365	5,686·9	243·24

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	MILKING SHORTHORNS—*continued.*					
Mature.		Yrs. dys.	lb.		lb.	lb.
Hill Holm Pet ..	A. Wintour, Te Rapa ..	..	350·0	365	16,180·7	581·50
Sherwood Queen ..	Mrs. Ranstead, Matangi	..	250·0	346	12,927·9	474·62
Sherwood Ruby ..	Mrs. Ranstead, Matangi	..	350·0	365	11,845·9	453·87
Greenfield Tottie ..	H. Campbell, Matangi	..	350·0	318	11,988·1	451·66
Sherwood Mystery ..	Mrs. Ranstead, Matangi	..	350·0	338	11,789·3	447·57
Greenfield Roany ..	H. Campbell, Matangi	..	350·0	325	12,040·3	444·43
Greenfield Fairy ..	H. Campbell, Matangi	..	350·0	363	11,698·6	441·49
Greenfield Flo ..	H. Campbell, Matangi	..	350·0	336	10,507·2	433·21
Greenfield Dot ..	H. Campbell, Matangi	..	350·0	322	10,429·9	426·30
Sherwood Peach ..	Mrs. Ranstead, Matangi	..	350·0	332	10,275·3	394·01
Sherwood Rose ..	Mrs. Ranstead, Matangi	5 19	350·0	347	9,742·7	353·63
	AYRSHIRES.					
Three-year-old.						
Greenfields Ina ..	C. E. C. Webb, Koputaroa	3 345	311·5	365	13,958·3	566·02
Mature.						
Milkmaid of Springview	A. H. Hansen, Te Rehunga	5 349	350·0	365	12,826·2	600·21

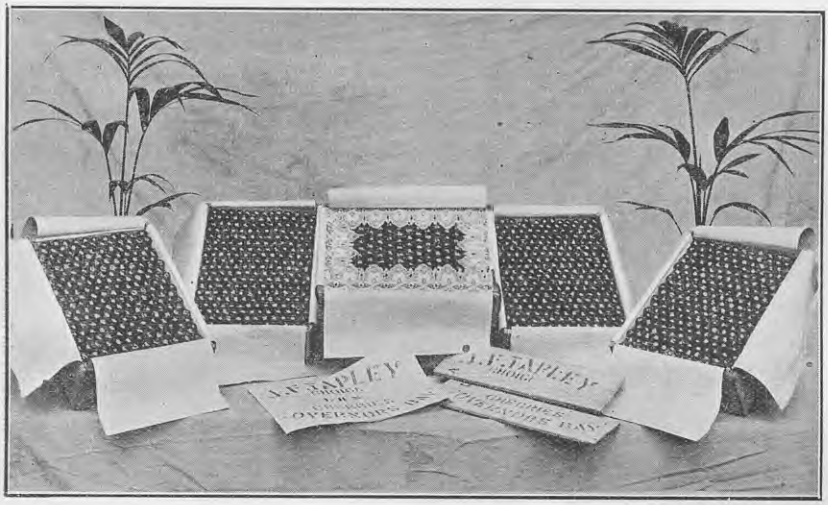
A NOTE ON CHERRIES IN CANTERBURY.

THE following information regarding cherries grown in the orchard of Mr. J. F. Tapley, Governor's Bay, Lyttelton Harbour, was supplied by Mr. G. Stratford, Orchard Instructor. The photograph on next page shows some of last season's pack:—

The cherries are put up in 12 lb. cases and faced. This is a decided improvement in the prevailing system of simply filling the cases with all sorts and sizes and sending to market. With the facing, grading has to be done, and consequently the face is a correct indication of the cherries throughout the case. The grower states that by adopting this method he has no difficulty in obtaining top prices on the market; his fruit sells very readily and advertises itself to the best advantage. A neatly printed "liner" is placed on the top of the fruit, adding much to the general get-up. The extra trouble taken is more than compensated for by the increased price obtained.

The cherries shown in the photo are from twelve-year-old trees growing in heavy loam topsoil, with a clay subsoil which is fairly free, although drainage is necessary to get the best results. The varieties are Early Rivers and California Advance, both of which do well in the Governor's Bay district. Other varieties grown are Early Purple Guigne, Bedford Prolific, Bigarreau Napoleon, Noble, Black Eagle, Warder's Early Black, and Monstrous De Mazel. Probably the most profitable is Bedford Prolific, which comes in for the Christmas market, is of large size, a good carrier, and a heavy bearer. Warder's Early Black, Early Rivers, California Advance, and Black Eagle are all worthy of

consideration as mid-season varieties if planting. Early Purple Guigne is undoubtedly a very fine cherry, and always commands a good price, but unfortunately it is very subject to dropping in this district. The Noble is a good cherry, but it is too late to realize high prices, while the Monstrous De Mazel up to the present has not proved itself a good bearer.



GRADED AND FACED CHERRIES FROM MR. TAPLEY'S ORCHARD, GOVERNOR'S BAY.

The Governor's Bay district is very suitable for the successful growing of cherries, and no doubt more will be planted as time goes on. Having such an excellent market—Christchurch—so close at hand, cherry-culture should prove a profitable investment.

GRIMM LUCERNE AT CHRISTCHURCH.

THE extraordinarily robust growth of a plant of Grimm lucerne selected by Mr. A. Macpherson, late Fields Instructor, Christchurch, has at various times been commented upon in the *Journal*, and a further note on the subject will doubtless be of interest. The plant made a continuous growth throughout the winter months of 1920. All the strong growths were cut away in September, and the fresh shoots made rapid headway, being quite 1 ft. in length within fourteen days after being cut. During November a second cut was secured. The average length was over 4 ft., and after being dried it was weighed and found to give $5\frac{1}{4}$ lb. of hay (from the one plant).

Judging by the vigorous growth of this selection of Grimm lucerne, 4,840 plants set out 3 ft. apart and 3 ft. between the rows would appear to be sufficient for 1 acre. This will be understood when the fact is mentioned that the plant when in full growth last season measured

12 ft. 9 in. in diameter. Taking the plant mentioned as a criterion, an acre of such plants would yield 11·3 tons of hay per acre for one cut. The plant actually gave five cuts last season, and the yields from each cut were approximately the same weight.

It may be mentioned that a plot of Grimm lucerne was sown at the Department's depot, Bath Street, Christchurch, in December, 1919. The plot is now twelve months old, and it is of interest to know that it has given four cuts in that time. The first was taken fourteen weeks after sowing, and the fourth on 6th December, 1920. The total yield of hay for the year from this plot, at a per-acre calculation, works out at 12¼ tons, which at £8 per ton (market value) gives the handsome return of £98 per acre per annum.—*R. McGillivray, Fields Instructor, Christchurch.*

FORTHCOMING AGRICULTURAL SHOWS.

Woodville A. and P. Association: Woodville, 25th and 26th January.
Helensville A. and P. Association: Helensville, 29th January.
Feilding I., A., and P. Association: Feilding, 1st and 2nd February.
Te Puke A. and P. Association: Te Puke, 3rd February.
Pahiatua A. and P. Association: Pahiatua, 4th February.
Clevedon A. and P. Association: Clevedon, 5th February.
Otago A. and P. Society: Dunedin, 9th and 10th February.
Dannevirke A. and P. Association: Dannevirke, 9th and 10th February.
Rodney Agricultural Society: Warkworth, 12th February.
Masterton A. and P. Association: Solway, Masterton, 15th and 16th February.
Northern Wairoa A. and P. Association: Aratapu, 19th February.
Omaha and Pakiri A. and P. Association: Leigh, 23rd February.
Franklin A. and P. Society: Pukekohe, 25th and 26th February.
Hauraki Plains A. and P. Association: Ngatea, 26th February.
Waikato Central Agricultural Association: Cambridge, 1st and 2nd March.
Egmont A. and P. Association: Hawera, 2nd and 3rd March.
Katikati A. and P. Association: Katikati, 3rd March.
Morrinsville A., P., and H. Society: Morrinsville, 9th March.
Matamata A. and P. Association: Matamata, 15th March.
Hawke's Bay A. and P. Society: Hastings, 15th and 16th March (Autumn Show).
Ashburton A. and P. Association: Ashburton, 17th March.
Mackenzie County A. and P. Society: Fairlie, 28th March.
Methven A. and P. Association: Methven, 31st March.
Mayfield A. and P. Association: Mayfield, 31st March.
Oxford A. and P. Association: Oxford, 7th April.
Temuka and Geraldine A. and P. Association: Temuka, 14th April.

WORK FOR THE COMING MONTH.

THE ORCHARD.

THE FIRE-BLIGHT CAMPAIGN.

THE fire-blight menace continues to be the most disturbing factor in fruitgrowing circles. Not only does this apply to the Auckland District, where the disease actually exists, but owing to its destructive nature and the probability of its sooner or later spreading farther afield growers of other districts are considerably alarmed. In the meantime the Auckland District growers have formed a strong Fire-blight Committee, and are generally adopting energetic measures with a view to coping with the trouble as effectively as possible.

The Department has still a strong staff of permanent and temporary officers in the field locating and cutting out infection wherever found. Owners of affected hawthorn hedges are under notice to eradicate the disease from such hedges before 31st March next. The preliminary step advised is to reduce all such hedges to a height of not more than 5 ft. Subsequently, if necessary, advice will be given as to the best means of dealing with affected parts still remaining.

Owing to the period between this and the end of March being recognized as a specially busy season for farmers, the shortage of labour is a factor which is fully recognized in connection with the cutting of hedges on the lines suggested. In view of this and the fact that the danger of further spread is limited until next spring, an extension of time will be granted in all genuine cases on application to the local Orchard Instructor, provided the applicant gives a definite undertaking to carry out the work and to destroy all prunings before the expiry of the extended period. The reason why the present date (31st March) is retained in preference to a general extension to June or July is owing to the impossibility of the limited number of Inspectors being able to adequately attend to the large area infected if the whole of the work is thrown on to the latter end of the safety period. This can be risked only in the event of the intention of the farmer being known, and the most satisfactory way of learning this is by the farmer lodging an application for extension, which will be granted provided he gives the undertaking previously referred to.

Judging from articles appearing in the Press there are a few fruitgrowers who are sceptical relative to the whole matter of fire-blight and the control measures. Theories put forward are various, but the trouble is mainly attributed to cold winds, weakness of the tree, lack of proper plant-food, &c. Statements have been made to the effect that a similar disease affected our orchards in different periods in the past and was only temporary in its effects, disappearing as quickly as it came, &c. These opinions would no doubt be very consoling if there were any hope of their being correct, but unfortunately there are none, consequently their expression is calculated to do a considerable amount of harm in connection with the fight which is being waged and which must be continued against this disease. There may have been infections in the past resembling fire-blight—in fact, there are still some—but despite this it is quite safe to say that the present fire-blight disease has never previously existed in New Zealand.

Although the disease is new to this country, through the medium of American literature on the subject, combined with over twelve months' practical local experience, its peculiarities have become well known to the officers of the Horticulture Division. There are, however, people who still appear to be in doubt as to whether fire-blight will actually kill trees or not. On this point there need be no doubt. Fire-blight will kill trees, and has already done so in New Zealand. Some trees are, of course, more resistant than others, but the hardiest of them are at least liable to be rendered more or less valueless from a fruit-producing point of view through blossom-infection, which is practically sure to take place any time the disease is allowed to be carried over from one season to the other in

their vicinity. The matters of weakness, strength, and cultural methods generally apparently play no part in the case. In America as well as New Zealand strong trees and weak trees alike, under practically every known condition, are equally readily affected.

It is not suggested that these and similar channels of investigation should be ignored, despite the non-success attending similar efforts elsewhere, but possibly a considerable amount of time would be required for their operation. If one's house were on fire it would be folly to stop to consider the installation of a high-pressure water-service if other means of fire-fighting were available. In a manner of speaking our New Zealand orchards are on fire, a portion has already been destroyed, and if we wish to prevent a general conflagration we must energetically adopt the only known means of prevention available. The only effective means to hand for the control of fire-blight—which is the form of "fire" referred to—is to cut out and destroy all infected parts, and to do this cutting-out so effectually as to prevent the disease being carried over to the following season either on fruit-trees or any other plant. Anything short of this will mean that fire-blight will be always with us.

—J. A. Campbell, Assistant Director of the Horticulture Division.

AUCKLAND.

Fire-blight: Since writing the orchard notes for last month an unlooked-for development has taken place in regard to this dread disease. Further infection has taken place in the inner suburban area of Auckland, and in the outer suburbs on the western side, reaching in this direction as far as the very borders of large commercial areas. From the time the infection took place early last season at Te Papapa the Department has adopted a vigorous policy of inspection and destruction of infected trees where necessary, with a view to limiting the infection to a definite area. This work is now being helped on by the honorary inspectors working under the Auckland Provincial Central Fire-blight Committee in conjunction with the Department in the commercial areas. However, the domestic orchardist and the general public may greatly assist by immediately reporting to the Orchard Instructor for their district any suspicious symptoms which may appear in their orchards from time to time. In view of the fact that hawthorn is a means of carrying over the disease from one season to another, all persons residing in the commercial fruitgrowing areas are asked to cut out their hawthorn wherever possible, in order to increase the possibility of successfully dealing with the disease in those areas. There is no other known method of successfully dealing with this disease than cutting out infected parts, and destroying the same by burning.

General operations: The most important routine operations for the month are cultivation and spraying. Citrus-growers who have so far been unable to get bordeaux on to their lemons at the falling of the blossom-petals from the main spring-crop flowering should lose no time in applying this at 4–4–40 strength, and in cases where verrucosis or grey scab is bad this spray should be repeated after about four weeks have elapsed.

Spraying summary: Peach, nectarine and plum—commercial lime-sulphur 1–125, or self-boiled lime-sulphur 8–8–50, when the fruit begins to ripen, and further as circumstances demand. Pear, apple, and quince—commercial lime-sulphur 33° test, 1–100, in conjunction with arsenate of lead, paste 1½ lb. or powder ¾ lb. to 50 gallons, every twenty-one days. To this may be added, if necessary, Blackleaf 40 at the rate of 1–800 for control of woolly aphis. Lemon and orange—bordeaux, 4–4–40, when petals have fallen from the main-crop blossoms (if not already applied). The commercial lime-sulphur application should be continued on pip-fruits wherever black-spot is showing. In cases where black aphis of the peach is giving trouble McDougall's Insecticide, 1–50, should be used. A second application may also be necessary to effectually control this insect.

—J. W. Collard, Orchard Instructor, Auckland.

HAWKE'S BAY.

A number of the various varieties will mature for picking in the immediate future, and care should be taken in the selection of fruits to pick. Immature fruits shrink badly soon after removal from the trees, while fruits allowed to remain on the tree to attain the maximum development and colour have a very short marketing-period, becoming overripe rapidly. Experiments have indicated that the best results can be obtained by picking only fruits which have a distinct

change of ground colour towards light yellow. This will necessitate going over the trees several times at intervals, but the uniformity of fruit marketed will well repay the extra care. Once fruit is picked it should be shaded from the direct sunlight as soon as possible, and stored or marketed without delay.

Little can be added to the spraying operations recommended last month, except to stress the necessity of keeping all pip-fruit covered with arsenate of lead, to meet the attack of the brood of codlin-moth which can be expected at this season of the year. —*W. H. Rice, Orchard Instructor, Hastings.*

NELSON.

With the month of February the apple harvest commences in earnest. Growers should therefore complete arrangements without delay and see that necessary supplies of packing-materials are on hand. Important modifications have been made in the export regulations regarding size and colour; these must be studied and the pickers instructed accordingly. Great economies can be made if the picking-teams are right. Teach them what to pick. Picking for export is by no means an easy job. While apples that are too small and immature must be left on the tree, *all* mature apples of sufficient colour must be gathered; any that are overlooked now and gathered later give no end of trouble if included in the pack. Apples below C grade should be placed in separate boxes by the pickers or placed in a heap at the butt of the tree; this precaution will save double handling later. As far as possible gather the fruit when it is cool, and place it in the shade.

Among the necessary improvements in the export pack are two very important ones. First, the box into which the goods are finally placed must be carefully examined before packing; a lot of fruit is lost for lack of this precaution. See that the box is strongly and well made. Put aside a doubtful box without hesitation. The second point is the matter of stencilling. Have you the right quantity of paint on your brush? Is that stencil straight and in the right place? Not only must stencils look well, but they must be very clear, and always in the same place. Nearly every time that fruit is handled those marks have to be read. Bad marking is not encouraging to a buyer.

Towards the end of the month autumn rains can be expected to commence, and spraying precautions must be renewed. Further application of lime-sulphur and arsenate of lead will be required.

Orchard cultivation generally should now cease. Where necessary a cover-crop can be sown now. The present time is more especially suitable for sowing lupins or peas. —*W. C. Hyde, Orchard Instructor, Nelson.*

CANTERBURY.

Spraying: The notes which appeared in the November *Journal* still hold good for both pip and stone fruits. At this period lime-sulphur may be applied at the strength of 1 in 120 on apples and pears. The second period of moth-infection may be expected about the third week of this month.

Reworking trees: The latter part of this month and February is a good time to bud to better varieties all poor and worthless kinds. Be sure the buds to be used are taken from trees known to produce a high-quality fruit. Insert the bud on the outer or underneath side of the limbs. Besides the bark lifting more easily, a better-shaped tree will be obtained than if the buds are inserted on the inside.

Summer thinning: Wherever trees are found to have too much growth throughout the centre, superfluous growths only may be cut to within six or seven buds from the base from which they spring. The leaders should not be touched. Heavy branches should not be cut at this time. Thinning should not be commenced until after the terminal buds have set. This will open up the centre of the tree and admit sunlight, which aids the development and ripening of wood and fruit-spurs.

Cover-crops: Growers intending to grow a crop between the trees for green-manuring purposes should order their seed so that it will be on hand when required.

Cultivation: The land should be given a thorough cultivation, so as to break any crust which may have formed and to check the growth of the weeds. Hand-hoeing should be done around the trees, so as to loosen the soil missed by the cultivator.

Marketing fruit: Care should be exercised that fruits are not allowed to become too ripe before being picked. The time to pick is one of the most

important problems in the successful marketing of fruit. With stone-fruits the degree of ripeness depends upon the distance from the markets. They should arrive on the market sufficiently firm to permit the retail fruiterer to hold them in good condition for from two to three days. Early apples are ready when they have attained full colour, and the fruit-stalk will readily part from the spur when the fruit is bent upwards with a slightly twisting motion. Early pears should be picked as soon as they have reached full size and before they begin to colour, and then the fruit-stalk readily parts from the spur. Both early apples and pears should be placed on the market without delay.

Fruit for identification: From time to time specimens of fruit are submitted for naming without any description of the habit or growth of the trees, or any particulars whatever. It is advisable that the specimens should be accompanied by a description of the tree; when the fruit ripens; the name, if any, which it is locally known by, and any other information which would be of assistance. At least three specimens (typical), with stems attached, should be sent.

—W. K. Dallas, Orchard Instructor, Christchurch.

OTAGO.

The reported prevalence of green aphis throughout Otago was not exaggerated. This disease has caused considerable damage to peach crops, especially early varieties, hundreds of trees being defoliated and defruited by its attacks. When trees become infested the first precaution must be to remove the tips of the shoots where infection is bad, and destroy by fire immediately, otherwise the insects will crawl back up the trees. Spray at once with Blackleaf 40 at 1–800, with 4 lb. of soap dissolved in each 100 gallons of spray-mixture. Watch the effect, and repeat the spraying if necessary.

Growers will be very busy marketing the stone-fruit crop at this time, but attention must be given to the necessary spraying to ensure this year's crop, and prepare for next year's also. Pests and diseases, such as woolly aphis and mildew, must be dealt with now, as next season's crops are dependent on the preservation of buds and laterals. Do not trust to luck; take practical measures by removing infected twigs and burning them. Spray well with Blackleaf 40 at 1–800 for woolly aphis. Use lime-sulphur at 1–120 for mildew if the weather is cool, but I strongly advise atomic sulphur at 8–10 lb. to 100 gallons of water under the present warm droughty conditions. Black-spot is in evidence; it is not serious at present, but growers are reminded that further infection is likely. If wet weather should set in careful watch should be kept, and lime-sulphur at 1–120 applied if the disease shows signs of further development. Spray again with arsenate of lead for codlin-moth, and also for cherry and pear slug if necessary.

Budding of fruit-trees can now be attended to where a change of variety is desired. Where grafting has been done during the dormant season the ties will need cutting. At the same time the new growths should be protected by tying, to prevent their being wrenched off by the wind.

—J. H. Thorp, Orchard Instructor, Dunedin.

THE GARDEN.

W. H. TAYLOR, Horticulturist.

VEGETABLE-CULTURE.

PLANTING and sowing for the winter supply should mostly be complete by this time. In the warmer districts cabbages, broccoli, brussels sprouts, savoys, and kale can be planted up to the middle of February. Any planted after that time are not likely to turn out first-rate. In the cooler districts celery should be all out before now, but in the warmer districts good results can be secured by planting much later.

Turnips should still be sown in small breadth, except swedes, which should be sown in breadth sufficient for winter use. French and butter beans may still be sown. Lettuce should be sown in drills, not to be transplanted. Water the seed in the drills before covering it up; it will be through the ground in about ten days; thin the plants as soon as they can be handled, and water as necessary. Silver-beet and spinach may be sown and treated in the same manner. The surface soil is usually dust-dry at this time of the year, and it is practically useless to sow small seeds without some provision for moisture.

Marrows, pumpkins, and other gourd plants are now running freely. The long vines should be stopped by cutting off the growing tips. It is quite common for the first fruits on these plants to fail to develop. That is because they usually come on the main runners, and the strength of growth prevents their development. The crop is mostly borne on side branches—laterals—and the object in stopping the long runners is to promote the growth of these fruit-bearing laterals. After the long runners have been stopped the growth of the plants is of a different character, and every growth is able to bear fruit.

Tomatoes: Strong growth is natural now, and all side shoots should be stopped as soon after they show as possible; a few days is sufficient to let them get away. Where the plants are growing in open situations, in not overrich soil, and are not watered much or at all, there is little fear of blight. But where they have been given a good deal of fertilizer, or other means taken to force growth, blight is always a danger, and spraying should not be neglected. Let it be of a preventive nature; it is a difficult matter to cure blight, though it may generally be prevented.

Asparagus: This, of course, is in full growth, cutting having long since ceased. If it is possible to give the plants an occasional dose of liquid manure it will do good. A light dressing of nitrate of soda is beneficial, and tends to keep the soil moist; 1 oz. per square yard may be given. The stronger the growth that is made during the next few months the better the next crop. Old beds become such a mass of growth, even when not planted closely, that wind does not affect the plants much. Young beds, however, are not so protected, and means should be taken to prevent the tops being blown off. Sometimes it is necessary to provide them with stakes, but in many cases it is quite sufficient to cut the tops off, so as to make them branch out. The different growths then become locked together and support each other. Topping the plants makes no difference in the total growth made, the side branches making greater development.

Rhubarb: No more stalks should be pulled from the summer varieties, but all the growth made after this time should be allowed to die down on the plants. Unless this is done the spring crop, which is the one of value, will not be worth anything.

Onions: At this stage no attempt should be made to force growth by feeding with liquid manure or fertilizer, as the result of such treatment might be to bring on a bad attack of mildew. Keep the soil free of weeds and the surface loose; this will be the best way to help the bulbs to ripen. In some places mildew comes almost as a matter of course—a climatic trouble that cannot be avoided. Early ripening is the best safeguard. Spraying is of use as a preventive of mildew, but once established the disease cannot be cured. To be effective the spray should be given at once, and it may be necessary to repeat it if rain occurs. Bordeaux mixture at 2–2–40 strength, or sulphide of potassium, 1 oz. in 3 gallons of water, may be used. The latter is the easiest to use, simply having to be mixed with cold water.

THE APIARY.

G. V. WESTBROOKE, Apiary Instructor.

THE EXTRACTING SEASON.

ALL preparations for the main extracting should now be complete. It is of great importance to see that the extractor is placed on a solid foundation and well fastened down by the stays provided. Where possible it is better to have the extractor on the floor in preference to a platform. The honey-house built on a hillside on the gravity system lends itself more readily to this method, and is preferred to any other system by those who have adopted it.

Where the contour of the land does not allow of this style of honey-house, the next best method is to make use of the honey-pump. Some beekeepers seem to have had difficulty in getting these to do the work, but it seems that the secret of success is to have a 1 in. pipe in place of the ¾ in. usually supplied, and also to see that there are no right angles in the piping. It is, however, very doubtful if these will do the work with thick honey.

In apiary work, as well as in all other occupations requiring the handling, packing, and marketing of foodstuffs, the question of cleanliness must not be lost sight of. Everything in the honey-house should be kept scrupulously clean. The

extractor and tanks should be scalded out previous to being used, and as soon as the day's work of extracting is done they should be covered with covers made for the purpose, so as to keep out all dust and vermin.

Removing Honey from the Hives.

As previously advised, see that the honey is well ripened before removing it. The usual method of removing honey from the hive for extraction is to take out the combs one by one, giving each comb a sharp shake to dislodge as many bees as possible, then give each side a light brush to remove those remaining. The frame of honey is then placed in an empty super or hive-body on the barrow, and taken to the honey-house. This method allows the combs to be examined, so as to reject any containing brood. But where queen-excluders have been in use the plan is usually to remove the queen-excluder the previous evening, slipping in its place a bee-escape board. As the bees go down through the escape during the night and are unable to return, this leaves the supers of honey clear of bees, and they can then be removed and placed on the barrow without the trouble of taking out each frame. The objection to this method, however, is that the honey is apt to become cold during the night, and so the work of extracting it is more difficult. This difficulty, however, is now overcome to a great extent by the use of the Hodgson ventilated escape-board, which allows the heat from the colony to pass up into the super, thus keeping the honey warm.

Extracting.

When sufficient honey has been removed to keep the extractor going for some time it is advisable to commence operations at once, while the honey is warm. Nearly all up-to-date apiaries are now equipped with a steam-heated uncapping-knife and capping-melters. There is no doubt that the use of these greatly facilitates the work of extracting.

Provision should be made to allow the honey to run from the extractor or pump through a strainer before it reaches the tank. It is a good plan to have a fairly coarse strainer on top to catch the larger particles of wax, and beneath it a finer one. For the lower one cheese-cloth answers the purpose very well. These strainers should be removed when necessary and washed in cold water, then given a good shake to remove the small particles of wax, and allowed to dry before again using.

From the strainer the honey should be run into tanks in order to allow it to settle and the small bubbles of air and particles of wax that have escaped the strainer to rise to the surface. These should be skimmed off as they accumulate.

The size of the tanks is a matter for the beekeeper's opinion, but the tendency now is to have deeper tanks sufficiently large to hold at least one day's extracting. The honey should be left in these for two or three days if the weather is good. Should the weather become damp during extracting the tanks should be kept covered so as to prevent the honey taking up moisture from the damp air. If it is found that the honey on the top is becoming thin it is advisable to skim this off and put it aside. No such honey should be put in packages for the market, otherwise it will probably mean a considerable loss, owing to fermentation setting up through the excessive moisture.

POULTRY-KEEPING.

F. C. BROWN, Chief Poultry Instructor.

THE GROWING STOCK.

FEBRUARY is more or less a slack period on the poultry plant. At the same time there are many things which will require attention if the stock are to be maintained in a healthy thriving state, and if the maximum profit is to be made from the business. The chief among these is to see that the growing pullets are managed to the very best advantage, as any neglect now will mean a set-back for life.

The aim of the poultryman should be to rear his birds in such a way that they will possess the desired size and constitutional vigour when the productive season arrives. With this end in view the birds should not be encouraged to lay before they are about six months old. The time when a pullet will commence to lay is largely influenced by the quality of the food supplied. Where rich foods, such as

meat, meat-meal, &c., are included in the ration, these have the effect of forcing the bird to lay at too early an age, with the result that she seldom grows to a desired size or lays a decent marketable egg. On the other hand, a ration consisting of good grain materials and a liberal supply of green food will tend towards encouraging growth, and not prematurity. Especially does this apply if a high percentage of good plump oats (preferably hulled) are included in the ration. Oats, providing they are of good quality, are an outstanding food for the growing pullet, while, on the other hand, inferior oats are next to useless for any class of poultry.

Of course, in all flocks some pullets will commence laying much sooner than others, even when a plain diet has been provided. In such cases it is a mistake to reduce the ration for the flock with a view to delaying the laying-period. The only safe course is to give the birds as much food as they can eat, and let nature take its course as to when the productive season commences. Generally speaking, the growing pullets require three good meals a day. As is the case with any class of live-stock, good and liberal feeding is one of the secrets in building up desired size and stamina.

Do not on any account neglect, if possible, to give the pullets a good range. The same may be said in regard to the cockerel intended for breeding purposes. It is essential that the birds be kept in the best of health at all times, and there is nothing more conducive to this than a good range, so that ample exercise may be secured. This should not be confused with the management of the cockerel being prepared for market, as confined quarters are essential if the greatest weight is to be put on in a minimum of time.

Never allow the young pullets of various ages and sizes to run together, as this tends against the younger members of the flock making good headway. It is always a wise course to grade young stock according to their age and size. Of course, there are wasters in every flock which are seldom or never worth troubling with. When these are detected they should be got rid of, as not only are they susceptible to all kinds of disease, but they rarely prove profitable to keep for egg-laying.

Always at this season of the year I receive many complaints regarding leg-weaknesses in half-grown cockerels. This trouble is usually due to insufficient exercise, caused usually by confining the birds in small runs, coops, &c. These conditions tend to overforce the body, which becomes too heavy for the legs to carry. Once a bird is affected in this way there is practically no cure. Prevention is the only way of dealing with this trouble, and the best preventive is to provide ample room for exercise. Many breeders, after selecting the most desirable cockerels for future breeding purposes, make a mistake by placing them in confined quarters with little more room than enough to turn in, usually with the result that the most promising male specimens lose the power of their limbs, and are finally sold as table birds. It cannot be emphasized too strongly that the cockerel intended for the breeding-pen should never be coddled, but, on the other hand, should rather be given the most natural conditions possible.

THE ADULT FLOCK.

The feeding of the adult flock is another matter calling for special attention at the present time. Hens it is intended to dispose of at the end of the present productive season should be provided with a forcing diet, in order that every available egg be secured before the birds are got rid of. On the other hand, birds it is intended to breed from next season should be given a plain diet, with a view to retarding egg-laying, so that their vitality will not be weakened when called upon to produce eggs for reproductive purposes.

A correspondent asks if it would be a wise course to encourage his hens to rest now with the hope of their laying better during the winter months. This I cannot recommend, as the less nature's course is interfered with the better. This brings to my mind the advice spread broadcast a few years ago that by giving a starvation ration and inducing a false moult the hens would lay right through the dear-egg season. It may have proved all right under special local conditions, but some breeders who tried it here found it to be all wrong. The birds moulted when it was desired, but they moulted again in the late autumn, which practically meant that neither autumn nor winter eggs were secured. For winter eggs there is no doubt that pullets, provided they are hatched out at the right time (say, September for the light breeds, and a month earlier for the heavier breeds), are the most desirable birds. Then, if the birds are not to be bred from, every available egg should be forced out of them until they prove unprofitable to keep, and this irrespective of the season and price of eggs.

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.

FLOWERING RAPE AND LIVE-STOCK.

J. M., Cheviot :—

I have a paddock of young grass showing a good deal of rape in flower. I am afraid to turn sheep on to it, as I know of sheep having been lost while grazing on flowering rape. Would it be safe to put cattle on it; or either sheep or cattle after the flowers are gone? There is plenty of young grass 8 in. or 9 in. high all over the paddock.

The Live-stock Division :—

Flowering rape or rape which has grown to seed is dangerous to both sheep and cattle when consumed in large quantities. Rape in this stage not only causes tympanites, or hoven, but also the acrid matter in the stems causes diarrhœa or scouring, which ultimately leads to chronic gastro-enteritis. Rape is more dangerous to stock when the seeds have formed, this is due to the oil, which resembles oil of mustard, which is very dangerous to animals either young or old. Neither cattle nor sheep are fond of eating flowering rape provided there is an abundance of other feed available. It would be extremely risky to turn cattle into a paddock where there is an abundance of flowering rape together with young grass 8 in. or 9 in. high. If it is essential to graze cattle on this paddock, half an hour a day would be the longest period cattle could be grazed, but even this might cause tympanites.

CONTROL OF WILD CONVOLVULUS.

MRS. R. W. KEMP, Tokomaru Bay :—

Can you advise me how to kill wild convolvulus? Some time ago a small patch appeared in an enclosure always reserved for hay. It is increasing rapidly, and very soon there will be no grass left, as the weed seems to take possession and kill out the grass.

The Fields Instruction Branch :—

Wild convolvulus is very difficult to control. We would advise deep ploughing in the autumn and resowing at once with a good grass-mixture. If not convenient to plough and resow, top-dress with a good pasture top-dressing mixture at the rate of 3 cwt. per acre, and graze, refraining from cutting for hay for a couple of seasons.

PICKING AND STORING OF LEMONS.

"AMATEUR," New Plymouth :—

Would you kindly advise me as to the best time to gather lemons, and the method of storing them until fit for sale.

The Horticulture Division :—

Lemons should be gathered when they show the first sign of turning yellow. The fruit should be cut off with a portion of the strig and be most carefully handled, as the slightest bruise results in a lost lemon. The fruits should be allowed to stand for a few days in the boxes they were gathered in, then packed in paper-lined boxes or tins, or on trays in single layer, taking care that none are bruised. The boxes or trays may then be stacked in blocks in such a manner as to permit a free circulation of air round each case. This is most important, as it allows any surplus moisture to escape. The trays should be examined about every month or six weeks and any decaying fruits removed. The object is to reduce the thickness of the skin and increase juiciness.

TRIMMING COWS' TOES.

N. A. H., Westport :—

I have a cow, now in her second season, which has great difficulty in walking owing to the length of her feet. The toes are crossed and she walks on the back of the foot. Would you please advise me as to how they may be trimmed.

The Live-stock Division :—

The overgrowing of claws in cattle is very common where the animals are grazed on soft land. The part of the claw which is overgrown can be removed, there being a special instrument made for the purpose, failing the use of which, a pair of strong pruning-shears may be used. The cow must be fixed in a position so that the foot affected is easily manipulated, the leg fixed by a leg-rope to prevent the cow from kicking. A portion of the horn is severed from the end of the claw with the shears, care being taken that the claw is not severed too far back, or the sensitive tissues will be injured. There is another method, which can be carried out with a piece of board, a broad wood-chisel, and a mallet. The board is placed under the claw, and the chisel on the claw where it is intended to cut off some of the horn. With a sharp blow from the mallet the claws can be severed. The only difficulties are the kicking of the cow or the cutting of the claw too far back and severing the sensitive structures.

TAKING NUCLEI FROM HIVES.—ZINC QUEEN-EXCLUDERS.

"DRONE," Hawera :—

I would like advice as to the best time to take nuclei from hives of bees, consistent with keeping the latter up to full strength for the honey-flow. The nuclei are to form a reserve for a few extra colonies next season, and for replenishing any queen that may be necessary during the spring. Could you also inform me if zinc queen-excluders are a success ?

The Horticulture Division :—

Nuclei may be formed at any time of the season providing the colonies are strong enough to stand the loss of bees. Experience in Taranaki has proved that the best time to get queens mated is in the autumn—say, March—and the loss of bees at this period would not affect the honey crop, but the nucleus colonies must be provided with winter stores. Zinc queen-excluders are quite a success, the best results being obtained by their use after the swarming-period. Queen-excluders generally have a tendency to induce swarming, and as this feature is not desirable when a honey crop is aimed at their use before the swarming-period is over is not recommended.

GRASSING OF DAMP SHADY LIMESTONE COUNTRY.

GEO. T. WHITE, Waitomo Caves :—

I have on this section several acres of rich loose land, some fairly steep, upon which the ordinary English grasses, although they germinate well and thrive for a season, seem to subsequently die out. When first burned the land threw abundant feed, but the grass has become very sparse now and is giving place to chickweed, wineberry, and lawyers. The sole reason seems to be that it is very much shaded by limestone cliffs and faces south. The original bush consisted mostly of large ratas, kohekohe, mahoe, konini, mamaku, and supplejack Can you recommend any grass-mixture that will meet the circumstances ?

The Fields Instruction Branch :—

The following mixture is recommended for your country : 10 lb. perennial rye-grass, 10 lb. cocksfoot, 4 lb. crested dogstail, 2 lb. Poa pratensis, 2 lb. Poa trivialis, 3 lb. timothy, 2 lb. white clover, ½ lb. Lotus major, 2 lb. Lotus hispidus; total, 35½ lb. per acre. The permanent constituents in this mixture are more or less shade-endurers, and when once established should prove permanent. If the expense were not so great one would add more poa pratensis and lotus major to the mixture. In the grassing of this type of country in the past too much

consideration has been given towards producing early and rapid feed from the time of sowing, perennial and Italian rye-grass figuring largely in the mixture. These species have proved themselves time and time again to be only temporary on much of your type of steep hillside country, and their temporary nature manifests itself in two ways: firstly, in a direct loss of feed owing to their going out after the second year; and, secondly, in the depressing effect these rapidly establishing grasses have on the establishment of those permanent species which are slower to establish. On certain country where the natural vegetation is likely to reassert itself rapidly after the burn some consideration, of course, must be given in the mixture to quick-establishing grasses, in order that stock may be maintained on those areas to cope with this reappearing natural vegetation. The aim, however, should not be to produce temporary feed for the feed's sake, but should be towards the production of a pasture that will be permanent. This will not be attained by making rye-grass the main constituent of the mixture. Cocksfoot and crested dogstail should be permanent on your country, and these two grasses should form the main constituents. Where the land is steep, however, and where soil-creep is a factor, cocksfoot and dogstail will not be permanent unless bound, as it were, in a continuous sole, and for this purpose the addition of Poa pratensis is recommended. The mixture of Poa pratensis, however, on the damp, limestone country should throw quite an appreciable amount of feed, besides acting more or less mechanically in the binding of the turf. On poorer faces Chewings fescue and Danthonia pilosa may be used for the same purpose. English trefoil may do well on your country, and the addition of 2 lb. to at least a portion of your sowing would be quite worthy of a trial.

FOUNDER IN CATTLE.

"BUSH COCKY," Owaka:—

A yearling bullock belonging to my neighbour became foundered through eating frosted turnips, and though about half a dozen cattle-drenches were administered these did no good. The beast became thinner and went about on its knees until finally destroyed. Is there any cure for this trouble if taken when the first symptoms are observed?

The Live-stock Division:—

Founder, or inflammation of the sensitive structures within the walls of the hoofs, is not of frequent occurrence in cattle. Treatment consists of giving at first a smart purgative of from ½ lb. to 1½ lb. of sulphate of soda or Epsom salts, according to the size and age of the animal. This should be followed by 2-dram to 4-dram doses of salicylate of soda two or three times daily. Cold packs should be applied to the feet, or the animal made to stand in a stream of water having a soft bottom, such as clay. The administration to a yearling bullock of about half a dozen cattle-drenches, which may contain full doses of a drastic purgative, would tend to aggravate rather than relieve the condition.

APPLES IN POULTRY-MASH.

"POULTRY," Waihi:—

Can you tell me if windfall apples, boiled and mixed with pollard, would be injurious to ducks or fowls?

The Live-stock Division:—

We do not recommend the inclusion of boiled apples in the morning mash for either fowls or ducks, as they are apt to have an injurious effect. A few raw apples may be thrown to the hens to pick at, but otherwise the birds should not be compelled to eat them in order to secure a meal of other food in the mixture.

Unidentified Subscription.—Two postal notes for 2s. each, Nos. 478938 and 478939, issued at Auckland, 3/12/20, have been received, with address Glenfield, but without name. The sender should communicate with the Publisher.

REVIEW.

THE LAND LAWS OF NEW ZEALAND.

DIGEST OF THE LAND LAWS OF NEW ZEALAND: By W. R. Jourdain, Solicitor of the Supreme Court and Chief Clerk of the Lands and Survey Department. Government Printer, Wellington, 1920; royal 8vo., 233 pp.; 30s.

THE official agricultural and pastoral statistics show that there are some 81,000 occupiers of holdings above 1 acre throughout New Zealand. The annual returns of the Lands and Survey Department indicate that the Crown tenants number about 33,000, while advances have been made under the Discharged Soldiers Settlement Act to over 8,000 soldiers to enable them to acquire farms. It will be seen that the proportion of Crown tenants and soldier settlers in the total number of farmers is an extremely large one, and a knowledge of the land laws is therefore of special value to probably one-half of the farmers in the Dominion. The land laws, however, are at the present time so numerous and amended that it is difficult to find the whole of the law relating to any subject without a great deal of searching. A good summary in ready-reference form, therefore, cannot fail to save much time and trouble.

Mr. Jourdain's work, recently issued under the direction of the Minister of Lands, is a summary, under alphabetical headings, of the whole of the provisions of the Land Act, 1908; the Land for Settlements Act, 1908; the Land Laws Amendment Acts for 1912, 1913, 1914, 1915, 1917, 1918, and 1919; the Land for Settlements Administration Act, 1909; the Land Settlement Finance Act, 1909, and amendment of 1910; the Discharged Soldiers Act of 1915, and amendments of 1916, 1917, and 1919; the War Legislation Act (Part II), 1916; War Legislation Act (Part I), 1917 and 1918; the Public Reserves and Domains Act, 1908, and amendments of 1911, 1912, and 1914; the Education Reserves Act, 1908, and amendments of 1910, 1911, 1913, 1914, and 1915; the State Forests Act, 1908, and amendments; the Scenery Preservation Act, 1908, and amendments; together with references to numerous sections in thirty-eight other statutes. Nearly one hundred law cases are cited in the Digest as bearing upon the provisions of the Acts summarized, and many references and notes are given so as to elucidate the meaning of the sections quoted.

The Digest will therefore be of great service to solicitors, local bodies, returned soldiers' associations, Crown tenants, and the public generally, as forming a ready and complete compendium of the law relating to Crown land, endowments, reserves, and forests. Special attention may be drawn to the portions headed "Discharged Soldiers Settlement"; "Aliens, Acquisition of land by"; "Small Grazing-runs"; "Pastoral Runs"; and "Aggregation of Land," which deal in a comprehensive manner with the legislation on these matters. They are of particular interest at the present time.

The Digest reflects great credit upon its author, and is a gratifying example of the interest taken by public servants in the work allotted to them. Great care has evidently been taken in its compilation, and the fact that a copy was presented by the Minister of Lands to each member of the House of Representatives during last session is a good indication of the value placed upon it by the authorities.

Copies may be obtained from the Government Printer. We understand that only a limited number are now in stock.

Warts on Cattle and Horses.—A good method for removing warts from cattle and horses is to clip the warts off with a pair of flesh-scissors. When bleeding has stopped apply nitrate of silver to the place where the wart has been. Another method is to tie a cord tightly around the base of the wart and let the growth slough off. The ligature should be rendered aseptic before being applied.—*Live-stock Division.*

LAND FOR DISCHARGED SOLDIERS.

DURING the present month the following blocks are being opened for selection by discharged soldiers :—

Twenty-four sections in the Tokatoka Block, North Auckland, in areas ranging from 48 to 98 acres, comprising first-class drained swamp, and suitable for dairying and agriculture. Fourteen sections in the Homebush Settlement, near Gisborne, in areas ranging from 4 to 27 acres. Five sections in the Wither Settlement, near Blenheim, in areas ranging from 9 acres to 10 acres, suitable for agriculture and small holdings.

Huia Settlement, near Ohura, and the Karu Settlement, near Te Kuiti—the former comprising six lots in areas ranging from 288 to 333 acres, and the latter five lots in areas ranging from 242 acres to 408 acres—will be offered on 18th February. Bomford Settlement, in Marlborough, containing 133 acres, will be offered as one lot on 8th March. Pukemapou Settlement, in the Waikato, acquired from Mr. J. B. Hutchinson, is being opened in twelve lots on 21st February ; these sections consist of first-class dairying-country, in areas ranging from 70 to 151 acres.

A large number of miscellaneous sections are now to be advertised for selection by discharged soldiers, and particulars of these will be available shortly.

REPOROA SETTLEMENT.

Considerable interest attaches to the Reporoa Settlement, situated in the Waiotapu Valley, between Rotorua and Taupo, as being the first estate in the "pumice country" acquired by the Government for soldiers. The estate, containing 28,083 acres of freehold and 1,297 acres of leasehold, was purchased from Messrs. Stead and Richmond in April, 1919, and arrangements were made to push on with the necessary survey, drainage, grassing, and other works required to make it suitable for soldier settlement.

Two blocks in the settlement have already been prepared and opened for selection, as the drainage and other works were sufficiently advanced to let the men commence work on the ground. The first block, containing 2,070 acres, comprising twelve sections, was offered in May, 1920, and there was a very keen demand for the sections. The second block, comprising ten sections, containing 2,733 acres, was offered and taken up in December last. These blocks comprise some of the better parts of the drained swamp, and are excellent soils for any class of agricultural or pastoral industry. The growth of grass and clovers in summer is phenomenal, enabling ready provision of fodder necessary for winter. Generally speaking, the locality is a most healthy one.

Prior to the second block being opened the secretary of the Auckland Returned Soldiers' Association in a newspaper advertisement asked intending settlers to communicate with him before applying. This advertisement called forth a reply from the settlers who had already been allotted sections, stating that they were thoroughly satisfied with their prospects, and that prosperity awaited any young man who was fortunate enough to draw one of the sections, provided he was willing to work and to face difficulties at the start.

The Chief Land Drainage Engineer has already expended a large sum in drainage, grassing, and other works, and further authorizations will be issued as necessary. Ten thousand posts were purchased by the Lands Department and placed on the ground for distribution at cost price to the settlers to prevent any delay in the erection of their fencing.

An area of some 12,000 acres of the higher lands is to be handed over to the Forestry Department, and that Department's operations will be an advantage to the settlement in many ways.

Several of the settlers are milking herds of cows this season, cream being collected by lorry from Rotorua thrice weekly. Provision is also being made in the settlement for a dairy factory when considered advisable.

A factor which has operated to somewhat delay the final settlement of the whole block is that portions are interspersed with Native lands, the acquisition of which is being pushed on as expeditiously as circumstances will allow.

LIVE-STOCK IN NEW ZEALAND: 1920.

Unless otherwise specified, the enumeration is at 31st January, 1920.

Land District.	Horses.	Asses and Mules.	Cattle (including Dairy Cows).	Dairy Cows.		Number of Sheep shorn, 1919–20.	Number of Lambs tailed, 1919–20.	Sheep (including Lambs) as at 30th April, 1920.	Pigs.	Goats.	
				In Milk.	Dry.					Angora.	Other.
North Auckland ..	39,456	58	412,248	109,165	17,559	693,265	246,708	664,455	35,905	1,198	1,741
Auckland	49,702	15	617,261	178,661	27,989	982,252	391,598	911,135	52,423	570	1,249
Hawke's Bay	36,534	83	465,514	40,307	7,014	5,531,706	2,050,604	5,454,427	16,058	616	646
Taranaki	23,498	3	357,906	148,186	9,190	957,090	336,425	860,365	42,043	204	2,469
Wellington	47,687	30	615,633	124,230	17,530	5,132,461	2,096,032	5,358,289	39,751	924	642
Nelson	8,348	..	59,903	17,381	3,583	421,623	136,903	451,374	9,205	1,128	1,064
Marlborough	7,111	..	39,967	10,113	1,543	965,247	307,480	1,011,741	5,816	548	951
Westland	2,777	2	40,561	8,132	1,940	55,897	29,005	66,100	3,273	14	94
Canterbury	63,686	42	193,248	60,009	8,976	4,262,804	2,160,035	4,727,882	41,037	255	168
Otago	38,500	21	134,324	40,007	7,182	2,638,757	1,051,316	2,807,098	14,128	20	16
Southland	29,108	8	165,380	46,566	8,191	1,434,148	641,646	1,601,640	7,190	..	47
Totals for Dominion..	346,407	262	3,101,945	782,757	110,697	23,075,250	9,447,752	23,914,506	266,829	5,477	9,087
Totals, 1919 ..	363,188	296	3,035,478	732,253	93,882	23,720,818	10,485,351	25,828,554	235,347	6,446	10,478

[From Agricultural and Pastoral Statistics issued by the Government Statistician, gazetted 21st December, 1920.]