VOL. XV, NO. 4. 20TH OCTOBER, 1917.

New Zealand Department of Agriculture,
Industries, and Commerce.

THE

JOURNAL

OF

AGRICULTURE.

Published by direction of
The Hon. W. D. S. MACDONALD,
Minister of Agriculture.

WELLINGTON:
BY AUTHORITY: MARCUS F. MARKS, GOVERNMENT PRINTER.

1917.

In the Waikato.

The

Journal of Agriculture.

WELLINGTON, NEW ZEALAND.

20TH OCTOBER, 1917.

EXTENSION OF CROPPING AND FODDER CONSERVATION.

TO MEET ANTICIPATED WAR-EMERGENCY INCREASES IN STOCK CARRIED.

Contributed by the Fields Division.

MANY inquiries have been recently received regarding special provision for wintering stock, particularly in view of the accepted possibility of a more or less compulsory "carry over" of certain classes. It is understood that after February next there may be a limitation in the numbers and kinds of lambs admitted to the freezing-works. Should this prove to be the case it will, of course, mean that a large proportion of the season's crop of lambs, which under ordinary circumstances would have been disposed of, will have to be maintained on the farms. It is hoped, however, that few of the Southdown and Shropshire cross lambs will be left on hand. Apart from the unsuitability of this class for carrying over, inability to get them into the works would be a serious blow to the more intensive form of sheep-farming towards

which New Zealand has been trending, and would adversely affect that class of the sheep-farming community which is least able to withstand the consequent losses.

Unfortunately, it has been only during the last few months that fears of a really serious space-shortage have become general. This has been clearly shown during the past winter in lowered values for ewes in lamb to dark-faced rams, as compared with prices for the same classes even prior to tupping-time. One hears here and there of farmers who have hitherto raised early fat lambs having used Romney rams on their ewes this year. It is fairly certain, however, that this has not happened to an extent which would appreciably ease the situation so far as early fat lambs are concerned. Undoubtedly the early-fat-lamb breeders will consult their interests by pushing the season's crop forward to the works as rapidly as possible. Rape, if not already sown, should be got in with the least possible delay—about 1 acre for every forty ewes with lambs to be fattened being the average requirement.

If the available space becomes exhausted it is clear that lambs in considerably increased numbers will have to be carried; while the forecast of the future shipping and storage situation would appear to warrant the assumption that other classes, both sheep and cattle, may have to be carried forward in greater numbers. Further, the not insignificant outlet for surplus stock provided by newly grassed bush-burns will also be restricted. Last year the bush-burn area suffered a reduction of approximately 60,000 acres. This year, as judged by advance orders for grass-seed, a further reduction of some 80,000 acres may be looked for, thus making extra demands upon available pasturage and crops. Such restrictions in normal stock movements cannot fail to be reflected throughout the whole stock-raising industry, and it is for every farmer, according to the extent to which his ordinary carrying-capacity is likely to be affected, to readjust his plans for the future carrying of his stock.

It is impossible within the limits of a *Journal* contribution—except in the most general terms—to give suggestions regarding cropping to meet the varied necessities and circumstances of farms throughout the country. A brief review of cropping in relation to stock requirements, qualified where necessary, may, however, be helpful in some cases in arranging cropping programmes. Farmers wishing detailed recommendations for specific circumstances and requirements should communicate with the Division.*

While it is sheep-feed that is chiefly in the minds of farmers in the present connection, the claims of dairy stock should not be lost sight of. Mixed farming is fairly general, and as a rule abundance of feed for one class of stock spells ample for another. Let us

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therefore consider the needs of the former in the first place. Over the greater part of New Zealand, on good land, three crops are of outstanding importance for dairy stock: these are lucerne, maize, and mangels.

Lucerne provides green feed in summer and early autumn, and hay of the best kind for winter use. For the present purpose it lacks two essentials as a forage — namely, rapid establishment and winter growth. Spring- and summer-sown lucerne is generally of little account in its yield of forage until a year has elapsed. When autumn-sown under favourable circumstances, satisfactory yields may be expected in the following summer. Anyhow, it is never too late to make a start with lucerne. Its value has been so amply demonstrated that to have lucerne land and no lucerne almost amounts to bad management. There is time to establish it now before the real pinch comes. The Fields Division is always prepared to give prompt advice regarding its requirements and culture. It has been stated that lucerne is of little account in providing green feed in winter, but its value as hay for all classes of stock during this season can hardly be overestimated.

Mangels are a crop of great value for feed for dairy cows, and also for ewes during July, August, and September. On good soils they are a more certain crop than swedes, and if they require more cultivation the total yield of digestible dry matter per acre of a well-grown crop of mangels will on the average exceed twice that of swedes as ordinarily grown. The fact is that easy methods of growing turnips and swedes have been against proper attention being given to mangels. Plenty of seed (at least 5 lb. per acre), rolling the drills after sowing, and early attention to weeding and singling are points very generally neglected. As a rule long reds are most prolific, but for harrowing out and feeding in the paddocks where grown the globe varieties are specially suitable. Fallow ground may be prepared and the crops sown up to the middle of November. It is well not to risk late frosts by too early sowing, although the early-sown crop has an advantage if it escapes frost. Fairly good crops of mangels are sometimes grown on clean ground by drilling them in November 14 in. apart, using 4 lb. of seed per acre.

An acre of a good crop of mangels should be ample provision, as supplementary feed in winter and spring, for fifteen to twenty cows or a hundred to a hundred and fifty ewes. A proportionately increased area should be sown to provide for any additional heifers which may have to be carried next winter. On cold clay soils with tenacious subsoils mangels are not at home, nor is their cultivation south of North Otago so generally satisfactory. Under these circumstances swedes can generally be found to successfully replace them, but the area should be then more than doubled, as the winter

growth of pasture is much less where mangels cannot be grown satisfactorily.

Maize is not surpassed on suitable land as late summer and early autumn feed for dairy cows. On good soils and in good maize-growing localities 1 acre to every twelve to fifteen cows is on the average a suitable provision. Three sowings at intervals of a fortnight, commencing about the beginning of November, should be made in the North Island. It is doubtful if forage maize has a profitable climatic adaptation farther south than Christchurch, and even there one late sowing in December is as much as is advisable. Surplus maize forage is excellent ensilage material.

Where forage is required for a large head of stock, or for conserving as ensilage, the difficulty of handling such bulky material in the absence of a maize-binder is considered an objection. Under these circumstances Japanese millet and Sudan grass, which can be dealt with by the mower or binder, may be grown. Both of these crops, especially Sudan grass, are suitable for grazing also. They have the same climatic adaptations as maize, but can be grown fairly well under a wider range of conditions than are necessary for good results with maize. Not less than 20 lb. of seed should be used if drilled, or 25 lb. to 30 lb. if broadcast. The yield is about one-third that of a good crop of maize.

Another crop which, under fair average conditions, may be made use of for late summer feed is tares. Sown at the end of October or beginning of November, at the rate of 2 bushels per acre, they provide bulky nutritious feed in January. They survive droughty spells better than cereals and crucifers, and are not subject to diseases or pests. Their use must be deferred until flowering, as grazing reduces the yield of forage to such an extent as to render their growth scarcely worth while. The seed is expensive, and the saving of seed for home use is thus almost a necessity.

Where lucerne is not available the saving of as much meadow hay as possible should receive the attention of every farmer according to his opportunities. It may be safely said that the provision of hay in New Zealand is generally quite inadequate. There should be a minimum reserve of half a ton for every grown beast. If circumstances should not necessitate the feeding-out of this quantity it will keep, and sooner or later will come in to avert what would otherwise be serious loss. This has been demonstrated time and again at the Department's experimental farms. Violent fluctuations in the prices of live-stock, which are inimical to the security of farming, can be to some extent averted by general ample provision of hay.

Attention to these desiderata for heavy stock should at the same time ease the position considerably as regards sheep. Special provision for the latter class of stock must be mainly in the direction

of an increase in the turnip and swede breaks. An average crop of turnips or swedes should carry stock at the rate of fifteen to twenty sheep per acre for three months, but when fattening is not aimed at and the stock are run off regularly a crop would go much further. It is where roots, particularly swedes, are a risky or doubtful crop that the chief difficulty presents itself. What to sow in autumn to take the place of roots or to make good partial failures with the root crop is a question which frequently exercises the minds of farmers; and where additional stock have to be carried it is a question requiring special consideration.

Among crops of the same family as turnips and swedes thousand-headed kale occurs to one as of limited suitability. Sown early in March on free, well-drained land it produces suitable feed for sheep, especially if a run-off is provided, but it is of little service before August. The crucifers generally are not vigorous growers even in the comparatively mild New Zealand winters. Chou moellier, autumn-sown, is even later than thousand-headed kale. Both chou moellier and thousand-head are suitable for sowing in November for autumn feed, carrying more stock than rape, if less suitable for fattening.

Turning to the legumes: while a mixture of tick-beans and oats is excellent for soiling dairy stock, there is not much choice of crops for sheep-grazing. Tares maintain their dwarf winter stage until the onset of spring, and it is as a rule well on in September before they show much growth. Moreover, as already stated, they do not make a satisfactory recovery when subjected to grazing in the early stages. Peas are still more useless at this period. The only legume which makes fairly good early winter growth is Egyptian clover or Berseem. Our experience with this crop indicates that it has possibilities, but these are more in the direction of its function as a substitute for lucerne and tares in supplying nitrogenous green forage for cows during winter than as a grazing-crop for sheep. In any case seed is not available in quantity.

There can be little doubt that it is among the cereals and Western Wolths rye-grass that the best autumn seedings for sheep-feed are found. Whether for cow or sheep grazing, there are few crops that surpass Western Wolths or Mammoth Italian for abundant palatable winter growth. Both withstand unfavourable conditions in a greater degree than any other class of forage, and can be sown early or late. If it is desired to work up the ground again in spring or early summer, one of the cereals or a combination of these may be grown instead. Probably Dun or Algerian oats and Emerald rye-corn are best suited for the time and the purpose. The barleys require exceptionally favourable winter conditions for success. They should be sown only on the lighter class of soils. Wheat is good, but does not yield quite so much feed as Duns or Emerald rye before

being grazed out. Autumn-sown cereals as green feed cannot be reckoned to carry sheep at a greater average rate than twelve to fifteen per acre for a period of three months.

Whatever crops are selected for autumn sowing they should be got in early to be of any real value in carrying stock during winter. When rains are unduly delayed in autumn winter feed of this class is always more or less scanty. At best they must be regarded as catch-crops to replace failures or partial failures in the root areas. The immediate concern with the majority of farmers having extra stock to winter is with due preparation for mangels, turnips, and swedes.

Into further details it is unnecessary to go at present. The utilization of rape-ground, stubble, summer fallow, &c., calls for further consideration at a later date, when it is hoped that the position regarding the extent of the need for increased provision will be less a matter of conjecture than at present.

HUMBLE-BEES IN NEW ZEALAND.

I. HOPKINS, Auckland.

WHEN gathering information from different sources preparatory to writing the Department's Bulletin No. 46, the "History of the Humble-bee in New Zealand," I was desirous of ascertaining whether the young queens became dormant in this country in winter or not, and if they did, for how long. Several of my correspondents informed me that they had seen them flying at different times in winter, but as no particular attention had been given to the matter I left the question open for further experience. From close observation during the past four winters by myself and others I am now satisfied that our young humble-bee queens do not hibernate in New Zealand in the sense that they do in Britain. During spells of stormy weather with a low temperature they become torpid, and remain so until a favourable change takes place with a rising temperature, when they become active again, so that it is possible to see them on the wing at any time in fine weather throughout the winter.

I expect that a good many young queens will have been drowned out during the recent exceptional wet months with floods. The bees we have make their nests underground, and are therefore liable to suffer in such a wet season as we have experienced. Seeing the immense benefit humble-bees are to the country, it would be well, in my opinion, for the Department, as soon as things become normal again, to import some of the above-ground species.

ELECTRICAL STIMULATION OF CROPS.

L. BIRKS, B.Sc., M.I.E.E., M.I.C.E., AND O'D. DAVIS.

AMONG the many uses to which electricity is now being put perhaps one of the most interesting and far-reaching is its application to the stimulation of plant-growth. In view of the increasing world food-shortage at the present time, due to various war influences, any means whereby stimulation of crops can be effected becomes of national importance.

The first experiments worthy of note in the direction of this new science of electro-culture were started in England in 1911 by Professors Priestly and Jorgensen and Miss Dudgeon. Up to 1915 no very conclusive results were obtained, but in that year considerable improvements were effected in the methods employed, giving definite results of commercial importance. As indicating the degree of success achieved, it was found that increases up to 50 per cent. over the normal crop were obtained with oats on Miss Dudgeon's land, while a crop of potatoes treated electrically yielded 40 tons 6¼ cwt. from 8 acres, as against 34 tons 3½ cwt. from soil not so treated, an increase of 15 per cent. Moreover, the "electrical" crop was ready for lifting a week earlier, and the class of potato was superior in every way to that of the untreated crop. Even more striking results were obtained last year at Miss Dudgeon's farm at Dumfries, where an electrified area of 1 acre produced no less than 62 bushels of oats and 4,924 lb. of straw, as against 42 bushels of oats and 2,619 lb. of straw on the normal crop, an increase of 49 per cent. in oats and 88 per cent. in straw.

These are only a few of the more important results obtained. Many investigators are now in the field, and their work is being greatly stimulated by the exigencies of the war. The English Board of Agriculture is turning serious attention to the problem of electro-culture, and many experts are agreed that by its aid the people in Britain will be made far more independent of imported food, and this without calling on the already scanty reserves of man-power.

NEW ZEALAND CONDITIONS AND LOCAL EXPERIMENTS.

In consequence of the development of large hydro-electric-power supplies, enabling electricity to be used freely and at a very cheap

rate, New Zealand is in a particularly favourable position to continue the investigations already carried out, and so help in the solving of what is now a problem of national interest. The Province of Canterbury, with its three million acres of farming-country and its agricultural institutions, together with its already well-developed hydro-electric-power supply, offers every facility for the carrying-out of electro-culture on a large scale.

Preliminary experiments have already been made at Christchurch in connection with the Lake Coleridge power-supply, with most encouraging results. More extensive investigations are to be made this year, and it is anticipated that as a result the commercial possibilities of electro-culture in New Zealand will be still further demonstrated. The following description of last season's experiments will serve to indicate two of the directions in which the practical applications of electricity have met with considerable success.

The first experiment was carried out in a glasshouse belonging to Mr. E. Lunt, of Spreydon. The house is 80 ft. by 30 ft., and is provided with the usual means of heating by steam-pipes. In August last year 1,400 tomato-plants were set out in this house. A week after planting one of the steam-pipes burst, crippling the whole heating installation, and of course depriving the plants of any protection from the severe frosts. Eight days elapsed before the heating-apparatus could be got into working-order, and during that time a sharp frost so damaged the plants that it was considered unlikely that they would mature at all. Ten days after the fracture of the steam-pipe the house was provided with an electrical installation consisting of fifteen 100 candle-power nitrogen-filled lamps with frosted globes. The lamps, provided each with a 9 in. enamelled-iron shade, were hung at a height of 2 ft. from the ground, the area under influence of each lamp being 100 square feet. The current was switched on each night at 9 p.m., and off again the following morning at 5 a.m. The restored steam-heating was used in conjunction with the electric lighting for one month only; after that it was discontinued altogether. The plants rapidly recovered from their frost-bite and made vigorous growth. As the height of the plants increased the lamps were raised accordingly, until the tops of the plants completely enveloped them. As a result of the electrical treatment the plants not only entirely recovered from their serious setback, but the crop was a very heavy one and matured relatively earlier than that in another house in which steam-heating had been used during the whole season. Owing to the breakdown of the heating-system it was not possible to obtain a direct comparison between two crops under exactly similar conditions except for the use of electric light, but there was sufficient evidence to

MR. LUNT'S GLASSHOUSE AT SPREYDON FITTED WITH ELECTRIC LIGHTS FOR STIMULATING GROWTH.

MR. FARR'S ORCHARD AT FENDALTON, SHOWING A FROST-PREVENTING ELECTRIC LAMP IN EACH TREE.

establish the fact that the electrical treatment resulted in a definite stimulation of growth with a proportionate increase in the yield.

A further experiment, which had for its object the investigation of the possibilities of frost-prevention in orchards, was made in the orchard of Mr. E. C. Farr, at Fendalton. Here twenty-four trees, arranged in three rows of eight, were chosen for the experiment. One row was of pear-trees, and the other two of mixed apples—Worcester Pearmain, Jonathan, and Sturmer. In the centre of each tree, well down towards the fork, was suspended a 250-watt radiator lamp. The lamps were switched on only on those nights when it was thought probable a frost would occur, and were left on all night. The first frost experienced during the season followed a very wet day. In the morning it was found that the electrically heated trees were quite dry on the inner branches, parts of the outside of the tree being frosted. The radius of action of the heat from the lamps was shown to be approximately 1 ft. below the lamp, 4 ft. above, and 3 ft. all round measured in a horizontal plane. Two hard frosts occurred during the season, besides many less severe ones. The heating of the trees had apparently no effect in the case of the pears, but the crop of apples on the "electrical" trees, in addition to being a heavier one than on the others, was ready for picking fully a fortnight earlier. The significance of the results of this experiment will be realized more fully when it is remembered that the late frosts which so frequently occur are responsible for much damage to the fruit crops, resulting frequently in a great shortage of marketable fruit and consequent inflated prices. The application of electricity for frost-prevention in orchards, coupled with stimulation of growth of the fruit, should prove a matter of considerable commercial importance.

METHODS OF ELECTRICAL APPLICATION.—COMMERCIAL RETURNS.

Electricity is applicable to the stimulation of plant-growth by four distinct methods—(1) The influence of heat; (2) the influence of light; (3) the stimulation by "ionization" of the atmosphere by means of high-pressure electrical discharge; (4) the stimulation of the roots by an electric current at low pressure through the soil.

These, together with the regulation of the humidity of the atmosphere by electric spray-pumping, give every possible means of controlling plant-growth and in much more flexible form than is available under natural conditions. With electric power we have thus the means at command of producing any season at will at any time of the year, and at a very moderate cost both in capital and maintenance. From field agriculture and horticulture a large increase in return is possible, but it is from intensive greenhouse culture that

the largest increase is available. The capital outlay in buildings alone per acre of glass-enclosed area is very high, probably exceeding £5,000 per acre, and the interest and depreciation charges at, say, 8 per cent. thus cost £400 per acre per year. In comparison with these figures the cost of a complete electrical installation for reproducing any season at any time of the year will be small—only 10 to 20 per cent. of the actual present capital, and interest and depreciation charge on the glasshouse. With such an equipment the glasshouse need not be out of service for a single week in the year. At least two, probably three, "springs" could be reproduced annually at any time of the year, and two or three crops taken off, each much larger than the normal annual crop produced by the natural effects of the sun and stimulated only with artificial heat. Moreover, the market price of tomatoes and similar crops produced throughout the winter would (under existing relations of supply to demand) be four to six times that of the summer crop. It is thus by no means unreasonable to look to electrical stimulation of glasshouse crops to produce on the same basis ten to twenty times the actual commercial return now obtained from the same houses, after allowing for all the actual costs of such stimulation.

Nor are the electrical methods very complicated, difficult, or expensive. As far as temperature-regulation is concerned, an automatic thermostat will maintain any temperature required up to 100° F. accurately to within a couple of degrees, throughout the day and night and throughout the year. Similar thermostats are already in regular service for fire-alarm services, and have been well developed for this purpose. The actual temperature to be maintained can be varied as required by a few turns of a screw.

To reproduce the effects of sunlight either ordinary incandescent lamps, or preferably mercury-vapour or other special lamps richer in the ultra-violet rays, may be used, the sunlight itself being relied on in the daytime. By this means the action of the chlorophyll of the leaves in fixing the carbon dioxide from the atmosphere can be continued for twenty-four hours per day, practically doubling the summer rate of growth and enabling the same rate to be continued through the winter as well.

The regulation of humidity will be effected by sprays operated from a small electric pump. The automatic control of the humidity is possible, but it would probably be cheaper to regulate it accurately to the degree required (say, twice a day) by hand, and it would thus be maintained fairly close to the required point throughout the twenty-four hours.

The further stimulation of growth by means of high-pressure discharge or ionization of the atmosphere, and of the roots by galvanic

currents, will probably yield even more prolific results in practice, judging by the experiments carried out in England and America, but these results cannot be so definitely forecast as in the case of stimulation by the correct degrees of heat, light, and humidity.

Cheap electric power is, of course, a *sine qua non*. The Lake Coleridge scale of charges offers electricity at £1 per kilowatt per month for unrestricted use—*i.e.*, ⅓d. per unit if it can be used for the full 720 hours per month; and 4s. per kilowatt per month if restricted to the hours of 9 p.m. to 8 a.m.—*i.e.*, ¹/₇d. per unit if it can be used for the full 330 hours per month. In practice the supply cannot be used for the full time as assumed above, but even if it can only be used for half time the cost per unit is only ⅔d. to ¼d., which is still very low. Most of the British and American experiments are worked out on the basis of electricity at 2d. to 5d. per unit, and even at these prices the electrical stimulation of crops is found to pay well.

There is thus a very large field for development hitherto practically untouched, and one which the war conditions render particularly important.

LIMESTONE-CRUSHING TEST.

A REPORT supplied by the Public Works Department on a trial at Otira of the patent "Lightning" crusher with samples of Nelson Marble Company's stone states that each of two 10 cwt. samples went through the machine in seven minutes, equal to 86 cwt. per hour, or 34·4 tons per day of eight hours. The cost of crushing worked out at 1·26s. per ton, the following charges being included: one man feeding, one engineman, coal, oil, maintenance, interest on capital cost of engine and crusher (£500), and depreciation. The crushed samples were passed through sieves with the following result: Retained on 16-mesh sieve, 0·5 per cent. (due to damaged bar); retained on 400-mesh sieve, 35·1 per cent.; retained on 900-mesh sieve, 6·6 per cent.; retained on 5,776-mesh sieve, 11·2 per cent.; retained on 32,400-mesh sieve, 11·6 per cent.; passed 32,400-mesh sieve, 35·5 per cent.

The rate of crushing given is very high when the degree of fineness is taken into consideration, the maker's rating of the machine being only 2½ tons per hour. It will be seen that practically the whole of the product passed through a 16-mesh sieve, but 35·1 per cent. was retained on a 400-mesh sieve. If finer crushing is required this can be arranged by placing the screen-bars of the machine closer together. The agents for the crusher (Messrs. Richardson, McCabe, and Co., Wellington) consider that the distance apart should then be about $\frac{3}{32}$ in., as against ⅛ in. in the Otira trial. There would, of course, be a slight corresponding reduction of output, but even so the output claimed by the makers would be maintained.—*B. C. Aston.*

NOXIOUS WEEDS AS AN ADMINISTRATIVE PROBLEM.

F. S. POPE, Secretary of Agriculture.

Paper read at the Annual Conference of the New Zealand Council of Agriculture, July, 1917.

IT will be within the memory of many of those present at this conference that the Noxious Weeds Act of 1900 was made law as the result of long and persistent endeavours on the part of a number of leading farmers, who felt that some organized efforts to cope with the spread of weed pests in New Zealand was absolutely necessary. The essence of the Act is that any farmer who fails to adopt suitable measures to control his weeds and allows them to flower, and is therefore presumably going to allow them to spread seed on to other lands, may be directed by an Inspector to cut the weeds, and may be prosecuted should he fail to comply with this direction.

Had this enactment been preceded or even accompanied by a vigorous and enlightened policy of education in regard to the best methods of coping with the spread of weeds enormous benefit would have resulted, and a discreet enforcement of the Act in the case of those who neglected to profit by the instruction afforded would doubtless have been of great value. Unfortunately, however, owing no doubt to lack of both the necessary trained officers and the needed finance, no such instructional campaign was attempted ; but Inspectors were appointed, and proceeded to insist on wholesale cutting of weeds, as they were, of course, bound to do both by the instructions under which they were working and by the force of public opinion amongst those whose land was threatened with invasion by weeds from neighbouring infested country. It must, however, be clearly stated that the Inspectors have never attempted or been permitted to carry out their duties in road-roller fashion, but have always been required to exercise considerable discretion before recommending the prosecution of any landholder for failing to "clear" weeds. Such matters as the financial position of the occupier of the land, the availability of labour, the pressure of other farm operations, the state of the infested land in regard to timber, rocks, &c., have always been considered by the Inspectors, and no one has been called upon to undertake clearing where the work was impracticable. At one time the power to prosecute was in the hands of the Inspectors themselves, and in the case

of a great majority of the officers was never abused; but after some years of experience it was found desirable to make a rule that the Inspectors were not to undertake prosecutions without the approval of the Director of the Fields Division, who, before agreeing to legal proceedings, invariably satisfies himself that the circumstances are such as to fully warrant extreme measures before these are taken. This arrangement results in greater uniformity of practice throughout the Dominion, and causes the Inspectors to be very sure that they have a good case before recommending a prosecution. It is not surprising, therefore, that it very seldom happens that legal proceedings taken by the Inspectors are unsuccessful.

It will be observed that the Act provides that where weeds are allowed to flower the Inspector *may* take action. Unfortunately, however, there is a strong body of public opinion which considers that it is the duty of the Department to substitute the word "shall" for the word "may" in this connection. It is, of course, well known that one of the chief difficulties in connection with administering noxious-weeds legislation is that public opinion is sharply divided on the question. Those landholders whose properties are infested to any considerable extent are strongly of the opinion that there should be no Government interference in this matter, and that they should be allowed to deal with their weeds, or neglect them, according to their own sweet will. Consequently they display considerable hostility, and in some cases extreme animus, when the Inspectors make any move in the direction of enforcing the clearing of the weeds. On the other hand, those occupiers whose lands are reasonably free from weeds, and especially those who are in danger of infestation from other properties, are equally vigorous in insisting that the Act should be enforced, some of them even holding that no discretion should be used and that the Inspectors should carry out drastically the powers conferred upon them by the Act. It will therefore be seen that the Department is and must remain in this matter "between the devil and the deep sea." At one time the Department undoubtedly held the view that those landholders who opposed the enforcement of the Act represented the devil; at the present time, however, we recognize that if the opponent of the Act is the devil, at least the devil is not as black as he is painted. In other words, there is a great deal to be said in favour of the view that over wide areas the wholesale cutting of weeds is not only impracticable, but an altogether uneconomical undertaking.

SUGGESTED AMENDMENTS TO THE NOXIOUS WEEDS ACT.

In these circumstances I am convinced that some drastic changes in the Act should be made whenever Parliament is in a position to

undertake ordinary legislation. The following are the principal directions in which I think the Act should be amended:—

(1.) The main difficulty at present is that it is an offence to allow noxious weeds to flower (excepting, of course, in the case of large patches, in regard to which there are special provisions). The result is that wherever weeds are flowering the public is justified in saying that the Department is neglecting to enforce the Act. As there are multitudes of cases in which the Department does not feel justified in calling on the occupier to prevent flowering, the present position is impossible. To remedy this I propose that the Act should be amended to provide that no offence shall exist until the Inspector has notified the occupier that the weeds must be cleared. This would make it perfectly clear that the Department is legally entitled to exercise its discretion as to the cases in which clearing should be insisted upon, and would enable the Inspectors to accept from occupiers a definite promise to undertake specific measures, other than cutting, for the clearing of the weeds or a reasonable part of them. For instance, if the occupier undertakes to lay down a certain area of the infested land in lucerne during the next season the Inspector could promise in return not to take any action in regard to the remainder of the weeds; or it could be provided that the Inspector could issue a notice giving the occupier the option of clearing the whole of the weeds, or, in the alternative, of clearing a specified portion and sowing lucerne. Similarly, occupiers could be given the option to undertake approved methods of improving the pasture by top-dressing, surface-sowing, draining, or liming; or of fencing and stocking heavily; or of planting trees to combat the weeds. To avoid unnecessary work in the giving of notices in regard to any districts where insisting on straight-out clearing is justified, provision should be made that notices published in local newspapers would be sufficient.

(2.) I should also like to see the Act amended to give the Department power, where the circumstances warrant further work, to insist on something more than mere "clearing." In many cases it is beyond dispute that the weeds should be grubbed or that the land should be cultivated, and where that is so the Department should have power to insist on such action. Experience proves that occupiers who have been induced to take steps beyond mere clearing are afterwards grateful to the Department for its action, and bitterly regret that they were not so persuaded years before.

(3.) Another proposal I wish to bring forward is that the provisions of the Act in regard to clearing should not apply in cities, boroughs, and perhaps town districts, excepting in cases where the Inspector considers that the weeds are on land likely to be used for

agricultural purposes or are a menace to such land. Seeing that a good many city, borough, and town authorities have now had members of their own staffs appointed Inspectors under the Noxious Weeds Act for their own districts, it would perhaps be better to provide that, with the exception mentioned in the last paragraph, the provisions in regard to clearing shall not apply in such districts unless the local authority makes a special order to that effect; and that where such a special order is in force the administration of those provisions shall rest with the local authority and not with the Minister.

(4.) A further proposal is that the country should be divided into areas, and that different requirements in regard to noxious weeds should be enforced in the several areas: for instance, that in one area the Department should be able to insist upon cultivation or grubbing; in another area clearing should be enforceable as at present; in a third area the matter might be left to the discretion of the officer. A few years ago I was in favour of amending the Act in this direction, but on further consideration I think it would be better to have these areas mapped out as a purely departmental arrangement to which the Inspectors should be instructed to work, which they would be enabled to do if the Act were amended as shown in clause (1) above.

(5.) I think the present arrangement under which local authorities are allowed to decide which weeds shall be legally treated as noxious in their districts should be abolished. The fact that there would undoubtedly be opposition to this change is no reason why the Department should not advocate it. From time to time bitter complaints are received from settlers to the effect that they are unable to persuade their local authority to declare certain plants to be noxious, and that consequently the Inspectors are powerless. I think the whole matter of the compulsory and locally optional schedules should be fully considered, and that additions should be made to the compulsory schedule; and, further, that the option should be with the Governor-General in Council; and, moreover, that the nature of the option should be reversed—*i.e.*, that the weeds should be compulsory in all districts except in any exempted by the Governor-General in Council.

(6.) If the present system of local option is to be continued, power should be given whereby any local authority that has declared a certain weed noxious may revoke its action.

(7.) If the present system of local option is maintained, Native Town Councils should be made local authorities.

(8.) The definition of "occupier" needs amendment. "Occupier" should, where necessary, cover the same persons as "owner" does in

the Rabbit Nuisance Act. In the Noxious Weeds Act "occupier" means "every person in occupation of land, and includes the owner of any land which is unoccupied or whereof the occupier is unknown or cannot be found." In the Rabbit Nuisance Act "owner" means "any person owning any estate or interest in any private land, or who by law for the time being regulating the recovery of rates is or may become liable to pay any rates leviable in respect of such private land, or any person in possession or occupation or in receipt of the rents or profits of any private land, or any agent, trustee, executor, or administrator of an owner."

(9.) A provision of the present Act that gives rise to an immense amount of bitterness, and in many cases to gross injustice, is the one which places upon occupiers the duty of clearing the weeds off half the road adjoining their land. For instance, there are cases where the local authorities in the course of roadmaking operations have themselves spread weeds over long distances along the road reserves, yet the adjoining occupiers are now saddled with the duty of keeping half the road clear. In numbers of other cases the weeds have spread naturally along the roads or have been carried by live-stock. Of course, on the other hand, there are very numerous instances where the weeds have spread from the adjoining properties. Taking the whole matter into consideration, I am strongly of opinion that the duty of clearing the weeds off the roads should rest upon the authorities responsible for the maintenance of the roads. It may be argued that the local authorities have not the necessary funds for this work, and would consequently neglect the weeds. The local authorities are, however, elected by the people, and I think the latter could be trusted to see that finance is provided and duly expended where the state of the roads in regard to weeds necessitates it. I therefore think that the Act should be amended by deleting the provision that occupiers shall clear the roads adjoining their lands.

EDUCATIVE MEASURES FOR WEED-CONTROL.

Before concluding, I should like to mention that the Fields Division of the Department is doing everything possible in the present adverse circumstances to prepare for and carry out an educative campaign amongst the farmers in regard to the best means of coping with noxious weeds in different circumstances. The Dominion has been divided into nine districts, and in eight of these a Fields Supervisor has been located, the ninth district being supervised by the head-quarters of the Division. Each of these Supervisors is an experienced man in agricultural operations, including the control of weeds, and they are doing all that is possible, with the assistance of the Fields

Inspectors, to impress upon farmers the best methods to adopt. In addition, a couple of dozen well-educated young men are now in training at the Central Development Farm, Weraroa, and these should, in the course of two or three years, provide a valuable addition to the Department's expert staff in this direction. It will thus be seen that there is good reason to hope that the next few years will see a great deal of work done of a kind that will do more to really abate the weeds nuisance, and at the same time improve the farming practice throughout the Dominion, than all the cutting of noxious growths that has been carried out since the Act came into force.

STUDIES ON THE LIGHTER SOILS OF THE NORTH ISLAND.

I. COARSE PUMICE SOILS.

B. C. ASTON, F.I.C., Chemist to the Department.

THE soils referred to in these studies are the pumice lands of the Central Volcanic Plateau and the dune lands of the coast. These are both soils of very recent and largely aerial origin (æolian). The pumice soils have been ejected from volcanoes and rest loosely on the subsoil; the littoral sands have been thrown up by the sea and blown into position by the wind. Where either of these soils is laid down by water, or becomes so situated that water may collect and remain on the surface, swamp conditions appear, which give rise to a large admixture of decaying vegetable matter, and, on draining, a fertile soil results. Where the drainage is better and factors favourable to a stationary condition of the sand-particles are present, forest or scrub eventually appears, and a large amount of humus becomes mixed with the sand. This when cleared of forest or scrub gives a soil which will grow pasture.

It is in the amelioration and successful utilization of these lands that it is hoped the following pages may prove suggestive. Owing to their large extent a very small improvement in the productiveness of these classes of country must mean a very great increase in produce, and it is the great desire to increase production to the maximum possible at the present troublous time.

POT EXPERIMENTS WITH COARSE PUMICE SOIL.

The following is a record of pot experiments carried out with red clover on pumice soil from the Mamaku Plateau (Rotorua County), situated 1,800 ft. above sea-level.*

The soil used was forwarded from the Mamaku Experimental Farm in clean sacks supplied from the Laboratory.

The seed was red clover from Blenheim, supplied by the Biologist, and germinated before planting on 15th September, 1916.

Fertilizers: The water-soluble fertilizers were shaken with water and sprinkled on the soil. The insoluble substances were applied in finely powdered form. The stable manure was shredded as finely as possible. All fertilizers were thoroughly incorporated with the soil before filling into the pots.

The pots were kerosene-tins cut lengthwise, and treated inside with paraffin-wax. Holes for drainage were provided, and the soil was filled in over a layer of clean broken bricks. Twenty pounds of damp soil was used in each pot, all pots after filling being of a uniform weight of 25 lb.

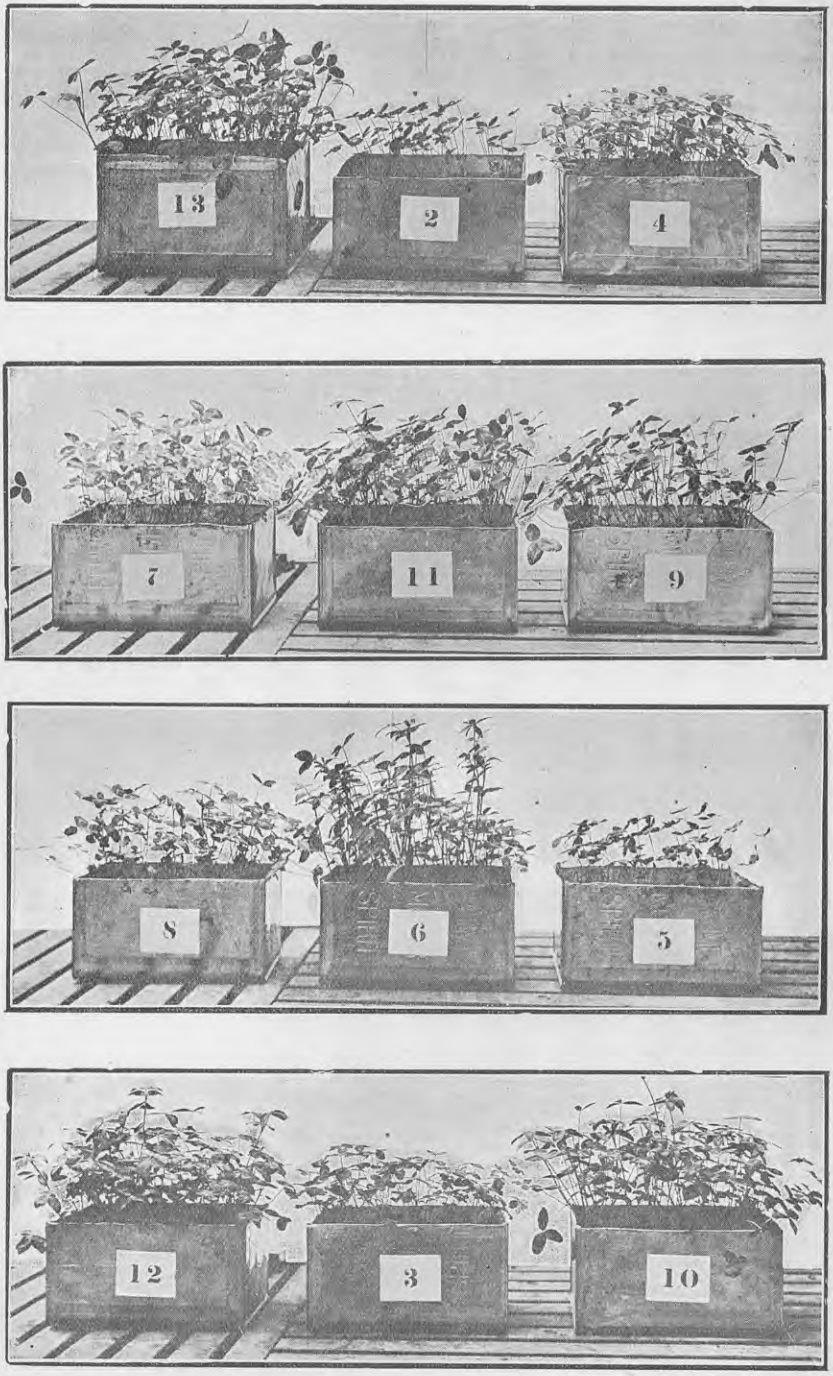
The manurial scheme was as follows:—

Pot No.	Dressing.	Weight per Pot.
		Grams.
1	Finely ground lime carbonate	246·00
2	,,	82·00
3	,,	16·40
4	Control (no manure)	..
5	Spent iron oxide from gasworks	8·20
6	Superphosphate (19·5 per cent. P_2O_5)	4·10
7	Control (no manure)	..
8	Ferrous sulphate (pure)	1·23
9	Iron oxide (red hydrated as used at gasworks)	8·20
10	Basic slag (17·8 per cent. P_2O_5)	4·10
11	Makatea phosphate (37·4 per cent. P_2O_5)	4·10
12	Basic slag and superphosphate (equal parts)	4·10
13	Rotted stable manure	164·00

Watering.—The pots were watered at intervals, the original weight of 25 lb. being maintained.

Early Growth.—The pots were examined comparatively on 20th October, when the order of growth appeared to be as follows: Nos. 12, 6 — 13, 10 — 11 — 9 — 4, 5, 8 — 7, 3 — 1, 2. At 20th November the order of growth remained apparently the same. The basic-slag pot seemed of a darker green than the other phosphate pots. The leaves of the iron-oxide and ferrous-sulphate pots were also somewhat darker, but those of the spent-oxide pot were rather off colour.

* Articles on pumice soils which may be consulted with advantage will be found in the *Journal* for May, 1912 (p. 374), and June, 1913 (p. 622).



POT EXPERIMENTS WITH PUMICE SOIL. SECOND CUTTING.

No. 13, dung; 2, limestone; 4 and 7, control; 11, rock phosphate; 9, iron oxide; 8, iron sulphate; 6, super.; 5, spent iron oxide; 12, slag and super.; 3, limestone; 10, slag.

Cuttings.—The clovers were cut and weighed at intervals, the following being the results, arranged in order of the dry weight (see manurial scheme for pot-dressings) :—

FIRST CUTTING, 2ND DECEMBER, 1916.

Pot No.	Green Weight. Grams.	Dry Weight. Grams.	Pot No.	Green Weight. Grams.	Dry Weight. Grams.
12	70·8	9·1	9	32·8	4·5
10	73·3	8·9	4	29·2	4·2
13	69·8	8·7	3	12·7	1·9
6	71·6	8·6	5	11·5	1·7
11	67·7	8·2	2	6·1	1·0
8	35·2	5·0	1	5·2	0·8
7	34·3	4·5			

SECOND CUTTING, 22ND DECEMBER, 1916.

Pot No.	Green Weight. Grams	Dry Weight. Grams.	Pot No.	Green Weight. Grams.	Dry Weight. Grams.
6	78·8	10·1	7	39·9	5·5
12	77·8	9·7	4	37·7	5·2
13	79·4	9·4	3	25·7	3·6
11	70·7	8·5	5	19·2	2·6
10	67·6	8·3	2	10·9	1·6
9	45·8	6·0	1	8·5	1·1
8	41·7	6·0			

THIRD CUTTING, 16TH JANUARY, 1917.

Pot No.	Green Weight. Grams	Dry Weight. Grams.	Pot No.	Green Weight. Grams.	Dry Weight. Grams.
11	66·2	8·5	3	44·7	6·7
12	68·1	8·4	4	41·2	6·2
10	60·7	8·2	8	40·8	5·8
6	60·3	7·6	2	27·0	4·1
13	59·6	7·1	5	21·1	3·0
7	45·3	7·0	1	20·9	3·0
9	44·9	6·7			

FOURTH CUTTING, 17TH MARCH, 1917.

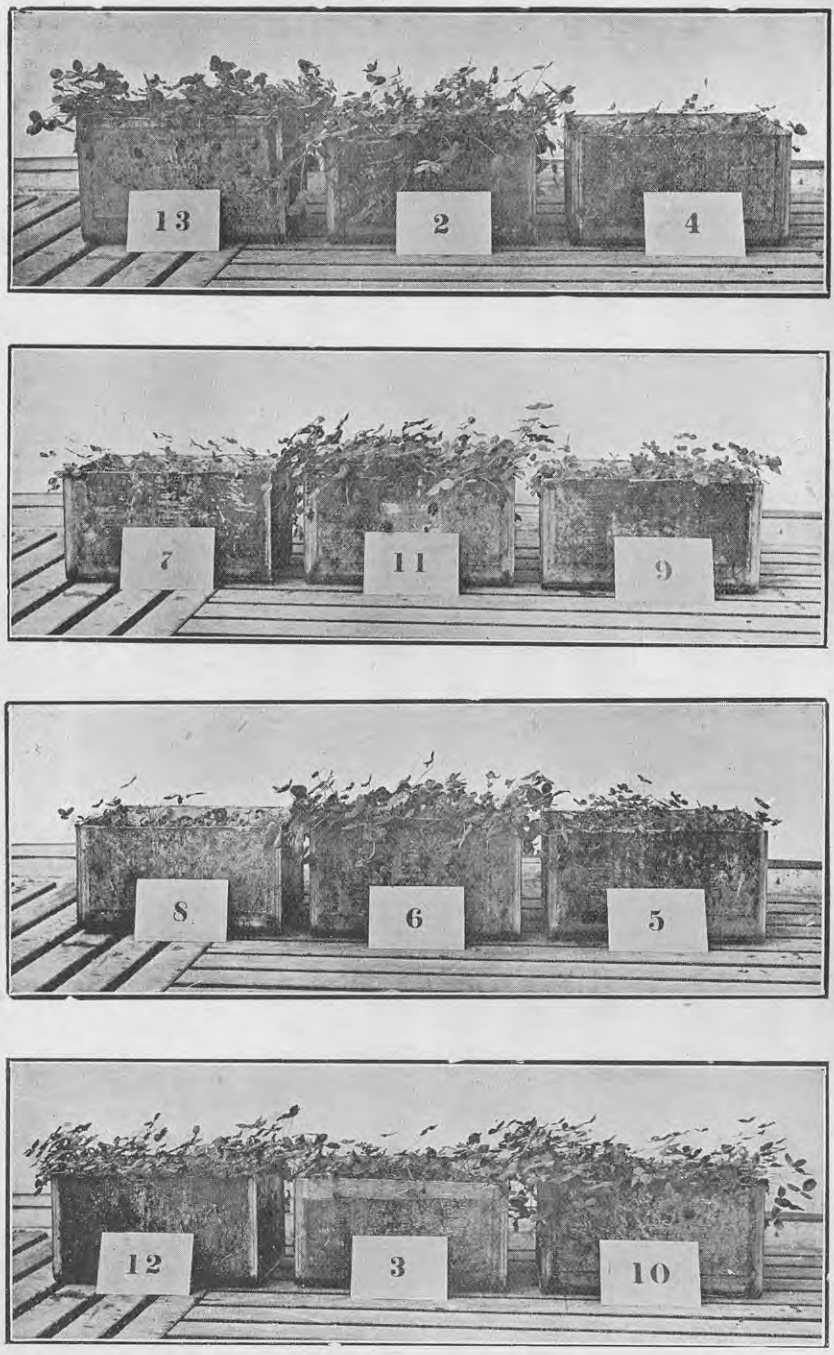
Pot No.	Green Weight. Grams.	Dry Weight. Grams.	Pot No.	Green Weight. Grams.	Dry Weight. Grams.
10	96·5	15·9	3	51·9	11·4
2	85·3	14·8	7	40·5	8·7
11	93·2	14·7	5	47·4	7·8
13	94·1	14·7	9	38·6	7·8
*12	94·8	14·6	4	32·6	7·1
6	93·1	13·4	8	32·9	6·6
1	72·8	12·5			

* Calculated for 12 plants (11 plants in pot).

FIFTH CUTTING, 22ND JUNE, 1917.

Pot No.	Green Weight. Grams.	Dry Weight. Grams.	Pot No.	Green Weight. Grams.	Dry Weight. Grams.
1	58·0	12·8	5	17·7	4·3
2	56·4	11·7	3	19·7	3·9
13	53·7	11·6	4	9·4	2·7*
10	55·6	10·6	7	15·4	2·7*
12	49·1	9·4	8	8·6	2·5
6	48·4	9·1	9	10·6	1·9
11	54·1	9·0			

* Nos. 4 and 7 (controls) were weighed together and averaged as regards dry weight.



POT EXPERIMENTS WITH PUMICE SOIL. FIFTH CUTTING.

No. 13, dung; 2, limestone; 4 and 7, control; 11, rock phosphate; 9, iron oxide; 8, iron sulphate; 6, super.; 5, spent iron oxide; 12, slag and super.; 3, limestone; 10, slag.

NOTES ON THE RESULTS.

The position of the plants in their order of growth on 20th October is instructive. There are evidently some substances which stimulate young growth greatly (such as soluble and insoluble phosphates), some which do not affect the growth at this early stage, and some (carbonate of lime and spent oxide) which are then positively injurious on this soil. This is more clearly seen in the figures for the dry weight of the crop at the first cutting, about ten weeks after sowing, when the phosphated and dunged pots are about twice the weight of the control pots, whereas those on the limed pots are less than half of the control, showing deleterious action. It will be noted that the pots are arranged in the diminishing order of the dry weights, and that the green weights sometimes do not fall in the same order.

The effect of phosphates on the whole series is eminently satisfactory in every form in which used, whether the acid (superphosphate) or alkaline (basic slag) mixtures of these, or as the natural rock phosphate. The crescendo effect of the basic-slag pot up to the fourth cut is remarkable, and is borne out by field experiments.* The excellent average result of the slag-super mixture is fully shown by the present experiments, and confirms the opinions already expressed in the *Journal* as to the value of this mixture.

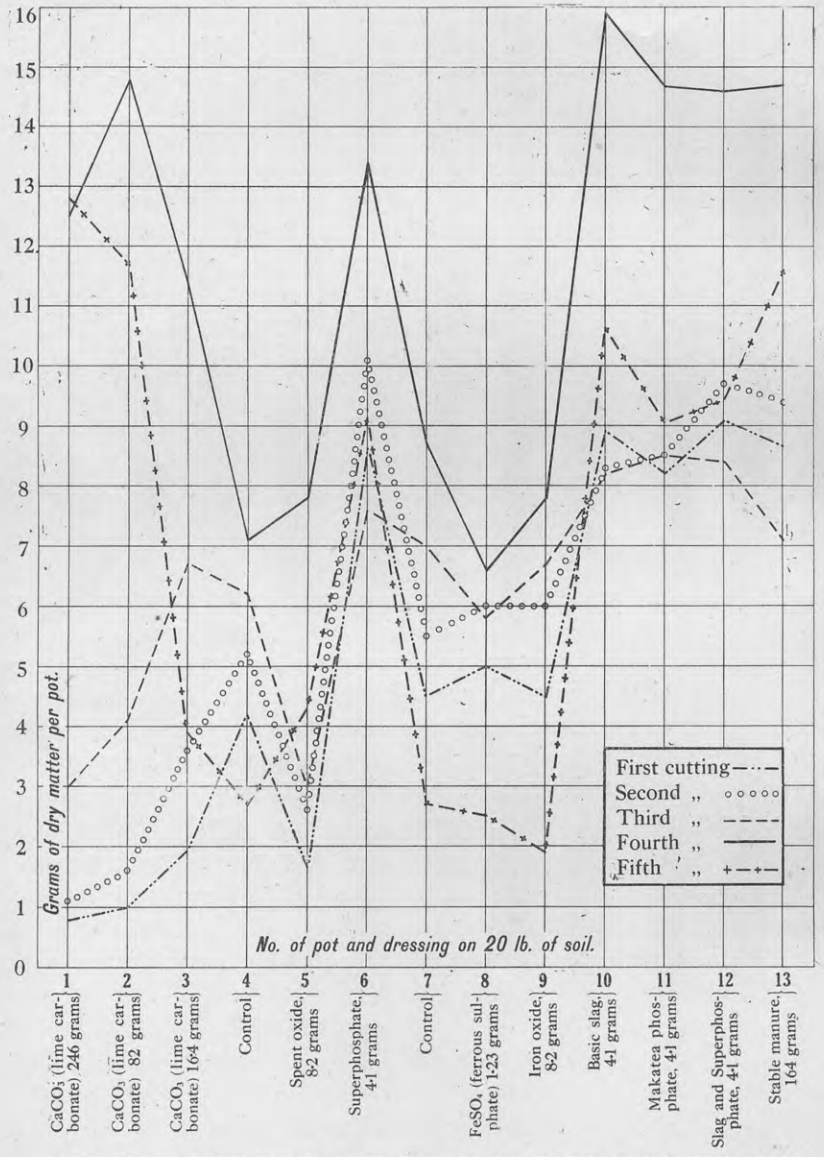
The effect of the limestone (carbonate of lime, $CaCO_3$) dressings is most instructive compared with the control (unmanured) pots. For the first six weeks there is a deleterious effect produced, which is accentuated with increased dressings. In the next two months the best of the limed pots had caught up and not only passed the control, but had given a better crop than any fertilizer except some of the phosphates and stable manure. Finally, in the last three months of the experiment the limed pots were the best of any.

Of the iron-treated pots the iron oxide (red) has had so little effect that it may be taken as a control pot. The ferrous-sulphate pot (copperas, $FeSO_4$) in the latter stages of growth has shown a slight deterioration, while the spent oxide (gasworks refuse), after showing a markedly deleterious action for the first three cuttings, improves in the fourth and fifth. Iron dressings are therefore unsatisfactory, though the spent oxide might be further experimented with. Any final beneficial result may be attributed possibly to the large amount of sulphur which this dressing naturally contains.

These experiments were not primarily designed for the purpose of comparing the relative yields given by soil differently manured, but to ascertain the effect of certain substances on the chemical composition of the clovers. This work is not completed, but the

* See *Journal* for November, 1913, p. 525.

record of the crop-yield is sufficiently complete and interesting to publish at the present stage of the investigation, and certain tentative conclusions may be drawn which should be checked by field experi-



GRAPH OF POT EXPERIMENTS WITH CLOVERS ON COARSE PUMICE SOIL FROM MAMAKU.

ments before being adopted. It must be remembered that the conditions were artificial, and towards the close of the season the plants in some pots would no doubt be suffering from those conditions,

whereas in the earlier stages of growth the conditions were doubtless more favourable than they would have been in the field. If, therefore, it is tentatively assumed that the amount of dry matter produced (*i.e.*, the clover less all water which may be expelled by heating in a water-oven at a temperature not greater than that of boiling water) represents the relative value of the crop, the following somewhat important deductions may be arrived at and should form the basis of experimentation with similar soil in field experiments.

SUMMARY.

On coarse pumice soils phosphates in any form may be expected to produce an excellent result on pasture, owing to the stimulation of the clovers and the stimulation of root-development generally of both grasses and clovers. Limestone exerts a deleterious effect for the first few months, but afterwards a highly beneficial effect. This suggests that lime carbonate gradually becomes changed in the soil into a state more favourable for plant-growth, and that a practicable method of applying lime without loss would not be as a top-dressing for grass, but by its application to ploughed land some months before the seed is sown.

The result with iron dressings is disappointing but not unexpected. Soluble iron salts are well known to be plant-poisons, and insoluble compounds of iron are so insoluble as not to affect the quantity of the yield, though possibly the quality may be improved.

Improvement of the quality of pasture on the type of soil experimented with may be best met by phosphate dressings. Increasing the store of humus by means of dung or by ploughing-in green manure where practicable, or by increasing the clovers, is to be recommended as a sound proceeding. The effect of liming requires to be ascertained in field trials, and the best method of proceeding determined. It is suggested that a solution of the difficulty of applying lime to pumice soils may greatly mitigate the necessity for, and therefore the expenditure on, so much phosphates.

Saving of Storage and Shipping-space.—In accordance with an arrangement made with the Imperial authorities, the meat-freezing works will this season cut and pack for space-saving purposes all freshly killed mutton and lamb carcases intended for export, subject to labour conditions enabling the work to be carried out. The method finally adopted differs slightly from that described in the July issue of the *Journal*, the carcase being severed about 2 in. below the pin-bone, thus leaving two chops on the hind quarters. In consideration of the extra labour involved by the cutting and packing, the freezing companies will be paid $\frac{1}{32}$d. per pound on all carcases so treated.

COTTAGES FOR MARRIED WORKERS ON FARMS.

THE following very cogent remarks were made by Mr. W. D. Hunt, of Invercargill, at the recent conference of the New Zealand Council of Agriculture, when moving an executive remit regarding the provision of financial assistance to enable farmers to erect cottages for married workers:—

The question of making proper provision for married workers on the farms of the Dominion is one that has been dealt with as yet only to a very small extent. If gone into thoroughly it will, I feel sure, do more than anything else to check the drift of population to the towns, and also be the means of placing more people in the country, than all other means put together.

Even before the war the supply and the conditions of agricultural and pastoral labour were both most unsatisfactory. The demand for labour in the country has always been much greater than the supply, but the demand has always been for single labour. Married labour was not wanted, because there was no accommodation for it. For years there has been no difficulty in obtaining married labour for country situations when suitable conditions were provided. The supply has always been much in excess of the demand, and even to-day under war conditions and a great scarcity of labour there are more married men available for country situations than there are positions to give them. I am satisfied from my own experience and observations that if suitable cottages were provided for married men it would largely solve the labour trouble on farms, and largely help not only in stopping the present drift to the towns, but set up a return drift to the country. If a young single man is working on a farm and wants to get married, he has the greatest difficulty in finding a situation on a farm where he will be provided with a comfortable home for himself and his wife. The young man and the girl he proposes to marry may desire, above all things, to remain in the country, but, if they are married, nine times out of ten they are forced to leave the country simply because the man cannot obtain a situation where he can take his wife and live in reasonable comfort. They are compelled to go to some town or township in order to get a house, and the man and his family become permanently lost to the country. The man has to abandon the occupation that he has been trained to and become expert in, and which, if continued in, would probably have resulted in his ultimately becoming a farmer on his own account. As often as not, in the town he goes to he drifts into the last of all occupations—viz., that of a casual labourer—or else some other blind-alley occupation that leads to nothing. This all means great loss to the man, to his family, and to the State.

The only remedy for all this is for farmers who employ labour to erect cottages and employ married men. This raises the question of finance. To build a comfortable cottage requires £400. Not many farmers can spare this sum right off in cash. I think the State should advance the farmers the money at as low a rate of interest as possible, obtaining repayment by way of a rate on the farm spread over a long period of years, which would wipe out both principal and interest on the instalment system. It may be argued that this would be unfair to the mortgagee (if any), but I do not think so. The rate should be a first charge on the land, and would thus come before the mortgage; but the mortgagee would have his security added to by the value of the cottage erected, and by the assurance that the farm would be more adequately worked by reason of a more certain supply of labour. The principle involved is the same as that under which River Boards are formed, and money is borrowed to straighten and deepen a stream, and so drain a large area. The interest and principal is repaid by a rate over the land affected, and this rate comes before all mortgages. The mortgagee is deemed to be compensated by having a better-drained security.

The married men employed on farms in the South where cottages are supplied are generally paid a weekly or yearly wage, but get no food: they find themselves. The cottage is supplied rent-free; and as much land as is required for a garden and poultry-run is attached to it. A milk-cow is also supplied, as a rule, and this keeps the man and his family in both milk and butter. Most married men, too, keep a couple of pigs, which are fed on the refuse from house and garden and the skim-milk. These things, apart from the cottage, cost the farmer almost nothing, but they are the greater part of a living for an industrious family. A man getting £2 5s. a week and the extras mentioned is infinitely better off than a man in town getting £3 a week, and the conditions under which his children are brought up are better almost beyond comparison. The farmer is ever so much better off with a married man on the conditions mentioned than with a single man at £2 a week and his food. Married men take much more interest in their work than single men. Further, the relief to a farmer's wife by being freed from the labour of cooking for the men is not by any means the least advantage of the arrangement.

There are very few of our farms that could not efficiently employ more labour than they now do, provided they could make satisfactory arrangements for a certain supply. An additional labourer placed on a farm will increase production just as much as an additional settler placed on a section and working it himself. The married labourer can be supplied by a capital outlay of £400. The settler requires a capital outlay of £4,500.

I will now try to show the area of the field that the suggested scheme has to work n According to the census of 1911 we had in the Dominion 19,984 farmers employing labour. The hands they employed numbered 39,439, or an average of two each. In addition, they had relatives assisting without wages to the number of 14,033. Besides, there were 29,941 farmers in business on their own account who did not employ labour. I am sure many of these could do with labour if they could get it. I am quite satisfied that there is ample

room for the profitable use of 50 per cent. additional labour on our present farms, provided a supply can be obtained that can be relied on, and it would quickly be used if the supply could be obtained. There will be room when the war is over for twenty thousand cottages on our farms. A large number of married labourers on farms would be the very best source possible to keep up the future supply of farmers to take up unimproved lands, and also to occupy subdivisions of larger estates being cut up. The provision for married labour would also result in a much larger number of children being brought up in the healthy surroundings of the country. They would grow up with the country instinct bred into them, and would, I am sure, in years to come prove to be the best of our population.

THE RABBIT PEST.

H. MUNRO, Inspector of Stock, Wellington.

THE necessity for utilizing the food resources of the Dominion to their fullest capacity for war purposes has recently been put forward on several occasions in support of the contention that rabbits, being a valuable article of human food, should not be wantonly destroyed by methods which render their carcases unfit for human consumption. This, like many other economic theories which appear sound to those who are not conversant with both sides of the question, may gain sufficient support to do considerable harm if well advocated and permitted to pass without contradiction.

After twenty years' practical experience in dealing with the rabbit question in all its branches in different parts of the Dominion the writer is firmly convinced that every acre of rabbit-infested area represents a loss in revenue according to the extent to which it is infested, and, further, that instead of being valuable food rabbit is so inferior in this respect as to be unworthy of comparison with the other edible meats produced in this country.

THE ECONOMIC SIDE.

Dealing with the economic side of the question, it is generally acknowledged that five rabbits will consume and destroy sufficient grass to maintain one ewe in profitable condition. Allowing that the average age at which rabbits are killed for marketing is one year, at the present market rates the five rabbits would give an annual return of 5s., as against the 25s. which could be produced from the average ewe which they are replacing. This comparison applies only to the infested areas which are within reach of the market, but when the greater extent of affected areas which are not w thin reach of

the market is also taken into account the case for the rabbit is made infinitely worse, for here they give no return whatever for their keep, and not even a lame economic excuse can be put forward to justify their continued existence. It must be remembered, moreover, that as a rule the landholder receives none of the return (if any) from the rabbits he feeds. While it is impossible to arrive at any approximate estimate of the number of rabbits in the country at any time, we have only to consider that their number at all times runs into millions in order to realize roughly the extent of the loss for which they are responsible.

DAMAGE TO PASTURE, AND DISEASE.

The value of the grass rabbits consume without giving anything approaching an adequate return does not by any means complete the case against them. In some districts they have done serious and in many cases practically irreparable damage to large areas of pasture. They are connoisseurs in the selection of locality and vegetation, congregating in the warmest localities in infested areas, where they eat out and in many cases totally destroy the most succulent vegetation, leaving the colder land and the coarser pasture to stock. In some localities where they were once numerous, but where their number has since been reduced to a minimum, some of the pasture has taken from ten to twenty years to recover from the effect of their ravages, and much of it will probably never fully recover its former productivity. Their excrement and urine are particularly obnoxious to other animals, and stock thrive badly on pasture which is fouled by them, even when the quantity and quality of the grasses appear otherwise sufficient and satisfactory. Where they have been numerous over an extended period the pasture retains their taint for a long time after they have ceased to pollute it.

Rabbits are so susceptible to internal parasitic affections that in some districts the mortality among them due to this form of disease has been found sufficient in itself to keep their numbers low for considerable periods. The writer has had experience in localities where approximately 50 per cent. of the mature rabbits were found to be affected with hydatid cysts.

RABBIT AS AN ARTICLE OF FOOD.

The poor and mangy condition of the majority of the several thousand dogs which were formerly kept in Canterbury and Otago for destroying rabbits, and which were exclusively fed on the latter, supplied an excellent gauge of the value of rabbit as an article of food. The condition in which these dogs were usually seen was not due to natural unthriftiness or want of proper care, but principally to the inferior food-value of rabbit, and in a lesser degree to the

prevalence among them of tapeworm due to eating rabbits affected with hydatids, of which the dog is the natural host.

For several years the writer fed dogs for certain times exclusively on rabbit, and at other times exclusively on mutton of such poor quality that it would not be used for human consumption, and always found the latter infinitely superior to the former for the purpose. Very few animals will eat rabbit from choice, and it is a common saying that natural enemies of the rabbit, such as weasels, ferrets, cats, &c., will not touch fur if they can get feathers—meaning that they will not prey on rabbits if they can secure birds. While their choice in the matter is regrettable their judgment must be regarded as sound.

The value of rabbit as a food for animals can safely be taken as a good indication of its value as human food. So far as the writer is aware there are very few of our people who will eat plain, unadulterated boiled or roast rabbit from choice, although there are many who like a nicely cooked and seasoned rabbit at intervals as a change of diet.

THE TRAPPING INDUSTRY.

The rabbit trapping and export industry can only flourish in districts where rabbits are so numerous as to constitute a menace to the agricultural and pastoral industries, and it is not in the interests of those connected with the industry that rabbits should be exterminated or their numbers reduced below a certain limit on any country from which they are able to draw supplies. It therefore follows that the existence of such an industry in any district instead of being an assistance is an obstacle to the extermination or proper control of the pest. The man-power which is employed in the industry represents some of the best unskilled labour in the Dominion, and it could be much more profitably employed in some other way. In order to be a successful trapper a man requires to have energy and initiative, and as men possessing these qualities can earn good money at trapping, that industry secures their services. The wages of the trappers depend solely on the number of rabbits they are able to catch, consequently they will continue to work on a block of country only so long as they are able to earn a good wage, and when no longer able to do this they will move to a fresh block where the rabbits have again become numerous as the result of a few months' rest. The number of rabbits left on country where a trapper is no longer able to earn good wages is always ample to enable such prolific breeders to again become numerous in the course of a few months if other means of destruction are not adopted in the interval. The business of men trapping rabbits for the industry is to kill, so far as possible, only what is suitable for the market, and the destruction of the young rabbits, which are not suitable for that purpose, is directly opposed to their interests.

The activities of the natural enemies of the rabbit, such as weasels, ferrets, cats, and hawks, which are of inestimable value in rabbit-infested country, are also opposed to the interests of the trapping industry, and trappers do not and cannot be expected to take an interest in their preservation.

CONCLUSION.

In conclusion, no proper place can be claimed for rabbits in the economic life of this country, and any person who discovers a more efficient method of exterminating them than those now in use will deserve well of his country by ridding it of a pest and at the same time providing a ready means of greatly increased production.

A "WATER-POTATO."

CURIOUS OCCURRENCE NEAR RANGITAIKI RIVER.

D. M. ROSS, Fields Supervisor, Hamilton.

To those who are acquainted with the history of the potato-plant and are aware of its wide climatic and geographical range, certain eccentricities manifested in its wild state will not be surprising.

On the islands of the Chonos Archipelago Darwin found the plant growing in great abundance on the sandy, shelly soil near the sea-beach. The tallest plant, he says, was 4 ft. in height. The tubers were generally small, but he found one of an oval shape 2 in. in diameter. They resembled in every respect English potatoes, and had the same smell, but when boiled they shrunk much, and were watery and insipid, without any bitter taste. He considered them undoubtedly indigenous, and ascertained that they grew as far south as latitude 50°. The specimens which he brought home formed a variety which by some botanists has been considered as specifically distinct. "It is remarkable," he continues, "that the same plant should be found both on the sterile mountains of central Chile, where for more than six months no drop of rain falls, and within the damp forests of the southern islands."

It apparently remains, however, for New Zealand to record the occurrence of what may be termed a "water-potato." On the northern side of the Rangitaiki River, in the Bay of Plenty district, opposite the old Maori settlement Waiohau, where a splendid spring of fresh water issues from the base of a hill and flows between banks heavily fringed with watercress to the near-by river, a remark-

able instance of a plant forsaking its normal environment may be observed. There watercress and potato-plants flourish together, and tubers are found among the cress-roots from 12 in. to 18 in. under water. Some of the tubers are almost in mid-stream, others may be found snuggled into the bank fibre, and the foliage of cress and potato mingle on the water-surface. It may be that the plants are dependent for their growth upon the earthy particles held by the cress-roots, and also that there is some fertilizing-quality in the water which drains from the great volcanic area. The potatoes when cooked are not at all mealy, but waxy. They grow to a fair size, and are fit for eating as early as August. I myself have taken the potatoes from the water, but could not determine whether or not they were in competition with the cress or in partial parasitic dependence upon it.

I was informed that this potato could not be cultivated on dry land, but subsequently found that there was a conflict of opinion on the matter. The question, however, has been determined by a trial recorded below. At the request of the Director of the Fields Division I forwarded some of the tubers for testing at the Moumahaki Experimental Farm last season. The Manager's report on the trial is as follows:—

Some of the "water-potato" tubers were planted on 31st August, 1916, in the potato variety trials, having the same treatment, soil, and manures as the sixty-six other varieties planted on the same date. The potato in question came away vigorously, and is distinct in foliage, with a large blue flower, bearing seed-apples naturally. The crop was lifted on 6th February, 1917, and was free from disease. The yield was as follows: Marketable tubers (table and seed), at the rate of 11 tons per acre; pig-potatoes, 1·87 tons: total, 12·87 tons. The cooking-test made on 6th February, by boiling, showed that the potatoes kept their colour twenty-four hours, but they could not be classed as good cookers. The starch-content is believed to be high. About the same date one root was lifted, and the tubers were put into running stream-water. In less than a month the whole of the tubers had rotted.

Despite the negative result recorded in the last part of this report, the circumstances surrounding the growth of the tubers in the Rangitaiki spring may indicate, if only slightly, a possible reversion of this long-domesticated plant to an ancestral habit.

Foot-rot in Cows.—Mr. E. R. Brinsdon, of Halfway Bush, near Dunedin, writes: "Some years ago I was worried a good deal with this trouble. A remedy I found very effective was to slack a little fresh lime; wash out between the hoof with warm water and soap, then apply the lime with a whitewash-brush. Whenever I saw a cow begin to limp I applied the lime, and seldom had to do it a second time."

TOMATO-CULTURE.

(Continued.)

W. H. TAYLOR, Horticulturist.

GLASSHOUSES.

SPAN-ROOFED houses are the most economical, as there is no high back wall to build. Narrow houses are to be avoided; a proportionally broad house is more economical as regards space, and the temperature can be kept more equable. A house 100 ft. long and 24 ft. wide would be well proportioned. The sides should be 5 ft. high, the lower 1 ft. 6 in. of which may be concrete and the remaining 3 ft. 6 in. glass. There has been a general tendency during late years to merely put down a foundation of concrete and make all the sides of glass. The plan is a good one, as it is impossible to get too much light. The house should run north and south, so that the rising sun will shine on one side of the span. At noon during midsummer the sun will be over the apex, and it will decline on the other side. For a house of the width indicated—namely, 24 ft.—the rafters should be 15 ft. long. This will give the roof an angle of 45°, with a height of 14 ft. at the apex. If the rafters were 14 ft. long the angle of the roof would be approximately 35° and the apex 12 ft. from the ground. This would be a sufficient slope, and suitable for summer work. It would, however, catch less sun in the early part of the season, and for that reason the greater angle is to be preferred. A door should be placed at each end of the house not only for convenience in working, but because one or both would be always available for purposes of ventilation. The doors should be wide enough to admit a wheelbarrow; about 2 ft. 10 in. clear of the jambs would suffice. Lean-to houses should face north, should have glass ends and front, and preferably a boarded back wall. The back wall would face south, the cold quarter, and boards are warmer than glass in positions where there is no sun-heat upon them.

AN EXPERIMENT.

Being persuaded that tomatoes will thrive with very little water, and, further, that the cause of most attacks of blight is the result of overwatering and too much manure, I carried out an experiment on these lines under glass last season at the Arataki Horticultural Station. The purpose of the experiment was to find out how little water the plants could do with and yet bear good crops of fruit.

Some plants of the Stirling Castle variety were obtained from a local grower, and when received were affected with leaf-blight. The plants were set out on 6th September, at distances of 12 in. by 30 in. They were not watered when planted or at any other time, and after about two months the soil was dust-dry to a depth of 8 in. By the end of November the plants were showing coloured fruit, and they continued to produce good fruit till March, when I relinquished the charge of the station. No spraying was done, yet the leaf-disease with which they were affected disappeared, and the plants remained perfectly clean. As evidence that the crop was good it may be stated that a plant in fruit was placed on exhibition in a shop-window, and experts who saw it flatly refused to believe the plant had not been watered. It may be further mentioned that practically all the flowers set fruit, some bunches having as much as eighteen fruits. Of course they were thinned, and the soil was fairly good and deeply trenched, but no manure was given. Naturally I do not advocate this system of culture for general use, but I claim that the experiment achieved its object—namely, to prove that disease does not affect tomato-plants grown under dry conditions, that large quantities of water are not required, and that fruit sets well when the plants are dry at foot and in a dry atmosphere.

OPEN-AIR CULTURE.

RAINFALL AND MANURING.

Blight annually takes a heavy toll from tomato-growers. A summer attended by an abundant rainfall that is beneficial to most vegetable crops is a time when heavy losses are sustained. Usually only some districts are affected; only rarely do all experience a good season. Too much rain evidently results in soft growth, which becomes a prey to blight. When a dry season occurs blight-attacks are comparatively rare. In this there is an object-lesson which should be taken to heart by all growers, both those in the open air and under glass. It is evident that blight-attacks are the result of too much water, and as attacks occur under glass where there is no rainfall it would appear to be excess water in the plant that causes the trouble—that is to say, too much water at the roots builds up a soft plant. I have long held the opinion that dry land well manured is the ideal for tomatoes, but that excess of rain on well-manured land is nearly certain to prove disastrous. Knowing that the tomato-plant is naturally an exceedingly strong plant and that it does not require much water (proved by success achieved in dry seasons), the rational treatment appears to be such as will ensure good growth during a dry season and not be attended by disaster if the season should be extra wet. I am satisfied that I have succeeded under

both conditions by planting in soil in which there was no recently applied animal manure and also comparatively little humus, and by never watering the plants. Fertilizing the soil is effected by applying wood-ashes before planting and a light dressing of bonedust and superphosphate after the plants have started to grow freely. In brief, I believe a moderate amount of stable manure to be beneficial if the summer weather is normal, but that it is likely to cause serious loss if there is an extra amount of rain; and that the most certain way to ensure an annual crop is to refrain from using animal manure. For reasons stated earlier, tomatoes should not be grown more than twice on the same plot without an interval of several years.

RAISING THE PLANTS.

The time to sow the seed should be regulated by the date the plants can be put out with safety. The factors deciding this are frost and the necessary temperature. In places where frosts periodically occur it is useless to plant till the worst are past. Where there is no frost it is useless to plant until the weather is warm enough to ensure growth. Plants put out too early are frequently injured by cold winds and sometimes killed. Eleven or twelve weeks is a reasonable time to allow from the sowing of the seed to planting out; less time is necessary if the plants are raised in heat. If the plants can be put out about the middle of October, mid-July will be early enough to sow. If the planting be delayed till November—a quite common occurrence—mid-August is early enough for sowing.

The way to raise the plants was described earlier. Hardening the plants is effected by raising the lights, both top and bottom, so as to allow air to pass freely through the plants. A few days later the lights should be pushed off on fine days, replacing them at night, and the final step is to place the boxes of plants in a sunny and somewhat sheltered position in the open air. As an alternative, where such a position is not available, a shelter can be provided by enclosing a space 6 ft. wide and the length required, by fixing a 10 in. board around it. A centre ridge should be erected about 4 ft. above the ground, from which canvas on rollers can be let down over the plants at night or during violent storms. The plants can be, and frequently are, raised in a shorter period of time than that stated, but the plants should not be considered fit to put out until the roots have taken possession of all the soil, and that requires the length of time stated.

PLANTING AND TRAINING.

For some years the most generally adopted mode of training was on a low trellis consisting of three wires. This was later reduced to

two wires, as the three were not furnished quickly enough. I still think this plan is best for private-garden use, and also for very windy places. The first wire should be fixed about 10 in. from the ground and the second a like distance above it. A straining-post must be put in at each end of a row. If the row is not longer than about 4 chains, no other posts will be required. Strong droppers, driven by a sledge-hammer, should be placed about three to each chain. Light fencing-wire is stretched as stated and stapled to the posts, but the staples should not be driven home, so that they may easily be drawn when the trellis is taken up. The plants are set about 30 in. apart. The first leader is taken up to the top wire and then tied along it. A strong shoot from near the base is led along the bottom wire, and the point of each leader pinched off when it reaches the next plant. Waste shoots are to be suppressed in all cases.

The plan now more generally adopted for training is to have a trellis of five wires. Rows are 3 ft. to 4 ft. apart, and run north and south. The plants are set 18 in. apart, and each plant is allowed two stems, which are trained perpendicularly up the wires. This method, of course, gives a larger yield per acre than the former, but is not so well adapted to windy situations.

A third plan is not to provide supports at all. The plants simply lie on the ground, and more stems per plant are allowed; in fact, training is then more in the way of thinning growth than by systematic method. This method may be described as a gamble. If the season proves a dry one there is a comparatively large return for the labour expended, but in a wet season the plants take blight readily. The fact remains that large returns have been secured in this rough-and-ready way.

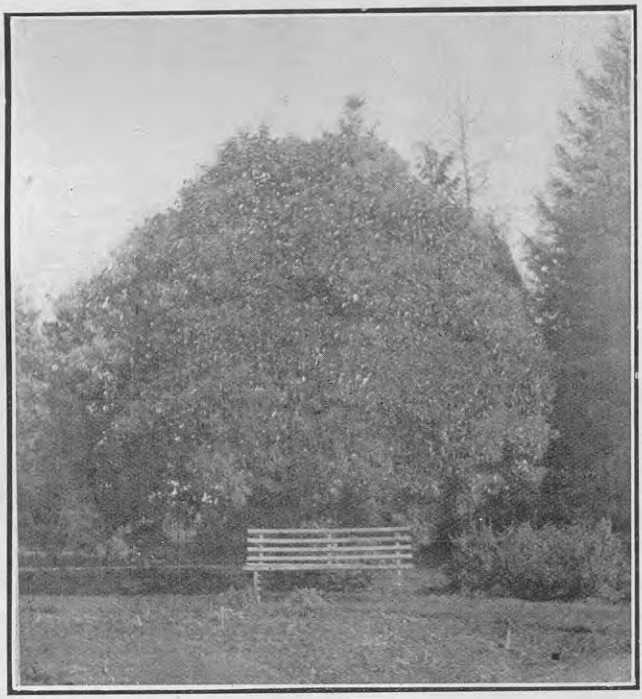
VARIETIES.

Most of the large growers have their own strains, the result of careful selection. Important points looked for are that the plants set the first truss, set freely, are short-jointed, and bear fruit of a paying size. The fruit should not be too small for outside growing, as it takes too many small fruits to fill a case. Round varieties are preferred for early houses, but for later houses it is not important to grow them. Carter's Sunrise is a good variety for early houses; others are Sutton's Satisfaction, Stirling Castle, Holmes Supreme, Chalk's Early Jewel. Moneymaker is now a leading favourite both inside and out. Clarke's Favourite is a selected large red, so also is Palmer's Select. There are, of course, many others.

[Diseases and pests of the tomato will be dealt with in the next issue.—ED.]

SPECIMENS OF CHINESE WAX-TREE.

Two beautiful specimens of the Chinese wax-tree (*Ligustrum lucidum*, variety *floribundum*) are growing in the Valetta Station garden, Ashburton County, now owned by Mr. H. S. Richards. These and other fine trees in this garden were planted by the late Hon. W. C. Walker, the former owner of the property. The Chinese wax-tree is the best known tree on which the wax-insects live. It grows to about 20 ft., the Valetta specimens being fully that height. These trees here flower in February and March,



CHINESE WAX-TREE AT VALETTA STATION.
[*Photo by Miss Withell, Mayfield.*

bearing clusters of small white, sweet-scented flowers. According to "Chinese Forest-trees," the wood is very tough, and used for a variety of articles. In China the tree is bent when young, so that it assumes any shape desired, and thus excellent hay-forks (all of one piece), frames for the backs of mules, on which packs are bound, handles of large baskets, walking-sticks, &c., are made from it. The Valetta specimens have numerous branches, and numbers of hay-forks could be obtained from them as stated. I am indebted to Mr. T. W. Adams, of Greendale, for identifying the tree and information regarding it. — *C. Branigan, Fields Inspector, Ashburton.*

SELECTION OF PEA-SEED.

J. BEVERLEY, Assistant Plant-breeder.

THE value of the pea crop, both as a fodder and grain, as well as for culinary purposes, is sufficiently great to warrant the best efforts of the plant-breeder to produce improved varieties, and for the seed-grower to maintain a high standard of purity, so that new introductions may not deteriorate in value.

Crops intended for seed purposes should be rogued at the flowering-stage, and sometimes it is necessary to hand-pick the several varieties also. Few varieties remain constant for long—that is, true to the type sent out by the raiser—because in a great many instances rogues are not destroyed, and through the consequent mixing with their progency the type rapidly degenerates in purity.

Experience at Svalöf and elsewhere shows that the majority of these so-called rogues which appear in cultivated crops may be artificially produced by cross-breeding, so that what was formerly regarded as atavism or reversion is now looked upon in many cases as simply new combinations of already existing units.

In order to test his own method of selection the writer has made several experiments to ascertain if the number of peas a pod contains has any bearing on the future crop as regards vigour and yield. The following table shows the results for the 1916–17 season :—

Variety.	Number of Seeds grown.	Number of Peas in a Pod.	Plant-vigour expressed.	Seed-yield expressed.
Beverley's No. 1 pea	50 (control)	Ordinary, 8 or less	100	100
	50	Once selected, 10	105	140
	50	Twice selected, 10	105	156

From this it will be seen that the control planting of fifty seeds is ordinary, because the average number of peas in a pod for this variety is eight. Pods containing ten developed peas are above the average, therefore maximum pods are not found on every plant, and usually not more than one or two on a plant. The results as regards plant-vigour and seed-yield indicate clearly the value of selection in this respect.

It may be added that soya beans are fairly regular to a given number of seeds in a pod—more so than peas. In the several varieties tested at Moumahaki the maximum pod has been found. (See *Journal* for August, 1916, p. 140.)

SWARMING OF BEES.

A. B. TRYTHALL, Apiarist, Ruakura Farm of Instruction.

BEES being only semi-domesticated, we can never implicitly rely on them to do the same thing under the same circumstances. This is particularly true with regard to the swarming impulse.

The causes of swarming are generally conceded to be—(1) Natural and hereditary impulse; (2) heat and lack of ventilation; (3) overcrowding of space for brood-rearing and storage of honey; (4) age of the queen; (5) excessive proportion of young bees in comparison to eggs and young larvæ.

Commenting on these in the order named the following statements may be made:—

Although swarming is the natural impulse for increase, yet many hives, often the best and strongest in our apiaries, go through the entire season without showing the least tendency to swarm. Now, if we could only find out an unfailing reason for this our problem of prevention would soon be solved, but so far our success has only been partial. With regard to the hereditary trait, we know from experience that Carniolan bees, for instance, will swarm themselves weak; that Blacks will often do their best in the same direction; and that Italians, though generally admitted to be a great improvement in this respect, still land us a long way from our goal. But, apart from the race of bees, it is generally conceded that individual strains show the swarming impulse less than others.

With regard to heat and lack of ventilation, the apiarist and not the bees is to blame.

Concerning overcrowding of space, we know that when a successful business man's house becomes too small for his needs he is apt to turn it over to his son and build a more suitable one for himself, so why be surprised if the bees do the same?

The older the queen the more liable she is to lead off a swarm.

Beekeepers are fairly agreed that if newly hatched bees, having strong nursing instincts, find their recently evacuated cells largely clogged with honey and pollen, resulting in less accommodation for eggs and larvæ, the swarming impulse is almost bound to develop immediately.

CURE OF SWARMING.

The cure of swarming, therefore, will be in the prevention or the reduction of the above causes by the following methods: (1) The selection (as near as possible) of non-swarming breeds and strains; (2) provision for sufficient ventilation; (3) ample space for the needs of brood and stores; (4) the early rearing and introduction of young queens; (5) a judicious use of foundation in the centre of the brood-nest.

Taking these points also seriatim, I need waste little time in discussing breed other than by saying that the great majority of beekeepers favour the Italian as the best bee for the New Zealand climate, and particularly so respecting its moderation with regard to swarming. In the poultry world strain often stands for even more than breed, and the sooner beekeepers breed only from those hives that have proved non-swarmers in the past the sooner we may expect to arrive at non-swarming strains of bees on similar lines to the non-sitting strains of fowls.

Ventilation should be provided in advance of the colony's requirements by increasing the size of the hive-entrance, and even to the raising of the front of the hive above the bottom-board by means of small blocks of wood at the two front corners, or perhaps even by giving, in addition, top entrances to very populous colonies with several supers.

Space for the storage of honey must also be provided well in advance of requirements, otherwise the nectar from the fields will be placed in the brood-cells to the exclusion of eggs and larvæ, which will lead to swarming perhaps more than any other cause.

It is the exception for a queen of the current season's rearing to swarm. Therefore the earlier our stocks can be requeened the less trouble we shall have with swarms. The poultryman pins his faith to pullets rather than to hens, and the sooner the apiarist follows his lead the better, particularly with regard to the question at issue.

Where bees are very numerous two or three frames of comb-foundation occasionally placed in the centre of the brood-nest not only provides an outlet for the bees' comb-building proclivities, but it also gives the bees the impression of plenty of room and occupation for all. The busier the bees the less tendency to swarm, as instance the fact how general it is for swarming to slow down immediately a heavy honey-flow comes on.

METHODS OF CONTROL.

After taking the above broad principles into consideration every beekeeper must adapt his methods to suit himself and his surroundings.

Speaking generally, in New Zealand, and especially the North Island, we are fortunate in having a long spring, with the result that bees are enabled to work up to full strength early, and what swarming is done is largely over before the main white-clover flow of nectar begins; whereas in England and large portions of America the bee-keeper is handicapped by swarming cutting into the middle of his main honey-flow.

Most methods of combating the swarming impulse are based on manipulations of the brood-chamber—some including and others without the use of queen-excluders. A method that the writer and others have used with success is to periodically—say, every week or ten days in spring or early summer—cursorily examine all hives for signs of swarming. Those hives very strong in bees and brood, or any that show signs of queen-cells, are treated at once by removing all frames of brood except two from the bottom chamber. Empty combs or sheets of foundation are put in their places, the queen being left with the two combs of brood mentioned. An excluder is now put on top, over which the supers (if any) are placed; then on top of all place the other brood-frames from below, destroying at the same time any queen-cells that may be in existence. In eight days' time again examine these top frames, and remove any queen-cells that may have again been built.

Providing the broad principles previously enumerated have been complied with, these hives are unlikely to require any further treatment for swarm-prevention, except in isolated cases, or, I am inclined to further add, in abnormal swarming seasons. Should, however, later swarming preparations be noticed from a cursory examination of the bottom of the combs in the brood-nest, by tilting the hives back on their stands and the help of a few puffs of smoke, the same process can be gone through again. To my mind, however, a better way to treat such second symptoms of swarming would be to introduce at once a good young queen. Some beekeepers vary the proceedings by raising two combs of brood every eight days above the excluder, and replacing them in the centre of the brood-nest by two frames of foundation, keeping up this process until the main honey-flow is in full swing, when usually the bees (in this district at least) get too busy to trouble about swarming.

Another method—followed by those who object to queen-excluders—is to scatter the brood-frames through the supers. Others, again, adopt the shake-swarm principle, removing all the brood and giving it to weaker hives, who in their turn, if necessary, are treated in the same way later.

I am strongly of opinion, however, that the best and easiest way of controlling swarming is by using the "Hand" floor-board and

method of procedure. This was by far the best of our experiments at Ruakura last season, and we are hoping to run a number of hives on this principle during the coming season, so as to give it an extensive trial alongside hives run on other systems.

It will be noticed that all these methods aim at forcing the queen to build up a practically more or less new brood-nest by giving ample room for the laying of eggs, and hence continually staving off the feeling of overcrowding or lack of accommodation.

In spite, however, of all precautions "The best-laid schemes o' mice and men gang aft a-gley," and he is a clever beekeeper (or has an exceptionally contented lot of bees) who never has a swarm. When queen-breeding by selection has arrived at such perfection that swarming trouble is no longer known the apiarist's millennium will have dawned. Personally, I should like to see that day.

KUMARA-PLANTS FOR DISTRIBUTION.

THE Manager of the Tauranga Horticultural Station (Mr. J. H. Davidson) advises that there will be a considerable surplus of kumara (sweet-potato) plants available at the station this season. The plants in question include some of the American varieties, and as these have been thoroughly tested and found superior to those grown by the Maoris it has been decided to distribute them as far as practicable on application to the Manager. Articles on kumaras and their culture were published in the *Journal* for October, 1913 and 1914. The best time for planting out is from the end of November to the first week in January.

In his current annual report the Forestry Superintending Nurseryman for the North Island, Mr. H. A. Goudie, remarks as follows: "The articles upon *Eucalypti*-growing from the pen of Rev. J. H. Simmonds, which appeared in the New Zealand *Journal of Agriculture*, contain a valuable record of the author's experience with this useful class of tree, and it is evident from the numerous inquiries received by this Department (Lands—Forestry Branch) that the articles mentioned have been widely read, and have greatly encouraged many who have hitherto had disappointing results with the planting of eucalypts. The inquiries for *Eucalypti* plants and seeds showed that the species described in the articles mentioned were chiefly in demand, and steps were therefore taken to produce the kinds likely to be asked for."

WORK FOR THE COMING MONTH.

THE ORCHARD.

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

THE fruitgrower is at the present time passing through the most critical period of the whole year. His prospects for the season are very largely dependent upon the climatic conditions prevailing from September to November. Such conditions not only influence the setting of fruit and the prevalence of fungus diseases, but in those localities subject to late frost the grower has additional worries, as it is quite possible that his crop may be partially if not wholly destroyed in a single night. By the time these notes appear, if the season be a normal one, the orchardist should have rounded the corner satisfactorily. In any case he should be in a position to form a fairly correct opinion of what he may expect of the season. Although bad weather is not unknown at any season of the year, from November onward the fruitgrower has very much less to fear in this respect, and can therefore rely to a far greater extent upon his own labours proving satisfactory than is the case earlier in the season. Such labours, however, must be continued and continued thoroughly, and also as extensively as the nature of the season demands.

SPRAYS AND SPRAYING.

From now onward practically every phase of summer spraying will require more or less attention, and it is always better to err on the "more" rather than on the "less" side. The principal troubles to be dealt with are,—

Fungus Diseases.—Black-spot of apple and pear; brown-rot (particularly of stone-fruits); powdery mildew.

Sucking-insects.—Woolly aphis; black aphis; red mite.

Chewing-insects.—Codlin-moth; leaf-roller caterpillar; pear-slug; bronze and brown beetle, &c.

It may be well to here specify some of the spraying-compounds that are found on the market and are in more or less popular use, as in many cases considerable confusion appears to exist regarding them :—

Fungicides.—Bordeaux mixture; soda bordeaux or Burgundy mixture; Professor Pickering's lime-water bordeaux; copper-sulphate solution; Cooper's Improved bordeaux; Lawes Antiblight; other bordeaux powders and pastes; lime-sulphur; and atomic sulphur.

Contact Sprays.—Oil emulsion; kerosene emulsion; Black-leaf-40; resin-and-soda solution; whale-oil soap; Vistolene; Katakilla; lime-sulphur; and atomic sulphur.

Poisonous Sprays.—Arsenate-of-lead paste and powder, and hellebore powder.

Standardization not yet practicable.—Fungicides.

Now, from time to time questions are asked with all seriousness and increasing frequence—more often than not in the nature of a complaint—as to why the number of sprays cannot be reduced to one selected specific for each purpose, and why cannot a more definite recommendation be given with regard to a strength that can be relied upon to do the work required of each without injury to the fruit or foliage. The reply to this, of course, is because we have not yet reached perfection in the science of spraying. No one mixture we have yet at out disposal can be relied upon to give the best results in all circumstances.

Take bordeaux, for instance. This mixture is recognized to be the very best fungicide we have, but it is very destructive on the skin of most fruits when used in the summer. Burgundy mixture is the same or worse as far as scorching is concerned, and popular opinion is against it being equal as a fungicide to the lime bordeaux; but, as well as being a good spray for potatoes, it does not clog the pump. Its main use, however, is when suitable lime or other ready-for-use fungicide is not available. Professor Pickering's bordeaux, in which copper sulphate and lime-water is used, is no doubt from a chemical point of view the ideal bordeaux, and as the percentage of copper sulphate is very much less than in ordinary bordeaux it is of special interest just now owing to the high cost of bluestone. Although it is being tested, not sufficient is yet known of it from a practical point of view to warrant its use being advocated.

Sulphate-of-copper solution is a good quick-acting fungicide for winter use, but the majority of those who have tested it are not quite satisfied that it is equal to bordeaux mixture.

Cooper's Improved bordeaux is a patent preparation introduced with the idea of providing a reliable fungicide ready for use. Lawes Anti-blight is on practically the same lines. Both are useful preparations, particularly to the owners of small orchards, as they save the trouble necessary in preparing bordeaux.

Lime-sulphur and atomic sulphur, besides being fungicides, are also insecticides. As fungicides they are superior to bordeaux for such fungus diseases as powdery mildew, but fall considerably short of bordeaux for all-round purposes. For the combined purpose of fungus and insect control they fill a very useful place, particularly if the season is not too favourable for black-spot. This applies to lime-sulphur particularly in connection with the latter disease. Bordeaux, owing to its tendency to blemish the fruit, should not be used in the orchard in the summer unless it is absolutely necessary, but lime-sulphur, if used with care, provides a good substitute under normal conditions as a preventive for black-spot, besides being useful, as previously stated, for other fungus diseases as well as insect pests.

The foregoing, therefore, explains to a certain extent the difficulty that exists in reducing the number of spraying-compounds to one formula. All the fungicides mentioned, although the whole of them are never included in any spraying advice given, have their uses under certain conditions. Nor is it possible throughout to definitely standardize the strengths. Every fruitgrower who has taken an interest in spray-testing will, I am sure, agree that it is very difficult

to determine which is the best under all conditions of several sprays of almost equal merit, particularly i such sprays are fungicides; and it is almost as difficult to definitely determine the exact strength at which such sprays should be used to give the best results under all conditions without injury to fruit or foliage. There are many conditions applying, such as variety, age and state of the tree, condition and situation of the orchard, &c.; but the greatest of all is the variation in the climatic conditions. The apparently contradictory results so often yielded render deduction uncertain and actual proof a matter of years. And so it will continue until the ideal spray is found—that is, one that will be successful under all conditions.

Contact Sprays for Sucking-insects.

Of the contact sprays mentioned for use in the summer, Black-leaf-40 appears to be one of the best, particularly for woolly aphis. This specific can be combined with arsenate of lead safely and used when spraying for codlin-moth. Black-leaf is, however, an imported preparation, and, besides being somewhat dear, New Zealand supplies are limited.

Resin-soda solution is also a good late-season spray for checking woolly aphis. It is considerably cheaper than Black-leaf. However, owing to its scorching effect it cannot be recommended for use early in the season. Even when used from March onward it is apt to do some damage. The extent of such damage at this stage, however, is not likely to be of any great danger to the tree.

Oil emulsions, particularly those emulsified with soap, can be used on pip-fruits at 1–40 to 1–60, and are useful for checking sucking-insects.

Kerosene emulsion is a spray which is not as popular now as it was a few years ago. Considerable damage has been done by this spray when improperly emulsified, but when the emulsion is perfect it can be used as strong as 1–12 on the majority of plants in foliage. Its principal use is in the destruction of young unprotected scale. This state in the mussel scale can be looked for during the latter part of October and early in November.

Vistolene and Katakilla are also patent preparations, and are both of considerable value in the destruction of aphides and other sucking-insects. The first-named has proved very efficient against black aphis on the peach.

Whale-oil soap makes a very reliable spray for red mite in the growing season, and can be used on both pip and stone fruits, but particularly the latter. At the strength recommended it can be safely applied to peach-foliage. Preparation is as follows: Warm 14 lb. whale-oil, and in another vessel dissolve 2 lb. caustic soda. Let the latter cool until it is just warm, and then slowly add the warm oil, stirring well. When cold this will set as a hard soap. Boil for about half an hour 5 lb. of this soap, 7 oz. of sulphur, and 5 oz. caustic soda, in 3 gallons of water. Make up to 40 gallons. Spray in the evening or on a dull day.

Lime-sulphur and atomic sulphur, as before stated, are insecticides as well as fungicides, and when combined and used with arsenate of lead throughout the season they keep many soft-bodied insects such as red mite well in check, but are of little use against woolly aphis.

Sprays for Chewing-insects.

Arsenate of lead, either in the paste or powder form, is the popular remedy for the chewing-insect group. There are many brands on the market, practically the whole of which are reliable. Among the popular are Swift's, Hemingway's, Bluebell, Electro, Sherwin Williams's, Rogers's, Lawes's, Lion, &c. For codlin-moth the paste form of lead is recommended at 1½ lb. to 2 lb. to 50 gallons of water. The powdered form is almost if not quite as strong again as the paste, and is recommended for use at about 1 lb. to 50 gallons. Codlin-moth and leaf-roller caterpillar are the two most destructive of the chewing-group. The former is well known, while the latter can now well dispense with letters of introduction as far as most districts are concerned. However, with pip-fruits the remedy for leaf-roller and codlin-moth is practically the same, as follows:—

Spray thoroughly and often with arsenate of lead. Without counting the calyx-spray the intervals between sprayings should be about three weeks, commencing not later than the second week in November. It is quite understood that many growers allow a much greater time between spraying than that given here, but they run a considerable risk in doing so, not so much perhaps of affected fruit as of blemished fruit. However, as far as moth is concerned, no doubt the practice can be followed with a fair amount of success under favourable circumstances. These circumstances depend upon how thoroughly the moth has been kept down in the past, and upon using a stronger spray than that previously mentioned, with, of course, the additional risk of scorching, also upon the absence of heavy rains. However, the advent of the leaf-roller alters the position. The habit of this pest is slightly different to that of the codlin-moth, making its satisfactory control a matter of more frequent spraying.

Resin solution for bronze and brown beetle is prepared as follows: Take 1¼ lb. resin, 1 lb. washing-soda, and 2 gallons water; boil until the mixture ceases to foam.

Hellebore powder: Although arsenate of lead at half the strength recommended for pip-fruits has largely taken the place of hellebore powder for the control of pear-slug on stone-fruits, hellebore at ½ oz. to a gallon of water is still popular when spraying is required before the fruit is gathered.

Summary.

Finally, in connection with spraying and spray-strengths—particularly in connection with fungicides and many of the summer insecticides—it must be remembered that the margin between the destruction of the insect or disease and the damage to foliage and fruit is often very small. Spray-strengths must be worked out in consideration of both, and this can only be done in a general way unless after a very long and exhaustive study of locality and climate, not forgetting the very many variations of climate in any one locality. Progress is being made along these lines, but no doubt it will be a long time before we shall be able to foretell definitely what will take place under all circumstances. In the meantime the sprays are here formulated as they appear to be best suited to the average conditions, and although

reliable under such conditions any spray recommended for use may be found to do more or less damage when used under conditions other than normal.

The following is a summary of the different spraying-mixtures and the strengths at which they are recommended for use for the different purposes :—

Pip-fruits.—Codlin-moth and leaf-roller ; pear-slug ; bronze and brown beetle : Arsenate of lead, powder 1 lb., paste 1½ lb. to 2 lb., to 50 gallons of water. For bronze and brown beetle add ¾ gallon of resin solution.

Woolly aphis : Black-leaf-40, 1 to 800, combined with arsenate of lead.

Red mite and other sucking-insects : Black-leaf-40, 1 to 800 ; lime-sulphur, 1–100 to 1–120 — or atomic sulphur, 10 lb. to 100 gallons water—combined with arsenate of lead.

Powdery mildew : Lime-sulphur, 1–100 to 1–120 ; or atomic sulphur, 10 lb. to 100 gallons water.

Black-spot : Pears—bordeaux, 3-4-40 ; or lime-sulphur, 1–80 to 1–100. Apples—lime-sulphur, 1–100 to 1–120. If season unfavourable, bordeaux, 2-3-40 for tender, and 3-4-40 for hardier varieties.

Stone-fruits.—Red mite : Whale-oil soap-atomic sulphur, 8 lb. to 100 gallons water ; or Vistolene, 1 to 100.

Black aphis : Vistolene, 1 to 100.

Brown-rot : Lime-sulphur, 1 to 125 ; or atomic sulphur, 8 lb. to 100 gallons water. Apply about the second week in November.

THINNING.

Thinning, as every experienced fruitgrower knows, has a very beneficial effect on the fruit crop. This work, although it has the effect of improving their quality as much as that of other fruits, is not extensively practised in the case of plums owing to their low market value. Judicious thinning becomes absolutely essential, however, with the peach, nectarine, and apricot.

Stone-fruits invariably drop more or less extensively about the time the stone begins to form. Thinning is usually deferred until after this drop takes place. It should, however, be gone on with as soon after as possible, as it is the formation of the stone that places the greatest strain on the vitality of the tree. In reality this is all the tree is concerned in—the reproduction of its seed. All our various classes of fruits have been brought to their present state of perfection by a process of careful cultivation and selection, but if left to themselves they still have a tendency to revert back. The pulp, as we know and enjoy it, is only incidental to the seed, and under stressed conditions the pulp, not the seed, is the first to suffer. Therefore, if the cultivator would have his tree produce pulp of a maximum quantity and quality he must keep it in good heart and reduce its crop to reasonable limits.

Thinning, as some one has neatly put it, is an operation which an orchardist should employ his neighbour to do for him, as the neighbour

would be more thorough in his treatment of the crop than the owner would ever find the heart to be himself, and in most cases it is thorough treatment that is required. Peaches should be thinned until at least 4 in. separate the closest fruits. Only one or at the most two fruits should be left on each twig or lateral. Whether it is to be one or two depends on the strength of the growth upon which the fruit is borne.

Under average conditions thinning means the destruction of a very large percentage of the crop, but nevertheless it pays to do it, as it usually means the difference between good fruit and rubbish. Other conditions being right, over two-thirds of the crop of a tree properly thinned should be A-grade fruit and the remainder B-grade.

There is another inducement to thinning, if such were required—namely, the control of the brown-rot fungus. Although it is agreed that this fungus in the first place finds entry to the fruit by means of a puncture in the skin, there is no doubt that the disease thrives to a very much greater extent when the fruits of a tree are crowded or touching.

DISBUDDING.

From now onward disbudding should play an important part in the shaping of young trees. This should commence as soon as the growth is sufficiently defined to allow the proper selection to be made. Disbudding is preferable in many ways to the removal of misplaced growths later in the season, particularly in the case of newly planted trees. Young trees are required to grow as strongly as possible. To what extent strong growth takes place depends largely on the class of tree and the nature of the season, &c. Under the most favourable circumstances this for the first year is rarely more than is required, while under less favourable conditions the growth runs from poor to moderate. The removal of growth in the summer gives a very decided check to the tree, and therefore should not be practised unless the strength of the latter warrants it; and, as intimated, this is the exception rather than the rule with trees the first year after planting. Therefore cutting-out should not be too freely practised—if practised at all—on other than free-growing trees during the first summer after planting. However, whether a tree is growing strongly or not, it is far better if the growths that it does make are properly placed. Here is where disbudding comes in. At the time this work is done little or no check will be given to the tree, leaving the operator free to shape his tree to the best advantage, which he can do very well if he is careful in selecting the growths suitably placed, and by checking or removing those likely to defeat his object.

CULTIVATION.

Through the summer the orchard should be kept well worked. Break up the surface well every three or four weeks with the cultivator. This will prevent the weeds from flourishing, and will also help to preserve the soil-moisture, which is a very necessary thing in a dry season.

POULTRY-KEEPING.

F. C. BROWN, Chief Poultry Instructor.

THE end of October should see this season's full complement of chicks hatched out. Chicks hatched later than this usually make unsatisfactory growth, and the later the hatching the more disappointing the stock. Not only do they lay in the cheap-egg season, but they are always more prone to disease than the bird brought out at the right time. It is true that when the little ones are placed under the very best conditions possible—for instance, in an orchard where good shade, shelter, and fresh ground are available—hatching operations may possibly prove more or less satisfactory even when early-maturing birds are brought out in November. The risk, however, is always there. Of course, ducklings, by reason of their early maturity, can be hatched to advantage up to the end of November, even when required for egg-production, and much later when table birds are aimed at.

With hatching operations practically over it is not to be thought that the present is a good time to take things easy. The maximum number of stock now being carried demands that the work of management be thorough in all respects in order to ensure good results from both the adult and developing birds. With the plant taxed to its utmost and the advent of warmer weather, vermin will commence to give trouble, and unless every precaution is taken to keep these in check the developing stock especially will seriously suffer. In fighting vermin there must be no half-measures—it should be taken up in a vigorous and determined manner. The houses should be first of all thoroughly cleaned, and then sprayed with a strong disinfectant or limewash, or given a good coating of tar. Care must be taken that the mixture gets into every crack and crevice. The nests, dropping-boards, and perches—those favourite resorts for vermin—must always be kept in a sanitary state. Spraying and similar measures will check red mite, fleas, &c., but as body vermin live on the fowls it is only by dusting themselves in loose earth (or a mixture of sand, ashes, &c.) that the birds will be able to get rid of these. At this season of the year there is no place where a bird likes so much to dust itself as under a tree where the soil has been newly turned over. Of course, young birds will require these dusting-facilities as well as the old ones.

Shade is another matter which must not be overlooked now for birds of all ages, and especially is it necessary for young stock. If shrubs and hedges have not been provided, some rough shelter may easily be made by sinking three or four short posts in the ground, connected with pieces of nailed timber and covered with branches of trees.

MARKING YOUNG STOCK.

It is always a mistake to allow old and young stock together indiscriminately without having a mark to distinguish one from the other. Not only should the different strains be specially toe-marked and registered accordingly, but the bird's foot should be punched for the sake of age-determination. It is next to useless depending on the eye in this connection, as there is no outward sign by which the age

of an adult bird can be determined. It is not by any means uncommon to see good pullets sent to market simply because they were affected with scaly leg, leading the owner to think that they were old birds. The fact of a bird having scale on its legs gives no indication whatever as to its age. The trouble is caused by a minute parasite which breeds under the scales of the bird's leg, and this is just as apt to attack a young bird as an old one. By having a system of marking the chickens much confusion and annoyance will be avoided, which usually takes place at culling-time in the vain endeavour to pick the one-year-old birds from those that are two years old and upwards and which have become mixed. Chickens may be marked immediately they are hatched. A punch for this purpose can be purchased at at cost of about 2s. For marking ducklings the ordinary chicken-punch is unsuitable, as the holes will invariably grow out. The best way of placing a distinguishing mark on the foot of a duck for the determination of age, &c., is to take a V-shaped piece out of the edge of the web of the foot. This should be done with a very sharp penknife, the foot of the duckling being held on a piece of solid board or leather during the operation.

VERTIGO.

Inquiries have already reached the writer this season as to why hens run round and round and at times fall over. The trouble is a dizziness affecting birds which have no protection from the influence of a strong sun. Especially is the trouble common with highly fed fowls and those carrying heavy combs. Sometimes a cure can be effected by removing the comb with a pair of sharp scissors. As is the case, however, with most troubles affecting poultry, prevention is the best way of dealing with this one, the essential being the provision of good shade, and mating the birds in such a way that heavy combs will not be produced in the progeny.

THE APIARY.

E. A. EARP, Apiary Instructor.

CARE OF THE BEE-YARD.

AT the commencement of the season the ground surrounding the hives should be attended to and a systematic clearance of weeds effected. Far too little attention is usually paid to obstructions in front of the alighting-boards. In no case should the bees have to force their way into the hives through a tangled mass of grass and weeds. Besides being unsightly, this growth tends to increase the work of the bees, and causes the loss of many valuable workers. A good plan to adopt during the working season is to skim off the weeds and spread agricultural salt round the hives, using about 6 lb. per hive. Although this is not a permanent remedy it has the effect during the summer months of destroying the weeds, and thus preventing the constant labour of cutting them. See that all the hives are level save for a

slight cant towards the front, and that each is set on four half-bricks, so as to allow a free current of air underneath the bottom-boards, and to prevent slaters (woodlice) and other undesirable insects from obtaining an entrance.

FEEDING AS A SAFEGUARD.

In many districts there is a distinct break in the honey-flow from the cessation of the willow and fruit bloom until the clover makes its appearance. It is during this period that the bees must be carefully watched not only to see that they are not dying of starvation, but also to provide for a sufficient increase in young bees which will develop into field workers by the time the main honey-flow arrives. Gently stimulative feeding is the best course to adopt at this period. The quantity of syrup fed will depend largely upon the strength of the hives. If feeding has to be resorted to the sugar-syrup may be fed in a less concentrated form than that which is given in the autumn and spring months, the quantity of water being increased. A syrup fed in the proportion of one of sugar to six of water is all that is required, and will be the means of keeping the colonies strong in brood and bees. The invariable rule should be observed to always feed in the evening and inside the hive.

VENTILATION.

No set time can be given for increasing the size of the entrances, but the action of the bees should be noted. If where the entrances to the hives were contracted in the autumn to prevent the intrusion of mice they have not been already widened, they should be attended to at once. Proper ventilation during the working season is an important item in bee-management, as it relieves large numbers of workers from the duties of fanning during the hot weather. In extreme cases it may be necessary to elevate the hive-body by placing inch blocks between it and the bottom-board. This should be sufficient to meet all requirements.

SUPERING.

Preparations should be well in hand for enlarging the hives. This may be done when the brood-chamber is getting full of bees, and the operation should be carried out in mild weather. Do not wait until the bees are cramped for room, but anticipate their wants and add supers when they are required. Where drawn-out combs are used no trouble will be experienced in inducing the bees to enter the supers. It often happens that no combs are available, in which case sheets of foundation must be used; but the bees will not always take readily to these unless there is a good flow of honey coming in, and a little encouragement will have to be given to induce them to enter the supers when only foundation is used. Should the bees fail to start work in the supers, elevate one or two frames of honey from the brood-chambers, at the same time inserting in their place sheets of foundation from the super. Do not bring excluders into use at this season, as the bees will rarely work foundation in the supers when they are used. Much time is lost by this practice, and very little honey will be gathered.

TREATMENT OF DISEASE.

As advised last month, beekeepers should not fail to treat all cases of disease as soon as settled weather conditions prevail. Nothing is to be gained by postponing treatment, and the earlier the infected colonies are dealt with the more likelihood there is of their working up to strength for the main crop. Generally the weather is settled enough in the latter part of November for undertaking treatment in all parts of the Dominion, and usually the clover is yielding sufficiently to enable the beekeeper to carry out the work with a minimum amount of feeding.

At every inspection of the hives the condition of the brood should be noted. If any of the capped cells appear to be different from the rest an examination of the cells should be made to ascertain the cause. The cappings of healthy brood are bright, fresh, and convex in form, whereas those attacked by foul-brood are darker, flat, and easily distinguishable from healthy brood by their blackish-brown colour. In the early stages of the disease on opening the cells a gluelike coffee-coloured mass will be noticed, and on the insertion of a splinter of wood the rotten mass will rope out some little distance from the cell. This ropiness is a true test for foul-brood. In the more advanced stage the disease is not so readily detected, because the rotten mass has dried upon the bottom of the cell in the form of a black scale. Generally, Italian bees will open the cells more readily than Blacks and remove the cappings, rendering it much more difficult for the beginner to detect the disease; but even though the cappings have been entirely removed the scale is easily detected on the base of the cell by holding the comb so that the light will pass over the shoulder into the cell.

Other indications of the disease in the advanced form are ragged perforations and a characteristic bad odour which is emitted. When the odour can be detected on opening up the hive it should be destroyed at once, remembering that the treatment of such colonies is only a waste of time, and it is by far the best policy to use drastic measures. When the disease has reduced the condition of the colonies until there are only a few bees left it is useless and dangerous to undertake treatment, and much the safest plan is to destroy the hive and contents as it stands.

Many new systems of treatment have been put forward, but with little success, and the beginner would be wise to discard any but the McEvoy treatment, which has been successfully used the world over. If it is properly carried out failure to eradicate foul-brood is almost unknown. It is the only treatment recommended by the Department, and is unhesitatingly advocated by the Instructors in each centre. If treatment has to be undertaken it should be carried out, if possible, in the evening, when the bees are quiet, there being then less risk of spreading the infection to other clean hives in the apiary. In cases where the hives are close together it is safer to close the entrances of the immediately adjoining hives.

To carry out the treatment prepare a set of frames fitted with narrow strips of foundation, and put these into a clean hive. Shift the diseased hive to one side, and place the hive fitted with these "starters" in its place. Remove the combs one by one, and shake

and brush the bees into the prepared hive. When the bees are removed put the diseased combs into a spare super and cover immediately. Remove all parts of the infected hive and combs to a place of safety out of reach of the bees. In four days' time the operation of removing the "starters" must be undertaken, when in their place frames fitted with fresh sheets of foundation are substituted. Shake the bees off each of the "starter" frames, and insert the frames containing full sheets of foundation. The comb built from the "starters" must be cut out and melted up. The object of the treatment is to induce the bees to use up the infected honey taken from the old hive, so that when they are given the second shaking they start clean.

It may happen that the bees will swarm out when given the second shaking. To prevent this either cage the queen or, better still, place a piece of queen-excluder in front of the entrances. This will prevent the queen from leaving, and all will be well.

A further examination should be carried out in three weeks' time to note the condition of the brood. If disease reappears after treatment do not start tinkering with the brood by cutting out isolated cells. This practice is dangerous, and although often advised is misleading. A much better plan is to remove the entire comb or, better still, make use of a modified form of the McEvoy method. In place of shaking the bees on to strips of foundation ("starters") for four days, the bees are shaken on to nine sheets of foundation and an empty bone-dry comb, this being inserted in the centre of the hive. At the end of twenty-four hours the comb can be removed and a frame containing a sheet of foundation put in its place. This operation should be performed quickly and quietly, with the use of very little smoke. The object of inserting the dry comb in the centre of the hive is to induce the bees to store the honey which they took from the diseased hive when shaken.

Treated Colonies.—If bad weather sets in a strict watch should be kept over treated colonies to prevent them from starving out. Feed sugar syrup in the proportion of four of water to one of sugar. Feeding should be kept up until the bees are gathering nectar freely.

VITICULTURE.

S. F. ANDERSON, Vine and Wine Instructor.

THE VINEHOUSE.

THE growth of vines during November is very strong, so that there will be much pinching and tying-back of the fruit laterals to be done. If this has been followed up as advised in Bulletin 40, "Cultivation of the Vine under Glass," there will be no great reduction of foliage at any time sufficient to cause a check to the plant. An hour or so, according to the size of the house, should be devoted daily to this work. As the shoots acquire sufficient toughness they can be tied back to the wires, and this can nearly always be done before the thinning of the fruit.

The question has been asked by some growers how to deal with those laterals that are not bearing fruit. The answer is to treat them the same as if they were showing fruit. On account of the foliage they bear they are as necessary to the vine as the others. Their function is also to develop the buds for the next year's output of growth, when they will probably bear fruit in the usual way. Their being non-fruit-bearing this season has been caused most probably by their having been over-cropped the previous season.

Another great advantage of daily attention to this work is the detection of mealy bug, mildew, or any other vine trouble that may make its appearance, followed by the application of the correct means of control. Prompt treatment of troubles of this kind saves an immense amount of worry and trouble afterwards. Spraying the vines should be withheld until flowering is quite over.

If the ventilators are closed at night they should be opened slightly very early in the morning in order to allow the moisture condensed on the foliage to dry gradually and so prevent scalding. This applies to the top ventilators only. Do not use the bottom ventilators at all until the grapes are coloured. They cannot be opened without causing draught, which is harmful to any plant grown in the still, warm atmosphere of a house. Some growers attribute mildew to the latter condition, but as mildew comes on outdoor-grown vines more than on those grown under glass this contention is doubtful. In any case the health of the vine is certainly controlled better in the more even temperature. On very hot days one of the doors may be opened for a time, and the path through the house wetted to prevent the temperature going too high. Provided ventilation from the top is ample, no harm will come to the vines if the temperature goes up to 90° or 100°.

All surplus bunches should be removed before coming into flower. Overcropping is the source of much trouble. Thin out the fruit well, and keep up a high state of cultivation.

The application of water to the cool-vinehouse borders must depend entirely upon local conditions. If they are kept frequently hoed, and the damp soil can be seen on removing the top few inches, they do not need watering. There are, however, plenty of vinehouses so situated that they do not get sufficient moisture in a dry season. In such cases some water must be given them. It should not be done by flooding the house or outside borders. A furrow scraped out with the hoe along both the inside and outside of the house, and the water run into this and allowed to soak in steadily, is the proper method.

THE VINEYARD.

Vines will now be pushing out their growth, and most kinds will be ready for disbudding. This work on the outdoor vines is confined principally to the stem and crown of the vine—that is, where the vine has been pruned in the usual manner during the winter, leaving the two 4 ft. rods of last year's wood (see Fig. 10, on page 201 of the *Journal* for March last).

The disbudding consists in reducing the numerous shoots that are put forth to just those that are required for producing new rods for the ensuing season, and these are to be trained up to and along the

top wire (see Fig. 10, C, C, page 203 of same *Journal*). Where the growth of the vine has been such that a new rod could not be obtained, then the old rod has to be retained and spur-pruned (as shown in Fig. 12, page 204, *idem*). This occurs in weaker-growing vines, such as Muscat Hamburgh. In this case leave only two of the strongest shoots from the crown; in the former case four should be allowed to grow from the spurs that have been left for that purpose. No disbudding is done on the rods left for fruiting.

Sulphur the vines as soon as 9 in. or a foot of growth has been made.

CELLAR WORK.

As the spring advances the wine in the cellar begins to move, particularly in the case of the young wine. This may force the bungs out, so that watch must be kept and the casks gone over daily for a time. Very drying winds occur at this period of the year, so that a certain amount of filling-up must be done.

THE GARDEN.

W. H. TAYLOR, Horticulturist.

VEGETABLE-CULTURE.

THE next few weeks should be a busy period in vegetable-gardens. Spring-sown crops will demand attention in hoeing, weeding, and thinning, and a good deal of advance work in sowing and planting has to be carried out. Thinning growing crops of onions, turnips, &c., should be done as early as possible. When the plants are crowded they draw up weakly, and delay in thinning is attended by harm in proportion to the delay. The soil should be kept loose between crops, this having very beneficial effects on growth.

Advance work includes sowing all the gourd tribe, which includes pumpkins, marrows, cucumbers, pie-melons, rock-melons, and water-melons. All these may be sown on the flat in groups 10 ft. or 12 ft. apart. A good plan is to make a drill in a circle about 12 in. across, the drill to be about 1½ in. deep. Three plants will be sufficient in each clump, but a few extra seeds should be put in to allow for losses. Gourds do not require very rich soil—moisture is of greater consequence, therefore the soil should be deeply worked.

Winter rhubarb may be sown in drills 2 ft. apart, and the plants thinned to 1 ft. apart, and eventually to 2 ft. apart when they begin to grow together. Rich and deeply worked soil is required for rhubarb. Good artificial manures are superphosphate and blood-and-bone, 2 oz. per square yard of the former and 1½ oz. of the latter, followed by nitrate of soda, 1 oz. per square yard, after the plants have begun to grow freely. Sulphate of potash is useful, but it may be substituted by wood-ashes in liberal quantity. Fowl-manure that has been kept dry till it will powder up is valuable for this and most other strong-

growing plants, particularly the cabbage tribe. Give about 3 oz. per square yard.

Peas and French and butter beans are to be sown for succession, also turnips if not sown within the last seven or eight weeks, which is about the life of a crop during the summer months. Runner-beans may still be planted; if sticks or other means of training cannot be afforded the haulm can be kept dwarf by pinching off the ends of the runners. If more than one row is planted the rows will require to be 3 ft. apart. The advantage of runner-beans is that the crop is continuous over a long period. In this respect they have an advantage over the dwarf beans. The continuance of the crop is, however, dependent on gathering all the pods as soon as they are fit for use. If beans are formed in the pods growth soon ceases. The same applies to dwarf beans. The pods should be gathered as soon as they are ready, even if they are thrown away. If it is desired to save seed a part of the crop should be set aside for the purpose. It is not good policy to save the last of a crop for seed, the plants being then exhausted and the seed not so good. The same applies to peas; the first strength of the plants should be devoted to seed-production, when strong offspring may be expected.

Parsnips and carrots should be sown for the winter crop. A good breadth should be put in, as these are the main crop. The carrots sown should be one of the large kinds. James's Intermediate is a true garden variety, but for farm-garden purposes I think it is better to sow Sinclair's Champion. Part of the bed can be thinned to 6 in. apart, and when fully grown the roots will be useful for live-stock. A row or two less severely thinned will provide smaller roots for table purposes. Seed of this class of plant should be thinly sown to save trouble in thinning, particularly with parsnips, which are somewhat troublesome to thin. The seedlings should stand about 5 in. apart, or farther rather than closer.

Cabbage-seed for the winter crop should be sown about the middle of November. The plants should be ready to put out early in January, except in the warmer parts of the Dominion, where a month later will answer better. Early celery may be planted in well-manured trenches. Plant tomatoes. Sow lettuce in lines, and thin out instead of transplanting. Red beet should be sown for winter use if not already done.

Potatoes.

Moulding-up should begin when the tops are about 9 in. high. The object of moulding is to shield the tubers from the sun, and incidently to prevent the haulm being broken by wind; it does not increase the crop, as some think. Moulding should not be left too late. The best tubers are those produced on the ends of roots farthest from set, and these are likely to be injured, or even torn off, if moulding-up is delayed too long. Moulding also has no effect of checking disease, but it is a protection against the potato-moth. Where this pest is troublesome the work should be well done, making sure that the soil falls closely about the haulm. It will pay to go along the rows with a hoe and draw the soil close up about the haulm.

Spraying pays because it saves the crop from blight if properly done. Spraying does not increase the crop—probably the reverse—

but it is better to spray than risk losing a large part of the crop. If the season proves to be dry blight may not be troublesome, but it is a gamble to trust to the weather, as it cannot be foretold. The first spraying should precede the first moulding, so that all the haulm may be covered; after that spray each fortnight, unless heavy rain washes the mixture off, in which case the operation should be repeated as soon as the rain is over. Lime-bordeaux consists of 4 lb. bluestone and 4 lb. fresh lime in 40 gallons water. Suspend the bluestone in canvas in a barrel containing 20 gallons of water. Slack the lime with a little water, then make up to 20 gallons. Pour the lime-water slowly into the bluestone-water, stirring all the time. This order of mixing must not be reversed. Five pounds of washing-soda may take the place of 4 lb. of lime. For small quantities use 1 lb. bluestone and 1¼ lb. soda to 10 gallons water.

KING ISLAND MELILOTUS-SEED FOR DISTRIBUTION.

MR. J. W. POYNTON, S.M., Palmerston North, writes to the Editor as follows:—

"I forward herewith a package of King Island melilotus-seed (obtained from Australia). It was formerly known as *M. officinalis*, but is now definitely recognized as *Melilotus parviflora*. It floated ashore on King Island, near Tasmania, in Bass Strait, in the stuffing of a mattress from a wreck, and spread over the wastes of white sand on the island, converting them into valuable pastures. The plant gave humus to the sand and, being a legume, enriched the soil with nitrates. It has since been used with success in reclaiming sand areas on the Victorian coast. I suggest you offer through the *Journal* to send small packets of the seed to settlers on our west coast from Paekakariki to New Plymouth. On this stretch the sea-sands in many places are encroaching on good land. If the plant succeeds in spreading here as it did at King Island and in Victoria it will be of much value to New Zealand. The seed should be soaked well in water before sowing."

Mr. Poynton's gift has been accepted with appreciation, and the distribution of the seed will be made from Weraroa. Applications from settlers in the district mentioned should be addressed to the Director of the Fields Division, Central Development Farm, Weraroa.

THE MEAT-EXPORT POSITION.

AT a meeting of the Board of Agriculture held early in the current month the question of shipping and storage space for meat and dairy-produce was discussed with the Hon. W. D. S. MacDonald, Minister of Agriculture, who was present. It was pointed out that, although the latest sheep returns show a large increase in the North Island, there has been a heavy mortality amongst hoggets, and the lambing in many districts is much below the average, which would probably do away with a considerable percentage of the surplus. The Board, however, thought it would be in the interests of the country that farmers be advised that, owing to the shortage of shipping, it would probably not be practicable to freeze and find space for all the stock available, and that they be urged to provide winter feed wherever possible to rear any lambs that might be left over. It was also decided to recommend that farmers should retain the best of their long-woolled ewe lambs for breeding purposes; also that arrangements should be made to tin a number of second-class fat old ewes, and in order that this might be done to request the Government to make inquiries as to the possibility of securing a good supply of British or American tinplates for the purpose. The Board also recommended that to ensure the freezing-space being occupied to the fullest extent with the primest meat it was desirable that the Inspectors passing the meat purchased by the Imperial Government should be more strict as to the quality, so that only finished animals should be killed and shipped.

PRICES OF BRAN AND POLLARD.

AN Order in Council dated 8th October, 1917, decrees that when bran or pollard manufactured in New Zealand is sold by any person other than the manufacturer the maximum price shall be the maximum fixed in May last (£3 10s. per ton for bran and £6 15s. for pollard, f.o.b., Lyttelton, Timaru, or Oamaru), with additions as follows: (1) When sold in a quantity of half a ton or more, 10s. per ton for bran and 15s. for pollard; (2) when less than half a ton, 12s. 6d. for bran and 17s. 6d. for pollard.

AREAS PLANTED IN COMMERCIAL ORCHARDS.

FOLLOWING are the estimated approximate areas planted in commercial orchards in the Dominion during the 1917 planting season. The districts quoted correspond to those of the Orchard Instructors of the Horticulture Division, by whom the estimates are compiled.

District.	Acres.	District.	Acres.
Whangarei	110	Taranaki and Wanganui ..	10
Auckland (North)	190	Nelson	400
Auckland (South)	35	Marlborough	100
Poverty Bay	18	North Canterbury	70
Waikato and Bay of Plenty ..	72	South Canterbury	230
Hawke's Bay	60	Otago and Southland	200
Manawatu and Wairarapa ..	30	Total area planted in 1917 ..	1,535
Wellington	10	Total area planted in 1916 ..	2,390

A NOTE FROM FRANCE.

IN an interesting letter, dated 25th July last, from the Anglo-French front, Sergeant T. C. Webb, jun., who was Orchard Instructor at Wellington before enlisting, writes as follows:—

It is all intense cultivation in this country, and wherever one goes can be seen field after field of wheat, potatoes, peas, sugar-beet, and vegetables. The fields are cropped up to within a mile and a half of the firing-line, and it is not an uncommon sight to see old trenches running through the fields with barbed-wire entanglements here and there. Most of the shell-holes have been covered in and made fit for cropping, but "Fritz" sends over an occasional shell and opens up the land for a few yards in the centre of the crops. The peas are mowed and threshed by hand. Beans are grown extensively and treated the same way. A noticeable feature here is that all the field-work is being done by hand; no machines have been working here since my arrival. The crops look well and are very even and well headed. The land appears to be free from weeds in the cultivated areas, but among our trenches there are Californian thistle and poppies in abundance, and they appear to be the chief nuisance here, although the poppies look pretty and set off the side of the trenches with their deep-red colour. In some of the old trenches one would fancy that he was strolling down some avenue in a public garden, but an occasional shell reminds one there is a war on. There is very little land wasted here; even the sides of the railway-lines are utilized for growing potatoes. There has been a fearful and wilful destruction of really good orchards and vineyards by the enemy. There are areas, where both sides have made a stand, that will be a tall order to clear when the time comes—miles and miles of trenches boarded and wired up and barbed-wire entanglements.

ANSWERS TO CORRESPONDENTS.

IN every instance a question to which an answer is desired in the *Journal* must be accompanied by the full name and the postal address of the inquirer, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

ORCHARDS UNDER SOD.

"ORCHARDIST," Nelson :—

Is there any similarity between the Kentucky blue-grass which American orchardists sow in their orchards and the couch-grass as we know it here? I notice that the couch if left alone develops a rising mat with loose ground underneath with fewer roots. Would the couch-grass be detrimental to an orchard if manured annually?

The Horticulture Division :—

"Kentucky blue-grass" is *Poa pratensis*, usually known as "couch." It is impossible without seeing specimens to say whether or not the grass you refer to as "couch" is this. American experience is that there is a great loss of fruit in orchards under sod, and manuring does not alter that result. It is stated by an American authority that in cases where orchardists appear to be satisfied with the results from trees under sod is because they have kept no check area to judge it by. Trees in sodded orchards show great diminution in growth as compared with trees on similar areas under tillage, and much dead wood. Grass has a toxic effect on the roots.

WINTER BREAKING-IN CROP.

"BRACKEN," Hokianga :—

We intend ploughing about 20 acres of heavy fern country this month (September) and leaving it for the summer. It is heavy clay soil and was previously bush country which fire destroyed. What would be the best crop to sow in the early autumn that would give winter feed and then do to plough under—say, in November, 1918—previous to sowing swedes? What would be the best manure to use for first crop? We know lime is needed, but it is almost out of the question, as freight would cost us nearly £2 per ton.

The Fields Division :—

For winter feed on an autumn sowing your choice is limited practically to the cereals. Either Italian or Western Wolths rye-grass would be best from the single point of view of providing winter feed, but when the short duration of the grazing and the improvement of the land are considered they must be left out. The following sowing is suggested : ¾ bushel ryecorn, ¾ bushel Algerian oats, and 1 bushel Scotch tares, per acre. The Scotch tares will not provide much winter feed, but would come away in spring and provide bulk for turning under. There is another difficulty here, however. Bulky green stuff turned under in November in a heavy clay soil would decompose slowly, and sowing of swedes would have to be done shortly afterwards. Under these circumstances the swedes would be apt to suffer from lack of moisture in the early stages, partly because the previous mixed crop would have dried up the ground and partly because this when turned down would impede capillarity. For this reason bad results frequently follow with crops sown too soon after green-manuring. We should therefore prefer to graze the previous crop right to the finish before ploughing for swedes, and with this in view would omit tares and increase the oats and ryecorn to 1 bushel each. Basic superphosphate is the most suitable manure under the circumstances.

REARING MOTHERLESS LAMBS.

J. SANDFORD, Ouruhia :—

Kindly let me have directions for rearing motherless lambs.

The Live-stock Division :—

One-third water and two-thirds cows' milk should be given to the lamb to start with. Afterwards the percentage of milk can be increased. It is also beneficial to add a little barley-water occasionally. The liquid should be given at about the temperature of the body. The secret in rearing young lambs is to keep them warm, and give them small quantities of food at a time (about half a teacupful) and often—every two hours to start with. All utensils, before using, should be thoroughly washed, then scalded.

COAL-ASHES FOR THE GARDEN.

"ASH," Methven :—

Kindly advise me whether the ashes of a lignite, such as Homebush or Mount Somers coal, are of any value as a garden manure, either by themselves or mixed with fowl-manure. If the ashes are of no value, are they harmful ?

The Horticulture Division :—

Coal-ashes have no manurial value, but they are not injurious except in certain circumstances. Coal-ashes have been largely employed to ameliorate clay soils, and have had beneficial effect in vegetable-gardens where the soil was largely composed of tenacious clay. On light soil the ashes would have an opposite effect. Coal-ashes should not be applied to soil in which potatoes are grown, as they cause scab. Fowl-manure would not be improved by an admixture of coal-ashes ; it would be better to dry the manure separately.

FORAGE CROPS FOR COWS.

"INQUIRER," Tuakau :—

Please advise as to the best crops to grow for feeding cows during the summer, commencing about Christmas-time.

The Fields Division :—

For end of December and beginning of January feeding sow from the middle to the end of October 2 bushels Algerian oats and 1 bushel Scotch or Golden tares per acre. The yield of green forage from tares is greatly reduced by grazing. The crop should not be grazed off more than once, and it should be cut and fed out when required. To follow on, maize should be most suitable in your district. If your soil is good grow one of the tall heavy-yielding varieties, such as Hickory King. For less favourable conditions ordinary Horse-tooth or Ninety-day would be more suitable. Use ¾ to 1 bushel per acre, and sow at, say, three intervals of three weeks, commencing in the middle of October. From 2 cwt. to 3 cwt. of basic superphosphate per acre should be given to each crop. Under conditions adapted to its growth lucerne is without doubt the best single summer forage, and you should set about establishing an area for future requirements.

WOODLICE.

"ORCHARDIST," Lower Hutt :—

Recently while weeding round some apple-trees I found woodlice at the roots. Do these insects do the trees any harm; and, if so, what is the remedy ?

The Horticulture Division :—

Woodlice only become a menace to vegetation when in considerable numbers. They eat green leaves and the tender bark of both stems and roots of plants. The remedy for woodlice is good and frequent cultivation ; they do not like being disturbed. Vaporite will kill them in places cultivation does not reach. Fowls eat them with avidity, and speedily clear ground of them.

PECAN-NUTS.

J. S. COTTERELL, Manawaru, Auckland :—

Information is desired as to growing Pecan-nuts. Is this climate suitable for them ?

The Horticulture Division :—

The Pecan-nut tree (*Carya olivaeformis*) is one of the hickories. The tree thrives well in this country. Specimens are known that are upwards of twenty years old and more than 25 ft. high. So far as we know, however, no nuts have yet been produced. The fact is the tree is variable; some bear well, some do not. Selection would be necessary, and apparently this has not been done even in America, where the English walnut is regarded as a better commercial proposition. The trees are grown from the nuts, which should be sown as soon after they are ripe as is possible.

CARE OF SHEEP ON GREEN FEED.

J. F. NICKLANS, Jun., Upper Fendalton :—

Would you kindly let me know the best drench or treatment for sheep when blown on green feed. We always suffer badly when feeding off crops or any green stuff. The trouble is just commencing again now (September).

Live-stock Division :—

Prevention is always better than cure, and in this case it is specially applicable. It is well known that where intense cultivation with its accompanying manurial preparation is carried on great care should be taken not to keep animals upon green feed for too long a time, otherwise indigestion will surely follow, as evidenced by scouring or blown animals, and even death. In cases of indigestion the best drench for a sheep would be 2 oz. of Epsom salts dissolved in a pint of water with the addition of a dessert-spoonful of ground ginger.

WIREWORMS IN THE VEGETABLE-GARDEN.

"WIREWORM," Pohuenui :—

Kindly advise as to the best method of getting rid of wireworm in a vegetable-garden. The soil is a rich loam, and has been at different times well manured with sheep-manure. The wireworms mostly eat the vegetable-seeds as soon as they germinate.

The Horticulture Division :—

The best way to rid soil of wireworms is frequent and thorough cultivation, so as to enable birds—which are particularly fond of them—to pick them up. Salt applied at the rate of 5 cwt. or 6 cwt. per acre when the land is in fallow will kill wireworms, but it could not be applied in effective quantity while crops are growing. Wireworms are the larvæ of click-beetles, which abound in grass; therefore keep the ground free of such growths. Peas may be protected by strewing soot freely on them before covering them with soil, and lesser quantities of soot strewn on other seeds should have protective power. Never dig in cabbage-stumps or similar vegetable debris, as they form very congenial harbour for wireworms.

PIG-FEED.

MR. JAMES RITCHIE, Blyth, Nightcaps :—

Kindly state which, beans or potatoes, is the cheaper food for pigs, taking the foods at £4 per ton each.

The Live-stock Division :—

The difference is about four to one in favour of beans. Bean-meal added to boiled potatoes makes excellent pig-feed.

MILKING-SHED SYSTEMS.

"SETTLER," South Westland :—

What is your opinion of the "race-bail" system for milking-sheds as compared with the "walk-through"?

The Dairy Division :—

At one time the race type of building was fairly popular with a number of the settlers, but very few of these buildings are now being erected, as the run-through design seems to give more satisfaction. A copy of the Department's standard plans for both types of shed has been forwarded to you.

AGRICULTURAL SHOWS: SEASON 1917–18.

Hawke's Bay A. and P. Society: Spring Show at Hastings, 17th and 18th October.
Ellesmere A. and P. Association: At Leeston, 18th October.
Poverty Bay A. and P. Association: At Gisborne, 23rd and 24th October.
Wairarapa and East Coast P. and A. Society: At Carterton, 24th and 25th October.
Timaru A. and P. Association: At Timaru, 24th and 25th October.
Kelso A. and P. Association: At Kelso, 31st October.
Manawatu and West Coast A. and P. Association: Spring Show at Palmerston North, 31st October and 1st November.
Waimate A. and P. Association: At Waimate, 1st November.
Canterbury A. and P. Association: At Christchurch, 8th and 9th November.
Marlborough A. and P. Association: At Blenheim, 13th and 14th November.
Wanganui Agricultural Association: At Wanganui, 14th and 15th November.
Nelson A. and P. Association: At Nelson, 19th and 20th November.
Taieri Agricultural Society: At Allanton, 20th November.
Winton A. and P. Show: At Winton, 21st November.
Wyndham A. and P. Society's Show: At Wyndham, 21st November.
Waikato A. and P. Association: At Hamilton, 20th and 21st November.
Egmont A. and P. Association: At Hawera, 21st and 22nd November.
Clevedon A. and P. Association: At Clevedon, 24th November.
Otago A. and P. Society: Summer Show at Dunedin, 28th and 29th November.
Stratford A. and P. Association: At Stratford, 28th and 29th November.
Auckland A. and P. Association: Spring Show at Auckland, 30th November and 1st December.
Gore A. and P. Association's Show: At Gore, 4th and 5th December.
Clutha and Matau A. and P. Society: At Balclutha, 6th and 7th December.
Southland A. and P. Association: Summer Show at Invercargill, 11th and 12th December.
Nuhaka A. and P. Association: At Nuhaka, 1st January.
Wairoa County A. and P. Society: At Wairoa, 16th January.
Helensville A. and P. Association: At Helensville, 29th January.
Woodville A. and P. Association: At Woodville, 30th January.
Feilding A. and P. Association: At Feilding, 5th and 6th February.
Central A. and P. Association: At Waipukurau, 6th February.
Dannevirke A. and P. Association: At Dannevirke, 13th and 14th February.
Taumarunui A. and P. Association: At Taumarunui, 13th February.
Masterton A. and P. Association: At Solway, 19th and 20th February.
Taranaki A. and P. Association: At New Plymouth, 22nd and 23rd February.
Hawke's Bay A. and P. Society: Autumn Show at Hastings, 5th and 6th March.
Opotiki A. and P. Association: At Opotiki, 7th March.
Matamata A. and P. Association: At Matamata, 21st March.

(A. & P. Association secretaries are invited to supply particulars of their show dates.)