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CURATIVE TREATMENT OF BUSH SICKNESS BY IRON SALTS.

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ONE branch of experimental work at the Mamaku Farm has been the administration to stock of medicinal compounds—supplied in the form of brick-licks, which the animals voluntarily consume, and drenches, given by hand or in the drinking-water—all of which contain elements known or suspected to be deficient in the soil of the area under investigation. It is, of course, not intended to suggest that drenching of stock with any remedy, however cheap or efficient, would be a practical remedy for bush sickness. The aim of drenching experiments is merely to obtain quick confirmation, on a few typical animals, of ideas formed from laboratory experience dealing with a subject of which so little is known that it may be regarded as situated on the borderland of knowledge.

Previous articles in this *Journal* and records in the Annual Report of the Department* have shown that while phosphate top-dressings as

* For articles and reports on bush sickness see *Journal* for November, 1911, August, 1912, April, 1913, June, 1913, February, 1914, November, 1915, October, 1916; and the Annual Report for 1915–16 (pages 3 and 36), 1916–17 (pages 12 and 39), and 1917–18 (pages 7 and 35). Articles on "Pumice Soils" are to be found in the *Journal* for May, 1912, August, 1913, October, 1917, and November, 1918.

a class are the best to produce a good palatable pasture, with a great general improvement in quality and quantity, this alone will not on the badly affected country keep the animals grazed on the pasture healthy, nor will it enable them to rear healthy offspring. But the dressing of pastures by phosphates does enable animals to be grazed and kept in health for a much longer period than if no such dressing was practised. If, however, in addition to grazing on phosphate-dressed pasture cattle are drenched for a period with syrup of phosphate of iron when they show signs of going off in condition they may be brought round from time to time and thereby be kept healthy.

The question, then, arises whether this good effect of the syrup of phosphate of iron is due to the phosphate or to the iron. An extended experiment in which cattle were supplied with superphosphate dissolved in drinking-water showed that the animals could not be kept healthy by this means longer than a year on untreated pasture, while in another experiment on treated pasture it was found that phosphate of iron gave a much better result than superphosphate. (Annual Report, 1916–17, p. 12.)

The direction which the curative experiments have therefore taken during the past year has been towards finding a substitute for syrup of phosphate of iron which will give the same good results but which does not contain phosphate. In this success has been achieved. The compound most experimented with has been the double citrate of iron and ammonium (the Ferri Ammon. Cit. of the pharmacist). It will be seen that this contains no phosphate, and yet, as the following experiments show, it is quicker and therefore more efficacious even than the syrup of phosphate of iron in bringing back a sick beast to health when grazed on good-conditioned pasture which has been dressed with phosphate.

One of the cows, "Mary," originally bred on the farm, was going off in condition with bush sickness, and was drenched with iron and ammonium citrate (Howards and Son's Ferri et Ammon. Citras, P.B.), 10 oz. of the crystallized salt in 1 gallon of water, 2 oz. of the solution being given night and morning. The animal showed signs of improvement within a month. The treatment was continued for three months, and she was then put on to other pasture with other cows which had merely access to iron-chloride brick-lick. In January last this cow was in excellent condition.

Another cow, "Jane," who was born on the farm, was a wreck with bush sickness on 11th May, 1918, but when dosed similarly with Ferri Ammon. Cit. quickly recovered, and was in good condition in October.

A calf showing signs of bush sickness was drenched with Ferri Ammon. Cit. (1 oz. of the same solution night and morning) at beginning of June up till 9th September, and made a complete recovery.

A yearling was early in July placed on the Ferri Ammon. Cit. treatment, getting 2 oz. of the solution night and morning. Progress was slow at first, but after improving continuously from 20th July it was, early in December, taken off the citrate and put on to lactate of iron, when it commenced to decline.

In addition to the iron-ammonium citrate, tartrated iron was tried as an alternative.

"Torpedo," a thin old cow, very low in condition and suffering from bush sickness, had had access to ferrous-sulphate salt brick for some time, which she took but did not improve on. She was accordingly put on to pasture similar to that of the other stock which had received citrate of iron and ammonium, but in this case the preparation used (10 oz. to the gallon) was made up of tartrate of iron and potassium—Ferrum tartaratum, P.B. (Howards' and Tyrer's)—2 oz. of this solution being given night and morning for two months. The treatment pulled her round considerably, and in December she was so far advanced that the treatment was discontinued. This is the only experiment to be recorded with tartrate of iron and potassium, but so far as it goes it indicates that this salt may be expected to prove efficacious.

FIG. 1.—FOUR TWO-YEAR-OLD BEASTS RAISED AT MAMAKU FARM BY AID OF "B" LICK AND PHOSPHATE-DRESSED PASTURES (OCTOBER, 1915).

[*B. C. Aston, photo.*

The fact that one or two organic salts of iron have shown excellent results does not imply, however, that others would be equally efficacious. The lactate of iron (ferrous lactate) has been experimented with at some length. This iron salt has been found successful in treatment of anæmia or chlorosis in human patients by Parisian medical men, and supplies of lactic acid are available as a waste by-product in the tanning industry. In experiments with cattle the ferrous lactate, given either as a drench or as a lick in brick form made up with plaster-of-paris and common salt, has proved disappointing. Animals invariably scour badly under its administration, and although they take the lick containing the lactate greedily up to the last there appears to be some reason why they are not able to assimilate satisfactorily this form of iron salt. Probably the lactic acid is an unsuitable acid to administer to ruminants.

Inorganic iron preparations have been tried to a considerable extent both as licks, drenches, and medicated drinking-water. With licks the best results have been obtained from what is termed the "B" lick, which contains iron in the form of ferric chloride (see fig. 1). The drawback to the lick is that a certain proportion of animals (about one-third) either take none at all or take it in such small amounts that no beneficial results are obtained. The other form of iron tried in brick form was ferrous sulphate, which has not given such good results as the chloride brick. Although both of these compounds give satisfaction up to a certain stage, they must be considered as only supplemental to the other treatment, which is truly curative.

FIG. 2. CALVES AT MAMAKU FARM SUCCESSFULLY RAISED TO AGE OF NINE MONTHS WITH AID OF IRON SULPHATE AND PHOSPHATE OF LIME MIXED WITH THEIR SKIM-MILK. [*B. C. Aston, photo.*

The composition of the "B" lick is as follows: Ferric chloride, 4½ per cent.; calcium hydrate, 10 per cent.; sodium chloride, 20 per cent.; calcium sulphate and water, 66 per cent.

Ferric chloride supplied as a medicated drinking-water has proved only a temporary alleviative. Ferric phosphate has given slightly better results, but there is considerable difficulty of getting stock to take the medicated water when there are pools of rain-water from which they prefer to drink.

The calves raised on the farm, mentioned in the 1916–17 Annual Report (p. 13) as doing so well on a treatment which included calcium

phosphate, iron sulphate, salt, and sugar, mixed in the skim-milk on which they were fed, all did well and throve up till May (see fig. 2), when they were put out on to grass and commenced to go off in condition. But the fact that nine out of twelve calves were reared to the age of nine months in a season when the mortality among calves in the district was exceptionally high and most settlers lost all their calves is no doubt attributable to the medicinal treatment.

SUMMARY.

Summarizing the results of the medicinal experiments to date, it would appear that of the inorganic preparations while either the administration of (*a*) phosphates or (*b*) iron compounds to cattle on phosphate-dressed pasture may enable them to be kept healthy for a much longer period than otherwise would be possible, it is only by drenching with a syrup-of-iron phosphate that animals may be kept healthy indefinitely or cured of bush sickness. Of organic compounds it is certain that the double citrate of iron and ammonium is a quicker cure for bush sickness than the syrup-of-iron phosphate. It is probable that other organic salts of iron would be similarly successful.

NOTE.—The experiments at Mamaku dealt with in the foregoing notes were under the supervision of Mr. W. T. Collins, M.R.C.V.S., Veterinarian, Hamilton, the animals being in charge of Mr. R. A. Jackson, Farm Overseer. Mr. R. Alexander, Inspector of Stock, Hamilton, superintended the purchase of necessary animals from time to time. Each of these officers by his keen assistance has contributed in no small degree to the success of the experiments.

NOTICE TO FARMERS REGARDING FERTILIZER-DILUTION SUBSTANCE.

THE attention of the Department has been called to a substance purchased by a northern farmer for the purpose of diluting fertilizers. This, on analysis, was found to consist of approximately equal parts of ground limestone and carbon, the latter probably derived from coal. The price charged was £4 10s. per ton, and the farmer reports that the price has since been increased to £6. The matter is being further investigated, but in the meantime the facts are published for general information.

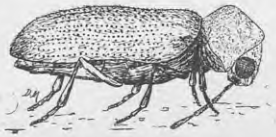
Elephant-grass.—Mr. R. S. Warwick, Rongokokako, writes that he obtained seed of this forage-plant from Australia three years ago, and grew it at Taueru, near Masterton. It came up fairly well, and reached a height of about 5 ft. The season was very droughty, and while all other surrounding herbage dried up the elephant-grass remained green and succulent-looking. It would not stand the comparatively severe frosts experienced in the Wairarapa, however, and died out in the succeeding winter.

THE WOOD-BORER AND ITS CONTROL.

By A. H. COCKAYNE, Biologist.

VARIOUS timbers are often destroyed through the larval activity of certain beetles popularly known under the general name of the "wood-borer." Timber affected with these insects is often said to be affected with dry-rot, a term that really should be used only when the damage is caused by one of the timber-rotting basidiomycetes. It is generally considered that an introduced beetle, cosmopolitan in its distribution and known scientifically as *Anobium domesticum*, is the one mainly responsible. There are, however, many New Zealand species of *Anobium*, and several of these undoubtedly cause considerable damage.

The extremely bad reputation that the *Anobium* wood-borer has gained as a timber-destroyer is due to the fact that it is extremely partial in its attacks to the New Zealand white-pine (kahikatea) and kauri. As both these timbers were commonly used in house-construction in the earlier days of settlement the wood-borer soon became a serious consideration. So bad are its ravages on white-pine, especially any that may contain sap-wood, that this timber fell into complete disuse for internal house-construction. For many years white-pine was almost unsaleable, and it was not until the advent of export dairying that this timber again became valuable.



ANOBIUM DOMESTICUM.
Enlarged 10 diameters.

Anobium domesticum is likely to bore into a very large variety of timbers, especially any that may contain appreciable amounts of sugar in their wood-cells. In general, however, it is only in white-pine and kauri that the most extensive damage is done. In both these timbers good heart-wood is likely to be affected, but with other timbers, such as red-pine (rimu), only the sap at times is likely to become riddled by the larvæ of the beetle. When timbers are stored for many years without much free ventilation species not normally affected may be attacked. This has well been shown in museum material from time to time.

The life-history of *Anobium domesticum* has not been worked out in detail in New Zealand, but it here seems to follow much the same lines as in Europe and America. The larvæ, after tunnelling and feeding in the timber from one to three years, emerge during the months of November and December. During this period a good many may be swept up each day from the floors of affected houses. The beetles each day lay from eighty to one hundred and fifty eggs. This will be done in crevices in the wood, or short bores will be made and several eggs deposited in each hole. In affected timbers the eggs are frequently laid inside old tunnels, and this often makes it impossible to spray for

killing the young larvæ before they enter the wood. *Anobium domesticum* is not really single-brooded, but as beetles usually emerge each early summer it is generally looked upon as such.

CONTROL MEASURES.

The control of wood-borer falls under two headings—(1) in house or building timber, and (2) in movable furniture. So far as wood-borer treatment in building-timber is concerned, this is yearly becoming of less importance. The majority of the old badly infested houses have been replaced by buildings in which white-pine is no longer used. It is only occasionally that renovation of badly infested buildings can be satisfactorily undertaken. The replacement of floorings and linings with red-pine or black-pine (matai) can, however, be done at times. When infested material is removed it is best done in late autumn to early spring, and the timber removed should be destroyed as soon as possible. The joists, &c., should be sprayed with a solution of arsenate of lead, using it at the rate of 1 lb. to 28 gallons of water.

In houses where only one or two boards are affected I always recommend the removal of the affected timber rather than to attempt any direct control. If, however, the cost of doing so is prohibitive, the affected wood should be sprayed in November, December, and January three times with a mixture of benzine and creosote, using five parts of benzine to one of creosote, or a mixture of benzine and naphthalene, dissolving about the equivalent of two moth-balls of naphthalene to every ½ pint of benzine. Benzines of the type of "Powerin" will be found very effective, as they evaporate a little slower than do the lighter types. Spraying with arsenical compounds is often recommended, but the habit of the beetle laying its eggs in old tunnels often makes this method unsatisfactory. The adult beetles appear to feed very little, and any poisonous spray must kill the larvæ emerging from the eggs rather than the mature insect.

So far as furniture is concerned a word of warning against the purchase of second-hand furniture is necessary. In many cases such furniture will be the means of introducing borer. Care should always be taken to see that any such furniture is sound before introduced into a house. Borer in chairs, tables, pianos, and other articles of furniture should be systematically treated. Benzine and creosote squirted into each hole with a small pipette, and then the entrance stopped with a pellet of soap, will be found the best treatment to adopt. Where the wood is extremely badly affected it will be best to get rid of the article rather than try to control the borer. A very good method of dealing with the pest is to keep a sharp lookout for the appearance of any dust or frass being ejected from the holes. Whenever this occurs the larvæ are very easily reached with an application of benzine, and treatment directly such dust appears is often entirely satisfactory, even when only once applied.

As a rule the early calf thrives the best. It is good practice to wean before the normal summer dry weather sets in, for then there is sufficient succulent herbage for the calves, and they do not receive a check.

ELECTRICAL FIXATION OF AERIAL NITROGEN.

By J. ORCHISTON, M.I.E.E., Wellington.

In a summary of a report by Dr. T. H. Norton on the proposed manufacture of nitrogen from the air in the United States, given by the *Electrical Review*, the authority named is quoted as stating, "All the fixation processes at present in industrial use are likely to remain so, and to extend in application according to local circumstances. Further progress will be made, but the general problem of fixing nitrogen from that inexhaustible reservoir the atmosphere is already solved, and the supremacy of synthetic manufacture over natural supplies of nitrate is already asserted. . . . . The pre-war cost of producing 100-per-cent. nitric acid from Chile saltpetre was about £22 10s. The cost of production by the electric arc depends chiefly upon the cost of energy. The new Rankin arc process is reported to give 33 per cent. higher yield than the Norwegian furnaces for equal energy-expenditure. If this claim be justified the furnace has great possibilities, especially in the western parts of the United States of America, where energy costs as little as £1 11s. per horse-power year. The cost of the Ostwald process for oxidizing ammonia is given as £2 10s. per ton of 100-per-cent. nitric acid (including 17s. 6d. for liberating ammonia from cyanamide and concentrating 52-per-cent. nitric acid). The cost of production of 100-per-cent. nitric acid made by various methods may therefore be summarized as follows:—

	Electrical Energy per Horse-power Year.	100 per Cent. Nitric Acid per Ton (British).
	£ s.	£ s.
From Chile saltpetre (at 1914 rates)	.. ..	22 10
Birkeland-Eyde arc process	.. 2 5	13 3
,, ,, ...	.. 1 11	10 11
Rankin arc process	.. 1 11	9 15
By oxidizing ammonia (from cyanamide)—		
(*a*.) Ammonia at £35 per ton	.. 2 5	14 17
(*b*.) ,, ,, ...	.. 1 11	13 8
(*c*.) Ammonia at £23 6s. per ton	.. 1 11	10 14"

The *Electrical Review* adds, "Overpopulation of the world—a contingency which has troubled many people, however unnecessary—is practically impossible now that unlimited quantities of atmospheric nitrogen can be fixed to meet the needs of intensive agriculture. An abundant supply of synthetic nitrogen compounds, made within our own frontiers, means an assured supply of explosives and security against starvation in war-time. Heavier crops may be obtained with less labour where nitrogenous fertilizers are used liberally. Finally, a national nitrate industry provides profitable investment for capital and labour, benefits industry and agriculture by its products, and

improves the balance of trade by substituting home production for importation."

As regards New Zealand, it is estimated that as power can be produced at the Bowen Falls, Milford Sound, at less than 15s. per horse-power year, the corresponding cost to produce a ton of 100-per-cent. nitric acid by the Birkeland-Eyde process would be £7 16s. 2d., by the Rankin method £5 10s., and by the Kilburn Scott furnace somewhat less. It would, however, be well to add 20 per cent. for extra labour charges over that paid in the United States.

To produce calcium nitrate all that is required is to pass a dilute nitric acid (35 per cent. to 40 per cent.) through vats containing limestone or marble until the liquid becomes a saturated solution of calcium nitrate, after which it is crystallized by evaporating the surplus water by means of heat given off from the arc furnace during the process of burning the air.

Many people think that because nitrate of soda is found in a natural state in Chile it is hopeless to attempt to compete with the natural product. They overlook the fact that the nitrate deposit, locally known as caliche, occurs as a layer from 1 in. to 6 in. thick under a bed of conglomerate consisting of sand, feldspar, and pebbles, usually from 20 in. to 30 in. thick. The caliche is never pure nitrate of soda. It contains mixtures of nitrate of potash, common salt, iodide and bromide of sodium, alkaline sulphates, sulphate of lime mixed with sand, &c., and only averages 25 per cent. nitrate. Picked pieces contain more.

To extract the crude salt a hole 20 in. in diameter is dug in the ground. When the saltpetre bed is reached a chamber 35 in. to 40 in. in diameter by 12 in. deep is made, and 3 cwt. to 4 cwt. of powder inserted. By this means a radius sometimes reaching 40 ft. is laid bare. The crude salt is hand-picked to eliminate stones and fragments of little value. It is then conveyed by means of baskets or trucks, which camels transport or draw, to the works for treatment. To dissolve the crude caliche three kinds of apparatus are used, involving the use of coal for heating and raising steam. When the solution is concentrated enough it is run into cases or boxes, where it clarifies, and is then decanted on top of the depot into iron or wooden crystallizers. The resultant crystals average about 95 per cent. of nitrate of soda, and are then ready for packing and conveyance by rail to the coast.

It will thus be seen that the actual labour involved in turning this natural product into a marketable commodity is much in excess of that involved in the electric process, in addition to the cost of coal and explosives. Labour troubles on the nitrate-fields have been very pronounced of late years, and still more accentuated after the war began, resulting in a considerable increase in the cost of production. Added to this the Chile Government levies an export duty amounting to £2 5s. per ton. Prior to the war Chile nitrate of soda was delivered in Europe for about £10 per ton. At present it is quoted in New Zealand at about £25 per ton, but is practically unobtainable. There is every indication that it will never return to the pre-war figure; hence the greater need for developing our water-powers where conveniently located for transport facilities.

The following is the atomic composition of a ton of the electrically manufactured fertilizer, calcium nitrate, the second analysis being another version of the case :—

	lb.		lb.
Nitrogen	291·58	Nitrogen peroxide ..	1,124·70
Calcium	437·08	Lime (CaO)	581·00
Hydrogen	58·68	Water	528·64
Silicon	2·60	Silica	5·66
Oxygen	1,450·06		
Total	2,240·00	Total	2,240·00

It will be observed that the only raw material not produced by the hydro-electric power is the lime and silica. As unburnt limestone or marble is used, the total amount contained in a ton of nitrates involves an expenditure of only a few shillings.

In addition to the burning of the air in the electric furnace, the bulk of the work of manufacture is performed by electric power, and the whole process is largely automatic—a very important consideration where labour is costly.

Electrically manufactured ammonium nitrate, a combination of ammonia and nitric acid, contains no less than 35 per cent. of nitrogen, and may therefore be classified as a concentrated fertilizer of the greatest value in the smallest bulk.

One great advantage claimed for the electrically manufactured fertilizers is that they can be depended upon to be uniform in quality and always up to standard. Other fertilizers may or may not be up to standard. It is well known that the proportion of phosphoric acid contained in commercial basic slag varies considerably. For example, eleven samples tested by J. Fritsch, the French agricultural chemist, averaged 18·28 per cent. of phosphoric acid, being equivalent to 129·39 lb. of phosphorus per ton. The samples fluctuated from 12·41 per cent. to 40·32 per cent. acid, or 87·83 lb. to 285·37 lb. of phosphorus to the ton, the balance being principally lime and silica. Stassfurt kainit usually contains 12·4 per cent. of potash, or 277·7 lb., equivalent to 230 lb. of potassium per ton.

In conclusion, it may be safely stated that owing to their isolation and the intervening mountains and lakes the water-powers of the western Sounds of Otago are practically of no commercial value for transmission to areas where any appreciable population is located. These powers, however, are eminently adapted for electro-chemical works on the spot, such as manufacture of the following products : Nitrogen, calcium carbide, ferro-silicon, ferro-manganese, ferro-titanium, ferro-nickel, ferro-molybdenum, ordinary steel, tool-steels, tungsten, zinc, calcining coal for carbon electrodes, graphite, carborundum, bauxite, aluminum, magnesium.

The electric furnace can utilize power which once over the falls is gone for ever, reclaim materials which in fuel-fired furnaces are irretrievably lost, and produce from them products necessary to the advancing demands of the arts of peace as well as to the national defence.

BEES AND FLOWER-FERTILIZATION.

THE CASE OF BEANS AND PEAS.

By W. H. TAYLOR, Horticulturist.

THE following notes are written with the idea of elucidating certain questions which have been under discussion for some time past, such as, "What perforates the flowers of broad beans?" "Why do runner-beans fail to set beans on the first flowers?" "Do bees cross-fertilize peas?" The authority used by the writer in dealing with these questions is Darwin, in his book "Cross and Self Fertilization of Plants."

Regarding holes in the corolla of flowers, Darwin states that in England these are always made by humble-bees, but that hive-bees invariably avail themselves of the holes and rarely visit in the proper manner flowers that have been perforated by humble-bees. By the possession of powerful mandibles humble-bees are particularly well equipped for making the holes; their object is to obtain the nectar quicker than by entering the flowers, thus enabling them to visit a larger number of flowers. My own observations convince me that there is sometimes another reason. I have taken advantage of every opportunity that has offered this summer to watch the movements of humble-bees on plants in my garden. The first noticed were small black specimens, probably *Bombus ruderatus*, a considerable number of which were at work on antirrhinums. The bees without exception alighted on the lower limb of a flower, and by their weight and movements depressed and opened it; they then entered the mouth of the flower, forcing their way right in so as to reach the nectar. Later on the black bees disappeared and greater numbers of the large banded bee, *Bombus terrestris*, appeared. Not one of these visited the mouth of a flower, but gnawed holes in the corolla just above the nectary. In the course of a few days it was only by close search that flowers could be found without a hole in the corolla; usually there were two holes, one on each side of the rib that runs down the lower limb of the corolla. In this case I conclude that the insects knew they could not reach the nectar in the proper manner. They undoubtedly were too large to enter a flower.

RUNNER-BEANS.

Darwin states that the flower of runner-beans (*Phaseolus multiflorus*) is entirely self-fertilizing, and yet though such is the case it is quite incapable of fertilization without the aid of insects, the fertilizing-organs being in a spirally wound keel from which they must be released to effect pollination. Bees visit the flowers continually. They alight on the left wing-petal, as they can best suck the nectar from this side. Their weight and movements depress the petal; this causes the stigma to protrude from the spirally wound keel, and a brush of hairs pushes the pollen before it. The pollen adheres to the head or proboscis of the bee which is at work, and is thus placed on the stigma

of the same flower or is carried to another flower. That this plant is self-fertile was proved by Darwin and others, who found that when plants were covered so as to exclude insects only very rarely was a bean formed, yet by moving the wing-petals with a pin fertilization took place and beans formed.

It will thus be seen that beans cannot be formed unless the flowers are visited by bees or some other insect sufficiently powerful to depress the wing-petals. The bees are, of course, quite unaware of the presence of the flowers until they see them. Bees do not detect flowers until a considerable number have expanded, presumably because they are not sufficiently conspicuous to attract their attention. The bees may not observe the first flowers on runner-beans, as they are near the ground and to some extent concealed by the foliage. But they soon detect and visit them when many flowers are out, and at once beans are formed. This clearly explains why the first flowers fail to set beans. If bees perforated the corollas instead of visiting the flowers in the proper manner no beans would be formed, because the necessary movement of the wing-petals would not occur.

BROAD BEANS.

Although not quite sure on this point, I believe the agency of bees is necessary to secure fertilization of broad beans (*Faba vulgaris*). If that is the case the reason why the perforated flowers fail to set beans is explained. It is the first flowers usually that are found perforated, and the question arises, Why is it? The explanation is quite simple. I have previously mentioned my observations regarding antirrhinums and how they were constantly visited by humble-bees. About the middle of March in my garden a plant known as "blue spiræa" (*Caryopteris mastocanthus*) began to open flowers. The bees soon found it, and after a day or two had abandoned the antirrhinums and concentrated their attention on the caryopteris. I counted as many as twenty-four large banded humble-bees on the plant at one time. Since that time, so far as I have seen, not a single bee has visited the antirrhinums, which is not strange, as bees always confine their attention to one species while they can, and evidently the nectar of the caryopteris (natural order Verbenaceae) is preferred to that of the antirrhinum (natural order Scrophulariaceae).

The first flowers on an early crop of broad beans open at a time when flowers of any kind are scarce, and the humble-bees make use of them. Later on, when more flowers of the beans have expanded, there are also many other flowers out, and the bees probably abandon the beans in favour of something more to their liking. So that an observer may watch in vain for more visitations by humble-bees on beans.

DWARF BEANS.

The flowers of dwarf beans (*Phaseolus vulgaris*) are entirely self-fertile without the aid of insects, as is abundantly proved by their being grown in greenhouses where bees are not present. Yet they are capable of cross-fertilization by bees, and it undoubtedly occurs. The extent of cross-fertilization is not, however, great, and different varieties grown in close proximity will remain fairly pure, but not entirely so.

GARDEN PEAS.

The flowers of garden peas (*Pisum sativum*) are entirely self-fertile, and usually behave as though cleistogamic (uncrossable), which they certainly are not. Fertilization is effected before the flowers open, and this precludes the possibility of crossing by wind-borne pollen. Notwithstanding these statements—and there is abundant proof that they are true—the flowers are obviously adapted to cross-fertilization. Darwin observes that it is remarkable that they are not often crossed, yet it only very rarely happens. He mentions cases of varieties that have remained pure for sixty years, though each year several varieties were grown together. Hive-bees can have no effect on the fertilization of these flowers, as they are not heavy enough to open them, consequently they cannot gather pollen from them except from old and already fertilized flowers, which they sometimes do, but not to any great extent. For my own part, I have frequently watched my garden peas this season and have not seen a bee on them. Darwin states that he had peas under observation for thirty years, and only thrice during that period did he see bees of the proper kind at work. These were *Bombus muscarum*, a humble-bee. These, he is sure, must have crossed some flowers.

SWEET-PEAS.

The flowers of the sweet-pea (*Lathyrus odoratus*) are entirely self-fertile, and can rarely be crossed by insects and never by wind-borne pollen. I have examined a large number of flowers and proved that fertilization takes place long before the flowers open. However young a flower may be a pod will be found in it, and the smallest pod I could divide with a sharp knife exhibited peas quite distinctly.

BEES AND SEED-GROWING.

It has previously been stated that bees confine their attention as long as possible to one species. It is also known that when gathering pollen bees will not wander far if they can get their load nearby. The knowledge of these facts, and, further, that different orders of plants will not cross, guides seed-growers in planning their plots. All the different species of brassica, which include cabbages, cauliflowers, &c., will cross each other. The seed-grower plans his field so that no two varieties of the same species are close to each other. But this would not ensure safety from crossing unless a considerable number of plants of each variety were grown, for bees will fly quite a considerable distance in search of flowers of a species. Safety is found in growing a good block of each variety. The bees then load up from the one block and the risks of crossing are very small.

Waterproofing Concrete.—Concrete can be made fairly waterproof by mixing in approximately 8 per cent. of clay in powdered form. The strength of the concrete is not materially lessened, though its setting is likely to be lengthened considerably. The result of a great many experiments, however, has been to show that good workmanship, a well-graded aggregate, and plenty of cement is the best way to render concrete waterproof.

INTEREST AND DEPRECIATION CHARGES IN FARM ACCOUNTS.

By A. D. PARK, A.I.A.N.Z., Accountant to the Department.

INTEREST.

THE matter of interest on capital and to what extent it should be taken into account in farm-cost accounts may be first considered. Some authorities advocate that interest should be debited to each farm trading account in proportion to the amount of capital involved in that particular operation. There are many reasons, however, why such practice should not be followed. The chief of these are,—

(1.) Interest represents income to the one who receives it and a deduction from the income of the one who pays it. This being the case, interest on invested capital cannot properly be charged in the cost of production, because no cash transaction actually takes place.

(2.) Interest on capital invested bears the same relation to the farmer as do the profits from the farm, and to ensure such profits it is quite necessary to have the farm properly equipped. It is therefore unreasonable to charge up to the individual farm operations interest on the value of the necessities to carry on those operations.

(3.) Cost accounts for farming operations in order to be reliable and useful should be based on absolute facts, and therefore should not have included any element of doubt or of a variable nature, especially when such costs are subjected to comparison. Cost charges usually are based on an increase in (*a*) some liability, such as wages, &c., or (*b*) a decrease in some assets, such as manures, seeds, &c., used. If the charging of interest is justified, how are we to arrive at a fair rate? Opinions would surely differ, with the result that farm costs for similar products on different farms with otherwise equal charges would show considerable discrepancies.

(4.) Taking the case of a crop unharvested at the end of the farmer's year, any interest included at stocktaking in the value of such crop directly anticipates profits from the crop and therefore inflates the inventory.

Interest charges on capital may, if considered necessary, be debited to an "Interest Account," or an "Interest, Rent, Rates, &c., Account," and at the end of the year closed into profit and loss account. Or, as an alternative, such changes could be provided for in the closing journal entries by a direct debit to profit and loss and a like credit to capital account.

DEPRECIATION.

The matter of depreciation charges—chiefly in relation to farm implements and machinery—will now be briefly considered. Flocks and herds of live-stock and crops are generally treated as floating assets, and as such are not subjected to depreciation. It is by the sale or use of the floating assets on a farm that profits are made, but it is by the use

of the fixed assets, such as implements and machinery, that the chance of making a profit is brought about.

The main points to be considered in charging depreciation are—(1) The cost price; (2) the probable life of the asset; (3) repairs and renewals during life of the asset; (4) the residual value of the asset. There would probably be no difficulty in ascertaining the original cost. The probable life of the asset should be estimated by those thoroughly experienced in its use, but it is also necessary to take into consideration the possibility and effect of new discoveries or later models which might compel the scrapping of the original asset. Repairs and renewals during the life of the asset should be charged, as they occur, to the work on which the asset is employed, when such repairs or renewals become necessary. The residual value is that which may remain in the asset when it is no longer useful for the purpose for which it was bought, and this can be determined by experts.

Having ascertained these facts, the probable cost of repairs and renewals is added to the original cost, and from this is deducted the residual value. The balance represents the amount of depreciation to be provided over the probable life-period, and by simple division may be obtained the amount of depreciation to be charged for that particular asset each year. This method writes off the same amount each year, and to this there is an objection, for while the depreciation charge remains stationary the cost of repairs, &c., will yearly increase as the asset gets older. The more favoured method, therefore, is to write off a slightly higher percentage from the *reducing* value of the asset, and not from the *fixed* original value. The result is that the depreciation at the start is higher, and is gradually reduced towards the end of the life of the asset. As the charges for repairs and renewals operate on the reverse scale, the profit and loss account under this method bears a more fixed yearly charge when both are considered.

The principle aimed at is to provide a rate of depreciation which will, at the end of the life of the asset, reduce the book value to what may be expected as the residual value.

Sale of Moumahaki Ayrshires.—The Department held its first sale of surplus pedigree Ayrshire stock at the Moumahaki Experimental Farm on 18th March. Breeders were well represented in the large attendance, and bidding was keen. In all forty-six animals were sold, averaging 20 guineas per head, this including eighteen calves. The seventeen cows offered averaged 33 guineas, seventeen heifers 18 guineas, and twelve bulls 7½ guineas. Among the cows the highest price, 58 guineas, was paid by Mr. F. Mills, of Hawera, for Agnes III; while Mr. Lawton, of Waiuku, paid 56 guineas for Dominion Fenwick Maggie. The buying ensures that this valuable stock will be well distributed in the North Island.

The best means of getting rid of the common field-daisy on lea land where it is present excessively is to sweeten the ground by draining and liming, afterwards plough the grass-sod well under, and then resow with a good mixture.

WEIGHTS AND MEASURES.

RELATION TO AGRICULTURAL PRODUCTS.

By R. WATERS, Biological Laboratory.

THE following notes were written to meet some of the difficulties encountered by students and by both small and large buyers and sellers of agricultural products. The difficulties arise as much from the inconstancy of the intrepretations of terms as from the variability in the systems and usages of races and of localities.

CONSTANT, VARIABLE, AND EQUIVALENT MEASURES.

Constant measures are those of weight, volume, or extent, each expressed by the same term, and meaning the same wherever that term is employed.

Variable measures of weight, volume, or extent are such as are grouped under a single term, the meaning of which consequently differs in different connections, or in the individual conceptions of different localities or even of the same locality.

Equivalent measures are sets of constants or variables, the terms of which are synonymous and the values of which are equal.

Constant Measures.

Pound Avoirdupois.—Among the English-speaking peoples of the world the pound avoirdupois is the standard of weight for most purposes; it goes by the same name and expresses the same weight. This standard evolved in the following manner: In 1758 the English standard of a pound troy was definitely laid down. This is the foundation of all legal weights. One-twelfth of this weight is a troy ounce, one-twentieth of a troy ounce is a pennyweight, and one-twenty-fourth of a pennyweight is a grain, so that 5,760 grains is a pound troy. Later it was determined that 7,000 grains troy should constitute one pound avoirdupois. These two standards were subsequently confirmed by Acts of the English Parliament that still remain law. Moreover, this conception of a pound avoirdupois has not been corrupted by trade customs to any appreciable extent.

Gramme.—Among the majority of the civilized nations of the world the metric system is required by law. In Britain and the United States of America its use is permitted, and it is there c mon y employed in scientific practice. The system is largely employed in dairy chemistry, seed-analysis, &c. The gramme is the unit of weight under the metric system. 453·59 grammes equal 1 lb. avoirdupois = 7,000 grains. These equivalent weights link up the gramme with the British

avoirdupois and troy systems. The rough equivalent "454 grammes equals 1 lb. avoirdupois" is constantly used in seed-analysis. It may be recalled that the gramme standard of weight originated in the following way: A metre, the metric unit of length, is presumed to be the ten-millionth part of a meridian line drawn from the Pole to the Equator. The one-hundredth part of a metre is a centimetre. A cubic centimetre (1 c.c.) of distilled water is the weight of 1 gramme.

Cubic Centimetre (*c.c.*).—The cubic centimetre is a measure of capacity under the metric system. 1,000 c.c. equals 1 litre, the unit of capacity; 1 litre equals 1·76 pints; 8 pints equals 1 imperial gallon. These equivalents link up the metric with the British measures of capacity.

Variable Measures.

Ton.—The term "ton" is applied to a variety of both weight and capacity measurements. As a measure of weight its chief use in the British Empire is to express the weight of 2,240 lb. avoirdupois. In this connection it is sometimes alluded to as the "long ton" or "gross ton." The "short ton," consisting of 2,000 lb., is the ordinary meaning of the word ton in respect to weight in the United States of America, and is thus commonly used also in Canada, South Africa, and in certain other parts of the British Empire. The metric ton consists of 2,204·6 lb.

As a measure of capacity a "register" ton is a unit of the internal capacity of ships; it consists of 100 cubic feet. The "ton" is also the unit approximately equal to the volume of a long-ton weight of sea-water, used in reckoning the displacement of vessels—35 cubic feet—called specifically a "displacement" ton. Again, the "ton" is the unit of volume for freight—approximately the volume of a ton weight of the particular commodity. In this case it is called a "shipping" ton. A ton of merchandise is often reckoned as 40 cubic feet, and a ton of timber at 42 cubic feet. The shipping ton of 40 ft. is used in New Zealand, with fractions expressed in cubic feet.

Hundredweight.—This term is applied to various measures of weight. In the British Empire it is most commonly 112 lb. avoirdupois. In the United States and various other parts, however, it is 100 lb. avoirdupois. The metric hundredweight contains 110·23 lb. avoirdupois. In each case the hundredweight represents one-twentieth of its particular kind of ton.

Quarter.—This is a term for various measures of weight and capacity, of which more strictly it always represents one-fourth. For instance, as a quarter of a hundredweight it represents in Britain 28 lb. avoirdupois, and in the United States 25 lb. avoirdupois. As a measure of capacity the quarter represents 8 bushels. Now, 1 bushel consists of 8 gallons, and 1 gallon, the standard British imperial measure, is the capacity of exactly 10 lb. avoirdupois weight of distilled water, which occupies 277,274 cubic inches of space. Thus—1 gallon = 277·274 cub. in.; (× 8) 1 bushel = 1·28 cub. ft.; (× 8) 1 quarter = 10·24 cub. ft. The quarter will also be seen to be approximately one-fourth of a ton as used in shipping—namely, 10·24 cub. ft. × 4 = 40·96: hence its name.

Bushel.—This is a term for various measures of capacity and weight. Like the quarter of capacity, it is a multiple of the British imperial

standard gallon—8 gallons constituting 1 bushel. A bushel, therefore, is the space occupied by 10 lb. × 8 = 80 lb. of distilled water, and has a cubic measurement of 277·274 cub. in. × 8 = 2,218·192 cub. in. = 1·28 cub. ft. This is called the "imperial bushel," and applies in the British Empire. In the United States at present, however, the term "bushel" is recognized as the space occupied by only 77·63 lb. of distilled water, the measurement of which is 2,150·42 cub. in. This is known as the "Winchester bushel," and was in early times the recognized bushel of England, being later abandoned. In various places throughout the world a bushel is actually a certain weight of a certain commodity. That weight may be a standard weight understood or enforced by law for each commodity within a certain district, country, or kingdom. Such standards, however, vary considerably in different localities. The bushel may also be a weight assigned to each line of certain commodities according to the actual weight of a bushel of capacity.

Summary.

The points of most practical value in the foregoing remarks may be briefly summarized as follows:—

1. The variable measures of weight and of volume arrange themselves round and depend very largely upon the ancient and constant British pound avoirdupois. Thus the ton, hundredweight, quarter, and bushel are in many of their meanings merely multiples of the pound avoirdupois.

2. One of the most useful equivalents in seed-analysis, and one that links up the British avoirdupois with the widely accepted metric system of weights, is the formula—1 lb. avoirdupois equals 453·59 grammes, or, roughly, 454 grammes.

3. Another most important equivalent linking the British avoirdupois with the British standard measure of capacity is that 10 lb. of distilled water equals 1 gallon. The formulas 1,000 c.c. equals 1 litre and 1 litre equals 1·76 pints are equivalents in constant use and connect the metric with the British imperial systems.

4. Great discretion must be exercised in commerce in the use of the terms "ton," "hundredweight," "quarter," and "bushel."

5. It is most important to remember that 1 c.c. of distilled water weighs 1 gramme—this not only because it connects up the capacity and weight measures under the metric system, but also because this fact underlies the standard by means of which the specific gravities of liquids and solids are compared and expressed. Specific-gravity estimations enter largely into scientific agricultural laboratory work. This cubic centimetre equivalent, together with "10 lb. water = 1 gallon," is used considerably in agricultural chemistry, notably in the preparation of solutions of a definite strength per cent. Thus 100 c.c. of water plus 1 gramme of a soluble solid is a 1-per-cent. solution of that solid, but 99 c.c. of water plus 1 c.c. of another liquid is a 1-per-cent. solution of that liquid.

LOCAL USAGE OF WEIGHTS AND MEASURES.

The more local usages of weights and measures introduce a still further set of meanings for certain of the terms just reviewed—meanings which are a very fruitful source of misunderstanding and even of extensive deception in transactions between buyers and sellers.

The Bushel.—In New Zealand certain agricultural seeds are in general sold neither by bushel capacity nor by the pound weight. They are sold upon an entirely arbitrary weight which is called a "standard bushel." The bushel standards are practically universally acknowledged throughout the trade in New Zealand. They are as follows: Oats, 40 lb.; wheat, 60 lb.; rye-grass, 20 lb. The number of bushels in a sack or in a line of many sacks is estimated on the number of pounds avoirdupois. Thus a sack containing 140 lb. of rye-grass contains $140 \div 20 = 7$ bushels, and is bought, quoted, and sold as 7 bushels. Again, a 48 in. sack may contain 160 lb. of rye-grass, in which case it is reckoned as containing $160 \div 20 = 8$ bushels. This kind of bushel has no connection with the bushel of capacity, which equals 1·28 cub. ft., nor has it much real connection with the term "bushel weight," which is the actual weight of a definite capacity of 1 bushel = 1·28 cub. ft., as discussed later. The most that can be said of it is that it has to do with the bushel weight, inasmuch as it is the *accepted* bushel weight for oats, wheat, and rye-grass. The most accurate conception of the basis on which rye-grass is bought and sold in New Zealand is that the transactions are made at a price per 20 lb. lot; similarly, with wheat, at a price per 60 lb. lot; and oats, at a price per 40 lb. lot. The standard of 40 lb. per bushel for oats, while constant in the New Zealand trade, may or may not agree with the standard of other places. For instance, the legal standard bushel in the United States for oats is 32 lb., while in Great Britain it is 40 lb. and 42 lb. for local, and 38 lb. and 40 lb. for foreign oats. Our standard of 60 lb. for wheat agrees exactly with that of the United States, but differs from the British, which is 63 lb. for local and 62 lb. for foreign wheat.

Bushel Weight.—The discussion of the term "bushel" naturally leads into a consideration of the term "bushel weight," which expresses the approximate (usually correct to the nearest pound avoirdupois) weight of a volume of seed measuring 1 bushel or 1·28 cub. ft. The intrinsic value of the amount covered by the expression "bushel weight" depends upon two factors—namely, the true density and the apparent density of the seeds.

True density: In physics this is the ratio of mass to bulk (or volume) of matter. In seed work the bushel weight is raised or lowered according to the density of the various parts of each seed. The density of the compact moist mass of starch, &c., constituting the kernel of rye-grass, for instance, is greater than that of the dry aggregation of empty cells constituting the chaff. If, then, the individual seeds of a line have very large kernels, as in certain Canterbury rye-grasses, or large kernels as compared with the weight of the chaff after dressing, as is strikingly exhibited in certain Hawke's Bay lines, then the total density of each seed is very great, and the weight of a bushel is high—perhaps 35 lb. If, on the other hand, another line, possibly through an unfavourable season, immaturity at harvest-time, or bad or long storage, consists of kernels that are shrivelled or small in relation to their chaff (or glumes), then a greater proportion of the seed consists of chaff than in the first instance, and the total density of each seed is less and the bushel weight low—perhaps as low as 25 lb. per bushel. From this it will be seen that the variation in bushel weight arising from true density in a seed like rye-grass that has such a large chaffy covering must be much greater than the variation from the same cause in the bushel weight of wheat, which is practically all kernel.

Apparent density: This refers to the density not of the individual seeds, but of the seeds together with the air-spaces about them just as they naturally lie in bulk. The principle involved can well be represented by a box of small shot and a box of larger shot made of the same material. Placed on the scales it will be seen that the small shot weighs heavier than the larger size. The reason for this is that in the case of the small shot the sum total of the air-spaces is less than in the case of the larger shot. This fact can be easily proved by filling the air-spaces in each case with water and pouring it off into a measure. It will therefore be seen that small seeds show a greater apparent density, and consequently a greater bushel weight than large seeds. Thus certain Hawke's Bay ryes show bushel weights greatly increased merely on account of the small size of their members, while certain Canterbury ryes are lowered in bushel weight largely on account of the greater size of their members. When, as in the case of some Hawke's Bay and other lines, the true density of each seed has been increased by the removal in the dressing of as much of the chaff as possible, and the apparent density is also high by reason of the small size of seed, very high bushel weights are sometimes obtained—as much as 40 lb. per bushel.

The influence of the apparent density upon the bushel weight of seeds is very frequently quite overlooked. To a large extent the popular view is that seeds of a heavier bushel weight are relatively better than those of a lighter bushel weight because the former indicates that the kernels of the seeds are well developed, and as it is the kernel that has to grow there is some assurance that seeds of a high bushel weight will be of good germination capacity. Moreover, large seeds are perhaps rightly believed to produce large and vigorous plants. Such a conclusion is often formed entirely with the idea that bushel weight is purely an indicator of true density; it pays no regard to apparent density, which may greatly negative the high results arising from true density.

A conclusion of this kind is in some cases accidentally true, but in others quite erroneous. Were it not that we have many seed-sellers of undoubted repute the bushel weight of seeds in quotations would generally be of doubtful value. When the germination capacity is not quoted it therefore behoves every buyer, where possible, to inspect or have inspected a sample of the seed offered, if for no other reason than to ascertain that the bushel weight quoted is not in reality obscuring undesirable qualities, such as small immature seeds, heavily dressed. If, however, the seeds are somewhat small but plump, as in the case of most Hawke's Bay rye-grasses, then despite heavy dressing they are probably excellent seeds.

Concrete for Small Sheep-dipping Plant.—On page 9 of the *Journal* for January last were given the quantities of concrete required for the dip and draining-floor of the one-man sheep-handling plant recommended by the Department. A correspondent writes pointing out that the information would be more useful to the average farmer stated in terms of the quantities of the different materials required for the job. These are approximately as follows for a 1–2–6 mixture: Cement, $5\frac{1}{2}$ barrels of 376 lb., or 17 bags of 124 lb.; sand, $1\frac{1}{2}$ cubic yards; gravel, $4\frac{1}{2}$ cubic yards.

LUCERNE EXPERIENCE.

THE several notes which follow deal with experience in certain localities, soils, or situations where lucerne-growing is still more or less in the trial or initial stage.

IN THE LOWER CLUTHA VALLEY.

The suitability of the lower Clutha Valley for lucerne-growing has been well demonstrated by one of the Department's original co-operative lucerne test-acres laid down some years ago on Mr. G. Anderson's farm, at Clutha Island, a locality which was recently visited by very severe floods. The area was sown in December, 1912, and despite adverse weather conditions the lucerne on the whole made a good start in its first season. Of the four divisions into which the area was divided for test purposes the plot with lime and inoculated soil did best; that with inoculated soil alone came second; the plot with lime alone was patchy; in the untreated plot the plants were thin and backward, although very even in growth. Although the stand eventually evened up it was demonstrated that on this land it would be well to dress with both lime and inoculated soil before seeding. The untreated soil sown with lucerne would in time become inoculated, but to secure an early and reliable stand both liming and pre-inoculation should be practised. The area, which was sown broadcast, has up to the present had no cultivation given to it. Three cuts have been taken off the stand each season. About two years ago the lucerne appeared sickly, and, thinking it was dying out, Mr. Anderson in the following winter carted and fed turnips to stock on the ground, with the idea of ploughing up the stand later. To his surprise, however, the lucerne came away better than before, and the stand was allowed to remain. This treatment was rough, but the stock very probably trampled and killed aggressive grasses and weeds and to some extent manured the ground. In any case the lucerne is still thriving. A further small area of lucerne was sown in the autumn of last year, under Mr. W. J. McCulloch's advice, on the property of Mr. Fazackerly, Clutha Island, and this is also growing remarkably well. The opinions of departmental officers concerned may be here quoted:—

Mr. W. J. McCulloch, Fields Instructor, Invercargill (in whose district the Clutha Valley is comprised): "I firmly believe that the farmers along the Clutha River banks are missing a great opportunity in not attempting to establish lucerne more generally. The land on which both the plots in question are situated is in every way similar to many hundreds of acres in that district."

Mr. A. Macpherson, Fields Instructor, Christchurch (under whose original direction the lucerne on Mr. Anderson's farm was established): "I have always held the opinion that the Clutha had a most suitable soil for producing lucerne to perfection—that is, where the land is not liable to be flooded over for any length of time. Farmers would do well, in view of the present uncertainty of the rape and turnip crops, to pay more attention to this valuable forage plant."

Mr. A. H. Cockayne, Biologist: "The point of importance in regard to this test, apart from the effect of winter-feeding stock on the area, is that lucerne is likely to be a success on the silt deposits of the Lower Clutha. I have always thought that such country, well supplied as it is with potash from the broken-up mica-schist of the interior, should prove valuable for lucerne. The success of this experimental area emphasizes the general suitability of river flood-plain land for lucerne-growing."

SOME OF THE LUCERNE AT SOMES ISLAND.

LUCERNE AT SOMES ISLAND.

In the *Journal* for April, 1918, an account was given of the laying-down and first season's growth of an area of lucerne at Somes Island Quarantine-station, where the clay soil and the formation are fairly typical of the hills round Wellington. In this case the ground was limed and manured, but no inoculated soil was used. After the final cut had been made last season the ground was hand-hoed between the rows in May, and another hoeing was given in August, the latter cultivation being preceded by a dressing of phosphate manure. The lucerne came away well in the spring and has made excellent growth during the season, five cuts of average length having been taken. The lucerne is established in three separate areas of varying aspects but similar soil. No appreciable difference has been noticed between the growth of the two varieties sown—Marlborough and Hunter River.

The lucerne forage has been very useful and acceptable for feeding to quarantined stock on the island.

LUCERNE ON PUMICE-DEPOSIT COUNTRY.

At the time of the Tarawera eruption, in 1886, a large extent of country in the neighbouring Bay of Plenty district was covered by a deposit of wind-borne pumice or ash ejected from the volcano. There are thousands of acres of this class of land more or less in fern and scrub which could be easily cleared and ploughed. With a view to testing the suitability of the land for lucerne-growing the Department has laid down a quarter-acre plot at the rabbiter's camp, Te Teko, Whakatane County. As will be seen from the following particulars supplied by Mr. R. Rowan, Fields Instructor, Auckland, the results so far are very promising. In the 1917–18 season the land—which consists of coarse pumice soil on a stratum of black loam lying from 12 in. to 18 in. below the surface—was in maize, turnips, and kumaras. To prepare it for lucerne it was ploughed in July, 1918, and 5 cwt. of carbonate of lime sown and harrowed in a few days later. At the end of October the ground was disk-harrowed and rolled twice, being well consolidated. On 18th November the plot was sown down in drills 21 in. apart, the seed being mixed with a total of ½ cwt. of superphosphate, ½ cwt. of bonedust, and 50 lb. of inoculated soil, in two lots—part Marlborough and part Hunter River variety. The seedling plants appeared above ground on 2nd December, and by 10th January had grown to a height of 4 in. to 6 in., the take being a fair one, but colour uneven. A good deal of fern, sorrel, and other weeds were now showing, and the plot was cleaned by intercultivation with a horse implement and hand-weeding. By 24th January the plants had grown to 8 in. to 12 in. high, with improved colour. Early in March the lucerne commenced to flower, was leafy, and in good healthy condition generally, with young shoots appearing. The height was rather uneven, averaging 2 ft. 6 in., and running up to 3 ft. 4 in. The plot was very clear of foreign growths. On 10th March the crop was mowed for the first time. The test has attracted considerable attention, and the future development of the stand will be watched with interest.

High Schools Camp at Ruakura.—By arrangement with the Department of Agriculture a very successful camp course, covering about a week, was held at the Ruakura Farm of Instruction last month for senior boys from the district high schools of the Auckland Provincial District. The schools of Taumarunui, Tauranga, Te Kuiti, Cambridge, Rotorua, Matamata, Paeroa, Waihi, Coromandel, Pukekohe, and Aratapu all sent contingents, a total of sixty boys being present. A very practical programme in close association with the varied activities of the Ruakura establishment was carried out in the daytime, while in the evening lectures on agricultural subjects of general interest were given. The camp was in charge of agricultural instructors of the Auckland Education Board—Messrs. W. Hudson, J. Stevenson, and F. R. Callaghan—each of whom dealt with sections of the course. Considerable assistance was also given by members of the farm staff.

INSECT PESTS IN ORCHARD NURSERY STOCK.

CONTROL OF RED MITE AND WOOLLY APHIS.

By GORDON ESAM, Acting Assistant Director of the Horticulture Division.

AT the Arataki Horticultural Station last winter experiments were undertaken in the control of red mite and woolly aphis on nursery stock by dipping and fumigation. Although little benefit was expected from fumigation against the eggs of red mite, it was considered advisable to test its effect on woolly aphis. Two-year-old Munroe's Favourite apples were selected for the trial. The tests were undertaken on the following lines :—

Lot 1 : Dipped 22nd July in red oil, 1–6, 1–8, 1–10, 1–12, 1–14. Ordinary dipping, trees being well submerged and then taken out. Some trees were dipped roots and all ; others were dipped to ground-level only.

Lot 2 : Dipped in red oil at same strengths as lot 1. Trees in this lot submerged for three minutes, roots included.

Lot 3 : Dipped in red oil at strengths same as lot 1, but oil heated to 120° F. Ordinary dipping, trees being well submerged (including all roots) and then taken out.

Lot 4 : Dipped in lime-sulphur, 1–6, 1–8, 1–10. Ordinary dipping, trees being well submerged and then taken out. Roots of some trees dipped.

Lot 5 : Fumigated 22nd July, as follows :—

Sublot.	Sulphuric Acid.	Cyanide of Potassium.	Water.	Capacity of Chamber.
(*a*.)	¾ oz.	¾ oz.	2 oz.	100 cub. ft.
(*b*.)	1 oz.	1 oz.	3 oz.	100 cub. ft.
(*c*.)	1½ oz.	1½ oz.	4 oz.	100 cub. ft.
(*d*.)	2 oz.	2 oz.	5 oz.	100 cub. ft.

This test was also varied by using a quarter less of sodium cyanide than the quantity of potassium cyanide shown above. All roots were exposed to the fumes of the gas.

The following are observations made on the corresponding lots of trees after planting :—

Lot 1.—Examined 30th October : Woolly aphis showing on oil 1–8, 1–10, and 1–12. No live red mites on any plot, but eggs looking fresh and red ; lighter in colour on oil 1–6 and 1–8. Examined 22nd November : No live mites on oil 1–6 ; several live mites on oil 1–8, 1–10, 1–12, and 1–14. Examined 11th December : No woolly aphis on oil 1–6, but an odd live mite or two. Oil 1–8 showing slight woolly aphis and live mites. Oil 1–10, 1–12, and 1–14, woolly aphis a good hold.

Lot 2.—Examined 30th October: No woolly aphis showing except on oil 1–14. No live mites on any plot, and eggs not so fresh-looking as on lot 1. Examined 22nd November: No live mites on any plot. Examined 11th December: Oil 1–6, 1–8, 1–10, 1–12, no live mites and no woolly aphis. Oil 1–14, an odd live mite or two and a little woolly aphis. Although all the roots were submerged in this test the trees made normal growth and compare equally with any of the other lots.

Lot 3.—Examined 30th October: No woolly aphis and no live mites. Eggs duller than on other plots—almost a brown colour. Examined 22nd November: No live mites on any plot. Examined 11th December: Oil 1–6, 1–8, and 1–10, no live mites and no woolly aphis. Oil 1–12 and 1–14, an odd live mite or two showing; no woolly aphis. Growth in this lot was in no way retarded by dipping the roots.

Lot 4.—Examined 30th October: All treatments quite a failure. Live mites on the move on each of the three plots. Woolly aphis showing on each.

Lot 5.—Examined 30th October: All fumigations quite unsuccessful. Live mites and woolly aphis on all plots.

CONCLUSIONS.

For the control of woolly aphis and red mite on deciduous nursery stock the tests clearly demonstrated that dipping is quite successful provided the plants are submerged for three minutes in oil at a strength of 1–10.

The failure of ordinary dipping as compared with a three-minutes immersion was very marked.

Heating the oil to 120° F. is as good as the lengthened immersion, but not practical for dipping purposes.

Lime-sulphur, 1–6, was quite inefficient compared with oil—in fact, a failure.

Fumigation, even used as strong as indicated in (*d*), was a positive failure.

There appears to be no danger in dipping the roots in July.

Most nursery stock is lifted and despatched before the end of July. The foregoing trials demonstrated that dipping in oil is perfectly safe in July. Further tests will be made during the coming months. It is proposed to dip during the last week in May, the middle of June, and in July, and note whether the earlier dipping has any detrimental effect on trees and if it will give the same result in the control of pests.

Mowing Weeds.—A good demonstration of the value of the use of the mower to deal with weed-growths on farm pastures was afforded at Ruakura this season in paddock No. 9. This was cut over early to get rid of the weed silene, or catchfly which had spread over the whole field. The operation was so effective that No. 9 took the position of best clover-field on the farm.

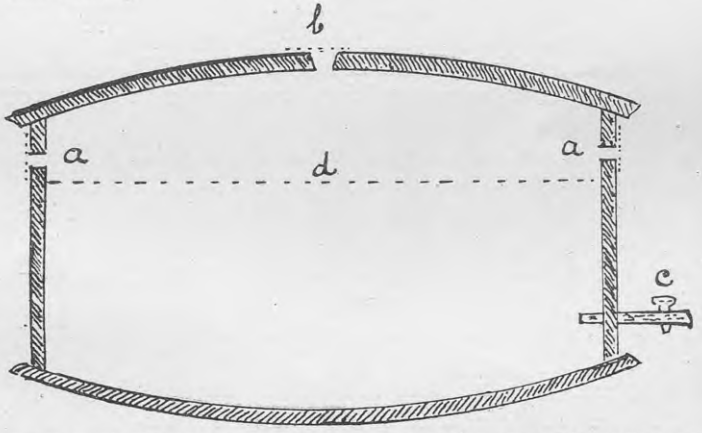
VINEGAR-MAKING FROM APPLES.

A SIMPLE METHOD FOR ORCHARDISTS.

By S. F. ANDERSON, Vine and Wine Instructor.

In making vinegar from any of the fruit-juices it is necessary (unless the product is strictly for home consumption only) to conform to the regulations under the Sale of Food and Drugs Act, 1908, No. 24 (1) of which states, "Vinegar shall be the liquid produced by fermentation and acetification of any of the substances mentioned in clause (2) of this regulation (including apples). It shall contain not less than 4 grammes of acetic acid in 100 cubic centimetres; it shall not contain any sulphuric or other mineral acids, lead, or copper; nor shall it contain any added substance or colouring-matter except caramel."

The specific gravity of a vinegar containing 5 per cent. of acetic acid should be about 1·019, the range being 1·017 to 1·021: that is, the finished article ready for putting on the market should register about this density.



SECTION OF BARREL ARRANGED FOR "SLOW" PROCESS OF VINEGAR-FERMENTATION (SEE OPPOSITE PAGE).

(*a*) ¾ in. holes at each end, covered with scrim or cheese-cloth; (*b*) bung-hole; (*c*) wooden spigot; (*d*) level of vinegar.

THE CIDER STAGE.

The first stage is making a cider, for which the following plant is required, installed in a suitable shed with water-supply, &c.: (1) Crusher; (2) a press for extracting the juice, or, as it is generally called, the must; (3) casks, tubs, wooden buckets, funnel, indiarubber tubing, taps, &c.; (4) hydrometer for testing the amount of sugar in the must.

Full directions for cider-making were given in an article published in the *Journal* for February, 1918, to which those requiring the information are referred.

The better the cider the higher quality will be the vinegar. Therefore the riper the apples and the more natural sugar they contain the more alcohol is developed. After crushing an average sample of the apples to be used, straining the juice, and testing it with the hydrometer, the result should show a specific gravity of 1·057. This is equal to 14 per cent. of sugar. If it is below this, sugar should be added, but well-ripened apples will exceed the figure quoted.

The juice or must is now placed into casks to ferment. As this operation cannot be done until autumn, about April or May, the temperature will then have dropped considerably, and some means are required to prevent it going below 60° F. Fermentation soon commences, and lasts three or four days. When that is quite over we have a cider containing about 7 per cent. of absolute alcohol by weight.

MAKING THE VINEGAR.

Vinegar is made from this cider by the transformation of the alcohol by acetic fermentation. This is brought about by the vinegar bacteria, in a temperature higher than that required for making the cider—namely, between 70° and 85°.

Probably the best method to be followed by the small grower will be what is known as the "slow" process. This is carried out in a barrel prepared as shown on the opposite page. After the cider is made it is put into this barrel to acetify. The current of air passing through the holes at the ends, and the high temperature, cause the oxidation of the liquid. Where the conditions are such that a high temperature cannot be maintained, as in a room or ordinary building, the cask can be placed on the sunny side of a building and protected from cold winds, but the process will be slower. A few quarts of vinegar will supply the vinegar bacteria and start the acetic fermentation. It is then a matter of time to turn the whole into vinegar.

FLANNEL FILTER.

The quantity to be made at any one time will depend on the size of cask used. A quarter-cask holds about 36 gallons, and prepared in the way shown in the drawing it would probably make only 20 gallons. A wine-hogshead holds about 63 gallons and would do for making about 40 gallons.

Neither the cider nor the vinegar should be allowed to come into contact with iron or iron vessels, as the acids set up dangerous salts. Iron hoops of casks and wooden buckets should be well painted to protect them.

After the acetic fermentation is complete, and the liquid has settled clear, it can be filtered before being put in other suitable-sized casks to be finally cleared. It is better for being kept a year. If not quite clear for bottling at the end of that time it may be fined with isinglass, whites of eggs, or Spanish clay. Half an ounce of isinglass, or the whites of six eggs, or about 2 lb. of Spanish clay, is sufficient for 50 gallons. Isinglass is the best for the purpose. It should be broken up into small pieces and soaked in half a gallon of the vinegar till it is

swollen and soft. Warming the mixture will aid in dissolving it. It should be put through a fine sieve to thoroughly break it up and reduce it to a very smooth solution before it is used. The whites of eggs or Spanish clay, if used, are treated in a similar way.

The filter may be a cone-shaped bag made of some sort of cloth, cricketing-flannel being the best material. The mouth of the bag is sewn round a small hoop to keep it distended, and the filter is suspended from the ceiling at a convenient height for putting the liquid through.

Quite a good article can be made in limited quantities by the method described. For vinegar-manufacture on a large scale special plant is required.

THE CAPE GOOSEBERRY.

By W. H. TAYLOR, Horticulturist.

THE Cape gooseberry (*Physalis edulis*) is botanically a perennial plant, though it does not always behave as a perennial in New Zealand, and for practical purposes it is not profitable to treat the plant as being perennial.

The course of cultivation is as follows: Sow the seed in boxes in autumn—March if in the open air, April if in frames; prick off the seedlings into other boxes and keep them away from frost; plant out in spring when frosts are past, in an open situation, full exposure to sunlight being necessary to secure best results. The soil should not be overrich with nitrogenous manures, but phosphates and potash are necessary. Liming the soil previous to planting is useful. With regard to planting, various plans are adopted. I recommend planting in clumps of three, placing a plant at each angle of a triangle the sides of which measure about 9 in., the clumps to be 5 ft. apart. Planted in this manner the growths lock together and wind will not affect them.

A good crop should be obtained the autumn after planting. The following spring, when frosts are past, the plants should be cut down to within about 6 in. of the ground. Frost may have killed most of the branches, but they should not be cut off till the time indicated, as they protect the base of the plants from frost. When the cutting-down is done new shoots will usually have started from the bottom, and these should be left. Strong growth will soon be set up, resulting in large clumps by autumn, when the heaviest crop will be obtained. When this (the second season's) crop is over the plants should be destroyed and a new start made. Many of the plants die after the second crop. It is a good plan where Cape gooseberries are grown commercially to start a new lot of plants every year, so that each year there will be a second-season crop (which is the heaviest) as well as a first-year crop. As regards yield there are many circumstances which will cause variations in the weight of crop. It depends largely on securing a good variety, which may be possible only by selection.

The Cape gooseberry is not subject to any special disease. In hot and dry places red spider sometimes attacks the foliage, but such attacks are not general.

CONTROL OF BLACK-SPOT OF PEAR.

SPRAYING-TESTS AT TE KAUWHATA.

By L. PAYNTER, Orchard Instructor, Hamilton.

IN view of the diversity of opinion regarding the control of black-spot of pear (*Fusicladium pyrinum*) in the Auckland Province it was arranged by the Horticulture Division to take over a portion of Mr. J. B. Haxton's pear-orchard at Te Kauwhata, with the object of ascertaining whether or not it was possible to effectually control this disease under the adverse conditions often prevailing there.

The failure of growers to control black-spot has been very apparent for some years past. The Fruit Inspectors in charge of the large centres have had a considerable quantity of fruit to condemn for this trouble. In this state of affairs it was considered the best course to try and convince growers that the fault in the main lay with themselves, in the shape of defective spraying. Whether the object has been accomplished may be left to readers of the following record to judge. Taking all the facts into consideration, and in conjunction with the results obtained in orchards in close proximity to the area under review, I think the percentage secured of clean fruit shows plainly that it is quite possible to reduce the infection to a minimum.

The season just past will be admitted by most, if not all, to have been one in which the development of the spores of black-spot has been very rapid, necessitating constant spraying to prevent infection.

The area selected consisted of Williams Bon Chretien pears, and was divided into four equal plots, each containing eighty-four trees, this being not so much with the idea of testing various spraying-compounds, but to ascertain, if possible, the minimum amount of spraying necessary if satisfactory work is to be accomplished.

The plots were sprayed as follows :—

Plot No.	Spray.	Date of Spraying.
1 and 2 ..	Lime-sulphur, 1–12	27th August.
2 and 3 ..	Bordeaux mixture, 8–6–40	1st October.
1, 2, 3, and 4 ..	Bordeaux mixture, 6–4–50	10th October.
1, 2, 3, and 4 ..	Bordeaux mixture, 3–4–40	31st October.
1, 2, 3, and 4 ..	Bordeaux mixture, 3–4–40	25th November.
1, 2, 3, and 4 ..	Bordeaux mixture, 3–4–40	17th December.
1, 2, 3, and 4 ..	Bordeaux mixture, 3–4–40	7th January.

Previous to the application of lime-sulphur to plots 1 and 2, on 27th August, the weather had been very wet. Plots 2 and 3 were sprayed on 1st October, as per table. This was intended as a cluster-bud spray, but owing to weather conditions the application was delayed nearly a week. Immediately after this rain set in again, but continued only for a few hours, followed afterwards by a

week of sunshine. At the time the next spraying was to be done rain again fell and continued for a few days, thus delaying what I consider the most important application—namely, 6–4–50 bordeaux at the pink stage. The weather being warm at this time—10th October—many of the trees were showing a great deal of bloom. It was a bright day when this application was given. Rain set in again the next day and continued almost every day up to the 31st, when the next application was given, it being also a bright day. Rain fell again the next day, and continued for a few days, making conditions favourable for the development of black-spot. Following upon this there came a spell of fine weather and warm days. The next application was given on 25th November, as per table, and was no sooner completed than light misty rain commenced to fall, but lasted only a few hours. The days intervening between this and the next application, on 17th December, were more or less showery. There was only one day in which no rain fell. After the last-mentioned application the weather was fairly fine until the New Year, when rain again set in, making conditions exceptionally favourable for the development and spread of the fungus-spores. The last application was given on 7th January, as per table. I may add that with the last four sprayings, commencing on 31st October, arsenate of lead was added for the control of codlin-moth. The results were as follows:—

Plot No.	Total Crop.	Infected Fruit.	Percentage of Infection.
	Cases.	Cases.	
1	99	14	14
2	137	5½	4
3	101	5½	5½
4	61	8	13
Grand total ..	398	33	Average 8⅓

Although the results are not quite up to expectations, consideration must be given to the fact that the writer's headquarters are thirty-five miles from the test area. This inconvenience the orchardist does not have to face, as he is always on the scene of action and in a better position to watch developments, and should therefore get even better results. I feel confident that as the percentage of infection during a bad season and under such conditions as mentioned was brought to the point just recorded there should be little or no trouble in reducing the infection even lower.

The foregoing data show the least infection upon the plots that received the cluster-bud spray in addition to the pink spray. This must be considered in conjunction with the weather conditions prevailing at the time of application.

The cluster-bud spraying was delayed almost long enough to call it the pink spray, as a great many of the buds were at that time showing pink. Moreover, when the pink spray was applied many of the trees were almost in full bloom. This was particularly so with plot No. 1.

The greater portion of the remainder of Mr. Haxton's orchard was in a very bad state, and would show at least 50 per cent. of black-spot infection, if not more.

The question of cost has been raised in considering the amount of spraying given to the plots under test. This has not been lost sight of. The material used, also time taken to carry out the work, are as follows: Bluestone (130 lb.), £5; lime (three tins), 15s.; lime-sulphur (8 gallons), £1 12s.; time (five days), £3 15s.: total, £11 2s. This works out at about 8d. per tree, which is not a very great item. It must also be remembered that the above is the maximum of spraying required. If weather conditions were favourable it could be reduced probably to about half, but "better sure than sorry." It is worth noting here that the crop of pears this season was light. The cost of spraying a heavy crop would be very little more.

In conclusion I may state that nothing less than thorough application of the sprays is of any use. It is quite necessary for a covering of the fungicide to be kept on the fruit to prevent infection, and more especially when conditions are such as to favour the development and spread of such a disease as black-spot.

THE AILANTHUS-TREE FOR WOOD-PULP.

INTEREST in the wood-pulp industry is being aroused in various quarters. The proposal is in the first place to utilize various native plants in certain areas. Before the industry can be established on a sound and permanent footing, however, it will be necessary to provide for regeneration of supplies.

In this connection a notice in a recent issue of the *Monthly Bulletin of Agricultural Intelligence and Plant Diseases*, Rome, of an article by an Italian writer, V. Fedele, is interesting. It states, "The author, as a result of experiments he made, mentioned the ailanthus as an excellent paper-yielding plant. It has the advantage of growing well everywhere, even in arid or purely rocky soils. By pollarding every three years and keeping the crown about 3¼ ft. to 4¼ ft. above the ground the author obtained about 200 lb. of wood, which yielded 44 per cent. of easily bleached cellulose of a quality suitable for paper-pulp. One acre may contain from 240 to 280 trees."

Ailanthus glandulosa is vernacularly known as tree of heaven. It thrives admirably in New Zealand, and has the remarkable habit of only making its strongest growth after pollarding. This habit, together with its rapid growth, particularly fits this tree for replanting worked-out timber areas. The ailanthus is readily propagated by root-cuttings, and transplants well at any age. An acre of trees would yield approximately 25 tons of wood every third year.—*W. H. Taylor, Horticulturist.*

Cereal Yields at Moumahaki.—Recent threshings of this season's cereal crops at the Moumahaki Experimental Farm gave the following results per acre: Oats, 100 bushels; barley, 73 bushels; wheat, 42 bushels. The yields for oats and barley are said to be records for that part of the coast.

CONCRETE FINISHING FOR A DRAINING-PEN.

THE following information is furnished by the Public Works Department in response to an inquiry regarding the best method of finishing off the concrete floor of a sheep-dip draining-pen, cement plastering being specially referred to :—

The cement plastering for a draining-pen should be composed of one part of fresh Portland cement to three parts of clean, sharp, fresh-water sand. The concrete should not be finished with a perfectly smooth surface, in order that there might be what is known as a "key" for the plaster to adhere to. If the concrete bed is laid in sections the plastering should be delayed until all the sections have been finished. The plastering should then be done, if possible, in one continuous operation, so that there would be no weak points in it at the end of one day's work and the commencement of another.

As it is not possible to prevent shrinkage-cracks appearing in concrete of any large extent unless the same is heavily reinforced, it is advisable to put in special joints in order that the cracks may appear along these joints, which would be in straight, symmetrical lines, and therefore not unsightly. These joints are quite easily made by the insertion of a sheet of brown paper, the method of procedure being as follows : Boxing, say, 12 ft. square by the depth proposed, is made and filled with concrete, the same being spaded down carefully alongside the boards. When this is set sufficiently the boards are removed, brown paper stuck to the vertical edge, and the new concrete filled against this paper.

In order to expedite work the whole area to be concreted can be divided off into squares, one-half of which could be done at once, every alternate square being left vacant. Then, when the first group of squares has set sufficiently, the whole of the remaining space can be filled up in one operation. If the second lot of concrete is kept excessively wet for about ten days after it is laid it will expand in setting and thereby reduce the cracks to a minimum. If a trowel is run along on the top of these joints, through the newly laid plaster, this will ensure the plaster cracking in straight lines exactly in harmony with the squares laid out in the main concreting.

The plaster should be approximately $\frac{1}{2}$ in. thick. Slight variations in its thickness, of course, will be brought about by the fact that the concrete surface is not absolutely true.

There is really no necessity for plastering such a structure as a draining-pen, for if properly graded gravel be used containing an adequate quantity of fine stuff, and if the mixture be well worked and screeded off, a quite satisfactory finish may be made without the expense and trouble of plastering.

By mixing a small quantity of specially fine stuff and applying it to any portions of the surface which appear rough, and then working over the whole surface with a wooden float or a fairly wide piece of canvas, it is possible to make a really good finish.

In order to ensure an even surface it is advisable to set up a board perfectly true on each side of the work at the height at which it is desired to finish, and then to run a straight-edge between these boards, working the same back and forth, and leading the concrete away from any high places and into hollows until the whole area dealt with is a plain surface.

THE "ANCONIA" SHEEP-DIP FRAUD.

FARMERS should appreciate the promptness with which this fraud was exposed, and the thoroughgoing manner in which the case was followed up by the New Zealand police authorities, ending in the man Harrison being convicted and sentenced to six years' imprisonment. The case involved the extradition of Harrison from Canada, one of the victimized storekeepers being sent from New Zealand to give evidence in this connection in addition to the police officer. Witnesses brought from Australia to supply evidence of Harrison's dealings in that country included a South Australian storekeeper to whom in 1917 Harrison (under an *alias*) had sold "Merino" dip, a worthless preparation similar to the "Anconia." Australian detectives were also brought over and unfolded an amazing past career of fraud, &c., on the part of the accused. In regard to Harrison's brief New Zealand campaign, the police estimate of the sum obtained by him by selling the "Anconia" dip is over £1,100. Their investigations also show him to have obtained fully £1,000 worth of credit from business people in the North Island between December, 1917, and March, 1918. This credit covered not only printed matter, materials for making the "dip," &c., but also the supply of office equipment, carriage of goods, hire of motor-cars, and many other items. It may be mentioned that Harrison escaped the meshes of the law in connection with the "Merino" dip business in Australia, a fact which makes the result of the New Zealand proceedings all the more creditable and satisfactory.

The following extracts from a report of the Supreme Court proceedings at Auckland last month may be here recorded:—

> Alfred J. Parker, Government Analyst for the Auckland District, said that he had made qualitative analyses of the contents of various packets of "Anconia" dip submitted to him, giving special attention to value. Some of the powder was yellow and some brown. The yellow powder was composed of sulphur, carbonate of soda, and salt. The brown composition was composed of sulphur, carbonate of soda, salt, ground limestone, and a trace of organic matter. He placed no value at all upon the mixtures as sheep-dip or disinfectant. The value of the contents of each packet was about 6d. A sample of "Merino" dip he had analysed was composed of salt, ground limestone, sulphur, and pollard.
>
> James S. Maclaurin, Dominion Analyst, said that the eleven packets of "Anconia" dip which he had analysed formed them

selves into three groups. Group 1 consisted of ground limestone, sulphur, tobacco-dust, carbonate of soda, and salt; group 2, of sulphur and carbonate of soda; and group 3, of sulphur, salt, and carbonate of soda. The only insecticide found was tobacco-dust in group 1. The proportion of tobacco when the dip was mixed according to directions was 1 in 5,000. This was 200 times less than the quantity specified by the English Board of Agriculture. There was not sufficient tobacco in his sample of "Anconia" to make it of any value as a sheep-dip. In groups 2 and 3 there was nothing of value, in the strengths prescribed, for sheep-dipping purposes. The cost of the materials in the packets in group 1 was about 3d.; in group 2, 9d.; and group 3, 8d. All the packets were branded the same.

John L. Bruce, Assistant Director of the Live-stock Division of the Department of Agriculture, described tests of the dip which had been carried out by him, and stated that it had not been of the slightest use in destroying ticks and lice. With this powder part of the substance sank to the bottom, and part floated, leaving the water practically clear.

The evidence of Mr. Bruce was corroborated by Hugh Munro, Inspector of Stock, and Herbert W. Carbury, Acting Officer in Charge of the Veterinary Laboratory, Department of Agriculture.

Humanistic entomology has been neglected in New Zealand in the past, but this aspect of entomological science is now being developed in order to aid the practical man in the suppression of insect foes. Some of the problems being taken up are the ecology of the orchard, field-crop, and vegetable insects. An investigation into the mosquitoes and other blood-sucking forms in relation to disease is well in hand. Our aquatic-insect fauna and its status as nourishment for fresh-water fish is an important feature awaiting the investigator. In the future new phases of entomology will occur; for instance, as the areas now being placed under exotic timber-trees expand so will the danger of insect attack increase.—*David Miller.*

SOMES ISLAND, WELLINGTON HARBOUR.

WORK FOR THE COMING MONTH.

THE ORCHARD.

AT the conclusion of the fruit-picking season in May most growers will have made up their minds in regard to extending their orchards and replacing unsuitable varieties with better kinds. It is a wise policy to place orders for fruit-trees as early as possible, so that nurserymen will have ample time to select and execute the order.

In connection with ordering, growers may be reminded of the regulations governing the grading of fruit-trees for sale. These will be in operation this season for the first time, and all nurserymen are required to grade their trees according to the standards laid down. In regard to apples and pears, the "A" or commercial grade includes trees whose diameter is not less than $\frac{7}{16}$ in. nor more than $\frac{10}{16}$ in.; "B" or nursery grade includes every tree whose diameter is less than $\frac{7}{16}$ in.; while the "C" or special grade includes all those whose diameter is more than $\frac{10}{16}$ in. All diameter measurements are taken 2 in. above the union.

In placing the order for apples and pears the grade desired should be stated, as this will ensure that the trees are up to the specified standard. On the other hand, if no specific grade is stipulated, the nurseryman will have the option of filling the order with one or more of the three grades, provided that such apples and pears are sold solely in accordance with the grade assigned to such trees. Apples and pears of all grades must be well rooted, and, if branched, of fair shape, and are to have three branches averaging 18 in. in length.

The requirements in regard to the grading of apricots, peaches, and nectarines are that every graded tree shall have a diameter of not less than $\frac{8}{16}$ in., and be well rooted and branched, and of fair shape.

Orchard work for the coming month is fully outlined in the district reports which follow.

—Gordon Esam, Acting Assistant Director of the Horticulture Division.

AUCKLAND.

Orchardists can regard May as the finish of the fruit season, and attention may be turned almost entirely to a general cleaning-up of orchards, sheds, spray-pumps, &c. This work should include the collection and destruction by burning of all mummified fruits that may be yet left hanging to the trees, or on the ground.

Intending planters are advised to get the work of preparation of ground for planting well in hand. The autumn rains will have put the soil in good condition for this work during the month. If left until after May the ground will probably be in too wet a state to permit of the carrying-out of successful preparation, more especially on the heavier type of gum-lands.

Opportunity should be taken, before all the leaves fall from the trees, to mark all those affected with silver-blight, in order that the desired treatment may be given whilst they are in the dormant and semi-dormant stages.

Spraying for woolly aphis and San Jose scale on apples may be carried out at the end of the month, if necessary, at strength 1–25.

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

HAWKE'S BAY.

Picking and marketing late varieties of apples will at the end of April still require attention. Select and cull out as much of the fruit as possible at picking-time, and thereby conserve haulage to the fruit-store. No grower should have reject fruit at the store—it should all be culled in the orchard.

Where orchard planting or extension is contemplated the land should be prepared at once, so as to ensure a good tilth prior to planting. The varieties should be selected and the order for trees placed early.

A start can be made in May with the pruning of stone-fruits. Rake up all prunings, fallen leaves, &c., and destroy all orchard-refuse.

As soon as the foliage has fallen it is desirable to spray many of the stone-fruits with bordeaux, 8–6–40. This will be found especially useful in controlling die-back on peaches and nectarines. All stone-fruits infected with San Jose scale should be sprayed with lime-sulphur, 1–15.

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

NELSON.

Spraying: Orchard-trees infected with aphis, red mite, or leaf-hopper may still be sprayed with Blackleaf 40 or red oil with great advantage.

Storing the crop: While the ordinary cool store is necessary for storage over long periods, and is a great convenience at all times, many growers find that an insulated store, without refrigeration, is very useful in the orchard. Indeed, it is claimed by some that Washington, Rokewood, Commerce, and similar varieties of apples keep better in such a store than in a refrigerator. No doubt most late sorts will keep for three months in a store only insulated if the conditions are right.

Before using a store of this kind it should be thoroughly cleansed, all decaying vegetation being removed and the place washed out with lime or bluestone, or fumigated with sulphur. Fruit should be rigidly culled before storing, grading out all that are bruised, broken, or punctured, as such will not keep under any circumstances. The goods may be stored in clean orchard-boxes, the stacks being placed on a false slatted floor to allow free ventilation. For the same reason a small space should be left around each case as when stacking in a refrigerator, and occasionally between stacks a 4 in. interval will be an advantage.

Yet another factor must be considered if the store is to be a success, and that is the intelligent and consistent management of the ventilators. The object is a low even temperature. This is usually obtained by shutting up the vents during the day to exclude the warm air, and opening them after sundown to allow the cold night air to blow through. These conditions are more easily secured if the store is surrounded by a grove of pine-trees or other evergreens.

Drains: Drainage is of the first importance in Nelson District orchards. The drainage-system is often rendered useless by being blocked up or overgrown. Trim down the sides of open drains and clean up the bottom, and see that drain-pipes finding an outlet there are clear and working satisfactorily. Any depressions likely to hold up surface water should have channels cut to let the water off. This may be often done by a single stroke of the plough.

—*William C. Hyde, Orchard Instructor, Nelson.*

CANTERBURY.

By the time for which these notes are intended the fruit season will be practically over. Growers will be able to "balance the ledger" and see whether their operations for the season have been successful or not. Unfortunately, the growers in this district have had a very bad time with frosts and gales, resulting in serious losses to many. Unfortunately, too, many growers neglected spraying because of the small crop of apples; consequently the orchards are not in as good a condition with regard to pests and diseases as they might be. Evidence of this can be plainly seen in the markets and the quantity of the fruit that has had to be condemned and destroyed. Woolly aphis has been very bad, and will require strict attention during the coming dormant season. Good results were obtained where growers sprayed with red oil, at strength of 1–60, during the last month or so. The proper grading and packing of fruit has not received sufficient attention in this district in the past, but it is hoped that, with the help of classes, a decided improvement will be noticed another season.

Now is the time for a general clean-up in the orchard before the winter operations commence. Stack away all empty cases and keep them dry; they will come in handy next season. Growers are advised to see that their spraying-apparatus is in good order and everything in readiness, so that no time will be wasted when spraying actually commences.

If no green cropping is being done, orchards should be rough-ploughed and allowed to remain for the winter months. This will expose the soil to the effects of frost and rain, sweeten the land, and make cultural operations much easier in the spring. Where new orchards are being planted the land should be got into good trim. Growers who have not yet decided upon the varieties to plant should lose no time in doing so.

All information can be obtained from the Orchard Instructor for the district.

—*G. Stratford, Orchard Instructor, Christchurch.*

OTAGO.

The fruit-harvest will now be nearly all gathered and autumn leaves falling, and growers will be making their plans for the winter operations. First and foremost among these should be the destruction of all disease-infected leaves and fruit that is lying around, and which if allowed to remain will carry on the disease for the reinfection of next season's crop. This applies to fungus diseases mainly, and embraces such troubles as black-spot, brown-rot, powdery mildew, leaf-curl, shothole fungus, and peach-rust. If it were possible to gather and destroy by burning all refuse such as mentioned much would be accomplished in this direction. Ploughing the land well and deep will cover most of the leaves, and it is advisable to throw the furrows towards the trees, thus ensuring good drainage, especially on the lower parts of the orchard. Then the spray-pump needs looking over and putting into order; leaking valves, connections, and hoses make spraying a nightmare. See that everything is right for a good start on the new season's spraying. Where die-back is troublesome on peach and nectarine trees a good autumn dressing of bordeaux, 8–6–40, is advisable in the autumn; when rust or brown-rot have been prevalent it is also worth while. Where woolly aphis is troublesome a spraying of red-oil emulsion is of great advantage, a strength of about 1–40 thoroughly applied doing good work at this time of the year. Pruning will be the next consideration. This is a most important operation, and on it largely depends the success or otherwise of the crop. Make a study of each variety and every individual tree of each variety. Help the weaker ones by lightening their burden, but give the strong a chance to yield a return, by leaving them some fruiting-wood to bear on. How often do we see trees putting out fruiting-wood during the growing season only to have it all removed again in the winter by the seccateurs. But these are points one cannot discuss on paper; the orchard is the best place to do this, and the writer hopes to meet growers there in due course.

A word to growers about to plant new areas. Spare no trouble to get the land in good order for planting. Subsoiling pays, especially if the soil is not of good depth above the subsoil. Avoid too shallow planting, and, above all, see that you receive well-grown healthy trees, even if you pay a little more for them. Yearling trees are preferable, but if the land is good and well worked good well-shaped two-year-olds will save a year and give a return more quickly.

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

POULTRY-KEEPING.

By F. C. BROWN, Chief Poultry Instructor.

BREEDING QUESTIONS.

WITH the approach of the breeding season various aspects of mating will naturally be under consideration by poultry-keepers. A correspondent writes that he mated some Black Orpington hens of a noted laying-strain with a male the son of a hen that won an egg-laying test, but the pullets produced proved to be very susceptible to broodiness and disappointing from an egg-laying viewpoint. He asks why this should be, seeing that the mothers did not go broody during the whole season, and laid continuously. The obvious answer to this is that one strain did not "nick" well with the other, and the laying-power of the pullets has been affected as a consequence. This is a

common experience where a direct out-cross has been introduced, and even where the birds are pure on both sides. Especially, however, would this apply in the case of some of the strains of so-called purebred Black Orpingtons to be seen at the present time. The appearance of many of these birds clearly denotes that one of the lighter breeds has been recently introduced in order to find a short-cut to heavy egg-production. In other words, many of them are nothing short of mongrels. True, the first crosses may have proved heavy-producing stock, but the subsequent generations distributed throughout the country have not only had the effect of spoiling many a purebred strain, but they have also been a source of vexation and loss to the unfortunate people who introduced them to their flocks.

After all, there is no definite way of mating birds of different strains that will develop all the desired characters usually looked for in the progeny. Probably the best course for a breeder who has a flock of undoubted layers which is thought to be sufficiently inbred, and fresh blood is required to maintain the necessary constitutional vigour, is to select a small number of the best hens and put them to the male of the strain to be introduced. In this way, in the event of the union not being a successful one, the result of the mating can be proved without seriously lowering the productive capacity of the laying-flock, for if the progeny proved to be unsatisfactory they need not be bred from. On the other hand, if the progeny were of desirable quality from appearance they could be tested and carefully selected before being introduced to the main flock. When a half-blood is introduced in this way it will probably have the effect of imparting to its progeny the good family qualities of the parents. On the other hand, if the fresh blood is introduced in a haphazard way to the whole of the breeding-pens the union will most likely beget throw-backs and latent undesirable characters, which would be a serious loss to the breeder.

A most common mistake made in breeding poultry is to imagine that fresh blood should be brought in each year for the maintenance of constitutional vigour. Far too many follow this practice without realizing its bad effects. The man who possesses and desires to maintain a heavy laying-strain takes no such risks. He would never dream of introducing a male into his main flock unless the bird first proved his value as a sire in a small way. Then he would mate the males of that cross with the hens of the flock, or *vice versa,* which, of course, would be inbreeding. The aim of the poultryman should be to breed a flock of birds of uniform type, and which possess the desired points indicative of a strong constitution and laying-power. It is no easy matter to attain this ideal, and it is even more difficult to perpetuate the type when once it has been secured.

It would therefore appear that careful selection of purebred stock, and inbreeding to a certain degree, is the keynote of building up the characters it is desired to develop, and the only way of maintaining them. Nature is probably the best guide we have. Inbreeding apparently does not trouble rabbits and sparrows. Nature provides for elimination of the unfit. Constitution is maintained without the necessity of importing fresh blood, and with no assistance from man these pests multiply with amazing rapidity. It is therefore imperative that where inbreeding is resorted to none but the strongest specimens should be bred from. Inbreeding has the effect of intensifying desirable

characters, but it also has the effect of fixing the bad ones. Careful selection is thus essential.

AGE-DETERMINATION.

An inquirer asks for definite signs by which the age of hens can be determined. There is no outward sign by which this can be ascertained, apart, of course, from the general appearance of the bird to the eye of the experienced poultryman. Generally speaking, the condition of the breast-bone will indicate whether the bird is a first-season one or older. If the former, the end of the breast-bone is much more flexible than is that of a two- or three-year-old bird, but apart from this it is impossible to tell with any degree of certainty the age of a fowl. Therefore the only safe course for age-determination is to mark the web of the foot with a punch. Chickens may be marked immediately they leave the incubator, and a punch for the purpose can be obtained for about 2s. 6d.

THE CONFERENCE.

The conference of the New Zealand Poultry Association at Christchurch last month was from all viewpoints easily the most successful one yet held. Indeed, it may be safely said that never before in the history of the poultry industry of the Dominion was there assembled such a keen body of enthusiastic poultrymen. The delegates present came from practically all parts of the Dominion, and it was claimed that no less than ten thousand poultry-keepers were represented. The officials of the association are to be congratulated not only on the growth of that body, but also on the businesslike way the conference was conducted. The manner in which the various delegates expressed their views as to the best means of aiding the industry was in itself sufficient to indicate that the interests of poultry-keeping in this country at the present time are in the hands of men of keen intelligence and capacity.

An outstanding feature of the conference was the presence for the first time of delegates representing the North Island and South Island Poultry Associations respectively. These bodies chiefly concern themselves with the show movement. It was really gratifying to see how the old-time rivalry between the fancier and the utility man has died down, and how each and all had the one object in view—namely, the production of more table poultry and guaranteed fresh eggs. With the general adoption of the new standards for judging utility poultry, which are being prepared, it is safe to assume that poultry shows will be given a greater stimulus than ever previously. The great aim is to have the birds judged on breed points as well as on their usefulness.

Right from the start of the Poultry Association its main aim has been to place the marketing of the egg product on a sounder footing, through the medium of egg circles. That the circles have done excellent work in this direction no one can deny. Each egg is stamped with a number denoting the producer from which it was supplied, and a guarantee to the consumer of its quality. True, there is room yet for much reform in this respect, but the association is doing its best to have more circles formed in order to bring this about.

It was pleasing to note that the question of cool storage of the summer surplus of eggs was freely discussed, while it was even more satisfactory to learn from an Auckland delegate that his circle had in

cool store no less than 50 tons of pulped eggs for use during the scarce season, besides large quantities of eggs in shell. This is how it should be. Any surplus should be preserved on the circle's own account, rather than allow others to do it and reap the reward as a consequence. No doubt other circles will follow the excellent principle adopted by the Auckland circle. Once this becomes more general it will go a long way towards bringing about a more uniform price for eggs throughout the year.

An important point in connection with the conference that may be mentioned was the absence of any suggestion to place the marketing of table poultry on a sounder basis. If it is essential to market the egg product under co-operative effort for the uplifting of the industry, equally so does this apply to the marketing of table poultry. Surely there is no reason why the centralization of both eggs and poultry should not be combined at the one depot. Further, why not move for co-operative fattening-depots whereat store birds could be primed and marketed in a proper condition? Again, why should not all poultry be sold by the pound according to its quality? If this much-needed reform is once brought about and well-primed birds are available it will not only have the effect of creating a keen demand at good values for choice poultry, but will also have a decided influence in building up the industry. At the present time at least half the poultry marketed is in a lean and unsatisfactory condition, which means a tremendous loss. Undoubtedly the foundation upon which to build the industry is to market both eggs and poultry to the best advantage.

THE APIARY.

By G. V. WESTBROOKE, Apiary Instructor.

PREPARATIONS FOR WINTERING.

By the end of this month all necessary manipulations of the hive should have been completed, leaving the bees in a proper condition for the coming winter. Supers containing combs that have been placed on the hives should now be removed; all supers that are not occupied by the bees should also be taken off. During the cold weather the bees should be confined to as small a space as they require. When the brood is found in the super it is advisable to examine the bottom story, so as to ascertain if it has been discarded by the bees for the upper one. If such is the case, remove the bottom story, placing the one occupied by the bees on the bottom-board. In removing from the hives combs containing no honey do not take those with a plentiful supply of pollen. This is a valuable asset for the winter and early spring rearing of young bees. In fact, where the colder climate prevents the bees flying in the winter it is absolutely necessary for them to have a supply.

Uniting Weak Colonies.—Now is the time to unite all weak colonies. It is more profitable to winter one strong colony than risk trying to winter two weak ones. Perhaps the best and simplest method is to kill the poorer queen; then in the evening remove the cover and mat of the hive to which the weak one is to be united, place a double sheet of newspaper in place of the mat, and carefully lift the weak colony

on top of the other. Leave no outlet for the top colony; the bees will then unite by gnawing through the paper, and by the time this is accomplished they will have become friendly. It may be advisable to make a few small nail-holes in the paper to give them a lead down.

Mats. — See that all hives are supplied with good mats. In the colder parts of the Dominion it is advisable to have two or three on top of the frames. These should be cut so as to fit neatly inside the hive, covering the frames without protruding over the edges of the hive. Ordinary grain-sacks make very good mats. Excellent winter mats can be cut from old carpets, provided they are well cleaned before using. Where the winter is very severe it is an advantage to place two sticks across the centre of the frames about 2 in. apart, under the mat. This will allow the bees a warm passage to all frames during extremely cold weather.

Watertight Covers. — It is of great importance to ensure that all covers are rainproof. Nothing is so detrimental to successful wintering as allowing the hives to become damp. The present excessive price of zinc will prevent the general use of this excellent material for covering the roofs. A good economical plan to cure a leaky roof is to give it a thick coat of paint, cover it with calico, cheesecloth, or similar material, and then apply another coat of paint over this.

HIVE RECORDS.

Every apiarist should keep a register for the purpose of recording the condition of each hive. These records should be entered up each time the hive is opened. If this is done it will save endless time and worry in trying to recollect which hive requires attention. An excellent plan for colonies which require early attention is to use small pieces of coloured cardboard—red for preference. To each of these is attached a small loop of string. A tack can be driven in the front or back of the hive, and the label hung on this. The cards can be readily seen in the apiary, and are a constant reminder to the beekeeper that such colonies require help. Notes may be pencilled on the card. For instance, a hive on the verge of starvation could be tagged "S.O.S." (short of supplies). This would be a distress signal that no beekeeper could fail to respond to. Should the hive be queenless it could be marked "— Q." (minus queen), or "D.L." (drone-layer). Each apiarist could mark according to his own ideas. Such tags, however, should only be used for urgent cases, otherwise the beekeeper, through familiarity, may get into the habit of neglecting the warning sign.

VITICULTURE.

By S. F. ANDERSON, Vine and Wine Instructor.

WINE-MAKING HINTS.

THE stage of wine-making embracing the crushing and vatting of the grapes will now be over. It is during this period and the subsequent rackings and separation from the lees and other matter that the good keeping and general excellence of the wine is affected. The bulk of lees in wines made from grapes of low sugar-content is just as great as

that in wines made from grapes containing a high percentage of sugar, but the amount of alcohol developed is less. The lower the alcohol the shorter should be the time between making the wine and clearing it of lees.

Red Wine.—The grapes for red wine are fermented with their skins in vats, so as to obtain the colour. As soon as fermentation is quite over, or apparently so, the wine should be drawn off and put into the casks prepared to receive it. The marc is then pressed and the wine from this kept separate, as it requires more time to clear than that drawn off the unpressed portion. It may prove too harsh—higher in tannin and acid—to mix with the other. The first wine when drawn off has possibly not quite cooled, and after being placed in the casks a further fermentation goes on. Bubblers are placed in the bung-hole of these casks, or a small bag of well-washed sand laid on the bung-hole. This is to permit the escape of the carbonic gas and prevent the air getting to the wine. When the wine is quite still it should have its first racking. The wine will not be quite clear, but the sooner it is taken off the thick lees the better. This occurs from two weeks to a month after the wine has been put into the casks. Other rackings at intervals of two or three months follow, till the wine is finally clear of yeast and other germs. Bright, clear, cool weather should be always selected for this work.

White Wine. — The methods followed in making wine from white grapes differ from those with the black. The must from the former is not usually fermented in the open vat. Immediately after being crushed and pressed the must is put into vats to allow of it being aerated and skimmed. This is to eliminate the germs of fungus, yeast, and albuminous substances and impurities which by agitation come to the surface. The white grapes grown in New Zealand appear to require this process chiefly on account of their being low in natural sugar. Delicate light wines are greatly improved by this treatment. Their keeping-qualities are prolonged, and the finings will be more successful. This treatment takes up most of a day. The must is then put into hogsheads not later than the evening of the day when the pressing is done. The barrels are filled within a few inches of the bung-hole, in order to leave the necessary space for expansion, this being produced by fermentation, which rapidly sets up. The foam or yeast issues from the cask and runs over, clearing the wine of impurities. While this is going on the overflow should be frequently wiped away from the sides of the cask, and washed from the floor of the fermenting-shed at least once in the day. The whole place at this time teems with harmful bacteria, and any surface wet with must or wine offers a favourable propagating-ground, especially during warm weather. The further management of the white wine is much the same as for the red.

General.—The wine should be preserved from contact with the air. All the alcoholic liquids are susceptible of undergoing acetic fermentation on coming in contact with air, water, and ferment. According to Pasteur, the acidity is due to a special ferment—*Mycoderma aceti.* Wines of a low alcoholic strength are more susceptible to change than those of a greater strength. All casks containing wine should be kept filled. To do this it is necessary to have small casks and kegs, so as to keep a supply for filling up. For general cellar-work there should

be a good supply of turned plugs. Bungs are only used when casks are closed up for sending out. When the wine is ready for closing up and the plugs put in they should be sealed up with paraffin-wax. All bungs and plugs should be well washed or scalded before being used. Keep the fermenting-house and its surroundings perfectly clean. If the grape-skins and stems (generally called the marc) are not to be used for distillation they should be taken right away at once for manure, as they soon become sour and breed the vinegar-fly.

THE GARDEN.

By W. H. TAYLOR, Horticulturist.

VEGETABLE-CULTURE ON THE FARM.

THE present is a good time to break up new ground, the soil being moist and easily worked. It is a common plan among small farmers to cultivate their vegetables in the field with the farm crops. This limits the cultivation of vegetables to the suitability of the soil to produce them. In many places vegetable-culture is only undertaken in the summer-time, the soil being too wet for earlier use. This is undesirable, as such places are bare of vegetables at the most important time—early spring, when the human system craves for fresh green food. It would be far better to fence off a quarter of an acre near the homestead, trench it two spits deep, or more if possible, and drain it if necessary. A hedge of an ornamental description planted inside the fence would keep out cold winds, and besides making the garden attractive would assist the growth of early vegetables.

On every farm there is manure from the horses and cattle which could be used in the garden, and this would keep the soil in good condition, practically for ever. Such manure is usually used for field-crops, where it is not really wanted, for fields are not continuously cropped, but after two or three years are laid down in grass, and when again broken up the turf supplies the humus that is required, while artificial manures suitable for the crops to be grown supply what else is wanted.

A garden of the size mentioned would give room for growing sufficient vegetables for a fair-sized family, as well as small fruits such as gooseberries, currants, raspberries, and strawberries, and a row of loganberries, for which latter a trellis might be erected along a path.

Trenching two spits deep is termed double-digging, or bastard trenching. The way to work is as follows: Mark out a strip 30 in. wide; then dig out the top spit, throwing it in a heap clear of the ground to be worked; the loose crumbs should also be shovelled out. Next dig up the bottom of the trench so formed, as deeply as possible, the soil not being removed but simply broken up. Work in a liberal amount of farmyard manure. Then mark out another strip the same width as the first, and dig the top spit and the loose crumbs into the first trench; next break up the bottom as before, and proceed in the same manner until the strip is finished. The soil thrown from the first trench is used to fill the last one. By this method the top soil is left

on top, which always should be done when new land is broken up. Gardens that have been long in use may fail to grow satisfactory crops even though well manured. Trenching so as to bring the bottom soil to the top will restore it to a fertile state. In this case the first trench should be emptied completely, digging out the bottom spit as well as the top one, and throwing each layer into a separate heap. Then the top spit of the second trench goes into the bottom of the first, and the bottom spit on top of that, thus reversing the position of the different layers.

In working a garden of this kind some crops that are raised on the farm need not be grown. If potatoes are grown on the farm it probably will be the main crop only, and a few early potatoes should be grown in the garden. Main-crop carrots are usually grown on the farm, and the garden need supply only a small early crop. Similarly with other crops, the garden should work with the farm, so that space and labour may not be wasted by producing supplies that are raised in a cheaper way.

Farm-gardens (using the term as distinct from station-gardens) are too often not a success. Commonly they get overrun with weeds, sorrel being a frequent pest. The principal reason is that the soil is usually dug only one spit deep, or perhaps only ploughed in the first instance. In the majority of places soil prepared in this manner is very wet in winter—often unworkable—and is sure to be neglected and overgrown with weeds. Deep trenching lowers the water-table, and if drainage is fairly good the soil is fit for working at any time, this making weed-control comparatively easy. When there is much sorrel it is a sign of a too-acid state of soil, and lime should be applied, it being necessary in vegetable-culture in any case. In an established garden, plots that are vacant should be turned over, leaving the surface rough, so that air may have free play. It is a great mistake to allow weeds to grow until the ground is wanted. Weeds harbour slugs and other pests, and cause losses and work afterwards.

CURRENT VEGETABLE NOTES.

Onions will now be ripe and harvested. Before they are finally stored all loose skins should be removed, and if the bulbs are to be strung up in ropes a length of top sufficient for tying should be left. If they are to be stored in bulk the tops should be cut off close, as in the bulk condition they are liable to breed mould and prejudicially affect the bulbs. Onions in bulk require to be kept in a perfectly dry place, but as for those in ropes a free circulation of air is of greater importance than a dry atmosphere. They must, of course, be hung where they will be free from dripping water.

Carrots, parsnips, and Jerusalem artichokes, though they have finished their growth, should be left in the ground, where they keep in better condition than in clamps or any other way.

The winter variety of rhubarb should now be available for use. It is best to pull the stalks freely, but the stools should not be stripped bare, always leaving a few of the younger stalks. The summer varieties require lifting after being in use two or three years. This may be

done any time after the tops are dead, and the roots can be stacked in any convenient place until they are planted again in spring.

Rhubarb of the summer varieties can be forced in the same way as sea-kale; but it is now necessary only in the coldest places, where the winter variety will not succeed. Forced rhubarb makes a dainty dish, the stalks being very delicate and a bright lively pink in colour. Forced clumps are practically useless for pulling from the next season, as it takes most of the summer for them to recover from the shock of forcing. Plants should therefore not be forced if a summer supply is wanted from them.

Cabbage and cauliflower plants from the autumn sowing should not be allowed to become crowded. If best results are desired the young plants should, as soon as they are large enough to handle, be pricked out in beds of good soil and placed about 4 in. apart. In that position they will make strong and thrifty plants, and will amply repay the small amount of labour expended on them.

Sea-kale, being dormant, may be forced at any time by placing boxes over the clumps and covering them with a foot thick of fermenting stable manure. Before covering the stools rake away any rubbish there may be, and remove weeds, give a dusting of soot and lime to keep wireworms and slugs from injuring the sprouting heads. Sea-kale can also be forced in heated greenhouses. In this case crowns are raised for the purpose and lifted and placed in large pots or in boxes, which can be placed under the plant-benches. They must, of course, be covered so as to ensure perfect darkness.

SMALL FRUITS.

Loganberries may now be pruned. If the plants were set out last season they are not likely to have made rods strong enough to bear a crop of fruit. The proper course is to cut them down close to the ground; they will then make strong canes, which are to be retained for fruiting the following year. On established hills the canes which have borne fruit should be cut out, and new canes laid in. If there is not a sufficient number of young canes those that have borne fruit may be retained for another year, in which case all the side shoots should be cut back to one or two buds. Loganberries may be trained on the wall of an outbuilding or on a fence. The systematic plan is to erect a post-and-wire trellis. The rows should run north and south. Set the plants 8 ft. apart and the posts one to every four plants. The posts should be 7 ft. long—2 ft. to go in the ground. Stretch three wires of No. 12 gauge, one on the top of the posts and the others one-third and two-thirds of the height from the ground. The new canes are trained to the wires.

Raspberry plantations should be put in order. The old fruiting-canes should be cut close down to the stool, so as not to leave any of the old wood. All spare suckers should be forked out. It is useless to cut them off; they spring up again in greater number and are a constant source of trouble. Six new canes are enough to leave at each stool; these should be shortened to ripe wood.

Gooseberries and currants will not yet be ready for pruning. The ground should be cleared of weeds in readiness for pruning, but it is not advisable to dig the soil. A firm surface, free of weeds, is a great

help when raking up prunings. These should be collected and burned; if dug into the ground they generate fungus, and may prove very harmful to the bushes.

It is not too late to sow Cape-gooseberry seed; in the warmer districts it is, in fact, quite early enough. It is strongly advised that the plants be raised at this time and kept over winter, in preference to sowing in spring. The autumn-raised plants give most fruit the first season. (Further information regarding the Cape gooseberry is given in a separate note elsewhere in this issue.)

THE FLOWER-GARDEN.

Roses: The present is an excellent time for transplanting; bushes transplanted at this time still retain most of their foliage; this promotes immediate root-action, and the bushes become re-established at once. If a bush has a very heavy top it may be lightened to some extent — just sufficient to enable it to stand when transplanted; straggling shoots may be shortened, but further than that no pruning should be done. It is inevitable that the roots be more or less damaged in lifting, and they should be cut back so as to remove the damaged parts. When planting the soil should be trodden very firmly about the roots, but the surface soil must be left loose. No manure of any kind should be allowed to come in contact with the roots, nor is mulching any benefit at this time. Cuttings of the right kind root well if put in now. Cuttings of hybrid perpetuals should be made of clean straight growths without side branches. The cuttings should be 8 in. or 9 in. long, the base cut square across close under a joint. Cuttings of tea roses and most kinds other than hybrid perpetuals should be side growths with two or three branches; they should be torn off with a heel of the old wood. The only preparation the cuttings require is a slight shortening of the tips, which will be immature. The cuttings should be planted in a nursery plot where the soil is of a non-binding character, with only two or three of the top buds on each piece above the ground. The soil should be trodden very firm about the base of the cuttings, leaving the surface loose. None of the buds that are buried should be cut off. When the rooted plants are taken up it will usually be found that the strongest shoots are from buds that were beneath the surface. The young plants will not require to be planted so deeply again, and it is usually best to reduce their height, cutting down to the strongest shoots.

Chrysanthemums: When the flowers are past the stems should be cut down to near the ground. If the soil has become weedy or trodden down the surface should be lightly forked over so as to admit air. This will greatly assist the stools to throw up new suckers. If a stool is slow to break into fresh growth it is a good plan to thrust a fork under it and prise it loose. Look out for slugs; they are sure to be in evidence now damp weather prevails, and may eat the young suckers before they are visible. Dust lime about the stools occasionally, choosing after dark as the time to apply it.

Dahlias may now be cut down. Unless there are reasons against it, it is safest to leave the tubers in the ground till spring. They keep quite well there, whereas when they are lifted they are often destroyed by woodlice or slugs eating the epidermis around the collar, where the

new growth comes from. The tubers should be lifted in spring just as growth is about to start. They can then be divided as required, bedded in a temporary position till the buds start, and then planted out in the borders.

Bulbs: All spring-flowering bulbs should be planted at once. The natural time for starting into growth has passed, but bulbs that have been lifted and stored in a dry place remain dormant much later than those left in the ground. This renders it possible to extend the planting season. When, however, the period of storage extends too near to the time when the bulbs should be coming through the soil, those in storage are not improving. Daffodils begin to flower in June, in some places even earlier. All bulbs that are in the soil are active long before the tops are visible. A slow start is essential to good flowers; therefore plant at once.

HEDGE-TRIMMING.

The question is frequently asked, When is the proper time to trim hedges? There is no reason why a hedge should not be trimmed at any time it requires it. In the case of elæagnus a number of light trimmings is better than one or two heavy trimmings. From the point of view of economy in labour combined with benefit to the hedge itself, and referring to the generality of hedges, two trimmings each year is better than one, and cheaper. In my experience there are two periods when growth is most active—namely, from early spring to near midsummer, and again when cooler weather and moister conditions begin in early autumn, continuing in winter to a varying extent ruled by the climate. The main trimming should take place in late winter or very early in spring. Severe cutting can, if necessary, be done at that time, as spring is the time when the plants can best recover from radical treatment. It is also desirable to start the hedge with all new growth in spring. Even if it is not intended to cut a hedge back to narrower limits, all the recent growths should be cut hard back to the proper line. All inequalities in outline should be rectified, and the hedge left with a perfectly level top and sides quite true, which will make future trimming easier. All fallen leaves and rubbish should be raked out from under the hedge and burned, thus destroying any insect pests that may have harboured there—of which there are usually a good many. The second trimming should be done in the week preceding Christmas. Most people like to have their garden trim at this time, and very little growth will be made after that until autumn. Another reason, and the principal one, for trimming at that time is that it relieves the plants of the burden of young shoots, which they are not well able to support through the dry summer weather, and the hedge is benefited by their removal. The plants in hedges are always close together, and this, together with other circumstances, nearly always makes the soil very dry about them. The relief to the plants effected by the removal of the crop of young shoots must thus be obvious.

The wool from the Ryeland flock at Moumahaki Experimental Farm this season obtained a valuation of 16d. per pound.

TEACHERS' FARM SCHOOL AT RUAKURA: JANUARY, 1919.

GROUP OF TEACHERS AND STAFF AT THE HOMESTEAD.

VETERINARY DEMONSTRATION BY MR. T. W. COLLINS, M.R.C.V.S.

THE FIRST HORTICULTURAL SECTION AFTER A LECTURE

ANSWERS TO CORRESPONDENTS.

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

FEED FOR BREEDING-EWES.

"COCKATOO," Enfield :—

In view of the scarcity of sheep-feed for the coming winter, would oats be a suitable feed for breeding-ewes, together with, say, an hour on turnips daily? Would it be necessary to crush the oats? What would be the quantity necessary per head per day to maintain the ewes in good condition? I would be glad of any other information you can supply on the subject.

The Live-stock Division :—

Placing the sheep for an hour or so a day on turnips and then feeding with oats would hardly be a suitable dietary for the ewes. With all ruminants it is essential that a good proportion of bulky food be given, as the function of rumination is dependent on this. Oats, being a concentrated food and therefore having to be fed in small quantities at a time, do not provide for this function. The most economical way to feed in your case would be to crush the oats and mix them with good chaff for the ewes. The amount of feed given to the ewes must be regulated by the condition they are in. About ½ lb. of oats per day should be sufficient for each sheep. In the case of pregnant ewes great care is necessary to ensure that the animals do not get too fat, as many of the troubles occurring at and just prior to lambing are directly due to gross condition.

PROVIDING GROUND SHELTER.

"ACACIA," Auckland :—

I wish to cut back wattle (black and lopantha) and pinus insignis, so as to produce ground shelter and make the hedges stand a cold wind without stripping. Would you kindly state at what season of the year this should be done, how it should be done, and what size the wattle and pines must be before trimming can profitably be commenced.

The Horticulture Division :—

Wattles cannot be regarded as suitable trees for providing permanent ground shelter. The lopantha species (*Albizzia lopantha*) is at best short-lived, and is by nature a straggling bush. Cutting the ends off growing shoots, leaving some active growth below each cut, will certainly promote a closer growth, but it is, as indicated, only temporary in character. Nor is the black-wattle capable of maintaining permanently a close state of growth. With this tree also the object sought may to some extent be gained by a light shortening of growths from time to time, always leaving growth below the cut, for wattles cannot be relied on to break again if cut to bare wood. The best time to cut would be just at the beginning of a flush of growth, either early in spring or early in autumn. Pinus insignis is a giant tree which strongly resents severe restriction, and whatever may be done it eventually loses the lower limbs unless it is grown in an open position and allowed to extend its branches. Very close hedges are sometimes formed by this pine, but they are not permanent. With regard to the size the trees should be before trimming is commenced, there is no reliable data to go on. Probably it does not make much difference so long as it is begun while the trees are young—say, four or five years old. It would be best not to cut heavily at any time, but to cut straggling branches back occasionally. Any time of the year except winter would be suitable.

EWES WITH CONTAGIOUS STOMATITIS.

S. H. F., Masterton :—

I have some stud Southdown ewes that have broken out with sores around the upper and bottom lips. The sores start like warts, and gradually get worse until quite raw and sensitive, and the sheep fall away in condition. The sheep were previously in first-rate condition; they have a good paddock but with a lot of thistles in it. Could you tell me a cure, and if it is a common complaint ?

The Live-stock Division :—

The trouble affecting your ewes is evidently contagious stomatitis. Treatment consists in cleaning the parts and applying sulphur ointment (1 in 8 of vaseline). The ointment should be applied liberally. Probably the thistles are the cause of the abrasions through which the microbes gain entrance, and thus set up the symptoms you describe. A change of feed should have a beneficial effect.

RAISING CHESTNUTS.

M. K. FORSYTH, Stanley Brook :—

Would you kindly give me information as to how chestnuts are propagated ? Can they be raised from the nut; and, if so, does the nut require any special treatment before planting ? I sent some nuts out from England while I was there. They were planted here over a year ago, and there is no sign of any of them growing.

The Horticulture Division :—

Chestnuts are raised from the nuts, which are best sown as soon as they are ripe in any ordinarily good soil that is friable and not too wet. Varieties are increased by budding on to stocks raised from nuts. The nuts you sent from England no doubt lost vitality during the voyage. They would require special packing and to be kept in a cool place.

TREATMENT FOR NORTHERN CLAY SOIL.

"SUBSCRIBER," Otorohanga :—

The soil surrounding Waikumete, North Auckland, is a brown-and-white cohesive clay. Please advise me how to bring this soil into a state of fertility. It grows paspalum and lotus angustissimus very well.

The Agriculturist :—

The soil you refer to can be improved in fertility by judicious liming, green-manuring, and thorough cultivation—using burnt lime at the rate of 15 cwt. to 20 cwt. per acre, worked into the soil during cultural operations, and ploughing under a lotus angustissimus crop occasionally to provide humus. This improvement will be augmented by the moderate manuring of the oats and forage crops (turnips, ryecorn, vetches, peas, &c.) that can be grown on such land. The cultivation required for these crops, and the growing of the leguminous plants mentioned, will be of marked bene it.

TREATMENT FOR SIDE-BONE IN HORSE.

"NUGGET," Matakohe :—

I have a draught mare which has developed a lump on her front legs, just above the hoofs; it is partly round from the back to the front on the inside of both feet. She goes a bit lame when she starts off, but it wears off. Would you kindly tell me what to do for it ?

The Live-stock Division :—

The lumps you describe will no doubt be "side-bones." There is no cure for this, though many cases are to a certain extent relieved by the application of a blister, followed by rest. After clipping the hair off and around the lumps, apply about ½ oz. of cantharides ointment (1 in 8 of vaseline). Afterwards turn the animal out for a spell.

CURLING OF LEMON-TREE LEAVES.

N. SMYTH, Rotoroa Island :—

Can you tell me the cause of the leaves of lemon-trees curling, also the remedy ?

The Horticulture Division :—

The most probable cause of lemon-leaves curling is ill-balanced fertilizers. The deficiency is most likely to be in potash and nitrogen, particularly the former. When autumn rains occur apply sulphate of potash, 2 oz. per square yard, spread over the surface soil, covering the presumed root-run, and lightly fork it in. Failing sulphate of potash wood-ashes will answer, provided they have not been exposed to rain ; give 4 oz. per square yard. If wood-ashes are not available apply the same quantity of "seed gypsum." When active growth begins give 1 oz. per square yard of nitrate of soda.

CATTLE AND PARASITIC GASTRITIS.

"DOUBTFUL," Bay of Plenty.

I have a paddock in which a number of young cattle contracted parasitic gastritis. I would like to know, if I place cows on the same paddock, whether they would be likely to contract the same complaint.

The Live-stock Division :—

We would not advise you to place cows on the paddock in which the young cattle contracted parasitic gastritis. While it is a well-known fact that cows seldom, if ever, are affected with parasitic gastritis in the same way as young stock—this doubtless being due to a more vigorous constitution—nevertheless the cows act as a host for the parasites, and thus the pasture remains contaminated. If the land is ploughable you would be well advised to turn over the paddock—also liming and draining if necessary—and thus get rid of the parasites.

WORMS IN PIGS.

W. GOTT, Spreydon :—

I am feeding three Yorkshire sows about four months old in a sty, and noticed that one or more of them has passed some round worms about 6 in. long. Would you please tell me what is best to do ? The sows all look well and are doing nicely.

The Live-stock Division :—

Santonin is the drug giving best results for worms in pigs. Give each animal 8 grains of the drug, mixed in the feed, on two consecutive mornings, and on the third morning give 8 grains of calomel mixed in the feed. Each animal should be fed from a separate trough, thus making sure that they all get the medicine.

FERTILIZING AN ORCHARD.

"ORCHARDIST," Masterton :—

Would you please advise the best manure to use for an apple-orchard which is in its third year of bearing. The ground has been well cultivated ; the soil is rather light and bad with sorrel. Would a good dressing of lime be any good, or would it be best to use some kind of artificial only ?

The Horticulture Division :—

The prevalence of sorrel in your orchard indicates that lime is needed. Apply 1 to 2 tons per acre of ground lime as soon as possible. It is quite likely that no actual fertilizer may be required, as lime has considerable powers in this respect. If, however, you consider more is wanted (this to be determined by the condition of the trees) superphosphate and bonedust, 1 lb. of each per tree, should be applied about midwinter, lightly forking it into the soil.

EFFECT OF MUSTARD AND SALT ON PIGS.

K. S. Cox, Putaruru :—

Could you tell me if mustard will kill a pig; and, if so, what antidote would prove successful if used in time? Does salt also affect pigs fatally?

The Live-stock Division :—

Mustard cannot be regarded as a poison in the true sense of the word. In small doses it acts as a stimulant, aiding digestion; in large doses it acts as an emetic, and as such is often used with small animals. Pigs are very susceptible to salt, and many cases of a fatal nature occur from the animals being fed on salted food, &c.

WINTER FORAGE CROPS FOR BREEDING-SOWS.

"SUBSCRIBER," Drury :—

I should like some information on fodder crops suitable for breeding-sows through the winter. The land here has become unsuitable for turnip crops and lucerne. Top soil is not deep, with heavy clay subsoil.

The Agriculturist :—

Crops suitable for feeding breeding-sows through the winter and for growing on the class of soil described include the following: Partridge field-peas, seeding 3 bushels per acre; black winter vetches, 2 bushels per acre; Buda kale, 3 lb. to 4 lb. per acre. The peas and vetches could be sown broadcast, while the kale is best sown in drills 28 in. apart.

PROPAGATING RUBBER-PLANT.

"RUBBER," Upper Hutt :—

I have a fine specimen of variegated rubber-plant, about 3 ft. high. Will you kindly inform me how to obtain a second plant from it. It is a single-stem plant.

The Horticulture Division :—

The top of a *Ficus elastica* plant may be induced to root by cutting a tongue on one side of the stem below the leaves. In cutting the tongue commence about 3 in. below the lowest leaf, let the knife enter with a slope, carry the knife upward for about 1 in., finishing about one-third through the stem. The tongued portion of the stem is then covered with a good pad of fresh sphagnum moss, bound securely. The moss must be kept constantly moist. An improved method is to cut a 3½ in. flower-pot of soft clay into equal halves. Enclose the pad of moss in the pot, which will fit around it; the hole in the bottom of the pot may need enlargement. Bind the two halves of the pot together with fine wire, and support it, if necessary, with a stick thrust into the soil in the pot. When the moss is filled with roots the stem of the plant should be severed below the pot. The new plant may then be potted up.

FORTHCOMING AGRICULTURAL SHOWS.

Otago A. and P. Association: Winter Show, at Dunedin, 3rd to 6th June.

Waikato Winter Show Association: At Hamilton, 3rd to 7th June.

Taranaki Agricultural Society: Winter Show, at New Plymouth, 11th to 14th June.

Manawatu and West Coast A. and P. Association: National Dairy Show, at Palmerston North, 17th to 20th June.

Rangitikei A. and P. Association: Winter Show, at Taihape, 25th and 26th June.

(A. & P. Association secretaries are invited to supply dates and location of heir shows.)

AGRICULTURAL EDUCATION IN THE UNITED STATES OF AMERICA.

THE matter which follows is extracted from a lecture* given at Melbourne by Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, Victoria Department of Agriculture, who recently visited America for the purpose of investigating agricultural conditions, &c. He states :—

The bill for agricultural education, research, and extension (in the United States) approximates £12,000,000. . . . What have been the results of the expenditure ? Primary production for the fifteen years prior to the war had been increasing to the value of £90,000,000 annually, and £90,000,000 per annum extra production is a fine dividend to realize on the amount spent for agricultural education.

Let me briefly review the forms of agricultural education. Agricultural education, taken in the broadest sense of the term, may be said to cover all those activities undertaken for the promotion of sound and profitable agriculture of a country. These may be classified as (1) instructional work, (2) investigational work, (3) extension work. By instructional work we mean all the formal teaching of agriculture from the primary schools to the University. The investigational work involves the discovery of new facts and principles pertaining to agriculture. By publicity or extension work is meant the conveyance and dissemination of agricultural information to those who are unable to take advantage of the formal teaching of the schools and colleges. The three great institutions are (1) the Agricultural College, (2) the Experiment Station, (3) the Federal Department of Agriculture.

INSTRUCTIONAL WORK.—THE AGRICULTURAL COLLEGE.

The agricultural colleges were born in the throes of the Civil War—at a time when the very existence of the nation was at stake—when doubt and pessimism seemed to reign supreme. They have had a chequered career. At first they attracted no students. To-day they are crowded. Forty years of failure and twelve years of dazzling success is the epitome of the history of the colleges. Last year 130,000 students were registered in the fifty-three colleges of agriculture in the United States, and of these 16,000 were undergoing a four-years course for the degree of Agricultural Science. It would take me too long to trace the history of the colleges, but success came when the Federal and State Governments began to invest money liberally in the colleges, and provide them with proper equipment, and high-class specialists as teachers.

Twenty years ago the students came to the colleges fresh from the cornfields, with no prior training. Now, however, they must have a high-school training before they are allowed to enter the colleges. The curriculum has gradually developed in such a way as to secure a unique blend of the vocational and non-vocational in varying proportions, with enough of both to turn out an efficient business man without sacrificing his education as a citizen. The authorities aim at making a good farmer, but they aim, too, at making the student a good citizen as well. Ninety-five per cent. of the students who graduate from the colleges either go on the land or take up some form of agricultural work—teaching, investigational work, or extension work. Of those who do not graduate practically all return to the land. In either case failures are almost unknown.

For those who cannot attend the full courses, short courses extending from two weeks to two months are held, so that they who desire to increase their knowledge of agriculture may do so. These courses are given by specialists, and thousands of farmers attend them every year. At Ohio there were over three thousand farmers in attendance at the College of Agriculture at the time of my visit.

A feature of most American colleges of agriculture is the provision made for the teaching of domestic science and home economics. Within the college is a group of buildings devoted exclusively to the training of young women in domestic

* Published in the *Journal of the Department of Agriculture of Victoria.*

science. In the American view, both men and women should be equally interested in farm life, and if training is necessary for the one it is equally essential for the other. Consequently regular four-year courses of instruction are provided for women, just as courses in agriculture are provided for men. Ninety-five per cent. of the women of America become home-makers sooner or later in their career—some of them become home-breakers too! For that reason, home-making, with all that it implies, forms the principal subject of instruction for women. The object is to teach the principles underlying the proper administration of the household, and to study foods, hygiene, nutrition, dietetics, textiles, clothing, and household management.

The equipment is usually very complete. Laboratories are fitted with gas-stoves, and gas, coal, wood, and electric ranges. Each girl is provided with a kitchenette, where her work in cooking is done. A practice cottage is associated with every course in home economics. This is usually a six-roomed house, furnished and equipped to accommodate five or six students and an instructor in charge. The furnishings are simple and typical of the average American home. The purpose is to provide an opportunity for students to gain practical experience in managing a household. The students are responsible for the planning, preparation, and serving of the meals, marketing and household accounting, and cleaning and laundering of the household linen. Emphasis is laid on the importance of a proper system of keeping household accounts. Each girl becomes in turn hostess, cook, waitress, maid, and laundress of the cottage. A feature of the course is the efforts made to reduce drudgery in the farm home to a minimum by the use of various types of labour-saving devices, and by the wise planning of the kitchen and kitchen equipment.

The number of students taking courses in home economics range from three hundred to a thousand, according to the size of the college and the number of its rural population. . . . The old idea that anybody can farm and that anybody can cook and manage a home has well-nigh disappeared, and with it the idea that farming means ploughing only, and that the activities of the home are fully represented by the making of hot scones. The schools of home economics have dignified labour by sending forth from their halls not merely cooks, but educated women who, because of their knowledge and skill in the practices and principles of the arts of the home, are able to use them as a means of expression for their best endeavours.

The Americans believe that for the young man who takes up farming an agricultural education is especially necessary. He faces more difficult problems than any preceding generation of farmers. He must go on to land many times more valuable than his father first occupied, and at the same time this land has lost much of its fertility. He must fight against more destructive insect and fungus pests and animal diseases than any farmer preceding him. He faces new problems in management and marketing. He must face these problems not only with experience, but with science as his ally and intelligence broadened by the best education.

In addition to the fifty-three colleges, agriculture is being taught in four thousand high schools and one hundred thousand elementary schools. America began her agricultural instruction in the colleges and universities. When a supply of highly trained teachers of agriculture was available agricultural education was extended to the high schools. Then, when the elementary teachers had received a training in agriculture, the subject was brought into the elementary schools.

INVESTIGATIONAL WORK.—THE EXPERIMENTAL STATION.

Agricultural investigation and research work is regarded both in the United States and Canada as a necessary and vital part of any system of agricultural education, and must form the basis for framing a sound policy for future agricultural development. The American experiment stations were founded by the Federal Government in response to a desire for aid in solving problems in American agriculture, and to perfect methods of improving agricultural practice. There are sixty of these experiment stations, and the average expenditure on each is £18,400 per annum.

Some idea of what a single experiment station has accomplished during the last century may be obtained by considering the results obtained at Wisconsin. It is demonstrable that the added wealth of the State of Wisconsin each year, as a result of the activities of the experiment station, is many times the whole appropriation made by Wisconsin for agricultural education. Of the seven tests widely used

in dairying, six originated at the Wisconsin station. The Babcock fat-test, invented in 1890, furnished a simple means of paying for milk on the basis of quality and for detecting fraud. It saved the factory system of buttermaking from ruin. This test permits of a more careful control of factory processes than formerly, thus saving more than half of the fat formerly lost in the skim-milk produced in creamery operations. For Wisconsin alone this amounts annually to a saving of over 1,500,000 lb. of butter. The greatest service of the Babcock fat-test, however, has been in making possible the improvement of dairy cows by eliminating unprofitable animals, and thus giving a scientifically accurate foundation for dairying. The Wisconsin curd-test detects the quality of milk as to taints. The casein-test, invented in 1909, registers the casein-content, which is of importance in determining the proper value of milk for cheesemaking. Many improvements in dairy processes relating to the pasteurization of milk, curing of cheese, have originated at this station.

These tests and experiments made at the Wisconsin station, which together form the most important contribution ever made to the science of dairying, and the work of the Wisconsin Dairy School, have enabled Wisconsin to gain the first rank among the States of the United States in the production of both cheese and butter. Since the Babcock fat-test was discovered the value of the dairy products of the State has increased from £4,000,000 to £16,000,000 per annum. It cannot be doubted that a considerable percentage of this increase has been due to the campaign of investigation and education which has been carried on by the University.

One of the greatest possible improvements in agricultural production is through the substitution of improved seed for scrub varieties. Beginning about 1898, efforts were made to develop seeds adapted especially to Wisconsin soil and climatic conditions. New varieties of maize, barley, and oats have been evolved at the station, and have added millions of bushels annually to the yields of Wisconsin fields. . . . Though only two-thirds the size of Victoria, and though the northern half of the State is mostly poor land in need of drainage, Wisconsin, besides producing £16,000,000 worth of dairy-produce, raises 100,000,000 bushels of oats, 70,000,000 bushels of maize, and 25,000,000 bushels of barley.

EXTENSION WORK.

The most significant feature in agricultural education in the United States during recent years is the development of the co-operative extension or publicity service in each State of the Union. The object of the extension work is to disseminate as widely as possible the mass of information which has been accumulated as a result of the investigations of the experiment stations and agricultural colleges.

Since the experiment stations were founded there has been gained by patient investigation sufficient exact and detailed knowledge of soils, crops, and farm-animals to enable the total wealth from agricultural production to be greatly augmented if the information could be widely disseminated and brought home to the last farm and the last farmer. There are many farmers who regularly secure double and treble the yields of their neighbours. A wire fence frequently divides the grower of a 30–40 bushel crop from the grower of a 10–15 bushel crop. To encourage the many to do what the few are doing is the objective of the extension or publicity work.

The principal forms of extension-work are (1) the county agent scheme, (2) home demonstration agents, (3) boys and girls' clubs. The experience of the last fourteen years has demonstrated fully the value of the county agent as a means of bringing to the people on the farms the results of experience and scientific investigation. Nearly every one of the three thousand counties of the United States has a county agent—a trained agriculturist located in the district—who works in co-operation with local organizations to advance the agricultural interests and improve agricultural practice in the county.

Yields of Wheat and Oats.—Returns of actual threshings received up to 19th March by the Government Statistician worked out at an average Dominion yield per acre of 34·22 bushels for wheat and 36·59 for oats in cases where particulars of areas were furnished. The great bulk of the grain threshed to that date was in Canterbury, with averages of 34·37 bushels for wheat and 36·46 bushels for oats.

THE WORLD SUPPLY OF CEREALS.

SOME ESTIMATES AND FORECASTS.

THE following matter consists of extracts from recently received reviews by Sir J. Wilson, K.C.S.I., who until lately represented New Zealand in the International Institute of Agriculture, of Rome. It contains much of great interest and import in the present extremely unsettled state of international affairs, centring so largely round the food-supply. The first part is dated 23rd December, 1918, and the second 22nd January, 1919.

THE WHEAT POSITION.

I have estimated that on 1st August, 1918, Britain, France, Italy, and Spain had, taken together, a carry-over of old wheat larger than their pre-war average, that the United States and Canada had only a minimum carry-over, and that there was on that date in the Argentine, Australia, and India, taken together, an exportable surplus of old wheat amounting to something like 100 million quintals.* I have also estimated that the "open" importing countries (including France) have had a crop this year 29 million quintals greater than last year, but 24 million quintals less than their pre-war average, and that the "open" exporting countries have had a crop this year 54 million quintals more than they had last year, and 86 million quintals more than their pre-war average. Taken together, the "open" importing and exporting countries (which on the pre-war average produced 57 per cent. of the world's total wheat crop) have a yield of wheat this year 83 million quintals more than last year and 62 million quintals above their pre-war average yield.

I have roughly estimated that, now that peace seems assured, all the importing countries in the world are likely to import, during the year ending July, 1919, not more than 162 million quintals (as compared with their pre-war average net import of 167 million quintals), this estimate being made up of 135 million quintals for the countries hitherto open and of 27 million quintals for the countries hitherto closed. The latter part of this estimate can only be a rough guess, as so little is known of the yield of last harvest in Germany, Austria-Hungary, Turkey, Serbia, Belgium, Rumania, and Russia, and as it is very uncertain how much wheat those countries will wish to import and be able to pay for, and how much wheat they will be permitted or aided to import by the Allied Governments, which are likely to retain control of this import for some months to come. In comparing their probable import this year with their pre-war average import the main considerations are (1) that their recent harvests are certain to have been much below their pre-war average in yield, (2) that the population they have to feed is much less than their pre-war average, (3) that they have become accustomed to consume much less wheat per head than before the war, (4) that the resources of the masses have been much reduced, (5) that the price they will have to pay for any wheat they import will, when measured in their depreciated paper currency, be much higher than the prices they have recently being paying for home-grown wheat, and that therefore their effective demand for wheat from abroad is likely to be much below what it would be if the pre-war standard of consumption were suddenly resumed. While they will no doubt require a large import of food grains from abroad, they are likely to content themselves to a greater extent than before the war with the cheaper grains, such as maize, rye, barley, and possibly rice, of which large quantities are available in one or other of the exporting countries, and to keep down their consumption of wheat. Moreover, the Allied Governments, in so far as they retain the control of the transport of food grains, are likely to encourage the

* Ten quintals are approximately equal to one ton.

import into those countries of the cheaper food grains and to discourage the import of wheat, because (1) it will cost less to import the cheaper grains, and (2) the cheaper grains are more likely to reach the starving poor than would be wheat, which, in the absence of efficient government, is more likely to be intercepted and consumed or hoarded by the rich and powerful.

As regards the exporting countries of the world, which before the war had on the average a net export of 170 million quintals, I have estimated that, after allowing for their probable consumption on something like their pre-war scale, the countries hitherto open will be able to spare from this year's harvests 147 million quintals, making altogether, with the 100 million quintals of exportable surplus of old wheat which they had on 1st August last, a total of 247 million quintals available for export before 1st August next; and as my estimate of the world's net imports this year is 162 million quintals, it would follow that on 1st August next these open exporting countries will have some 85 million quintals of old wheat still available for export—enough to meet the normal demand of all the importing countries in the world for six months, and a much larger carry-over of exportable surplus than the world ever possessed on the corresponding date in time of peace. This estimate includes 20 million quintals as the exportable surplus from India after the harvest of next May, but does not include anything from Rumania and Russia, which between them on the pre-war average exported net 60 million quintals, and which may quite possibly have some net export before next August.

All countries, both importing and exporting, are making great efforts to increase their sowings of wheat for their next harvests, and in several of the more important countries the Governments have stimulated these efforts by the promise or the prospect of high prices; and it seems certain that, if the weather conditions are on the whole not very unfavourable, the yield of the harvests of 1919 will, in the open countries, be much above the pre-war average, and probably that, even if allowance be made for a general resumption of the pre-war average consumption per head in all countries, the world's wheat harvest of 1919 will be larger than the world's consumption during the year 1919–20, so that there will be a still larger carry-over of exportable surplus on 1st August, 1920, than on 1st August, 1919. The probabilities seem to be, therefore, that from now onwards for the next two years there will be a great and growing accumulation of wheat in the exporting countries, taken together.

In my note on the world's merchant shipping, dated 23rd November, I have estimated that the world's steamer tonnage will soon be equal to what it was before the war and will continue for some time to increase rapidly, and that therefore the rates of ocean freights may be expected to fall rapidly to something like double what they were on the average before the war. War-risk insurance, which has been very high, will no longer be charged on the transport of wheat.

Now that military considerations no longer occupy the foremost place, all dealings in wheat, whether by Governments or by private individuals, will be mainly regulated by financial considerations—that is, by the general law of demand and supply. The demand is no longer so urgent, and all holders of wheat in all countries who have been holding it up in view of the possibility of a continuance of the war and of still higher prices will be anxious to get rid of it now that prices are likely to fall. The largest individual holder of wheat is the Australian Government, which will soon have more than 50 million quintals of wheat to sell abroad, and which seems ready to sell a large quantity of it at 38s. per quarter f.o.b., the price at which it sold to Britain last year 30 million quintals of wheat, much of which is still in Australia. If, as seems likely, it will soon be found possible to obtain tonnage at a rate double the pre-war average—say, 12s. per quarter—then, allowing for ordinary marine insurance, handling and profit, it may soon be possible and profitable to bring Australian wheat to Europe and sell it at less than 60s. a quarter. The Argentine also will soon have some 40 million quintals to sell abroad. The present price of wheat at Buenos Aires is 48s. per quarter, and if it will soon be possible to obtain tonnage at something like 6s. a quarter Argentine wheat also may soon be selling in Europe at less than 60s. a quarter. India is out of the running at present owing to the drought and the action of Government, but after next May may be in a position to spare 20 million quintals of wheat, and if the weather should be normal the internal price of wheat may fall as rapidly as it has risen, and come down to about 47s. a quarter, the Karachi price of last July. At double the pre-war rate freight would be about

8s. a quarter, so that next summer Indian wheat may also be obtainable in Europe at about 60s. a quarter. The competition between these three countries to sell, and the eagerness of holders of wheat in them to reduce their embarrassing stocks, may even lead them to accept lower prices than those above mentioned, which are considerably above the average prices they were glad to take before the war (Australia 31s., Argentine 33s., Karachi 29s.). If the result of the competition to sell were to induce them to accept something like their pre-war average prices, wheat from those countries might in a few months be selling in Europe at less than 50s. a quarter.

The United States Government have guaranteed to farmers a minimum price of 75s. per quarter at Chicago on all wheat grown in 1918 and 1919, and will be reluctant to sell, or to see wheat sold, at less than this price. But if Europe can import wheat from Australia, the Argentine, or India at 60s. a quarter or less it will not pay more than this for American wheat, and export from the United States will cease, and there will be a great and embarrassing accumulation of wheat in that country, unless the price in America comes down. There is a suggestion that the United States might form a large wheat reserve, but that would be costly and unsettling, and seems unlikely to be adopted in view of the very large acreage likely to be under wheat this year. It seems probable, therefore, that the Government will be forced to allow the holders of wheat to sell at what price they can get, and to pay them the difference between the guaranteed price and the price at which the wheat is actually sold, the United States taxpayer thus having to shoulder the loss which would otherwise fall on the United States farmer and wheat-merchant, just as the British taxpayer has had to shoulder the loss which would otherwise have fallen on the British consumer had the price of the loaf been allowed to go above 9d. If wheat from the other exporting countries can soon be landed in Europe at less than 60s. a quarter and freight from America soon goes down to 3s. a quarter, then the price in New York may soon go down to below 57s. a quarter and in Chicago to not much over 50s. a quarter, as compared with the pre-war price of 30s. If the other exporting countries find it to be in their interest to accept prices not much above pre-war prices and their wheat reaches Europe at a total cost of 50s. or less, the price at Chicago may go down to about 40s. a quarter, more especially if the present prospect of something like a record harvest in the United States next July becomes assured.

The condition of things in Canada is similar, except that the Canadian Government have not yet guaranteed a price for the wheat to be reaped in 1919.

In Britain the Government is still selling foreign wheat at 80s. a quarter, although, according to Mr. Hoover, it has till recently cost 107s. a quarter to import wheat from America; the difference being paid by the British taxpayer as part of the cost of supplying the British consumer with a loaf at 9d. per 4 lb. By the Corn Production Act the Government guaranteed to the British farmer a minimum price of 55s. a quarter on all wheat grown in 1918 or 1919, but it has not yet had to pay anything under that guarantee, because the British farmer has been able to obtain a much higher price for his wheat in the market. He has been prevented from obtaining a higher price than 75s. 6d., because that price was fixed as a maximum for home-grown wheat, and because foreign wheat was obtainable from the Government at 80s. a quarter. These conditions still prevail; but if, as seems possible, wheat from Australia and the Argentine, and perhaps from India and America, can soon be landed in Britain at a total cost of less than 60s. c.i.f. they cannot last much longer. It might be argued that, in justice to the taxpayer, the consumer, who has for so long been supplied with wheat at much below its actual cost, should now for some time pay something more than the new cost, so as to make up to the taxpayer part of the loss he has paid, but such a course is obviously impracticable. The price of wheat in Britain must soon be allowed to fall to the level established by the law of demand and supply, and it therefore may soon (say, by next June) fall to 60s. a quarter, or even, if the prospects of a very large world's wheat harvest next year become assured, to less than 50s. a quarter. By September English wheat may be selling at 40s. a quarter.

THE GENERAL CEREAL-SUPPLY.

In my note on the world's supply of wheat dated 23rd December, 1918, I estimated that on 1st August next, after supplying the probable needs of all the importing countries in the world up to that date and retaining enough to maintain their own population till their next harvest and to provide the usual carry-

over, the exporting countries of the world would still have an exportable surplus of old wheat of about 85 million quintals. According to my present estimate for the five cereals (wheat, rye, barley, oats, and maize), they will have on 1st August only 17 million quintals of the five cereals taken together. At first sight these estimates seem inconsistent with each other, but they are really reconcilable. If the estimate for the five cereals be analysed it may be stated as follows (in millions of quintals) :—

ESTIMATE FOR THE YEAR ENDING JULY, 1919.

—	Import.	Available for Export.	Estimated Exportable Surplus on 1st August, 1919.
Wheat—			
Open countries	135	247	+112
Closed countries	27	..	— 27
Total all countries..	162	247	+ 85
Four inferior grains—			
Open countries	86	74	— 12
Closed countries	56	..	— 56
Total all countries..	142	74	— 68
Total five cereals—			
Open countries	221	321	+100
Closed countries	83	..	— 83
Total all countries..	304	321	+ 17

This means that while wheat, taken by itself, would show an exportable surplus of old wheat on 1st August next of 85 million quintals, there would be a deficiency of the four inferior grains (rye, barley, oats, and maize) of 68 million quintals, and if this had to be drawn from the surplus of exportable wheat the exportable surplus on 1st August of all the five grains taken together would be reduced to 17 million quintals. But this is not likely to happen. In the first place, I have not taken into account the exportable surplus on 1st August last in the United States of oats and maize, which must have been considerable after their excellent yield in 1917. In the second place, I have made no allowance for a possible net export of the five cereals from Bulgaria, Rumania, and Russia, which between them on the pre-war average exported 145 million quintals of the five cereals. In the third place, I have not taken into account the probable exportable surplus from the coming harvest of maize in the Argentine to be reaped next April. The reports regarding the prospects of this harvest are so far very favourable, and as on the pre-war average the Argentine exported 29 million quintals it is probable that at least that quantity will be available for export from the new harvest, in addition to the 20 million quintals of maize I have estimated as at present available for export from the produce of the last harvest. In the fourth place, if the exporting countries find that there is a demand for the inferior grains at suitable prices, they can easily meet it by reducing by a small percentage the home consumption of those grains by live-stock, and will probably prefer to do so rather than export wheat instead. Therefore although my estimate would, as it stands, mean a reduction in the 85 million quintals of wheat I have estimated as the exportable surplus of old wheat on 1st August next there is no reason to reduce it on this ground.

However, since I made that estimate on 23rd December the harvest weather in the Argentine has been bad, and the official estimate of this year's wheat-yield is only 51 million quintals, as against my rough estimate of 57 million quintals; and in India the winter rain is still holding off, which reduces the prospect that, after the coming harvest in May, India might be found able to spare 20 million

quintals of wheat for export. I would therefore now on these grounds reduce my estimate of the world's exportable surplus of old wheat on 1st August next from 85 million quintals to 70 million quintals, which is still a much larger quantity than the pre-war average exportable surplus on that date in excess of the usual carry-over. Such a surplus would be sufficient in itself to meet the pre-war average demand for wheat of all countries for nearly five months without drawing on the produce of the harvests to be reaped after 1st August next.

These estimates, and especially those for the closed countries, are necessarily mere conjectures as to what seems most likely to happen. In framing them I have assumed that in each country the weather conditions from now up till next harvest will neither be very favourable nor very unfavourable, and that in a few months general peace conditions will be secured and some progress made in evolving order out of the present chaos in many parts of Europe. A great deal will depend on the action taken by the Supreme Council of Supply and Relief. In ordinary times of peace it may be presumed that practically all concerned—producers, dealers, consumers, and Governments—will be mainly influenced by purely financial considerations, their desire being on the one hand to make as much profit as possible out of the sale or handling of the grain, and on the other to obtain what grain they require as cheaply as possible; and a more or less reliable estimate can be framed, on the basis of a study of the past, as to what is likely to be the general result of the action of masses of men determined almost entirely by motives of self-gain. But in time of war, when peoples and Governments are dominated by military considerations, and many of them willing to make great sacrifices of their own interest or convenience in order to secure victory, and to obtain the necessary supplies of grain at whatever cost, it is difficult to estimate what the final result of their action will be on the world's grain-market. So again, in times of famine, when motives of charity determine the action of many people and Governments and lead them to sacrifice their own pecuniary interest to the desire of saving their fellow-men from starvation, it is difficult to estimate how far these charitable motives will lead them to go. From reports in the newspapers it appears that the Supreme Food Council propose to undertake famine relief operations on a large scale, and at all events to feed the peoples of the liberated countries and Armenia until next summer. It is estimated that £80,000,000 will be required, and it seems probable that the United States Congress will provide a fourth of this amount. The population to be relieved is estimated by Mr. Hoover at 125 millions. It is not clear whether it is intended to expend the whole of this huge sum without return, but presumably an endeavour will be made to obtain payment for part of the food sent from any Government or local body or private consumer who may be in a position to pay for it.

According to our long experience of famine relief in India, the best policy is to provide the famine-stricken with the cheapest grain available in quantity sufficient to maintain them in health and vigour. In the first place this costs less than if they are provided with dearer food, or, in other words, it makes a given sum go further in the relief of starvation; and, in the second place, there is less likelihood of the inferior grain being intercepted on its way to the poor by the rich and powerful—a consideration of great importance in the absence of ordered Government able and willing to enforce a fair system of distribution. At present the cheapest grain in the world to be obtained in any quantity appears to be maize, of which there are probably at this moment in the Argentine about 20 million quintals available for immediate export, with the prospect of another 30 million quintals after the next maize harvest in April. According to Broomhall, the price of wheat for February shipment at Buenos Aires on 18th January was 10·40 paper dollars per quintal (about 42s. per 480 lb.), while the corresponding price of maize was only 4·95 dollars per quintal (about 20s. per 480 lb.); so that, in proportion to its nutritive qualities maize is at present in the Argentine much cheaper than wheat. The United States, again, with its splendid crop of maize in 1917 and its average crop in 1918, could easily spare almost any amount of maize by simply reducing the number of pigs, which seems to be embarrassingly large. The present prices at Chicago are—wheat, 226 cents per bushel (say, 75s. per 480 lb.), and maize 136½ cents per 50 lb. (say, 55s. per 480 lb.); so that in the United States also maize could probably be bought in large quantity at a cheaper price than wheat, with due regard to the comparative life-saving potentialities of the two grains. India, too, had it not been for the failure of the monsoon, could probably have spared for export some 50 million quintals of rice, and may possibly still spare a considerable quantity at a lower price than wheat. The Supreme Council, therefore, may perhaps find it advisable, in its operations

for famine relief, to supply the liberated countries with maize from the Argentine and the United States, and with rice from India, rather than with dearer wheat, and for similar reasons may encourage the importation of maize and rice into Germany and Austria in preference to wheat.

Further, in many of the distressed parts of Europe there is a greater scarcity of butcher-meat and fats than of grain, and it may be found advisable in the interest of the poorer classes to import meat, or even live animals, and so reduce the import of grain. Some parts of Russia have probably a large surplus of live-stock, some of which might be within reach of means of transport.

If, as seems probable, there are in the troubled parts of Europe many farmers and peasants who are in possession of stores of grain larger than they themselves can consume before next harvest, one of the most efficacious means of relieving famine in the towns and elsewhere might be to import, instead of grain, gold, silver, and copper coins, and paper money which they could trust, and agricultural machinery, cloth, and other articles of which they stand in need, and which they would be glad to accept in exchange for their grain. The difficulty would be to arrange an efficient system of distribution, but probably this could be done to some extent through the local channels of trade. Next to the restoration of a general feeling of security, which will largely depend on the success of military operations, perhaps the greatest need is the restoration of communications, on which, as well as in the fields and factories, there must be a great amount of urgent work to be done; and, according to our Indian experience, one of the best means of affording relief in famine is to offer useful work to the famine-stricken at a wage sufficient to maintain them to buy enough food of the cheapest kind available to maintain themselves in health. Even the laziest man will work for a mere pittance if otherwise he would starve; and the eater of wheat or rye will rather buy maize or rice if his resources are reduced and he can get more of those grains for his money. It may be found possible to organize to some extent famine-relief measures of this useful kind, more especially if trustworthy money and credit can be made available; and experience shows that if the famine-stricken are enabled to earn good money food will come to them in the ordinary course of trade if it is anywhere within reach.

Most of these measures would tend to reduce the necessity of importing grain, and it may be found that, even if motives of charity are allowed to have full sway, the actual net import of grain into Europe up to next August will not be larger than I have estimated.

My principal study has been the question of the world's supply of wheat, and while it is impossible to forecast the future with any certainty, present probabilities seem to be that on 1st August next the exporting countries will find themselves in possession of exportable surpluses of wheat aggregating something like 70 million quintals.

IMPORTATION OF CATTLE FROM TASMANIA.

THE regulations under the Stock Act prohibiting the importation into New Zealand of cattle, except from the United Kingdom and Canada, have been modified by an Order in Council gazetted on 27th March, permitting such importation from Tasmania, subject to the following special conditions: The consent of the Minister must first be obtained for the introduction of the animals. The cattle on arrival in the Dominion must undergo quarantine for forty days. Every shipment must be accompanied by a statutory declaration made by the shipper setting forth the kind, number, sex, and brands or marks, and declaring that all such cattle have been in the State of Tasmania from birth; that they are at the time of shipment, and have been during the preceding six months, free from all infectious and contagious diseases; and that they have not during the six months immediately preceding shipment been in direct or indirect contact with any stock infected with any such disease. On every such declaration is to be inscribed a certificate, signed by a Government veterinarian, certifying that he has, within the thirty days immediately preceding the date of shipment to New Zealand, examined and tested with the tuberculin test such cattle, and has found them free from infectious and contagious diseases. Particulars with respect to the test, showing dosages and temperature records, must be supplied with the certificate.

MARKETS FOR NEW ZEALAND APPLES IN CANADA AND THE UNITED STATES.

THE Department recently obtained reports from the New Zealand Government Agents at Vancouver and San Francisco regarding the market prospects, &c., for apples of the current season's crop from this Dominion, in their respective countries.

VANCOUVER.

The agent at Vancouver, Mr. W. A. James, reported, under date 19th February last, as follows :—

The consensus of opinion among wholesale fruit-dealers and commission merchants in Vancouver is that the present season offers exceptional opportunities for the remunerative shipment of New Zealand apples to Canada. The general indication, based upon present values and the general state of the market, is that apples of good quality should sell for, approximately, 3½ dollars (14s. 7d.) per box, freight and duty paid, at Vancouver, it being understood, of course, that the apples would be in good condition, well graded, and free from pests. The price as noted is the price which shippers should anticipate securing, as the cost of selling and profit would be at the expense of the importer. From the price named, however, the exporter would require to provide, by deduction, the cost of duty. Duty, 60 cents per barrel, equals, per 40 lb. to 48 lb. boxes, 20 cents ; fruit-inspection fees, per box, 3 cents ; Vancouver wharfage and handling charges, say, 7 cents : total, 30 cents. So that, approximately, apples should be laid down, say, at 3 dollars (12s. 6d.) per box, c.i.f., Vancouver. The rates of duty as noted above are the preferential rates extended to New Zealand, but apples imported from the United States or Australia take general rates of duty, which are 90 cents per barrel of 24 imperial gallons—say, 30 cents per 40 lb. to 48 lb. box, containing approximately 8 gallons.

The view of the trade is that the most advantageous time to ship would be the late March and April sailings from New Zealand. It would not be advisable later than that, the reason being that the early fruit from California would then be reaching this market and coming into competition. It is possible, of course, that some small shipments might be made later. The general view held by the importing trade is that perhaps this market for the two months indicated should be capable of absorbing approximately 20,000 cases, each 40 lb. to 48 lb., which is the usual package of this market.

The suggestion is made from the various commission sources that as soon as New Zealand exporters are able to ship, and can obtain freight-space, they should cable their firm offers. Immediately on receipt of this information the commission man is then able to go to the wholesale houses both in the Province of British Columbia and the adjoining prairie provinces and accept their orders for definite quantities based upon definite terms of sale ; then definite orders can be made accordingly. This would eliminate all chance, unless, of course, exporters might prefer to ship to their own correspondents upon consignment and take their own chance upon the market. Cable offers should indicate clearly the number of cases offered, variety, style of box, net weight, wrapped or unwrapped, what grade (number of apples to the box), for what shipment, and terms of sale.

Inspection at Vancouver is very rigid. As to grading, the suggestion is made that it is not advisable to ship apples smaller than 188 to the 40 lb. to 48 lb. box. It is important that exporters should be advised that all shipments should be accompanied by Customs invoices made out in the form as required by the Canadian Customs regulations. These invoices to be signed by the shipper both on the face and reverse, and must be furnished in duplicate for Customs purposes. It is necessary that these invoices should conform to Customs requirements in every respect in order to enter under the British preferential-tariff rates, which are extended to New Zealand (but not to Australia).

The regulations are very drastic in regard to pests, particularly codlin-moth ; and it is learned through discussion with the trade that it is not unusual for shipments to be refused entry on the slightest evidence of this pest. One insect upon fruit or case being detected in any one shipment would result in the entire shipment being condemned. It is therefore suggested, as a matter of precaution, that

instead of shipments being consigned to Vancouver they should in every instance be consigned to Winnipeg, the reason for this being that the fruit inspectors for the Province of British Columbia have no jurisdiction for shipments destined for other provinces where fruit is not grown. Shipments so consigned are available, therefore, for shipment outside the Province of British Columbia if they are found to be affected in any slight degree. If not affected, it is a very easy matter for the holder of the bill of lading in Vancouver to arrange for the delivery of the shipment at Vancouver.

This is a plan that a great many fruit-importers adopt where they have reason to fear their shipments may be condemned by the fruit inspector for any slight cause. Fruit is not raised in the prairie provinces; and, as a matter of fact, it is there that the best market is obtained. These prairie provinces are not suited to fruitgrowing, for climatic conditions, and therefore there are practically no restrictions upon the entry of fruit which would be rejected in every instance in the Province of British Columbia, where fruit inspections are particularly stringent.

SAN FRANCISCO.

The Agent at San Francisco, Mr. H. Stephenson Smith, cabled on 20th February last, as follows:—

Apples: Markets are active for future delivery, April, May, June, July; 10s. to 12s. 6d. per case; market advancing rapidly. Consider present time favourable to make trial shipment of 1,000 cases, 104 to 175 apples to each case, giving preference to red varieties. Must be guaranteed free of pests. Must be sent in refrigerators, consigned to my order.

Confirming this advice by mail Mr. Smith quoted trade opinion that the present year is an extremely favourable one for placing New Zealand apples on the American market (owing largely to shortage of locally produced cold-stored supplies). The prices mentioned of 10s. and 12s. 6d. per case might be regarded as the minimum likely to be realized, and that with the advancing market 15s. to 17s. 6d. might be expected in May. He again pointed out that a horticulture certificate to the effect that the fruit was clean and free from all pests was necessary.

NOTE.—Particulars regarding certificates and similar requirements may be obtained from the Director of the Horticulture Division of the Department.

SUPPLY AND EXPORT OF HIDES.

WITH reference to the embargo recently placed on the export of hides for the purpose of assuring supplies to local tanners, a conference comprising representatives of the Board of Trade, and of brokers, freezing companies, producers, tanners, and boot-manufacturers, was held at Wellington on 11th April. After discussion, the difficulties were narrowed down to (1) the necessity of allowing freezing companies to export a portion of the hides bought prior to 6th March; (2) the difficulty of dealing with hides offered at auction. It was estimated that if the freezing companies were allowed the right to export approximately 20,000 hides no other difficulty would be raised in making all the balance available for use in New Zealand. A sub-committee, consisting of Dr. Reakes, Director-General of Agriculture, Mr. W. G. Foster, and Mr. W. S. Bennett, was set up to work out an equitable allocation of approximately 20,000 hides among the various companies, the tanners raising no objection. With respect to the second difficulty, the conference decided to recommend that the Order in Council governing the matter be amended—(*a.*) That ox-hides offered at auction in the following grades and at the following prices, and not purchased by tanners, shall be deemed to have been refused in such circumstances as to show that the goods are not required for local purchase at those prices: Superior 33-44, 11¼d.; 45-52, 11¾d.; 53-58, 12¾d.; 59-69, 13½d.; 70 and over, 14d. (all f.o.b.): First grade, 1d. less: 2nd grade, 1½d. less. (*b.*) That cow-hides offered at auction in the following grades—33-39, 40-49, 49 and over—and not purchased at the prices fixed in the schedule of the regulation, shall be deemed to have been refused. The conference expressed the opinion that if these suggestions were give effect to the scheme would work smoothly. The producers' representatives objected *in toto* to any limitation of prices. The Board of Trade recommended the adoption of the conference proposals, and the Minister (Hon. W. D. S. MacDonald) has approved. The local hide-sales will be resumed shortly.

BUTTER-PRICES EQUALIZATION FUND.

THE constitution of the Butter-prices Equalization Fund is set forth in the following clauses of the arrangement for the purchase by the Government of the exportable surplus of butter manufactured in New Zealand during the period 1st August, 1918, to 31st July, 1920, as gazetted on 19th March :—

16. (*a.*) For the purpose of equalizing the profits of those manufacturers who supply creamery butter to the Government under this scheme of purchase and export and the profits of those manufacturers who supply creamery butter for local consumption the Government will establish a fund to be called the Butter-prices Equalization Fund.

(*b.*) For the purpose of constituting such fund the Controller shall retain out of the purchase-money payable from time to time to each seller of creamery butter under this scheme a sum equal to the excess of that purchase-money over the sum of 1s. 6d. per pound of the quantity of creamery butter for which payment is so made, but for the purpose of this clause such purchase-money shall be computed without any deduction for short weight or for butter graded lower than first grade.

(*c.*) The moneys so retained shall constitute the said Equalization Fund, and shall be held by the Government in trust for distribution in accordance with the following provisions.

(*d.*) The Equalization Fund shall from time to time be expended by the Controller on the following purposes : (i.) In the payment of all expenses incurred in the establishment or administration of the fund. (ii.) In the distribution among manufacturers of New Zealand creamery butter sold by the manufacturers during the period mentioned in clause 1 hereof, whether before or after the date of these presents, for local consumption at prices fixed by the Order in Council of the 16th day of April, 1918, of such sum as may be deemed justly payable in order to compensate those manufacturers for any loss incurred by them in so disposing of their butter. (iii.) In refunding to the sellers at whose expense the Equalization Fund has been established all sums not expended for the aforesaid purposes.

(*e.*) The determination of the Controller as to the expenditure of the Equalization Fund shall for all purposes be final and conclusive ; but in the exercise of his powers in this respect he will at all times consult the Dominion Butter Committee as now established, or such other committee or body as may for the time being be substituted therefor, as representing the manufacturers of New Zealand creamery butter.

GOVERNMENT PRICES OF WHEAT.

AN Order in Council gazetted on 7th April amended the regulations of 25th February respecting the sale and purchase of wheat as regards the several months in which the stated prices will be paid by the Government. These now stand as follows : In the South Island elsewhere than in Nelson and Marlborough—January, February, March, and April, 6s. 6d. ; May, 6s. 6½d. ; June, 6s. 7d. ; July, 6s. 7½d. ; August and after, 6s. 8d. per bushel. In the North Island, and Nelson and Marlborough, the same schedule applies with an addition of 4d. per bushel in each case.

EXPORTATION OF OATS.

THE Comptroller of Customs notified in the *Gazette* of 13th March that the Minister of Customs is prepared to consider applications for the exportation of limited quantities of oats to the United Kingdom and British possessions. Applications should be addressed to the Comptroller at Wellington, and must show the quantity desired to be exported, the name of the exporting vessel, the port of shipment, and the port and probable date of final departure. Permits will be granted only for shipment by vessels named. If the quantity covered by a permit is not shipped by any vessel named therein further application will be necessary.