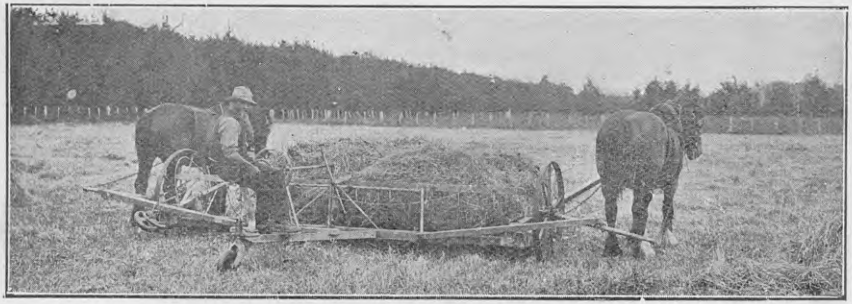

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THE DEHORNING OF CATTLE.

VARIOUS ASPECTS AND CONSIDERATIONS.

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THE subject of the dehorning of cattle was briefly reviewed in the *Journal* for January, 1918, since when a larger amount of evidence has been accumulated and the matter further considered from its different aspects. The prinicpal objections raised to dehorning have been from a "cruelty-to-animals" point of view, and that of purebred stud or exhibition cattle. Various suggestions have been put forward, and after careful consideration the Department proposes to meet these objections while also endeavouring to attain the desired object.

THE CRUELTY POINT OF VIEW.

It has been demonstrated that horned cattle are the chief cause of bruises found upon beef carcases, and this brings one to the first point for consideration—namely, whether it is a matter of cruelty to dehorn cattle. The removing of the horn "bud" from calves is a simple and practically painless operation when compared with castration, ovariotomy, or the docking of lambs. In older cattle the operation is more spectacular than cruel, due to bleeding. The operation, if skilfully performed (by this is meant sharp, clean instruments and the animal securely fixed up), is almost instantaneous, and the job once done lasts

a lifetime. On the other hand, the saving of the animal from one short pain leaves it for the remainder of its life in possession of a weapon with which it can, and generally does, inflict gross cruelty upon other animals, including human beings, whenever in a mood to do so. It may be noted here that at least one of the leading societies for the prevention of cruelty to animals has passed a resolution in favour of dehorning, preferably in the calf stage. In any case it is unlikely that proceedings taken under any legislation at present in existence would be likely to succeed, so overwhelming is the evidence that dehorning is an important factor in the prevention of cruelty to animals.

STUD OR EXHIBITION CATTLE.

Purebred cattle or cattle intended for exhibition purposes are reared and cared for under different conditions from those under which general dairy stock are kept, and the same opportunity is not allowed them for attacking their mates, which, if allowed to take place, would be disastrous to the owner intending to exhibit or sell. He is careful, therefore, to avoid any injury to his stock in this way. Another very important matter which must not be overlooked is that the dehorning of horned breeds of cattle does away with the characteristic expression of the breed the presence of which is absolutely necessary in expert judging. Such stock should therefore not be dehorned while kept for exhibition; but when such purposes have been fulfilled and it has been decided to fatten off the animals for slaughter, and they are likely to mix with other cattle in saleyards, mobs, or in railway-trucks, they should certainly be dehorned a few weeks previously.

DAMAGE TO CARCASES IN THE MEAT TRADE.

The heavy loss sustained annually, especially for the meat-export trade, by the disfigurement of carcases is well known to all engaged in the trade, while the number of wholly condemned or partially rejected carcases, even for home consumption, is astounding to those with knowledge of this matter. The most serious aspect lies in the fact that it is the best and most valuable cuts of meat which are most liable to be so damaged.

Many complaints have reached the Department indicating that careless shunting of railway-trucks in transit is the principal cause of cattle being bruised. This has been greatly exaggerated, it being no sure sign to rely upon probes as evidence that where no such marks exist all other bruises can be put down to careless shunting. One horned animal in a truck of otherwise hornless cattle can and does so frighten the others as to cause them to seriously bruise their sides and hind quarters against the truck in an attempt to save themselves from the more dreaded horn. This can be seen at any time even when the trucks are stationary. It is essential for the reduction of bruising that there be more careful handling and less stick while yarding, loading, or detraining cattle, that male and female animals be kept separate as far as possible, and that all cattle be dehorned before forwarding for slaughter.

It is not feasible to here go into all the details which have accumulated at the Division's office, but the following examples are

a fair average from among statistics supplied by departmental officers employed specially at slaughtering-places :—

In one mob of 105 horned cattle received by rail at one meat-works, examination after slaughter showed thirty-one bruised buttocks, thirty-eight bruised sides, twenty-two bruised shoulders, thirty-three bruised hips, two bruised legs, one bruised back, and fifteen horn-pokes. In this case forty-two hind quarters and twenty-six fore quarters were rejected for export.

Other reports state : "On the 16th and 18th instant there were slaughtered 111 head of Polled Angus cattle ex rail. Thirty were found bruised, mostly upon the hip, so it looks as if bruisings were done in yards or elsewhere."

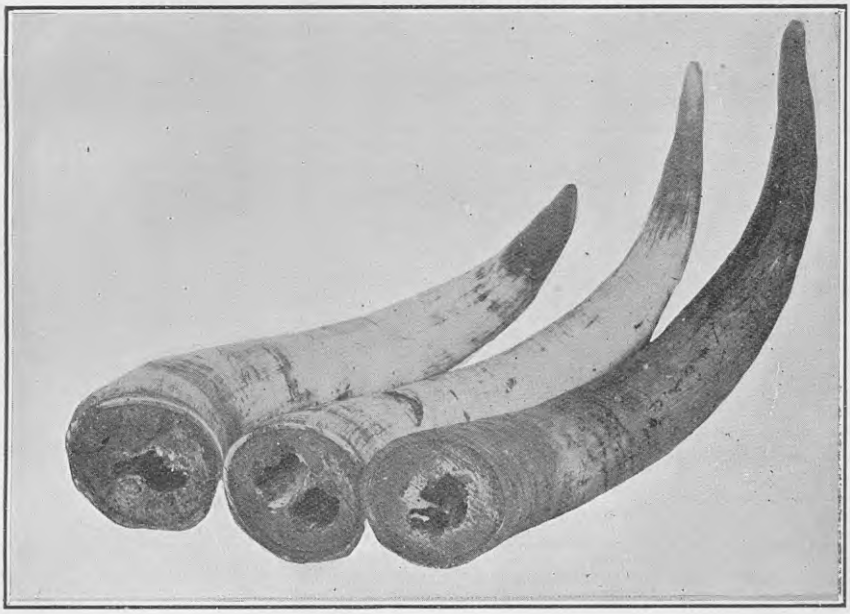

FIG. 1. HORNS SAWN OFF, SHOWING HOLLOWS.

The horn on left has been removed 3 in., that in middle 2 in., and the one on right, 1½ in. from the head.

"Forty head of polled cattle ; several slight hip and shoulder bruises, but nothing serious on the whole. Very clean, and no room for complaint."

"Sixteen horned bullocks ; seven carcases rather badly bruised."

THE HORN DESCRIBED.

Before dealing with the methods of dehorning, the horn itself may be described. Briefly, the horn is composed of two parts, the true horn or outer shell, which is of non-sensitive structure like the human finger-nails, and the core or inner structure, which is very vascular, and (unlike the quick underneath the human nail) is composed of open

bony structure richly supplied with blood-vessels, and hollow. It fits closely into the horn, and is a strong support to it, while the outer horn acts as its protection.

The growth of the horn does not start from the skull, but in tissue between it and the skin. At this period it is loose but for its connective tissue, blood-supply, and nerves, being then known as the bud or button, and can at this time be easily removed. As time goes on, the bud secures a firm hold upon the bones of the skull and absorbs that part of it which it covers, thereby opening up a direct communication between the frontal cavities of the head and subsequent cavities of the horn,

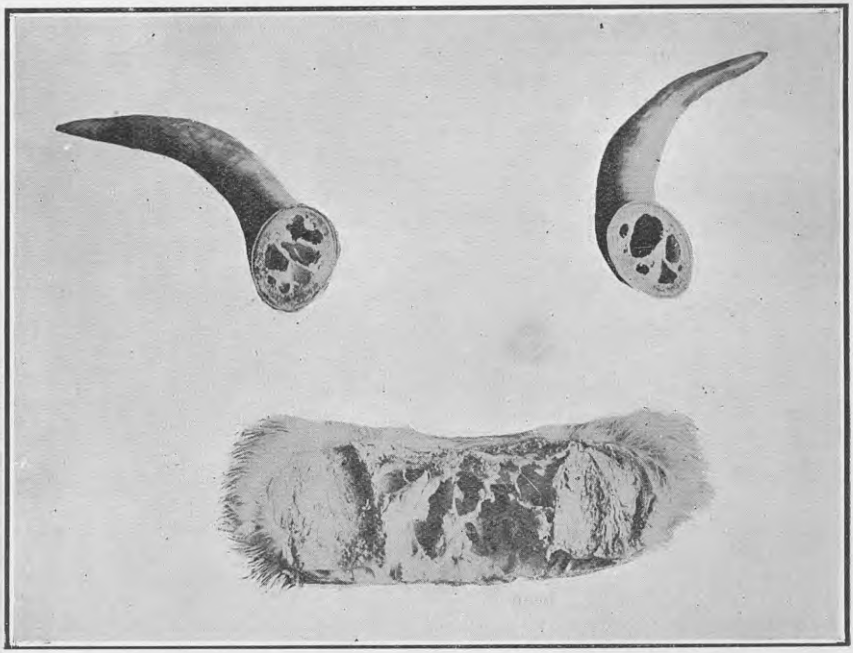

FIG. 2. HORNS REMOVED $\frac{1}{2}$ IN. FROM THE HEAD, AND FRONTAL PART OF SKULL.
Showing sinuses (hollows) which interconnect skull and horns.

as shown in the accompanying illustrations. The horn is now to all intents and purposes a part of the skull, as will also be observed in the photos.

These sinuses are fairly large both in the horn and forehead. This offers, after the dehorning of adult cattle, facilities for the access of dirt into the head. If this is not guarded against suppuration may take place and be very troublesome. The presence of dirt or suppuration is shown by the animal shaking its head, holding it on one side, or rubbing the stump against some object. There is evidence of pain, and pus may make its appearance. In such cases it would be best to consult a veterinarian.

Thus horn-prevention in young calves is greatly to be preferred, for at that time there is no actual opening into the skull, and any dirt in the wound could be easily washed out.

HORN-PREVENTION IN YOUNG CALVES.

In calves, the undeveloped horn can be felt as a small round body loosely attached to the head just underneath the skin, and shaped like a button. The period to examine the calf for this is from the time it is a week old, as if there is to be a horn the sooner it is removed the better. If this stage is allowed to pass, and the horn shows through the skin, the operation should then be delayed for dehorning whenever the growth is sufficient for this purpose.

The best and most reliable method of horn-prevention is the surgical one, the only instrument generally employed being a sharp knife; but if the operator were to add to this equipment a pair of claw forceps and a pair of curved scissors the work could be more expeditiously done. The procedure is for an assistant to hold the calf in a steady position; the bud is then felt for, and the hair removed from the part sufficiently to leave a clear field for operation. With the forefinger and thumb the bud is raised until the skin is tense. A cut is then made with a sharp, clean knife over the centre of the bud; the claw foreceps are next used to pull the bud sufficiently far up to allow the curved scissors to get underneath and clip the bud out. No after-treatment is required, but if the weather is hot or the wound appears dirty a wash with a weak solution of any standard disinfectant should be given.

Another method is to clip the hair off, then wash the part with water, and when still wet apply caustic over all the bud. Caustic sticks can be procured from any chemist, and also a holder which will protect the operator's fingers. The only precautions necessary are that the whole of the bud, even its extreme edges, must be so treated, otherwise small horns may grow. Wet weather must be avoided, as this would weaken the caustic before its full effects took place. Only sufficient moisture is required to keep the end of the stick wet during the process of rubbing-in. One application is sufficient if properly done, and no after-treatment is required, but the animal should be again examined within a few days to see if the operation has been successful. If not, the scab should be removed by washing or brushing, and another application made.

DEHORNING OF ADULT CATTLE.

The best time to dehorn adult cattle is when the weather is cool and no blow-flies are about. Cows should be dehorned when the milking season is over or drawing to an end, and before they are many months in calf. When the animal is young and the horn green it is best to use a clean, sharp pair of shears. In older animals, and especially where the horns have a broad base, a sharp bone-saw should be used. This prevents any chance of fracturing the frontal bones of the head. This is common enough where the horn is very solid, especially if the shears are allowed to get blunt. In selecting a bone-saw one should be got

deep enough to go through a large horn without the back coming into contact with the horn, otherwise a clean-cut under-surface will not be attained.

When a number of cattle are to be dehorned, and by either method, it will be to the advantage of the operator to make special arrangements for holding the animals while being operated upon. An ordinary race can be used for this purpose, with certain alterations to the breast-bars—one to have a U-shaped notch in the centre, big enough to hold the windpipe and gullet. This prevents injury to these parts when the top bar, which is fixed upon a bolt at one end, is brought firmly down upon the upper part of the neck to keep the head steady. The cross-bars behind should be arranged to press firmly upon the hind quarters of the animal, so that it cannot move backwards even a few inches. This saves the fingers of the operator, and also his saw, from damage.

Having everything satisfactorily fixed up, grasp the horn with the left hand, and, after selecting the part where the dehorning is to take place, begin to saw quietly until a track has been made for the saw. There is no pain at this stage, as only the non-sensitive part of the horn is being gone into. Then drive quickly, but do not press the horn downwards more than just enough to relieve the saw, as a clean underneath cut is desirable. The other horn is now similarly treated, and the animal yarded for observation. Where only a bull is to be subjected to dehorning, this can be done by securely fixing him to a tree and using the saw in the same manner.

The correct distance from the head for taking off a horn is 1½ in. If cut shorter than this a very large hole is left exposed on the head; if longer, the animal will still find a use for the stump as an offensive weapon.

The operation being finished, the yarded animals should be examined, and any case of excessive bleeding attended to by the application of tar. After-treatment is seldom required unless in hot weather, when, in all cases, tar should be applied to the stump. Where it is found that dirt has got into the head, causing suppuration, the cavity should be syringed out with water to which has been added some disinfectant.

CONCLUSION.

In milking-herds the result of the dehorning operation has been observed by the writer in some ten thousand cases. None of the animals died as a result, three slipped their calf, and a few delayed healing up. The milk-supply dropped on average 3 lb. the first day, regained 2 lb. the second day, and was back to normal the third day. There is no record of a subsequent additional quantity or quality of milk due to dehorning, only a general remark that the loss was more than made up, so that no definite information can be given upon this point.

The subject of the dehorning of cattle interests the meat trade, the stockowner, and the consumer, both from the standpoint of the prevention of cruelty and financially. It is claimed for dehorning (1) that a herd of cows settles down better after dehorning, thereby increasing the quantity and quality of the milk-yield to an appreciable

degree; (2) that a large amount of bruising, especially in fat cattle forwarded for slaughter, can be avoided by the practice; (3) that horned cattle inflict unnecessary cruelty upon each other; and (4) that many fatalities to human beings would be prevented by dehorning.

THE SIX-HORSE-TEAM UNIT.

COST OF UPKEEP IN CANTERBURY.

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THE necessity for research work in farm costing has been universally appreciated by agricultural economists, especially in America, and, to a lesser degree, in Great Britain. A new country with great natural resources is apt to ignore the importance of cost accountings, but, with the upward trend of the price of land, wages, and equipment, combined with the gradual exhaustion of virgin soil fertility, even the agriculturists of New Zealand are realizing that more attention must be given to the cost of production. It is often assumed that land-values are at present largely fictitious, but till this is proved by a correct balance-sheet the claim is futile.

In here discussing the cost of upkeep of the six-horse team in Canterbury it is realized that the figures submitted may be open to criticism. The idea of the investigation was not so much the establishment of a permanent basis on which the cost of cultural operations might be founded, but rather to suggest to farmers the immense importance to themselves of a complete and exhaustive inquiry into the costs of raising farm-produce. At the same time it does establish a basis on which the cost of cultural operations can be calculated, perhaps with greater accuracy than has hitherto been attempted in Canterbury.

SYSTEM OF THE INVESTIGATION.

In making this investigation the following questions were kept constantly in view: (1) The cost of maintaining a six-horse team for one year; (2) the cost of cultural operations per acre, calculated at 150, 175, 200, 225, 250, and 275 working-days per annum.

Twenty-seven men were selected on land ranging from the downs at Waikari to the downs of Timaru, taking in the light plain country and also the better type of loam as found round Methven, Wakanui, and Lincoln. Good practical farmers were chosen in every instance. They were visited personally by the writer, and by dint of cross-examination the information as recorded was procured. Owing to the lack of records it was extremely difficult to procure absolutely reliable

data, in most cases estimates only being given. A questionnaire was prepared, an example of which is here printed, showing a typical estimate.

Specimen Copy of Questionnaire.

Farm No. 13. Name and Address:.....

Items of Cost.	Capital.	Interest.	Depreciation.	Repairs.	Annual Cost.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Horses	270 0 0	16 4 0	..	..	16 4 0
Replacement ..	..	..	36 0 0	..	36 0 0
Chaff (29 tons) ..	105 7 4	6 6 3	..	..	111 13 7
Oats (240 bushels) ..	34 0 0	2 0 8	..	..	36 0 8
Hay	..	..	..	..	..
Grazing (15 acres) ..	225 0 0	12 18 0	11 5 0	..	24 3 0
Harness	65 0 0	3 18 0	2 0 0	3 15 0	8 13 0
Covers	15 0 0	0 18 0	7 10 0	..	8 8 0
Buildings ..	400 0 0	24 0 0	10 0 0	5 0 0	39 0 0
Insurance	..	..	..	..	2 11 0
Shares	..	..	..	..	4 5 0
Shoeing	..	..	..	..	3 18 0
Machinery ..	460 0 0	27 12 0	38 0 0	25 0 0	90 12 0
Oil	..	..	..	..	3 0 0
Wages	..	..	..	..	94 0 0
Bonus	..	..	..	..	10 0 0
Keep (of teamster)	..	..	..	..	52 0 0
Totals ..	1,574 7 4	93 16 11	104 15 0	33 15 0	540 8 3

As experienced by investigators in other countries, the problem of a basis for valuation of horses and feed at once presented itself. The majority of the farmers interviewed expressed the opinion that feed (chaff, oats, and grazing) should be valued at the market price, and returns which might reasonably be expected from their use in other directions. On the average farm in Canterbury the final product is in the form of meat, wool, wheat, seeds, oats, or chaff. The team is maintained to enable the farmer to produce feed for his stock and to cultivate his land for his cash crops. In other words, he is not looking for a profit on his team, which is simply a means to an end, and therefore any feed used by that team must be charged at cost price and not market price. This principle has been laid down very rigidly by the Institute for Research in Agricultural Economics, at Oxford University. The Hon. C. S. Orwin, M.A., in his report on the Institute, points out that it is mainly the lack of farm records which drives the farmer to this basis of valuation. It is only by a sound system of farm accounts that a comparison can be made between the advisability of using crops as intermediate products (that is, crops fed to produce meat, wool, &c.), or putting them on the market, hoping to realize a larger margin of profit.

This question is one of great importance, but cannot be discussed at length here. So far as this article is concerned, it is sufficient to say that the feed consumed by horses is charged at cost price. Before it was possible to arrive at the cost of producing these feeds it was

necessary to set an arbitrary value on them, to enable the cost of horse labour expended on the oat crop to be calculated. For this purpose chaff was charged at £3 10s. per ton and oats at 2s. 6d. per bushel, which brought the cost of the team to £2 3s. 1d. per day on the basis of 250 days' work per year. The cost of cultural operations was then calculated, when it was found that, on the details supplied by the farmers concerned, chaff was costing £3 12s. 8d. per ton and oats 2s. 10d. per bushel. A correction was made accordingly in the cost of upkeep of the team. It is recognized that the figure thus obtained is not absolutely correct, but on the information available it is difficult to see what better method could be devised.

Horses are charged on valuation, as there is no information available to decide the cost of rearing an animal till such time as it becomes a useful part of the team.

Machinery and harness are charged on a new replacement value, a flat rate being used on all farms.

ANALYSIS OF COSTS (SEE ACCOMPANYING TABLES).

Table I is self-explanatory. All that need be said is that money invested in such things as horses, feed, land, harness, buildings, and machinery is charged at 6 per cent. interest. The annual expenditure on insurance, ploughshares, shoeing, oil, wages, bonus, and keep of teamster is not charged with interest. It is questionable whether this method is correct; but, as the payments are likely to be distributed over the whole year, the capital represented might be called "floating capital," and in this case at least is considered free of interest in order to simplify the estimate. In assessing the cost of grazing, the estimated cost of the establishment of the pasture (£2 5s.) is spread over three years, at the rate of 15s. per acre per annum.

It will be seen that the farm totals (Table I, column 19) are subject to a considerable "spread," or variation. By studying Tables I and II together the reasons for these variations are evident. The most obvious reasons for the spread in the estimates seem to be (1) soil variation, (2) farm location, (3) the efficiency of the teamster, and (4) amount of land cultivated.

In column 2 of Table II (horses) replacement covers both depreciation and deaths, amounting to 12 per cent. of the average capital value, which places the average life of a farm-horse at eight and a third working-years. This estimate opens up a subject requiring serious thought on the part of the farmer—namely, team-management. In the course of this inquiry several methods of maintaining the efficiency of the team came under notice, but the subject is beyond the scope of this article.

On farms 2 and 3 the practice is to feed straw-chaff and oats. It will be noted that in both cases the cost of feed is high—in fact, the estimates from farms 1, 2, and 3 are so high that they have rather a serious effect on the average cost of upkeep. In a later article, however, an attempt will be made to show the earning-capacity of the respective teams.

Table I, showing Annual Expenses under the Different Headings—i.e., *Interest on Invested Capital, Feed consumed, Current Expenses, Repairs, and Depreciation.*

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Farm No.	Horses (Interest, 6 %).	Horses (Replacement).	Chaff.	Oats.	Hay.	Grazing.	Harness.	Covers.	Buildings.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1	18 0 0	30 0 0	84 14 3	203 12 2	10 12 0	28 7 0	12 8 0	7 8 0	56 0 0
2*	14 8 0	35 0 0	61 19 7	195 4 7	5 6 0	19 10 0	17 11 6	7 19 5	37 0 0
3*	14 8 0	30 0 0	28 12 2	225 4 2	..	36 19 0	8 18 0	8 18 0	49 10 0
4	14 8 0	35 0 0	142 9 4	54 16 0	15 18 0	27 0 0	13 18 0	13 0 0	29 0 0
5	19 16 0	20 0 0	134 15 1	72 12 9	..	32 0 8	11 10 0	8 14 9	21 0 0
6	16 4 0	35 0 0	138 12 7	26 5 5	..	24 15 0	14 18 0	10 11 4	26 0 0
7	18 0 0	30 0 0	138 12 7	45 0 7	5 6 0	33 15 0	13 18 0	6 0 1	30 8 0
8	18 0 0	30 0 0	138 12 9	24 14 7	..	37 16 0	10 18 0	5 18 0	19 0 0
9	14 8 0	30 0 0	154 1 0	26 4 7	..	27 6 0	16 8 0	6 14 5	22 10 0
10	14 8 0	30 0 0	123 5 1	43 10 6	11 13 2	25 10 0	13 18 0	8 8 0	26 5 0
11	18 0 0	30 0 0	115 10 8	60 1 1	..	27 6 0	11 3 0	6 14 4	30 0 0
12	13 4 0	40 0 0	134 15 8	32 8 5	..	24 16 8	24 18 0	7 7 10	20 2 0
13	16 4 0	36 0 0	111 13 7	36 0 8	..	24 3 0	8 13 0	8 8 0	39 0 0
14	18 0 0	25 0 0	96 5 3	37 10 8	..	32 15 0	13 12 0	8 4 4	25 16 0
15	14 8 0	40 0 0	96 5 3	30 0 7	25 0 0	25 12 4	6 0 0	10 1 4	33 0 0
16	14 8 0	27 10 0	146 6 11	..	..	31 10 0	11 18 0	5 18 0	31 0 0
17	16 4 0	32 6 0	115 10 8	6 0 1	5 6 0	38 5 0	13 6 0	6 14 4	22 0 0
18	14 8 0	30 0 0	115 10 8	14 11 5	..	25 10 0	11 18 0	6 14 5	20 0 0
19	16 4 0	45 0 0	111 13 9	14 8 3	..	37 10 0	12 4 0	5 17 7	27 0 0
20	14 8 0	30 0 0	134 15 8	..	..	27 6 0	10 18 0	9 1 5	17 10 0
21	12 12 0	31 10 0	115 4 8	18 0 4	..	25 10 0	13 18 0	6 3 3	22 0 0
22	14 8 0	30 0 0	115 10 8	..	..	25 10 0	11 1 0	6 14 5	23 15 0
23	16 4 0	38 0 0	111 13 7	..	..	19 10 0	10 0 0	9 2 6	29 0 0
24	14 8 0	18 0 0	138 12 7	..	..	36 3 4	8 8 0	5 17 7	28 19 0
25	12 12 0	22 10 0	127 1 8	..	..	25 10 0	8 18 0	8 8 0	10 7 0
26	13 8 8	25 0 0	96 4 3	7 10 0	2 12 11	34 13 0	11 0 0	7 18 11	20 10 0
27	12 12 0	25 0 0	115 10 0	..	..	33 16 8	11 5 0	5 17 7	27 0 0
Av.	15 6 5	30 15 5	116 16 4	58 13 10	8 2 0	29 4 8	12 7 0	7 14 8	27 9 4

1.	11.	12.	13.	14.	15.	16.	17.	18.	19.
Farm No.	Insurance.	Shares.	Shoes.	Machinery.	Oil.	Wages.	Bonus.	Keep of Teamster.	Total.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1	4 9 3	0 15 0	6 18 0	85 0 0	6 0 0	150 0 0	..	52 0 0	702 4 5
2*	2 11 0	12 0 0	5 14 0	100 12 0	6 10 0	104 0 0	15 0 0	39 0 0	679 5 8
3*	2 11 0	4 5 0	3 12 0	93 2 0	6 10 0	104 0 0	10 0 0	52 0 0	678 9 4
4	2 11 0	12 0 0	..	109 12 0	5 0 0	104 0 0	19 0 0	52 0 0	640 12 10
5	1 5 6	7 0 0	8 8 0	76 17 0	2 12 0	130 0 0	15 0 0	78 0 0	639 11 9
6	1 18 3	7 0 0	12 0 0	117 12 0	3 0 0	130 0 0	..	52 0 0	615 16 7
7	2 4 7	6 6 0	3 18 0	77 12 0	5 0 0	104 0 0	10 0 0	52 0 0	582 0 10
8	1 18 3	3 12 0	7 4 0	80 12 0	3 10 0	104 0 0	17 10 0	78 0 0	581 5 7
9	1 11 8	11 3 0	7 4 0	75 12 0	3 0 0	119 0 0	..	52 0 0	567 4 8
10	2 11 0	3 5 0	3 15 0	82 12 0	4 0 0	104 0 8	10 0 0	52 0 0	559 0 9
11	1 18 3	6 0 0	..	78 12 0	4 16 0	102 0 0	10 0 0	52 0 0	554 1 4
12	1 5 4	11 5 0	5 0 0	61 12 0	2 0 0	120 0 0	..	52 0 0	550 14 11
13	2 11 0	4 5 0	3 18 0	90 12 0	3 0 0	94 0 0	10 0 0	52 0 0	540 8 3
14	1 15 0	4 10 0	..	102 12 0	5 4 0	104 0 0	10 0 0	52 0 0	536 4 3
15	1 18 3	10 10 0	6 12 0	85 12 0	7 15 0	104 0 0	10 0 0	52 0 0	533 17 9
16	1 18 3	1 0 0	..	77 12 0	2 5 0	104 0 0	14 0 0	52 0 0	521 6 2
17	1 5 6	7 10 0	..	62 12 0	2 16 0	104 0 0	10 0 0	65 0 0	508 15 7
18	0 19 0	9 0 0	15 0 0	70 12 0	3 0 0	104 0 0	10 0 0	52 0 0	503 3 6
19	1 11 8	2 14 0	..	50 19 0	2 8 0	114 0 0	..	52 0 0	493 10 3
20	0 19 1	6 0 0	..	69 12 0	4 10 0	104 0 0	10 0 0	52 0 0	491 0 0
21	1 5 4	3 12 0	..	72 12 0	2 0 0	114 0 0	..	52 0 0	490 7 7
22	1 5 4	1 2 6	3 15 0	72 12 0	3 5 0	114 0 0	..	52 0 0	474 18 11
23	1 18 4	2 2 0	..	58 2 0	2 0 0	104 0 0	14 0 0	52 0 0	467 12 5
24	1 2 4	6 15 0	..	67 12 0	3 0 0	97 10 0	..	39 0 0	465 7 10
25	0 12 9	3 0 0	..	73 12 0	2 5 0	104 0 0	10 0 0	52 0 0	460 16 5
26	1 5 6	5 0 0	..	64 12 0	3 15 0	104 0 0	10 0 0	52 0 0	459 10 3
27	1 11 8	0 9 0	..	56 0 0	1 6 0	104 0 0	..	52 0 0	446 7 5
Av.	1 16 1	5 17 2	6 12 9	78 6 4	3 14 3	109 4 1	11 8 4	53 8 11	548 5 8

* Horses fed on straw-chaff and oats.

Table II, showing Variation in Estimates of Items carrying Interest.

(For variations in hay, insurance, shoes, oil, wages, bonus, and keep, see Table I.)

1.	2.						3.	4.	5.			6.			7.			8.						9.					
Farm No.	Horses.						Chaff.	Oats.	Grazing.			Harness (Capital Value, £65).			Covers.			Buildings.						Machinery. (Capital Value, £460.)					
	Capital Value.			Replacement.					Area.	Capital Value.		Depreciation.			Repairs.			Capital Value.			Depreciation.			Repairs.			Depreciation.			Repairs.		
	£	s.	d.	£	s.	d.	Ton.	Bush.	Ac.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
1	300	0	0	30	0	0	22	1,356	9	360	0	0	6	5	0	13	10	0	6	15	0	700	0	0	10	0	0	4	0	0	32	8	0	25	0	0
2	240	0	0	35	0	0	*780	1,300	10	200	0	0	4	0	0	9	13	6	14	5	0	7	2	6	400	0	0	10	0	0	3	0	0	23	0	0	50	0	0
3	240	0	0	30	0	0	*360	1,500	16	416	0	0	1	0	0	4	0	0	15	0	0	8	0	0	400	0	0	18	0	0	7	10	0	15	10	0	50	0	0
4	240	0	0	35	0	0	37	365	12	300	0	0	3	0	0	7	0	0	16	16	0	12	0	0	400	0	0	4	0	0	1	0	0	32	0	0	50	0	0
5	330	0	0	20	0	0	35	484	12	384	0	0	3	2	0	4	10	0	15	12	0	7	16	0	200	0	0	8	0	0	1	0	0	27	5	0	22	0	0
6	270	0	0	35	0	0	36	175	15	225	0	0	5	0	0	6	0	0	18	18	0	9	9	0	300	0	0	5	0	0	3	0	0	66	0	0	24	0	0
7	300	0	0	30	0	0	36	300	15	375	0	0	3	5	0	6	15	0	13	10	0	5	4	0	350	0	0	7	0	0	2	8	0	23	0	0	27	0	0
8	300	0	0	30	0	0	36	153	12	480	0	0	2	10	0	4	10	0	15	0	0	5	0	0	300	0	0	1	0	0	..			28	0	0	25	0	0
9	240	0	0	30	0	0	40	180	10	330	0	0	7	10	0	5	0	0	12	0	0	6	0	0	250	0	0	7	10	0	..			23	0	0	25	0	0
10	240	0	0	30	0	0	32	290	10	300	0	0	2	0	0	8	0	0	15	0	0	7	10	0	250	0	0	6	5	0	5	0	0	30	0	0	25	0	0
11	300	0	0	30	0	0	30	400	10	330	0	0	2	5	0	5	0	0	12	0	0	6	0	0	300	0	0	9	0	0	3	0	0	31	0	0	20	0	0
12	220	0	0	40	0	0	35	216	12	264	0	0	13	10	0	7	10	0	13	4	0	6	12	0	200	0	0	6	2	0	2	0	0	23	10	0	10	10	0
13	270	0	0	36	0	0	29	240	15	225	0	0	2	0	0	3	15	0	15	0	0	7	10	0	400	0	0	10	0	0	5	0	0	38	0	0	25	0	0
14	300	0	0	25	0	0	25	250	15	375	0	0	3	7	0	6	7	0	12	0	0	7	10	0	280	0	0	5	0	0	2	0	0	25	0	0	50	0	0
15	240	0	0	40	0	0	25	200	14	252	0	0	2	5	0	5	0	0	18	0	0	9	0	0	300	0	0	10	0	0	5	0	0	28	0	0	30	0	0
16	240	0	0	27	0	0	38	..	10	400	0	0	3	10	0	4	10	0	15	0	0	5	0	0	300	0	0	12	0	0	1	0	0	30	0	0	20	0	0
17	270	0	0	32	6	0	30	40	15	450	0	0	4	8	0	5	0	0	12	0	0	6	0	0	200	0	0	8	0	0	2	0	0	20	0	0	15	0	0
18	240	0	0	30	0	0	30	100	10	300	0	0	3	0	0	5	0	0	12	0	0	6	0	0	150	0	0	5	0	0	6	0	0	23	0	0	20	0	0
19	270	0	0	45	0	0	29	96	10	500	0	0	3	6	0	5	0	0	10	10	0	5	5	0	250	0	0	10	0	0	2	0	0	15	7	0	8	0	0
20	240	0	0	30	0	0	35	..	10	330	0	0	3	10	0	3	10	0	16	4	0	8	2	0	150	0	0	7	10	0	1	0	0	20	0	0	22	0	0
21	210	0	0	31	10	0	30	120	10	300	0	0	4	0	0	6	0	0	11	0	0	5	10	0	200	0	0	8	0	0	2	0	0	23	0	0	22	0	0
22	240	0	0	30	0	0	30	..	10	300	0	0	3	18	0	3	5	0	12	0	0	6	0	0	200	0	0	6	15	0	5	0	0	23	0	0	22	0	0
23	270	0	0	38	0	0	29	..	10	200	0	0	3	0	0	3	2	0	16	6	0	8	3	0	300	0	0	10	0	0	1	0	0	22	0	0	8	10	0
24	240	0	0	18	0	0	36	..	18	317	14	0	1	10	0	3	0	0	15	0	0	4	19	7	325	0	0	9	0	0	1	9	0	20	0	0	20	0	0
25	210	0	0	22	10	0	33	..	12	300	0	0	1	0	0	4	0	0	15	0	0	7	10	0	100	0	0	3	7	0	1	0	0	36	0	0	10	0	0
26	228	0	0	25	0	0	25	50	11	400	0	0	3	7	0	3	15	0	14	4	0	7	2	0	200	0	0	7	0	0	1	10	0	22	0	0	15	0	0
27	210	0	0	25	0	0	30	..	8	464	0	0	3	7	0	4	0	0	10	10	0	5	5	0	250	0	0	10	0	0	2	0	0	18	8	0	10	0	0
Av.	255	9	7	30	15	0	31	391	12	337	13	10	3	10	2	5	3	3	14	1	1	6	17	1	283	10	4	7	18	1	2	13	10	26	12	2	24	2	3
Percentage of capital value				12			..	..	..	..			5·4			7·9			..			49			..			2·78			1·3			5·78			5·24		

* Straw-chaff used; amount given in sacks.

Table III.—Summary of Expenses under the Different Headings.

1. Farm No.	2. Estimated Capital invested.	3. Interest at 6 per Cent.	4. Depreciation (estimated by Farmers).	5. Repairs (estimated by Farmers).	6. Annual Charges under Columns 3, 4, and 5.	7. Cost of Feed (Cost Price).	8. Annual Floating Capital (Wages, Bonus, Keep, Oil, &c.).	9. Total Annual Charges.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1	2,180 10 8	130 13 6	88 3 0	35 5 0	254 1 6	282 0 8	226 2 3	762 4 5
2	1,626 18 4	97 11 4	86 12 6	62 13 6	246 17 4	247 13 4	184 15 0	679 5 8
3	1,835 10 0	110 1 4	76 10 0	69 10 0	256 1 4	239 10 0	182 18 0	678 9 4
4	1,673 18 8	100 19 2	95 0 0	58 0 0	253 19 2	201 2 8	185 11 0	640 12 10
5	1,650 6 8	98 19 7	75 3 0	27 10 0	201 12 7	195 14 2	242 5 0	639 11 9
6	1,494 9 10	89 12 6	131 14 0	33 0 0	254 6 6	155 11 10	205 18 3	615 16 7
7	1,741 16 0	104 9 3	79 14 0	36 3 0	220 6 3	178 6 0	183 8 7	582 0 10
8	1,774 2 10	106 8 6	75 10 0	29 10 0	211 8 6	154 2 10	215 14 3	581 5 7
9	1,527 1 8	91 12 4	81 10 0	30 0 0	203 2 4	170 1 8	194 0 8	567 4 8
10	1,489 7 0	89 17 9	83 5 0	38 0 0	211 2 9	168 7 0	179 11 0	559 0 9
11	1,632 13 4	97 18 9	85 15 0	28 0 0	212 13 9	164 13 4	176 14 3	554 1 4
12	1,329 19 4	82 15 3	98 14 0	20 0 0	201 9 3	157 15 4	191 10 4	550 14 11
13	1,574 7 4	94 16 11	104 15 0	33 15 0	236 6 11	134 7 4	169 14 0	540 8 3
14	1,618 5 0	97 1 3	77 2 0	58 7 0	232 10 3	126 5 0	177 9 0	536 4 3
15	1,454 3 4	87 4 2	99 15 0	40 0 0	226 19 2	114 3 4	192 15 3	533 17 9
16	1,618 1 4	97 1 7	85 10 0	25 0 0	207 11 7	138 11 5	175 3 3	521 6 3
17	1,576 13 4	94 11 9	81 19 0	22 0 0	198 10 8	119 13 5	190 11 6	508 15 7
18	1,349 15 0	80 13 6	74 10 0	31 0 0	186 6 6	122 18 0	193 19 0	503 3 6
19	1,674 9 4	100 9 3	86 8 8	15 0 0	201 17 11	118 18 8	172 13 8	493 10 3
20	1,388 7 4	83 5 9	76 12 0	26 10 0	186 7 9	127 3 4	177 9 1	491 0 2
21	1,372 0 0	82 6 3	79 10 0	30 0 0	191 16 3	125 14 0	172 17 4	490 7 7
22	1,386 0 0	83 3 1	77 3 0	30 5 0	190 11 1	109 0 0	175 7 10	474 18 11
23	1,416 13 4	84 19 9	88 13 0	12 12 0	186 4 9	105 7 4	176 0 4	467 12 5
24	1,613 16 0	96 15 11	66 19 7	24 9 0	188 4 6	129 16 0	147 7 4	465 7 10
25	1,269 18 0	76 3 8	77 17 0	15 0 0	169 0 8	119 18 0	171 17 9	460 16 5
26	1,507 12 4	90 2 5	72 14 0	20 5 0	183 1 5	100 8 4	176 0 6	459 10 3
27	1,568 10 0	94 1 9	68 0 0	16 0 0	178 1 9	109 0 0	159 5 8	446 7 5
Averages ..	1,572 0 3	94 8 1	84 5 1	32 3 2	210 15 3	152 9 0	185 1 5	548 5 8

In the case of harness and of machinery a standard replacement value is taken — £65 for harness and £460 for machinery. It is interesting to note the percentage of repairs and depreciation to the capital value, as given in the bottom line (Table II).

Table III gives a summary of the expenses under the different headings. Column 2 ("Estimated Capital invested") includes the cost price of chaff, oats, and hay, the whole being charged with 6 per cent. interest. Column 7 gives cost of feed, grazing excluded. Cost of grazing has been charged in depreciation of pastures. Column 8 represents the bulk of the cash payments made during the year. To these amounts would be added repairs and some of the costs attached to the growing of oats for the following year.

As mentioned previously, the spread or variation in the final estimates is considerable. When taken together the yearly cost varies from £762 4s. 5d. on farm No. 1 to £446 7s. 5d. on farm No. 27. If this spread is expressed in points per cent., taking the average (£548 5s. 8d.) as 100, we find that the variation extends from 139 per cent. to 81 per cent., which equals plus 0·39 of the average to minus 0·19 of the average. This is expressed in Table IV.

Table IV, showing Total Annual Cost on all Farms.

Farm No.	Total Annual Cost.	Percentage Variation or "Spread."	Farm No.	Total Annual Cost.	Percentage Variation or "Spread."
	£ s. d.			£ s. d.	
1	762 4 5	139	15	533 17 9	97
2	679 5 8	124	16	521 6 2	95
3	678 9 4	124	17	508 15 7	93
4	640 12 10	117	18	503 3 6	92
5	639 11 9	116	19	493 10 3	90
6	615 16 7	112	20	491 0 2	89
7	582 0 10	106	21	490 7 7	89
8	581 5 7	106	22	474 18 11	87
9	567 4 8	103	23	467 12 5	85
10	559 0 9	102	24	465 7 10	84·75
11	554 11 4	101	25	460 16 5	84
12	550 14 11	100·5	26	459 10 3	83·5
13	540 8 3	98·5	27	446 7 5	81
14	536 4 3	98			

£548 5s. 8d. = 100 per cent. = average of twenty-seven farms.

The farms can be divided into three groups according to soil and locality—namely, medium loam, as found round such districts as Methven, Wakanui, and Lincoln; down land, as experienced round Timaru and in parts of North Canterbury; and light stony soils. Table V shows these groups with their respective variations worked out as in Table IV. The accompanying graph (printed on page 364) illustrates the same variation in a diagrammatic form.

Working off Table IV we can with reasonable accuracy assume that the cost of upkeep on a six-horse team is £548 5s. 8d. per year.

It is quite evident that a six-horse unit cannot be maintained throughout the year without an extra horse for relief work, and therefore, though with no ordinary implement will more than six horses be used, seven must be kept. On the estimates quoted, the extra horse will cost £44 4s. per year in interest, depreciation, feed, covers, and shoes. Where seven horses are kept this amount must be added, bringing the annual cost to £592 9s. 8d.

Table V, showing Classification of Farms into Soil-groups.

Farm No.	Total Annual Cost.	Percentage Variation or "Spread."		Farm No.	Total Annual Cost.	Percentage Variation or "Spread."	
	Medium Loam.				*Downs Land.*		
	£ s. d.				£ s. d.		
5	639 11 9	127		1	762 4 5	126	
8	581 5 7	116		2	679 5 8	111	
16	521 6 2	104		3	678 9 4	111	
17	508 15 7	101		4	640 12 10	105	Average for group: £607 6s. 4d. =100 per cent.
19	493 10 3	98	Average for group: £502 18s. 6d. =100 per cent.	6	615 16 7	101	
20	491 0 2	97·5		7	582 0 10	96	
21	490 7 7	97		10	559 0 9	92	
22	474 18 11	94		11	554 1 4	91	
23	467 12 5	93		14	536 4 3	88	
25	460 16 5	92		24	465 7 10	77	
26	459 10 3	91·75			*Light to Stony Land.*		
27	446 7 5	89			£ s. d.		
				9	567 4 8	105	Average for group: £540 6s. 6d. =100 per cent.
				12	550 14 11	102	
				13	540 8 3	100	
				15	533 17 9	99	
				18	503 3 6	93	

The daily cost of the team, and correspondingly the cost of cultural operations, depends on the number of days the team is worked during the year. In Table VI the daily cost is shown for both six and seven horses working 150, 175, 200, 225, 250, or 275 days respectively.

Table VI, showing Cost of Team per Day (Eight Hours).

Number of Horses.	Number of Days worked.					
	150.	175.	200.	225.	250.	275.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
6 ..	3 13 1	3 2 8	2 14 10	2 8 6	2 3 10	1 19 10
7 ..	3 18 11	3 7 8	2 19 3	2 12 8	2 7 4	2 3 1

Taking the daily cost of six horses working 250 days in the year, t is interesting to note the distribution of the cost over the direct upkeep of the team, the expenses connected with the teamster, and the interest, depreciation, repairs, &c., of the harness, machinery, and buildings, as shown in Table VII. It must be remembered that the

cost of teamster (13s. 11d. per day) included keep and is only for 250 days in the year. Where the farmer is working the team himself he saves this direct charge.

Table VII, showing Distribution of Daily Cost of Team at £2 3s. 10d

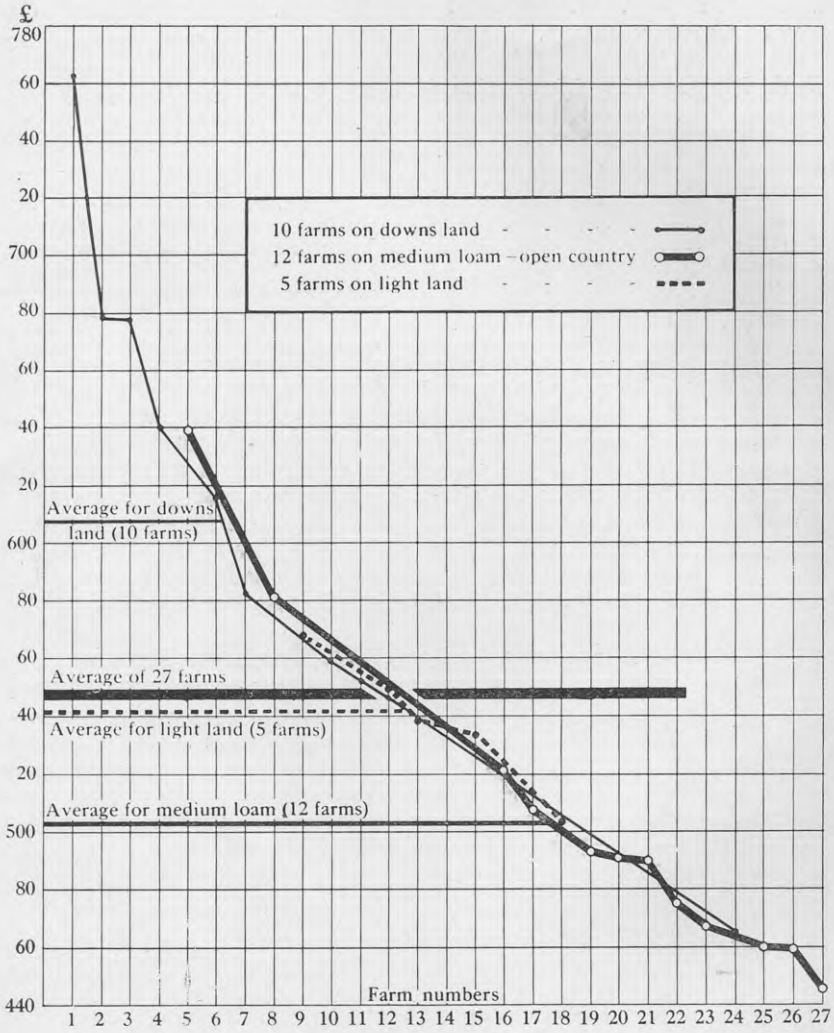
Item.	Cost.	Percentage of Total.
	£ s. d.	
Horses	1 1 0	47·909
Teamster	0 13 11	31·749
Interest, depreciation, repairs, &c. ..	0 8 11	20·342
Total	2 3 10	100·000

To determine the actual cost of cultural operations it was necessary to find the area worked per day with the respective implements. This information was collected from the same range of farmers. Column 1 of Table VIII shows the average of the twenty-seven estimates for the several operations, whereas column 3 shows the cost per acre over a wide range of working-days for both six and seven horses. In drilling and rolling, six horses will not be used. They must therefore be idle, or, if worked in any other way, an extra man will be required, which will balance the irregularity in the cost of these operations.

Table VIII, showing Cost of Tillage Operations per Acre.

1.		2.	3.					
Operations.	Acres per Day.	Number of Horses.	Number of Days worked.					
			150.	175.	200.	225.	250.	275.
			s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Deep ploughing ..	4·64	6	15 9	13 6	11 10	10 8	9 5	8 7
		7	17 0	14 7	12 9	11 4	10 2	9 3
Skim-ploughing ..	5·13	6	14 3	12 3	10 8	9 5	8 6	7 9
		7	15 5	13 2	11 2	10 3	9 3	7 10
Disking ..	14·00	6	5 3	4 6	3 11	3 6	3 2	2 10
		7	5 8	4 10	4 3	3 8	3 5	3 1
Grubbing ..	13·20	6	5 6	4 9	4 2	3 8	3 4	3 0
		7	5 11	5 1	4 6	4 0	3 9	3 3
Heavy harrowing	28·40	6	2 7	2 2	1 11	1 8	1 7	1 5
		7	2 9	2 5	2 1	1 10	1 8	1 6
Light harrowing	30·50	6	2 5	2 0	1 10	1 6	1 5	1 4
		7	2 7	2 3	1 11	1 9	1 7	1 5
Drilling ..	14·00	6	5 4	4 6	3 11	3 6	3 2	2 10
		7	5 8	4 10	4 3	3 9	3 5	3 1
Rolling ..	17·77	6	4 1	3 6	3 1	2 9	2 6	2 3
		7	4 5	3 10	3 4	3 0	2 8	2 5

Graph showing Classification of Farms into Soil-groups.



SUMMARY.

It may reasonably be claimed that the average of the twenty-seven estimates given can be accepted as being as nearly correct as any estimate before submitted. It costs £548 5s. 8d. per year to keep six horses and equipment, or £592 9s. 8d. to keep seven horses and equipment. The cost varies on farms according to soils, locality, and management. The power unit is the most expensive item on the farm, and in many cases bad management of the team alone will cause a debit balance, when it should be bringing in an income for its owner. Every day the team is idle it costs the farmer somewhere in the vicinity of £2 without return. Unnecessary horses should not be kept on a farm, and those that are kept should be worked to full capacity.

THE RELATION OF BIRDS TO AGRICULTURE IN NEW ZEALAND.

VI. THE HAWKS AND OWLS.

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REGARDING no other birds has enlightened opinion changed so much within the last few decades as in connection with the hawks and owls and their relation to agricultural interests. Had this article been written fifty years ago it would have consisted partly of invective, with perhaps a few philosophical reflections on the role of predaceous birds in a state of nature, and partly of specifications for traps and snares and other ways and means of decreasing the numbers of hawks and owls. Every man's hand was against them. The advance of science, with the increased respect paid to exact knowledge, gradually brought about a reconsideration of the position and an official exoneration of some of the species concerned. But it took years of teaching, in season and out of season, before even a few enlightened landowners ceased to look on the gibbeted carcases of kestrels and barn-owls as evidence of their gamekeepers' efficiency. Even yet we suppose it is by no means impossible to find the bodies of these entirely useful—almost incalculably useful—birds strung up in a mixed and unsavoury company of weasels, stoats, rats, cats, and other genuine vermin blighting a beautiful countryside with the odours of decay and the evidence of die-hard superstition. We speak, of course, of English conditions. In New Zealand, as a matter of course, the indigenous birds received by a kind of vicarious inheritance the benefit, or more frequently the blame, of the traditional beliefs regarding those English birds to which, in the popular mind, they were supposed to be the most nearly allied. If any comparison were made at all it was in favour of the birds of the homeland, from which an entirely injudicious selection was made for introduction into New Zealand.

It is an innate tendency of the human mind to seek explanations for all things—and, unfortunately, it is only of comparatively recent years that science has shown that just as much in the apparently familiar and trivial phenomena of the countryside as in superficially more serious issues the correct explanation is the only one to be desired. The cruel-looking talons and powerful beaks of the hawks and owls were taken as evidence enough that all such birds must live on a diet of flesh. In addition to the incriminating characters of bodily structure, shared with the hawks, the owls possess other qualities which did not tend to endear them to the popular imagination. In fact, their mysterious nocturnal habits, noiseless flight, and eerie cries rendered them objects of superstition, and were in themselves, as evidenced by the night-jar's case, sufficient to condemn them. The English night-jar or goat-sucker (*Caprimulgus europaeus*) is an entirely harmless, purely insectivorous bird, which pursues its prey, consisting largely of night-flying moths and beetles, when the falling dusk increases the ghostly appearance of its noiseless flight. Yet this bird is credited

with sucking the milk of goats and with other almost impossible misdemeanours entirely on account of its somewhat owl-like uncanny habits and appearance.

Misled by the similar characters of bill and feet, which are not due to true relationship, but more probably form an example of what is now known as "convergent evolution," similar environmental factors (in this case an identical method of procuring food) leading to resemblances often exact in structural details—misled, that is, by the great likeness in claws and beak between the hawks and owls—the earlier naturalist classed these two rather unrelated groups together as birds of prey (*Accipitres* or *Raptores*). Such an order, with two divisions—one for the hawks and eagles or diurnal birds of prey, and the other for the owls or nocturnal birds of prey—seemed a very natural grouping, but later research has shown that it was not justified. In any case, from an ecological and economic viewpoint it is necessary to draw a sharp line between the hawks and owls. Speaking generally, it may be said that although some of the hawks are purely beneficial and others predominatingly so, a number are entirely destructive; while all the owls are, on the whole, useful species. The distinction corresponds to the difference in habit; owls might be capable of taking chickens and game, but the time they choose for hunting is such that practically only noctural mammals and insects are likely to become their victims. We have, it is true, in New Zealand one owl, an introduced species, which is largely diurnal and bird-eating. Departing from our usual custom, we shall deal with it in this article along with the indigenous owls.

No consideration of the role of the diurnal birds of prey would be complete without a reference to the part played by otherwise purely destructive species when plagues of rodents, of small birds, or even of locusts are pursuing their course of devastation. Such irruptions act as foci on which concentrate predaceous birds from large areas. Moreover, in accordance with the principle to which reference has been made before, and which constitutes the first rule of economic ornithology, birds which normally live hardly at all on rats or mice or locusts, as the case may be, take the food which is thus spread before them in preference to their more usual but less easily captured prey. On these occasions the larger and more destructive of the hawk tribe may for a time be of very material service.

Gossard and Harry, writing of rats, rabbits, and injurious rodents generally, state: "They abound in forests, field, and orchards, and about the abodes of man, even seeking the shelter and protection of his roof and living upon the fruits of his labour. Probably through no means that human ingenuity is or will be able to devise can the scourge of noxious rodents be effectually checked. The raptors—the hawks and owls—constitute a natural, and probably the most important, check on the abnormal increase of these devastating animals. Plagues of rodents have been recorded from ancient times to the present day. At whatever time or place these have occurred investigation has disclosed that they followed a reduction in the numbers of the rapacious birds that normally ranged over the stricken areas. Nevada suffered such a plague during 1907–8, which resulted in great loss to the ranchman. Among the birds that flocked to the infested region to feed on

the animals were hawks, owls, gulls, crows, ravens, herons, and shrikes. Such food habits indicate not only an emergency value for these species, but with almost equal certainty prove their constant, though unrecognized worth. Thus, many of the hawks were shot by men who were trying to suppress the plague by means of poison. Just so long as the farmer destroys such valuable birds, just so long will his crops suffer through the ravages of destructive rodents and insects. Knowing the danger invited by the destruction of useful birds, the husbandman should demand their protection. A few species are in part or wholly detrimental, but it is the safer plan, where one does not know their specific value, to let the harmful live, rather than, through ignorance, to kill the beneficial."

None of the three New Zealand hawks can be ranked among the purely injurious species useful only on the rare occasions when the numbers of rats or other pests increase to the proportions of a plague.

The second category includes those species which are of mixed value, whose status must be independently determined in the different districts of their range. Thus they may be ranked justly as pure pests perhaps in a poultry or game-rearing locality, and as positive blessings in neighbouring rabbit-infested districts. The burning question—persecution or protection—is very liable to depend in these cases rather on the predominant interests than on an impartial investigation of the damage committed and the services rendered.

The third class comprises those kinds which are predominantly or entirely beneficial, and which should be strenuously protected wherever they occur. The European kestrel or windhover (*Cerchneis tinnunculus*) is an example, while the two indigenous owls of New Zealand should also be grouped here.

Coming now to the birds of New Zealand, we find the number of kinds of birds of prey rather surprisingly small. Such widespread groups as the vultures and eagles are totally unrepresented in the living avifauna, although it is true that the smaller moas often fell a victim to a gigantic, now extinct eagle—*Harpagornis*. The hawks are represented by two kinds of falcons, found nowhere else in the world, and by a harrier which occurs also in Australia. Two species of owls are indigenous and found nowhere else, while a third has been introduced to cope with the small-bird nuisance. These will all be now dealt with in turn.

THE BUSH-HAWK OR SPARROW-HAWK (NESIERAX POTTSI MATHEWS AND IREDALE).

This is the smaller of the two indigenous falcons, differing from the larger quail-hawk (*N. novaehollandiae* Gmelin) in very little else but size. Its upper plumage is a very dark brown, almost black, while the under-parts are reddish-brown marked with whitish. Both the bush-hawk and the quail-hawk are easily distinguished from the larger, gracefully gliding, and much more common harrier by their rapid dashing flight.

The nest may be placed in clumps of astelia in trees, or built on ledges of rock. The very handsome eggs are "yellowish-brown, stained and mottled with reddish-brown."

Although known as the bush-hawk, this species occurs also to a considerable extent in open country, where the rock-ledge type of nesting-site may be utilized. Guthrie-Smith considers that the bush-hawk has actually gained by the settlement of the country, the large numbers of introduced small birds proving a valuable addition to its food-supply. This little hawk appears nowhere to be common, although it may turn up in very unexpected places. Thus one of the writers saw a fine bird of this species sheltering in a macrocarpa cypress in the Wellington Botanical Gardens recently.

The bush-hawk is remarkable for its courage and rapacity, which enable it successfully to tackle birds much larger than itself. These fighting-qualities are much in evidence during the breeding season, when both sexes will not only drive away from the vicinity of the nest such large and powerful birds as the white heron and shag, but will unhesitatingly attack man himself; while they "have often chased cattle-dogs to the shelter of the stockman's horse."

Its food consists of rats, mice, lizards, and birds, and there can be little doubt that the predominating items are birds. There have been, and there possibly may be still, poultry-yards which suffer periodically from the attacks of bush-hawks. Fowls, ducks, and even young turkeys have been recorded as victims. On the whole, however, the bush-hawk is not plentiful enough to be a frequent pest in this respect, most of the depredations among poultry being the work of the far commoner harrier, which is the species most commonly intended when the term "hawk" is used. Far more often the introduced small birds become the prey of the bush-hawk.

The relation of the bush-hawk to the rabbit nuisance has not, so far as the writers are aware, been properly investigated. It is not even known whether this species preys to any extent on rabbits. Information on this point is eminently desirable.

To sum up, the bush-hawk may occasionally do considerable damage among poultry; it preys to a large extent on useful insectivorous or seed-distributing indigenous forest-birds, though the fact that it is itself indigenous renders its activities in this direction no disturbance of the balance of nature, and as such not to be viewed with apprehension, while, on the other hand, it accomplishes perennial good work in helping to abate the small-bird nuisance and in keeping down rats and mice. In its present limited numbers, then, the bush-hawk should not be considered a pest; but any untoward increase of the species would probably result in trouble to the poultry-keeper.

THE QUAIL-HAWK (NESIERAX NOVAEHOLLANDIAE GMELIN).

The quail-hawk is a considerably larger and more powerful bird than its congener, the preceding species. As, however, it differs in very little else besides size, doubts have frequently been expressed as to whether the two species are really distinct. An examination of the evidence inclines us to the view that there are two good species, but the question cannot be considered finally settled. Of the two the quail-hawk is very much the rarer—now so rare, in fact, that its economic relations are scarcely worth considering. Rats, mice, lizards, birds of many kinds, and even the larger beetles all figure in its

menu. It has a decided penchant for pigeons, both domestic and indigenous. This, coupled with its liking for poultry and its audacity in venturing even into houses in search of its prey, would render it a very serious foe to the poultry-keeper were its numbers at all great.

As a matter of fact, the only specimen of the quail-hawk of which the writers have heard at all recently was one observed by Mr. W. W. Smith, chasing sparrows almost in the Town of Wanganui.

The nest is usually placed in a rocky situation, and the breeding-habits are believed to resemble closely those of its near ally the bush-hawk.

THE HARRIER (CIRCUS APPROXIMANS PEALE).

The harrier is the largest and commonest bird of prey inhabiting New Zealand. Its lazily gliding form is a familiar feature of the rural landscape from the North Cape to the Bluff. It occurs also in Australia.

Harriers generally, the world over, form a well-defined group of raptorial birds, with long tails and legs, and a habit of leisurely quartering the ground with easy and graceful flight "accomplished with no apparent effort." The nest is usually placed on the ground, though one of the writers has found several nests of the New Zealand harrier, near Wanganui, placed 20 ft. or 30 ft. above the ground in low trees, tangled masses of supplejack, &c. The eggs are white—more like those of owls than the richly marked eggs of the true hawks. From the latter the harriers differ also in their less courageous disposition and in the correspondingly more defenceless nature of their usual victims. These qualities, coupled with the habit of feeding on carrion and offal, while they render the harriers generally and the New Zealand one in particular very unpopular with bird-lovers, frequently make them valuable from an economic point of view. Thus Gossard and Harry write, regarding the common North American species (*Circus pudsonius* Linn.): "The character of its food makes it one of the most valuable among the birds of prey . . . protection should be afforded this worthy species." Such an unqualified eulogy cannot be delivered on the New Zealand harrier; but there can be no question whatever that its unsavoury reputation is by no means all deserved, while its many good qualities are persistently overlooked.

The food of the harrier consists not only of carrion, offal, and of such birds—sick or wounded or small—as it can safely attack, and mice, rats, lizards, and frogs, but also of all insects large enough to excite its appetite. From a consideration of the food of other harriers throughout the world, from observation in the field on the New Zealand species, and from an examination of the stomach-contents of several specimens, the present writers are strongly inclined to the opinion that birds form a much smaller percentage of the food than is usually imagined. It is true that Buller records the finding of remains of no fewer than eleven pheasants, five rats, three quail, and one weka (*Gallivallus* sp.) round a harrier's nest containing young birds, while A. H. Messenger in a recent number of the *New Zealand Life and Forest Magazine*, writing on the enemies of a North Auckland game-farm, files a very serious indictment of the harrier. The latter

observer states that the harrier "takes a heavy toll of pheasant chicks and even full-grown birds. . . . In one of the paddocks on the game-farm . . . about a hundred young pheasants were turned loose. These birds were about three-parts grown and able to shift for themselves, yet every time one of them came out from cover to search for food a hawk would swoop down in an attempt to capture it. All day long these hawks were hovering overhead, and only the constant watchfulness of the keeper saved the pheasant flock from serious losses. Mr. Dobson (the keeper in question) states that on one occasion he took a hen pheasant and placed it out in an open paddock under a wire cage. Lying hidden in some scrub near-by, he shot fifteen hawks in three hours, as these hungry marauders came swooping down on their apparently defenceless victim."

These two items seem to indicate that harriers in the neighbourhood of game-farms are to be condemned in no uncertain manner. On the other hand, when one considers the extreme abundance of harriers throughout the country, and the very great infrequency with which one hears reports of damage by harriers in poultry-yards, one is forced to conclude either that the young birds of the game-rearing establishment form an easier and exceptionally enticing prey, or that domestic and semi-domestic birds are not as a general rule attacked. As a matter of fact, the harrier is known to be very timid; it has been put to flight by starlings, Australian magpies, and domestic fowls, while guinea-fowls are said to be such efficient guards against hawks that they are often kept on North Auckland farms as a protection for the other poultry with which they feed.

The stomachs of several harriers shot in the North Auckland district in March contained the remains of a rat, of large black crickets (*Gryllus servillei*), and of the migratory or true locust (*Locusta migratoria*). Of these animals the first two are, of course, serious pests, while the locust is a potential one, kept in bounds by natural means, of which bird enemies—in this case chiefly kingfishers (see article of this series in October *Journal*) and harriers—are probably very important. As regards rats, Buller records that a thousand harriers were shot per year on a Canterbury station for three years, and at the end of that period rats had become extremely numerous. In rabbit-infested districts it is generally recognized that harriers are beneficial.

One of the most serious crimes laid at the door of the harrier is the killing of young or sickly lambs. There is no innate impossibility in this, it is true; the writers have repeatedly seen that the carcases of recently dead lambs have had their eyes picked out, apparently by the harrier hawks, which eventually reduce the bodies to skeletons. At the same time no exact proof has ever been brought forward of the actual killing of lambs by harriers. Buller makes the rather cautious statement that they "are said to be very destructive during the lambing season."

In summarizing the evidence for the economic position of the harrier we should mention, firstly, that these facts are proved—namely, that the harrier renders extremely valuable services in the destruction of rats, mice, and the larger insect pests such as crickets and locusts, of which, by reason of its large size, voracious appetite,

and most assiduous hunting, it must capture incalculable numbers; while, on the other hand, it is admittedly a very serious pest of game-rearing establishments. With regard to lambs, whether the harrier actually kills young healthy lambs or whether it attends only to sick, dying, or dead ones remains to be proved by exact observation. More information is also required as to its value as a destroyer of rabbits. Accurate data are essential; only on the acquirement of these can the treatment to be meted out to harriers in the different districts be *profitably* decided. In a district containing no game-rearing establishments and no extensive sheep-farms it is obviously not only waste of money but sheer foolishness to put a price on the head of the harrier. In the immediate vicinity of game-farms hawks may be kept down by all possible means.

THE LAUGHING-OWL (SCELOGLAUX ALBIFACIES GRAY).

As this fine endemic species is now extremely rare, if not entirely extinct, it may be here dismissed in a very few words. It fed largely on the Maori rat (*Mus exulans* Peale) and on the larger beetles. It has been the fashion to attribute its decrease to the practical extinction of the Maori rat, but as this animal was almost certainly brought to New Zealand by human agency it could not have formed the primitive food-supply of the laughing-owl.

THE MOREPORK (SPILOGLAUX NOVAESEELANDIAE GMELIN).

Every one knows the morepork, or ruru—at least by its note. It is a small brownish owl, common in many parts of the Dominion, even in the immediate neighbourhood of cities. The roundish pure-white eggs are laid in a hole in a tree, or even in masses of needles in the forks of pine-trees. The old birds will often attack persons in the vicinity of the nesting-site.

The morepork is almost solely nocturnal, sallying forth at dusk to search with noiseless flight for mice, rats, and for various insects, which latter it sometimes takes on the wing.

Among the insects destroyed by this wholly useful bird are beetles, many of them the mature stages of destructive borers, including the most injurious of our larger timber-grubs—the huhu (*Prionoplus reticularis*), the large weevil (*Rhyncodes ursus*), and various species of wetas. On several occasions an entomological friend of the writers, who collected the moths attracted by a certain street-lamp, found a morepork in attendance, playing havoc with his prospective specimens. When it is remembered that the larvæ of a large proportion of these moths are injurious caterpillars, including cutworms and army-worms, it will be agreed that the insectivorous propensities of the morepork should ensure it a high place in the good graces of the agriculturist.

It may be regarded as certain that the morepork subsists almost entirely on rats, mice, and insects, but, as Buller states, of the fact that it "also preys on small birds there can be no reasonable doubt, although it has been frequently denied." Not only has it been known to take some of the smaller bush-birds such as bell-birds and king-fishers (Buller), but cage-birds also have fallen victims. The very infrequency of such cases, however, coupled with the abundance of

FIG. 1. YOUNG MOREPORK, A FEW WEEKS OLD.

Of two eggs in the nest only one was hatched. The young bird was photographed after temporary removal to the base of a neighbouring tree.

[*Photo by F. Bruce Levy.*

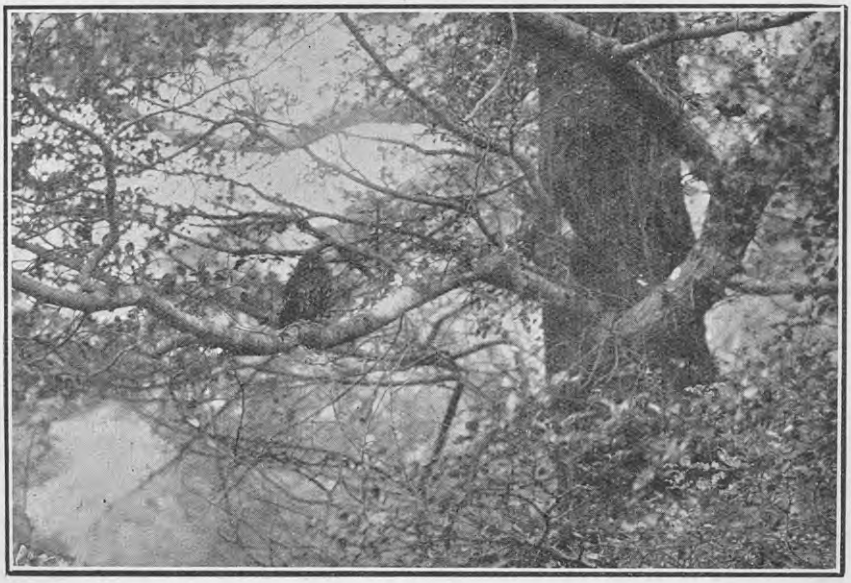

FIG. 2. SHOWING THE MOTHER MOREPORK.

The bird perched on a branch is watching the search operations at her nest in another beech-tree a few yards away. Bush at York Bay, near Wellington.

[*Photo by W. D. Reid.*

moreporks, even around dwellings, indicates that such lapses are entirely exceptional. Oliver states that a report was received of the destruction of indigenous small-birds by moreporks on Little Barrier Island, but an examination of the stomach-contents of six disclosed nothing but the remains of insects, chiefly the large and injurious chafer (*Stethaspis suturalis*).

The morepork deserves all possible protection. It is gratifying to see that already in many quarters its value is fully recognized.

THE INTRODUCED LITTLE OWL (ATHENE NOCTUA SCOP.).

This small owl is indigenous to Europe. In 1906–8 it was introduced into Otago to cope with the small-bird nuisance. In this case, as with the morepork, it was not realized that the diet is very largely insectivorous. In fact, it seems a truth singularly difficult of comprehension by the popular mind that even large and powerful "birds of prey" are often considerably addicted to insect food. But the little owl is chiefly a daylight hunter, and although beetles and other insects form a large part of its food it is certainly true that it destroys far more birds than does the morepork.

Mr. H. C. Anderson, of Stirling, in a very informative letter written this year to one of the writers, draws attention to the fact that the covered nests of the sparrows are much less likely to be robbed of young birds by the little owl than are the open nests of less injurious species. In fact, it has been rumoured that the little owl was likely to inflict far more damage on the indigenous birds than on the introduced ones it was imported to control. Nor would such a case be without precedent in the disastrous annals of "acclimatization." There seems at present, however, little need for apprehension on this score. Philpott (quoted by Thomson) states that "observations have shown that the little owl does not enter the bush, but keeps on the outskirts or about isolated trees. For this reason I do not anticipate that our native bush-birds stand in much danger from this owl." The same writer in 1918 considered, "There can be no doubt that such introduced birds as the sparrow and others which roost about hedges, plantations, and buildings will pay a heavy toll; indeed, I have reason to think that the thrush, the sparrow, and the starling are already diminishing in numbers near Invercargill. Where a pair of owls have established themselves the evensong of the thrushes and blackbirds gives place to an incessant chorus of terrified alarm-notes."

Mr. Anderson, in the letter above referred to, deplores the fact that starlings, thrushes, and blackbirds were fast disappearing owing to the attacks of the little owl, while sparrows seemed as numerous as ever. He further states that "in the last few years the grass-grub has taken a big hold in pastures in south Otago, and its presence is largely responsible for comment on the absence of the starling, thrush, and blackbird."

CONCLUSION.

In concluding this article on the hawks and owls the writers feel that the need for exact information is greater than their present data can fill. Their object will, however, be attained if they have succeeded in showing, firstly, that hawks and owls do indubitably render very

valuable services in the destruction of vermin and insect-pests, and, secondly, that there is a crying need for careful observation to decide the status of every particular species in every particular district.

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THE OVERRUN IN BUTTERMAKING.

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THE clause in the Dairy Industry Amendment Act, passed in 1922, requiring manufacturers of butter and cheese to furnish to every milk or cream supplier each year a statement showing the amount of butter and cheese made from each pound of fat received has led to an increased interest in the subject, and the question is frequently asked, What is the overrun? Overrun is usually spoken of as the amount of butter made in excess of the butterfat received. Owing to losses in manufacture, however, and to the allowance of overweight in each box of butter sold, in actual practice it is the amount of butter for which payment is received in excess of the butterfat paid for.

Overrun is made up of the water, salt, and curd which butter contains in addition to butterfat, which is the principal ingredient. It is usually shown as the percentage of butter in excess of the fat received, but may be shown as the ratio of fat to butter made. For example, if we pay for 100 lb. of fat and sell 120 lb. of butter the overrun is 20 per cent., but the ratio of fat received to butter made would be 1 to 1·20.

Overrun in buttermaking and yield in cheesemaking are the same, but in cheesemaking it is expressed as yield, as, for instance, pounds of cheese made per pounds of fat received = 2·6.

The pfercentage of overrun is calculated as follows: Butter made — fat received × 100 ÷ fat received = per cent. of overrun. For example —Butter sold, 240 lb.: butterfat paid for, 200 lb.: 240 — 200 = 40 lb. overrun: 40 × 100 ÷ 200 = 20 per cent. overrun.

The factors which influence the amount of overrun are: (1) Actual losses of fat in manufacturing; (2) deficiency of matter not fat contained in the finished butter; and (3) errors in calculating the amount of fat received.

ACTUAL LOSSES OF FAT.

Two systems of butter-manufacture are in operation under factory conditions—namely, (1) butter made from whole milk received, and (2) butter made from cream received; and these two systems are

generally spoken of as "whole milk" and "home separation." A few factory concerns operate both systems.

The actual loss of fat under the whole-milk system averages probably 3·25 per cent. of the fat received in the milk, and under the home-separation system 1·75 per cent. of the fat received in the cream. Under the whole-milk system the actual losses of fat may be classified under four heads: (1) Loss in skimming milk; (2) loss in handling cream and butter; (3) loss in buttermilk; and (4) loss in packing butter. In the home-separation system the actual losses come under the last three heads.

The percentage of fat lost in skim-milk and in buttermilk can be ascertained by means of the butyl alcohol Babcock test. This test gives results corresponding closely to results obtained by gravimetric analysis, and shows higher and more correct results than are readable in the ordinary Babcock test. The test is, briefly, 2 c.c. of normal butyl alcohol, 9 c.c. of milk, and 7 to 9 c.c. of 182–183 sp. gr. sulphuric acid, placed in a 0·5 graduated bottle, whirled 6–2–2 minutes, and the reading doubled.

Skim-milk is generally about 85 per cent. to 90 per cent. of the whole milk, and contains an average of about 0·07 per cent. of fat when milk containing 4 per cent. of fat is separated. The loss of fat from that received in the milk is approximately 1·5 per cent. Thus 90 lb. skim-milk contain $0·07 \times 90 \div 100 = 0·063$ lb. fat. From 4 lb. fat in milk the loss is 0·063 lb. From 100 lb. fat in milk the loss is $0·063 \div 4 \times 100 = 1·57$ per cent. The loss of fat in handling cream from the separator to the pasteurizer, in running it to the churn and in the handling of the resultant butter exclusive of the loss in buttermilk, and in packing or pounding the butter, is difficult to estimate, but can reasonably be set down at 0·5 per cent. of the fat received.

The amount of buttermilk from cream containing 40 per cent. of fat, including an allowance for water used in handling and churning, may be stated at about 65 lb. per 100 lb., and a normal percentage of fat in the resultant buttermilk is about 0·5 per cent. This loss of fat from that received in cream is equal to 0·81 per cent., thus: $65 \times 0·5 \div 100 = 0·325$ lb. fat lost from 40 lb. fat in cream. The loss per 100 lb. of fat would be $0·325 \div 40 \times 100 = 0·81$ per cent.

Boxes of bulk butter usually contain 56 lb. 8 oz. of butter, including the weight of the wrapping-paper, which, when taken off, weighs about 4 oz. It is customary to place 4 oz. of butter in each box and make no charge for it, to allow for possible shrinkage and other wastage. A similar allowance is sometimes made for unavoidable losses incurred in pounding up each 56 lb. of butter for local trade. With butter containing 82·5 per cent. of fat the loss is 0·444 per cent. of the fat contained in the butter. Thus 56·25 lb. butter contains 46·40625 lb. fat, since $56·25 \times 82·5 \div 100 = 46·40625$; 0·25 lb. butter contains 0·20625 lb. fat, since $0·25 \times 82·5 \div 100 = 0·20625$; 0·20625 lb. fat in 46·40625 lb. fat = 0·444 per cent., as $0·20625 \times 100 \div 46·40625 = 0·444$ per cent.

It is recognized that some of the losses have in practice occurred before that stage of manufacture has arrived for which later losses have been calculated. The variations thus caused are, however, of

no practical significance for our purpose, as they affect only the second place of decimals.

In each system the actual losses of the fat received are therefore approximately as follows :—

Under Whole Milk.

	Per Cent.
Skim-milk	1·5
Handling cream and butter ..	0·5
Buttermilk	0·81
Packing butter	0·444
Total	3·254

Under Home Separation.

	Per Cent.
Handling cream and butter ..	0·5
Buttermilk	0·81
Packing butter	0·444
Total	1·754

The constituents of butter are generally noted in short analysis under four heads as (1) fat, (2) water, (3) salt, (4) curd and ash. New Zealand butter of average quality contains about 82·5 per cent. fat, 15 per cent. water, 1·5 per cent. salt, and 1 per cent. curd and ash.

The overrun under the whole-milk system, when butter of such composition is made and the loss of fat is 3·25 per cent. of the fat received in the milk, will be 17·25 per cent. Thus, $100 - 3·25 = 96·75$ lb. fat sold in butter ; $96·75 \times 100 \div 82·5 = 117·25$ lb. butter made per 100 lb. fat purchased in milk, giving an overrun of 17·25 per cent.

Under the home-separation system, and when the loss of fat is 1·75 per cent. of the fat received in the cream, the overrun will be 19·09 per cent. Thus, $100 - 1·75 = 98·25$ lb. fat sold in butter ; $98·25 \times 100 \div 82·5 = 119·09$ lb. butter made from 100 lb. fat purchased in cream, giving an overrun of 19·09 per cent.

If it were possible to manufacture fat into butter without loss it would therefore be possible to make an overrun of 25 per cent. Since 80 lb. fat — the legal minimum percentage — would represent 100 lb. butter, 100 lb. fat would represent 125 lb. butter, or an overrun of 25 per cent. But as manufacturing losses do occur, if we assume these to be as indicated above, the overrun will be as follows :—

Under whole milk : 100 lb. fat received, less 3·25 lb. lost, equals 96·75 lb. fat retained in butter sold. If 80 lb. of fat represent 100 lb. of butter, 96·75 lb. of fat would represent $96·75 \times 100 \div 80 = 120·93$ lb. butter, or an overrun of 20·93 per cent.

Under home separation : 100 lb. fat received, less 1·75 lb. lost, equals 98·25 lb. fat retained in the butter sold. If 80 lb. fat represent 100 lb. butter, 98·25 lb. fat would represent $98·25 \times 100 \div 80 = 122·80$ lb. butter, or an overrun of 22·80 per cent. As the fat content of butter is not infrequently as high as 85 per cent., however, and as a fat content of 80 per cent. is seldom found, an average of 82·5 per cent. may be taken as fairly general.

DEFICIENCY IN MATTER NOT FAT.

The amount of matter not fat which butter may contain is limited by legal enactment, which requires that butter shall contain not less than 80 per cent. of milk (butter) fat and not more than 16 per cent. of water. The manufacture of unsalted butter, which has a high fat content, will reduce the overrun, while if butter be made for the

American market, which requires about 3 per cent. of salt, the fat content will be lower and the overrun higher. When making for the British market, which requires about 2 per cent. of salt, it can be regarded as good work if butter is made containing: fat, 81·5 per cent.; water, 15·5 per cent.; salt, 2 per cent.; and curd, 1 per cent. The overrun if this average is maintained would therefore be—whole milk, 18·71 per cent.; home separation, 20·55 per cent.

A careful check can be kept on the various constituents of the butter made, by means of the several tests with which all buttermakers are familiar, provided a representative sample of the butter in the churn is obtained. To do so it is necessary to take small pieces of butter from different parts of the churn and emulsify and thoroughly mix them. Tests may be made from the same sample in the following order: Moisture, by the drying-off method; fat, by the benzine process; salt, by the silver nitrate test; and curd and ash, by subtracting the total of the first three from one hundred.

The accompanying table shows the overrun obtainable under varying conditions, and gives an indication whether the losses under either of these headings have been excessive, providing all and only the butterfat received has been paid for. It will be noted that when the butter made contains 82·5 per cent. of fat, the loss of $\frac{1}{4}$ per cent. of fat in manufacturing reduces the overrun approximately 0·3 per cent. The loss of $\frac{1}{4}$ per cent. in matter not fat, such as a low water content, reduces the overrun 0·36 per cent. approximately. The aim of the buttermaker will be, then, to retain as much of the water in the finished butter as the legal standard will allow, and the maximum amount of salt, having due regard to the taste of the buyer, since any deficiency in either must be made up with butterfat and the overrun be thereby reduced.

ERRORS IN CALCULATING THE AMOUNT OF FAT RECEIVED.

Under the whole-milk system errors in calculating the amount of fat are not so likely to occur as when handling cream, since the former is weighed in larger quantities, is more liquid and therefore more easily sampled, and the testing is a simpler process. With cream, which is in smaller quantities and contains a higher content of butterfat, the same accuracy is not possible. The tare weights on cream-cans should be marked to half-pounds, and if not exact should be made so by the addition of solder to the bottom of the can. Net weight to $\frac{1}{2}$ lb. should be credited to the supplier, and even then the fractional weights which cannot be credited will give the factory an advantage at this stage.

Sampling, on the other hand, and all other parts of the testing will incline to give the supplier the advantage, with the exception of fractions in reading the test, and the practice of some factories in crediting to $\frac{1}{2}$ per cent. is undoubtedly more accurate. Since these are matters of calculation, the term "loss" under this heading is hardly correct, as no butterfat is actually lost. Want of attention to these details, however, will have a considerable influence on the overrun and consequently on the payments for butterfat. A sample of cream which contains 40 per cent. of fat, if credited to the supplier

TABLE SHOWING THE OVERRUN OBTAINABLE UNDER VARYING CONDITIONS.

Composition of Butter.		Percentage of Manufacturing Losses.														
Fat Per Cent.	Matter Not Fat Per Cent.	0	0·25	0.50	0·75	1·0	1·25	1·5	1·75	2·0	2·25	2·5	2·75	3·0	3·25	3.5
		Percentage of Overrun.														
80·00	20·00	25·00	24·68	24·37	24·06	23·75	23·43	23·12	22·81	22·50	22·18	21·87	21·56	21·25	20·93	20·62
80·25	19·75	24·61	24·29	23·98	23·67	23·36	23·05	22·74	22·42	22·11	21·80	21·49	21·18	20·87	20·56	20·24
80·50	19·50	24·22	23·91	23·60	23·29	22·98	22·67	22·36	22·04	21·73	21·42	21·11	20·80	20·49	20·18	19·87
80·75	19·25	23·83	23·52	23·21	22·91	22·60	22·29	21·98	21·67	21·36	21·05	20·74	20·43	20·12	19·81	19·50
81·00	19·00	23·45	23·14	22·83	22·53	22·22	21·91	21·60	21·29	20·98	20·67	20·37	20·06	19·75	19·44	19·13
81·25	18·75	23·07	22·76	22·46	22·15	21·84	21·53	21·23	20·92	20·61	20·30	20·00	19·69	19·38	19·07	18·76
81·50	18·50	22·69	22·39	22·08	21·77	21·47	21·16	20·85	20·55	20·24	19·93	19·63	19·32	19·01	18·71	18·40
81·75	18·25	22·32	22·01	21·71	21·40	21·10	20·78	20·48	20·18	19·87	19·57	19·26	18·96	18·65	18·34	18·04
82·00	18·00	21·95	21·64	21·34	21·03	20·73	20·42	20·12	19·81	19·50	19·20	18·90	18·59	18·29	17·98	17·68
82·25	17·75	21·58	21·27	20·97	20·66	20·36	20·06	19·75	19·45	19·14	18·84	18·54	18·23	17·93	17·62	17·32
82·50	17·50	21·21	20·90	20·60	20·30	20·00	19·69	19·39	19·09	18·78	18·48	18·18	17·87	17·57	17·27	16·96
82·75	17·25	20·84	20·54	20·24	19·93	19·63	19·33	19·03	18·73	18·42	18·12	17·82	17·52	17·22	16·91	16·61
83·00	17·00	20·48	20·18	19·67	19·57	19·27	18·97	18·67	18·37	18·07	17·77	17·46	17·16	16·86	16·56	16·26
83·25	16·75	20·12	19·81	19·51	19·21	18·91	18·61	18·31	18·01	17·71	17·41	17·11	16·81	16·51	16·21	15·91
83·50	16·50	19·76	19·46	19·16	18·86	18·56	18·26	17·96	17·66	17·36	17·06	16·76	16·46	16·16	15·86	15·56
83·75	16·25	19·40	19·10	18·80	18·50	18·20	17·91	17·61	17·31	17·01	16·71	16·41	16·11	15·82	15·52	15·22
84·00	16·00	19·04	18·75	18·45	18·15	17·85	17·55	17·26	16·96	16·66	16·36	16·07	15·77	15·47	15·17	14·88
84·25	15·75	18·69	18·39	18·10	17·80	17·50	17·20	16·91	16·61	16·31	16·02	15·72	15·43	15·13	14·83	14·54
84·50	15·50	18·34	18·04	17·75	17·45	17·15	16·86	16·56	16·27	15·97	15·68	15·38	15·08	14·79	14·49	14·20
84·75	15·25	17·99	17·69	17·40	17·10	16·81	16·51	16·22	15·92	15·63	15·33	15·04	14·74	14·45	14·15	13·86
85·00	15·00	17·64	17·35	17·05	16·76	16·47	16·17	15·88	15·58	15·29	15·00	14·70	14·41	14·11	13·82	13·52

as 38 per cent. will cause him a loss of 5 per cent. of his total butterfat. Thus on 40 the loss is 2; on 100 the loss is $2 \times 100 \div 40$ per cent. = 5, or for 100 lb. fat received only 95 lb. is paid for. The butter made is still 119·09 lb., and 119·09 less 95 equals 24·09 lb. butter made in excess of fat paid for. The overrun will therefore be $24{\cdot}09 \times 100 \div 95 = 25{\cdot}35$ per cent. The increase in overrun due to the lower reading of the cream test will be $25{\cdot}35 - 19{\cdot}09 = 6{\cdot}26$ per cent. Similarly, the same error in a 30 per cent. cream will result in a loss of 6·66 per cent. of fat to the supplier, and the overrun will be increased by 8·45 per cent. Should the error result in an overcredit of 2 per cent., the overrun will be reduced by 5·68 per cent. when 40 per cent. of cream is being received, and by 7·4 per cent. with 30 per cent. of cream.

The influences of the overrun on the value of the fat may be seen in this way: If we have 100 lb. of fat and make 120 lb. of butter worth 1s. per pound, 1 lb. of fat is worth 120s. ÷ 100 = 14·4d. But if only 115 lb. of butter is made from 100 lb. of fat, 1 lb. of fat is worth only 115s. ÷ 100 = 13·8d.: or 1s. × 1·15 = 13·8d. The value of the overrun per pound of fat is therefore in the first case 14·4d. — 12d. = 2·4d., and in the second 13·8d. — 12 = 1·8d.

If the expense of making and marketing amounts to 1·8d. per pound of fat the factory will be able to pay out 1s., the same price as received for butter when the overrun is 15 per cent., but if the expenses exceed 1·8d. the payment for butterfat will be less per pound than was received for butter. But with a 20-per-cent. overrun and the same manufacturing costs the factory can pay 14·4d. — 1·8d. = 12·6d. per pound, or 0·6d. more than was received per pound for butter. Assuming that each supplier has been credited with his correct amount of fat, and that the reduced overrun is the result of faulty manufacturing methods, the loss falls equally on all suppliers. But should the low overrun be the result of error in weighing, testing, &c., it is only one of calculation, and will fall unfairly on certain suppliers.

Taking three suppliers sending in 30, 40, and 50 per cent. cream, and assuming they are credited with 31, 41, and 51 tests. The first will be paid for 3·33 per cent. too much fat; the second will be paid 2½ per cent. too much; and the third will be paid for 2 per cent. too much. Since the percentage of error is not evenly distributed, and there is only a certain sum available for distribution, the first will receive more money than he is entitled to, and the second will receive a fair proportion, and the third less than he is entitled to. Should the error result in a similar reduction in test the first will receive less than his due, the second will receive the same, and the third more money than he is entitled to.

CONCLUSION.

From the foregoing it will be seen that the overrun plays a very important part in the affairs of a dairy factory, and the necessity for checking it at each testing-period cannot be too strongly emphasized. The greatest care is required from the time the milk or cream is received until the butter is packed, and each step of the process must be carefully checked in order to avoid unnecessary losses.

Putting aside the accurate testing of milk and cream, which have been fully dealt with on many occasions, practical and reliable tests are available with which all buttermakers are familiar. Of these the moisture and salt tests are the most important, as they determine the fat content of the butter and to a great extent the overrun. Manufacturing losses cannot be reduced below a certain minimum, as a percentage of loss is unavoidable, while the curd content of butter cannot be increased without endangering the keeping-qualities of the butter. The factors of moisture and salt, however, are within certain limits, in the hands of the buttermaker.

DIPLODIA CANKER, DIPLODIA GRIFFONI.

A COMMON FUNGOUS DISEASE OF THE APPLE.

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DIPLODIA GRIFFONI (Griff. et. Maublanc) Sacc. et Trav. ranks second in importance only to black-rot as a canker-forming disease of the apple. It was first recorded for New Zealand in 1916, from specimens forwarded by R. Waters to Kew. It has been confused by several authorities with black-rot, and until recently was constantly referred by the writer to that disease. Recent cultural work performed in this Laboratory shows that the diseases are quite distinct.*

The disease appears to have a limited distribution, for elsewhere it has only been recorded from England and France, where it appears to be a minor disease. So far as is at present known, in New Zealand it is confined to the apple, although in France it has been also recorded on the pear.

APPEARANCE AND EFFECT ON THE HOST.

The disease is prevalent on young laterals, but is not confined to these, for it is occasionally found on two- and three-year-old wood. When attacked the lateral is soon girdled, and the leaves wilt and turn brown, thus rendering the presence of the disease noticeable, for these wilted shoots present an appearance very similar to those infected with fireblight. It cannot be considered a serious disease, for it ranks second in importance to black-rot as a disease of the apple, and it has been already pointed out (*Journal* for August last) that in New Zealand black-rot is in itself a comparatively minor trouble.

When the canker thus formed is carefully examined it is seen to possess several features which separate it from black-rot and other cankers. It is slightly depressed, and is well defined from the healthy wood by one or more deep crevices with slightly raised margins. The colour is a distinct reddish-brown, with a conspicuous arrangement into light and dark bands, giving the whole canker a zoned appearance. It will be remembered that the black-rot canker is also zoned; in this case, however, the zones are due to definite crevices, and not to

* A detailed account of this cultural work will be published elsewhere.

colour. Diplodia canker is rendered still more conspicuous on account of the whole surface being studded with the fructifications of the causative organism. These appear as small conical elevations, also arranged in zones.

On older wood an elliptical sunken canker is formed. It is, as a rule, confined to one side of the branch, so girdling does not occur; consequently in the absence of wilted leaves this stage is easily overlooked. For a time they present a similar appearance to cankers on the laterals; later they change to a dull brown, and in very old specimens the bark may fall away in strips, exposing the wood and giving the wounds a ragged appearance.

FIG. 1. DIPLODIA CANKER ON YOUNG TWO-YEAR-OLD BRANCH. × 2.

Point of entry through woolly-aphis injury. Note the numerous pycnidia.

[*Photo by G. H. Cunningham.*

FIG. 2. CANKER ON THREE-YEAR-OLD BRANCH. NATURAL SIZE.

Note sunken nature of the canker, and the zoned arrangement of the pycnidia. Point of entry through broken stub.

[*Photo by W. D. Reid.*

I have not found this fungus on fruits in nature, but when artificially inoculated into apples it produces a firm brown rot. On the surface appear numerous black raised points, the fructifications of the fungus.

LIFE-HISTORY OF THE CAUSATIVE ORGANISM.

There are two spore stages in the life-cycle of this fungus. Shortly after a canker is formed numerous black papillæ appear beneath the dead bark. Microscopic examination shows these to consist of small flask-shaped pycnidia, containing very numerous, large, one-celled, colourless spores. This is the first or *Macrophoma* stage. Should the canker persist for some time the spores change in colour to dark brown and become one-septate, producing the second or *Diplodia* stage. The latter is a comparatively rare stage, the abundant one being the *Macrophoma*.

I have recently proved by cultural work that these two stages belong to the same cycle. *Macrophoma* spores were sown on various culture media, and after a time in certain of the media the *Diplodia* stage appeared.

The fungus is apparently able to penetrate the tissues only through some injured surface. Field observations show that the chief source of infection is through woolly-aphis injuries, but infection through stubs left as a result of careless pruning is not uncommon. Should a spore be carried to such a surface it may germinate and produce a hypha, which penetrates into the tissues and there divides repeatedly to form a mycelium. The hyphæ penetrate into the tissues of the cortex and wood, growing radiately outwards from the infection centre. Should the shoot be a small one girdling quickly follows. Sections

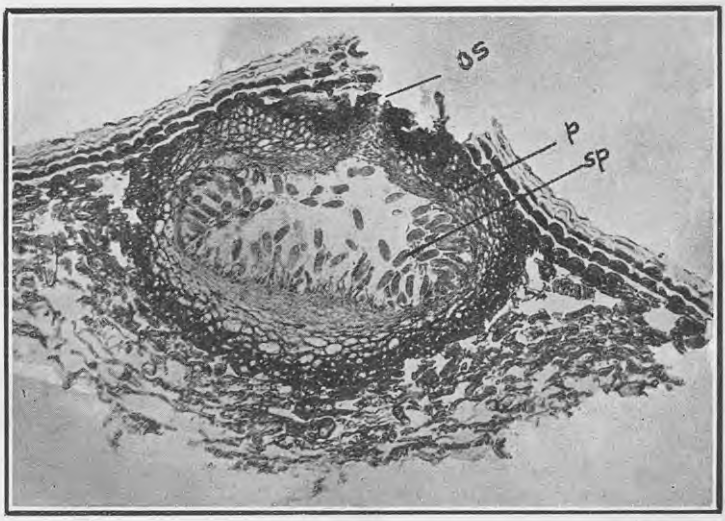

FIG. 3. PHOTOMICROGRAPH OF A SECTION THROUGH PYCNIDIUM. × 75.
(*p*) Pycnidial wall; (*os*) ostiolum; (*sp*) spores.
[*Photo by G. H. Cunningham.*

through old cankers show that the hyphæ of the fungus penetrate through cortex, bast, and wood tissues, killing and discolouring them.

The mycelium persists in a canker, especially one on an older limb, for two or more seasons. Under favourable conditions it produces fructifications on the surface of the canker throughout the whole of this period. These fructifications are flask-shaped receptacles, opening by a pore (ostiolum) on to the free surface of the canker. The enclosed spores are embedded in hygroscopic mucilage, which in a humid atmosphere absorbs water, swells, and is forced out through the ostiolum to the surface, where it appears as a gelatinous tendril in which are embedded the spores.

The mucilage is dissolved by rain, and the spores lie free on the surface of the bark. When dry they are carried long distances by

the wind. It is probable that insects play an important part in their distribution. The fungus is not confined to the living host, for I have very frequently obtained this species on dead twigs (apple) lying on the ground in the orchard and in heaps of prunings. Spores from such sources give the same growth in culture media, and produce the same rot in apple fruits as those taken from cankers. I have been able to infect apple-shoots with spores (*Macrophoma*) produced in culture by introducing them into wounds artificially made in the cortex, but have failed to infect leaves either directly or through wounds in the epidermis.

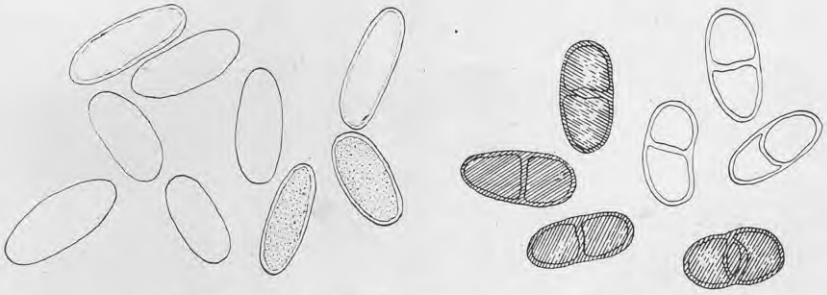

FIG. 4 (LEFT). MACROPHOMA SPORES. × 500.
FIG. 5 (RIGHT). DIPLODIA SPORES. × 500.
[*Original.*

REMEDIAL TREATMENT.

It has been shown that this organism is spread from spores produced from fructifications embedded in the dead bark of cankers, and that the fructifications may be formed at any time during the life of the canker, the mycelium being perennial. It is seen that twigs left on the ground or in heaps or prunings—twigs on which the fungus is living as an ordinary saprophyte—are also a source of infection. Further, it has been shown that infection can occur only through wounds in the bark, principally through injuries caused by woolly aphis.

The following remedial treatment is suggested: (1) Removal of the sources of infection, and (2) the prevention of infection by wound-treatment. Unfortunately, in the latter case this would necessitate the control of woolly aphis—a difficult task—as it is through injuries formed by these aphids that the majority of infection occurs. I believe that this phase may be ignored, and that if the sources of infection be removed the disease will soon prove to be a negligible one. This would not prove a difficult matter, for, so far as is at present known, the fungus in New Zealand is confined to the one host plant; I have not succeeded in obtaining the spores, even on dead wood, on other than the apple.

To summarize: (1) Cut out all cankers whenever they appear; (2) carefully rake up and destroy all prunings; (3) burn all heaps of prunings and do not allow them to lie about, for they are a fruitful source of infection; (4) keep woolly aphis in check.

GENERAL SUMMARY.

1. *Diplodia* canker is a fungous disease confined to the apple. It forms cankers on laterals and branches. It has not been found on leaves or fruits in nature.

2. Cankers caused by it may be readily recognized on account of the characteristic light and dark bands of reddish-brown colour.

3. There are two spore stages in the life-cycle, a *Macrophoma* followed by a *Diplodia* stage. They have been connected by the aid of cultures.

4. The fungus overwinters in the cankers and on dead twigs on the ground and in pruning-heaps.

5. It is a wound parasite, entering principally through woolly-aphis injuries.

6. Remedial treatment suggested is the removal of sources of infection and the keeping in check of woolly aphis.

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GORE EXPERIMENTAL AREA.

NOTES ON OPERATIONS, SEASON 1922–23.

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THE season 1922–23 in the Gore district was a very wet one, as a result of which some of the operations carried out on the experimental area received a set-back during the initial stages of growth, resulting in difficulty being experienced in the harvesting and weighing of the various crops. The following brief summary of operations will prove of interest to farmers in Otago and Southland, but it should be borne in mind that the Gore area, properly speaking, is a demonstration rather than a true experimental area. The work being carried out is so designed as to give an indication in regard to the suitability or otherwise of certain crops in the locality where the area is situated, and also, by preliminary trial, to pave the way for more exhaustive experiments where indications have been obtained that such are likely to meet with success.

MAJOR WHEAT.

As a result of the success of Major wheat at Winton Experimental Area during the season 1921–22, where it gave a per-acre yield of 62 bushels, weighing 65½ lb. of dressed seed per bushel, it was decided to lay down 3 acres of this variety at Gore for seeding purposes. The quick-germinating properties of this seed were again noticed, and, as had previously been observed, the crop came to maturity a full three

weeks ahead of Solid-straw Tuscan. This, to Southland farmers in particular, is a valuable feature, and the fact also that Major stands up well with little susceptibility to lodging makes it, from a farmer's point of view, a highly desirable variety to grow. The wheat handles well and is easily threshed. Sown at the rate of 3 bushels, and with 3 cwt. superphosphate per acre, the crop when threshed gave 60 bushels per acre—quite a creditable yield.

This, together with other trials, having proved quite satisfactory, a quantity of Major wheat was forwarded to the mill of Messrs. W. Reid and Sons, Arrowtown, for a report in regard to its actual milling-characteristics. The wheat was carefully tested by Mr. Warring, the miller, and a report upon it furnished by him reads as follows:—

This wheat was in very soft condition, and therefore not capable of being easily handled on mill. On the breaks it behaved fair, but, owing to the rolls having to be put up, gave an excessive percentage of "break" flour. On the reduction rolls it was necessary to come up off the stock, otherwise it flaked badly. Possibly owing to its condition, it dressed very poorly, and gave a low percentage of flour and a correspondingly high percentage of pollard. Flour inclined to be dark and slippery. However, sample not altogether the best for a flour test, owing to its condition; but inclined to think this wheat at best only suitable for blending purposes. The net weight of wheat was 422 lb., less loss in screening and milling, 12 lb., equal to 410 lb., producing as follows: Flour, 254 lb. = 61·95 per cent.; bran, 54 lb. = 13·17 per cent.; pollard, 102 lb. = 24·88 per cent.

From this report it will be observed that the sample forwarded was of poor milling-quality, but, as mentioned in the report, the sample was not a good one on account of the bad weather prevailing at harvest-time. The three chief varieties of wheat grown in Southland are Solid-straw Tuscan, White-straw Tuscan, and Velvet. During the season 1920–21 samples of these were collected from Southland, and milling tests were conducted by the Department's Chemical Laboratory. To contrast Major grown during the season 1922–23 with these wheats may not be a fair comparison, but will certainly prove interesting in showing the relatively poor position held by Major, as follows:—

Locality.	Variety.	Bran.	Pollard.	Flour.	Season.
		Per Cent.	Per Cent.	Per Cent.	
Gore	Major	13·17	24·88	61·95	1922–23.
Wrey's Bush ..	Velvet	13·7	14·7	71·6	1921–22.
Winton ..	Velvet	15·6	12·9	71·5	1921–22.
Athol	Solid-straw Tuscan ..	10·9	17·2	71·9	1921–22.
Wendon ..	White-straw Tuscan	15·3	14·5	70·2	1921–22..
Winton ..	White-straw Tuscan	13·7	14·8	71·5	1921–22.

From this it will be seen that so far as the 1922–23 sample of Major wheat was concerned its milling-qualities were so poor that one now feels diffident about recommending the growing of this variety until further tests have been made. A wheat which matures early, yields well, and has strength of straw is, in spite of such desirable characteristics, much discounted for Otago and Southland farmers if its milling-properties are not as good as the wheats already grown in these districts. Further trials are therefore being made with Major in order to definitely fix its relative value.

OATS AND PEAS FOR ENSILAGE OR HAY.

An area of approximately 4 acres of Garton's oats and Grey Partridge peas was grown for the purpose of providing sufficient green material to build an ensilage stack. The crop was put in on 18th October, 1922, at the rate of 1½ bushels oats and 1½ bushels peas, mixed, and sown with a Massey-Harris seed-drill. A mixture of oats and peas can be sown quite conveniently in this manner.

Associated with this crop was a manurial trial. The field was divided into five sections, four of which received different manures, one being retained as a control plot. The crop was harvested on 1st February, and the following green-weight yields were recorded: Plot 1, unmanured, 15 tons 6 cwt.; plot 2, 2 cwt. superphosphate, 15 tons 12 cwt.; plot 3, 1 cwt. superphosphate and 1 cwt. Nauru phosphate, 14 tons 18 cwt.; plot 4, 1 cwt. basic slag and 1 cwt. superphosphate, 13 tons 10 cwt.; plot 5, 2 cwt. basic superphosphate, 13 tons 6 cwt.

From these results it can at once be seen that no reliable information in regard to the relative value of different manures can be obtained from experiments laid down in this manner. No allowance for soil-variation was made, and as a result the unmanured plot, which was obviously on the best ground, gave the second-highest yield. All attempts to ascertain the effect of different manures are quite ineffective when carried out on these lines, and it is only by having a multiplicity of plots of each kind of manure that a fairly accurate estimate of the value of such manures can be obtained. The experiment therefore is of value inasmuch as it shows how impossible it is to arrive at satisfactory results by such means, and this should be noted by farmers who carry out private experimental work of this nature.

The crop was converted into ensilage, for which purpose oats and peas are admirably adapted. The value of this combination as a hay crop is also recognized, and it is to be recommended as specially suitable for this purpose in Otago and Southland, where a larger acreage should be grown. Its value as a summer forage is not sufficiently recognized. Sown during the first week of November this crop should be in good condition for feeding green to dairy cattle during the usually dry months of January and February.

OATS AND GOLDEN TARES.

A small block of 1½ acres of oats and Golden tares was also sown for ensilage purposes, in the same manner as the oats and peas. There does not appear to be any great advantage in sowing tares in preference to peas, and the price of tares is much higher than that of peas. This block was divided into two sections, one of which received 2 cwt. per acre of Nauru phosphate, the remaining block being unmanured. The manured area gave a green-weight yield of 11 tons 1 cwt. per acre, and the unmanured block yielded 10 tons 8 cwt. per acre. As in the case of the oat and pea crop, no inference is to be drawn from the apparent beneficial effect of the manure used, as the difference in the yield could just as easily be accounted for by variations in the soil.

Apart from the value of this crop for ensilage and hay purposes, it is especially suited for autumn sowing, to provide early spring feed.

Tares do well when autumn-sown where peas would fail, which is a valuable characteristic. As a smother-crop oats and tares are of great value in suppressing the growth of Canadian thistle, and they have been tested at Gore with excellent results for this purpose.

RAPE VARIETIES.

As in the past, a portion of the area was devoted to demonstrating the growth of different varieties of rape. All were sown on 28th October (with the exception of Smith's Broad-leafed Essex, which was sown on 29th November) in ridges, at 1 lb. per acre, with 1 cwt. each per acre of Nauru phosphate, blood-and-bone, and superphosphate. The varieties tested, with their yield per acre, were as follows: Plot 1, Colonial, 22 tons; plot 2, European, 20 tons 11 cwt.; plot 3, Kangaroo, 20 tons 5 cwt.; plot 4, Gigantic, 14 tons 2 cwt.; plot 5, Buda kale, 17 tons 6 cwt.; plot 6, Smith's Broad-leafed Essex, 18 tons 8 cwt.

The individual plots were too small to fence off in order that their relative fattening-qualities could be assessed, so the whole block was fed off with lambs. These were weighed on the block on 4th March, their average weight per head being 80·1 lb. They were taken off on 15th March, and gave an average weight of 81·4 lb., showing an increase in weight for the ten days' grazing of 1·3 lb. per head.

It is pleasing to note that Colonial gave the highest yield, which goes to bear out our repeated assertion that New Zealand can grow rape-seed equal to the best European. Gigantic proved a poor yielder and did not come up to expectations. The variations of results in these yields may not in every case be due to the superiority of one variety over the other, for it has to be borne in mind that the soil was, to say the least, very variable.

WINTER FORAGE CROPS.

A trial of winter forage crops was conducted on approximately 1¼ acres, with the object of demonstrating to farmers the value of certain crops as winter feed for dairy cattle. It is not sufficiently recognized that very satisfactory winter forage crops can be grown in Otago and Southland quite apart from turnips, and those farmers who visited the Gore area last season expressed themselves as agreeably surprised in this respect.

The crops dealt with were Thousand-headed kale, chou moellier, and two varieties of cabbage. They were sown on 28th November in raised drills, at the rate of 1 lb. per acre, with the same manures as used with the rape crops. Good germination resulted, and when final weighings of the crops were made during the month of June the following yields per acre were recorded: Thousand-headed kale, 11 tons 14 cwt.; chou moellier, 24 tons 10 cwt.; Drumhead cabbage, 19 tons 4 cwt.; Succession cabbage, 20 tons 1 cwt.

In weighing these crops the plants were cut off level with the ground, no roots being weighed. Succession appeared to be the better of the two cabbage varieties.

Observations in regard to palatability were made, and it was noticed that the sheep appeared to prefer the crops in the following

order: chou moellier, Thousand-headed kale, Succession cabbage, and Drumhead cabbage. The preference of the sheep for chou moellier was most marked. There can be no doubt that for a winter forage crop chou moellier has a great deal to recommend it. Even on club-root infected ground chou moellier, although susceptible to the disease, is not seriously damaged by it; and, as a matter of fact, club-root does not seem to materially affect the growth of the plant. As a fodder for dairy cattle it is difficult to surpass, and the fact that it does not taint milk makes it, from a dairy-farmer's viewpoint, an excellent crop to grow for both summer and winter feeding.

SOFT-TURNIP VARIETIES.

A block of different varieties of soft turnips always appeals to the Southern farmer, who depends to a very large extent on turnips for winter feeding. The regular practice of testing different varieties of turnips on the Gore area was again carried out, and an area of 2 acres was devoted to this purpose. The turnips were sown in ridges on 18th December, at 1 lb. per acre, with the same manure as for the rape (1 cwt. per acre each of Nauru phosphate, blood-and-bone, and super). Nineteen varieties were sown, and observations in regard to their freedom or otherwise from attack of club-root were noted, the results being as follows:—

Variety.	Yield per Acre.		Infection by Club-root.
	Tons	cwt.	
Paragon Red (Canterbury-grown seed) ..	21	2	16·6 per cent.
Hurst's Devonshire Greystone	20	2	Very slight.
Smith's Improved Green Globe	25	3	Very slight.
Hurst's Purple-top Aberdeen	16	7	Very slight.
Hurst's Fosterton Hybrid	19	16	2 per cent.
Hurst's Imperial Green Globe	25	3	2 per cent.
Hurst's Centenary	26	16	Slight.
Hurst's Green-top Aberdeen	16	7	7 per cent.
Garton's Hardy Green Globe	27	17	Slight.
Deep Golden Yellow Long Keeping	19	16	Slight.
Smith's Purple-top Bullock	21	0	Slight.
Webb's New Renown	21	8	10 per cent.
Webb's Purple-top Scotch	15	10	22 per cent.
Webb's Yellow Tankard	24	13	Slight.
Kelway's First-in-the-Field	22	6	Slight.
Kelway's Green Ring	29	9	Slight.
Smith's Sittyton Prize Green-top Yellow ..	22	10	4 per cent.
Garton's Hardy Green Globe	25	9	9 per cent.
Hardy Green Globe (Canterbury-grown seed) ..	26	16	3 per cent.

The above gives no true indication in regard to the relative yields of the respective varieties, and is merely included in this report with the object of showing that the majority can quite safely be tried out on the farms of the district. In regard to the last two plots, the area laid out in each of these varieties was approximately ½ acre. The two varieties made a very interesting comparison, and a marked superiority of the New Zealand seed over the European was noted. The ultimate yield recorded for the former was higher; but by far

the most important fact noticed was that the crop grown from New Zealand seed was much less infected with club-root and dry-rot than that from European seed.

SWEDE VARIETIES.

A number of swede varieties were sown on 28th November with the same manure as used for the soft turnips. The varieties were weighed after being topped and tailed, and an examination was made in regard to their freedom or otherwise from club-root. Particulars are as follows :—

Plot.	Variety.	Yield per Acre.	Infection by Club-root.
		Tons cwt.	
1	Webb's New Buffalo	31 1	Very slight.
2	Webb's New Masterpiece	24 13	3 per cent.
3	Webb's Short Top	20 2	Very slight.
4	Webb's Arctic	29 9	Very slight.
5	Webb's Golden Melon	19 16	Very slight.
6	Webb's New Empire	25 3	Very slight.
7	Kelway's Brown Universal	28 0	Very slight.
8	Kelway's Longport Green-top ..	25 15	Very slight.
9	Kelway's Best of All	31 1	9 per cent.
10	Garton's Superlative	33 9	Very slight.
11	Bell's Mervue	32 3	8 per cent.
12	Smith's Defiance	27 0	23 per cent.
13	Hurst's Universal	31 1	24 per cent.
14	Hurst's Perfection	32 3	9 per cent.
15	Hurst's Monarch Purple-top ..	29 9	3 per cent.
16	Danish Swede	27 17	30 per cent.
17	Crimson King (Canterbury-grown seed)	31 12	20 per cent.

As was the case in the soft-turnip variety trial, no true inference can be drawn in regard to the relative yield of the different varieties, on account of soil-variations, nor in regard to their apparent degree of club-root resistance. One must assume that the degree of infection is only an indication in regard to the location and intensity of infection in the particular field.

The main crop of swedes consisted of an imported Danish variety (which must not be confused with a Danish variety that is being tried on the area in relation to its club-root-resistant properties) and Crimson King from seed grown in Canterbury. The Canterbury-grown seed produced a crop which appeared to be much freer from dry-rot and club-root than the imported Danish swede.

CLUB-ROOT INVESTIGATION.

A continuance of the club-root investigation afforded some interesting results during the season. Readers are referred to previous reports on the Gore area for full information in regard to the work being done. From these it will be noted that the efficacy of lime is being tested as a means of controlling or limiting this disease, and a crop rotation is simultaneously being carried out with the same object in view. The results recorded in 19 2–23 are as follows :—

Plot.	Quantity of Lime per Acre, applied 1920.	Yield per Acre.	Percentage of Club-root Infection.
	Block A, sown with Hardy Green Globe Turnips.		
	Tons.	Tons cwt.	
1	2	22 6	57·0
2	16	28 0	3·0
3	Nil	25 9	48·3
4	8	35 6	24·0
5	4	31 0	20·8
	Block B, sown with Webb's Renown Turnips.		
	Tons.	Tons cwt.	
1	2	20 2	9·5
2	16	25 0	9·6
3	Nil	16 0	21·6
4	8	26 16	12·0
5	4	24 13	16·8

These results afford interesting material for thought, and apparently point to lime, after being several years in the soil, having some inhibiting effect on the prevalence of the club-root organism. Where large quantities of lime have been applied, as in the case of the plot which received 16 tons per acre, there was certainly less disease apparent than on the plot which received no lime. One would like very much to use these results as an argument that lime when applied in fairly large quantities would lessen the disease, but the figures must not be accepted at their face value as giving a true indication of the intensity of attack. The plots were small, and the bulbs grown thereon few in number. One or two bulbs attacked by the disease consequently make the percentage of infection read very high. Furthermore, there is every likelihood that the ground upon which the experiment is being tried is not uniformly infected in the same intensity, and this would certainly make for wrong interpretation of results. All that can be said in regard to this experiment is that a strong indication was given supporting the oft-repeated assertion that lime counteracts club-root; further, as a result of the previous experiments it would appear that the effect of lime in this connection is not apparent until some three years after the application has been made.

GENERAL.

The lucerne trial was continued, and several new varieties were sown down. From indications up to the present there is apparently no doubt as to the unsuitability of lucerne for this district, and it cannot be recommended as a crop on land of similar type to that of the Gore area.

Mangolds were grown on the heaviest piece of land on the area, and the results were quite satisfactory in evincing the fact that there are undoubtedly many places in Southland where this crop can be satisfactorily grown.

The season 1922–23 was remarkable for the keen interest taken in the farm operations by the general farming community. The number of visitors was large, and several field-days were given to different branches of the Farmers' Union.

The work on the area was most satisfactorily carried out by the Overseer, Mr. T. Pattinson, who deserves credit for the manner in which he laid out the experiments and attended to the farm operations generally.

TESTING OF PUREBRED DAIRY COWS.

NOVEMBER CERTIFICATE-OF-RECORD LIST.

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

THE appended list, comprising the records of 162 cows which received certificates during November, 1923, forms the largest number of certificates issued in any one month since the inception of the C.O.R. testing system in New Zealand. That quality is represented, however, as well as quantity will be apparent from a glance at the records —two cows having produced over 800 lb., four others over 700 lb., and fifteen over 600 lb. of butterfat.

NEW JERSEY CLASS-LEADERS.

Alfalfa Pansy.

In the junior two-year-old section for Jerseys appears Mr. F. J. Saxby's Alfalfa Pansy, whose yield of 690·16 lb. butterfat places her at the head of that class. But though she has displaced Aster's August Child, the previous leader, the margin between the two records is only 1·01 lb. fat. Alfalfa Pansy commenced her test at 2 years 4 days, as compared with 1 year 337 days in the case of Aster's August Child. There is, therefore, a difference of thirty-two days in age, which at the usual rate of increase in standard for age would represent 3·20 lb. fat.

Alfalfa Pansy was sired by Waipiko Masterpiece, and her dam is Woodruffe, who at the age of 15 years 276 days commenced a C.O.R. test on which she qualified with a production of 436·01 lb. fat, a fine performance considering her advanced age. Another daughter of Waipiko Masterpiece is Alfalfa Cicero Fontaine (also owned by Mr. F. J. Saxby), whose record of 665·74 lb. fat at 2 years 69 days is not very far below that of the animal under review. Waipiko Masterpiece was sired by Eminent's Fontaine, and his dam also traces to that sire. It would therefore seem that this source may be largely responsible for the merit of Alfalfa Pansy. Woodruffe, the dam of Alfalfa Pansy, was almost fifteen years old when this daughter was born, so that her ancestors had passed their prime before the certificate-of-record testing system was properly founded in New Zealand, and therefore have few records to show. However, such widely recognized individuals as Dry Monopole, Retford, Magnet's Boy, and Grisette have doubtless left their mark.

It may be mentioned that Alfalfa Pansy's highest month was the fourth one of the test, when she yielded 68·65 lb. fat, while for her final month—August—she is credited with 56·90 lb. fat in 29 days, thus showing that she had the ability to maintain her yield both against the inclement months and advancing pregnancy—a clear demonstration of sound constitution.

Marshland's Stylish Princess.

The November *Journal's* list included in the class for senior two-year-old Jerseys the name of Marshland's Eminent, who, commencing test at the age of 2 years 328 days, produced 712·08 lb. fat, and of Marshland's Stylish Princess, who yielded 715·75 lb. fat, commencing test at 2 years 353 days. Both these heifers are owned by Mr. W. J. Chynoweth, of Pukeroro, Hamilton, and both have exceeded the record of the previous leader of their class—namely, Lady Superior—who is credited with 680·33 lb. fat in 365 days, commencing at 2 years 183 days. Marshland's Stylish Princess, having the higher record, is, of course, entitled to the class-leadership, although on performance under test there is obviously little to choose between these two high-yielding youngsters.

Marshland's Stylish Princess is by Briar's Twylish, who has four other C.O.R. daughters to his credit, all with worthy performances. Briar's Twylish is by Lord Twylish (imp.), who has eight C.O.R. daughters, and from Briar Rose, who, in the first year of C.O.R. testing in New Zealand, gained a certificate for 464·14 lb. fat in 334 days, at 7 years 308 days. Briar Rose is by King Thistle (two C.O.R. daughters) from Orange Rose, with a certificate for 553·01 lb. fat, at 10 years 333 days, gained in the second year of the C.O.R. system. She is by Belvedere Bobs, who has four C.O.R. daughters. The dam of Marshland's Stylish Princess is Glenwood's Princess, who has earned two certificates, one for 412·84 lb. fat as a senior three-year-old, and another for 484·84 lb. fat in 300 days as a mature cow. It will thus be seen that Marshland's Stylish Princess has a strong butterfat-record backing.

Space will not permit treating the pedigree of Marshland's Eminent, whose name was doubtless suggested by her paternal grandsire Eminent's Fontaine, but it may be mentioned that the only similarity in breeding comes from Briar Rose, already referred to, who is the dam of Marshland's Eminent and the granddam on the sire's side of Marshland's Stylish Princess, the new leader.

Zola of Rosy Creek.

Another new class-leader whose record appeared in last month's list is Zola of Rosy Creek, owned by Mr. E. Joyce, of Kaponga. This young cow produced 741·20 lb. fat, thus defeating the record of Woodstock's Baby, the previous leader of the three-year-old Jerseys by no less than 83·29 lb. It may be mentioned that 1923 has brought out a particularly strong class of three-year-old Jerseys. In addition to Zola of Rosy Creek, three others have defeated the previous champion for the class—Mr. E. Joyce's Farce, with 691·54 lb.; Mr. F. J. Saxby's Twylish's Daisy, with 704·24 lb.; and Mr. C. G. C. Dermer's Waipiko Gerda, with 710·75 lb. fat.

Zola of Rosy Creek was bred by Messrs. A. and J. O'Donnell, of Inaha, and is by Bilberry's Twylish out of Zola. Bilberry's Twylish has qualified for the special champion butterfat bull class recognized by the New Zealand Jersey Cattle Breeders' Association—that is to say, he has sired five daughters which are from different dams and have doubled their butterfat requirement for certificate. The fact that he is now in this class must stamp him as an outstanding sire

capable of transmitting his butterfat-producing qualities. He is by Lord Twylish (imp.)—sire of eight C.O.R. daughters—from Gould's Bilberry V, a good old foundation cow, who was sired by the well-known K.C.B. Zola, dam of Zola of Rosy Creek, has a certificate for 472·26 lb. fat as a senior three-year-old. Her sire is Belvedere Sun Prince, who has sixteen C.O.R. daughters, and has also qualified for the champion butterfat class just referred to. Belvedere Sun Prince was sired by K.C.B. (twenty-nine C.O.R. daughters). Gloire de Dijon 3rd, the dam of Zola, was one of the first cows to be entered for C.O.R. test, and has a record of 293·40 lb. fat in 245 days at 3 years 32 days. She was sired by Blizzard, who has seven certificated daughters to his credit. Zola of Rosy Creek, therefore, has a very strong ancestry, particularly so far as males are concerned, and, properly mated, should be a link in the chain to still greater achievement.

In concluding these brief pedigree notes on Jersey leaders it is gratifying to mention that so far this year four out of the five classes into which the breed is divided have had the previous leaderships surpassed, the record of Mr. A. J. Smith's St. Lambert's Bell, leader of the four-year-olds, being the only one that remains.

Pretty's Flirt.

We have pleasure in recording that Pretty's Flirt, the 1,010 lb. Jersey champion, whose performance under certificate-of-record test was referred to in last month's *Journal*, has now fully qualified for certificate by producing a heifer calf on 7th December. The calf was sired by Jersey Brae's Progress, bred by Mr. T. Church, of Te Rapa, a bull 87 per cent. of the strain of Eileen's Fox, a son of Majesty's Fox, the well-known Jersey sire, who has thirty C.O.R. daughters to his credit. Although Jersey Brae's Progress is very closely inbred, the strains represented are in no case the same as those contained in the breeding of Pretty's Flirt. It will therefore be interesting to see how these two distinct lines will nick.

THE AYRSHIRE BREED: DIMPLE OF EDENDALE.

Mr. W. Hall, of Lepperton, has been successful in gaining the leadership of the two-year-old Ayrshire class with his fine heifer Dimple of Edendale, whose record of 529·46 lb. fat appears in the current list. She was sired by Dominion Beauty's Bonus (bred at the Moumahaki Experimental Farm), who carries similar strains to Auchenbrain Brown Kate IV, at one time the champion Ayrshire butterfat cow of the world. The same strain also appears on the dam's side, though further back.

The Ayrshire breed has proved its worth in many parts of the world, and here in New Zealand a number of good performances have been recorded. We have always regretted that Ayrshire breeders have not patronized the certificate-of-record testing in proportion to the entries from other breeds. We believe that the Ayrshire ranks high among the special-purpose dairy breeds, and only by means of authenticated butterfat yields can its breeders hope to gain that recognition, or the breed to secure that development, which the Ayrshire merits.

LIST OF RECORDS, NOVEMBER, 1923.

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
	JERSEYS.					
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Alfalfa Pansy ..	F. J. Saxby, Ohaupo	2 4	240·9	365	10,898·1	690·16
Crofton Countess ..	R. C. Jury, Tikorangi	1 354	240·5	365	10,874·3	677·01
Waipiko Jolly ..	C. G. C. Dermer, Waipiko	1 350	240·5	365	11,512·9	610·40
Meadowvale Perfect Day	E. O'Sullivan and Sons, Tariki	1 345	240·5	365	9,322·4	574·76
Waipiko Carissima ..	C. G. C. Dermer, Waipiko	1 347	240·5	365	11,605·6	551·64
Alfalfa Madam ..	F. J. Saxby, Ohaupo	2 3	240·8	365	8,530·9	526·70
Linden Grove Silver Bell	Mrs. M. A. Gadsby, Stratford	2 34	243·9	365	8,207·8	524·23
Meadowvale Endeavour	E. O'Sullivan and Sons, Tariki	1 352	240·5	365	7,855·2	523·89
Spring Song of Rosy Creek	L. Kavanagh, Hawera	1 347	240·5	365	9,816·5	518·74
Kuku Priscilla ..	R. L. Horn, sen., Ohau	1 340	240·5	365	10,214·1	490·83
Rosy Creek Lingerie	L. Kavanagh, Hawera	1 337	240·5	365	8,767·6	484·20
Meadowvale la Gamboge	E. O'Sullivan and Sons, Tariki	2 10	241·5	365	7,478·5	483·08
Ashton Lady Linda	R. L. Parkin, Fitzroy	2 12	241·7	365	7,672·9	477·41
Holly Oak Genoeve	G. B. Hull, Silverstream	2 0	240·5	365	9,177·7	474·89
Marina of Rosy Creek	A. and J. O'Donnell, Hawera	1 342	240·5	365	9,532·8	473·65
Grannie's Joli ..	A. J. Hale, Hillsborough	2 10	241·5	365	6,926·2	470·13
Ashton Majesty's Jewel	R. L. Parkin, Fitzroy	1 328	240·5	363	7,744·7	467·07
Signor's Fancy ..	G. Buchanan, Paeroa	1 314	240·5	365	7,719·0	463·46
Maori Beauty's Doreen	W. T. Williams, Pukehou	1 325	240·5	365	9,537·3	460·45
Meadowvale Liberty	E. O'Sullivan and Sons, Tariki	2 20	242·5	365	8,530·7	456·70
Te Maire Maid ..	R. L. Tippler, Shannon	1 364	240·5	364	9,091·6	451·81
Meadowvale Genoa Daisy	E. O'Sullivan and Sons, Tariki	2 6	241·1	365	7,444·0	440·45
Mignonne's Pride ..	J. S. T. Short, Hawera	2 34	243·9	365	7,785·6	431·83
Rockview Ruby ..	W. H. Fitness, Rehia	2 6	241·1	353	7,294·9	429·05
Arrabelle's Queen ..	E. Bennett, Cardiff ..	1 303	240·5	365	7,244·3	424·24
Realization ..	E. Bennett, Cardiff ..	1 349	240·5	365	6,665·9	420·46
Penrose Merry ..	J. B. Clemow, Stratford	2 2	240·7	365	7,186·9	417·66
Te Matai Clematis ..	L. W. and J. T. Prosser, Leeston	2 26	243·1	365	7,118·6	403·84
Miro Meadow's Carnation	A. A. Ward, Tariki ..	1 277	240·5	365	7,487·9	399·17
Hurden Beauty ..	G. E. Cowling, Manaia	1 336	240·5	365	6,460·7	392·46
Maori Butterfat ..	H. B. Lepper, Lepperton	1 357	240·5	328	7,849·7	388·84
Brookley Gem ..	W. Johnson, Ngaere	2 52	245·7	356	6,084·1	387·11
Hurden Goldsize ..	G. E. Cowling, Manaia	1 360	240·5	365	5,358·5	386·43
Solanine	G. R. and H. Hutchinson, Auckland	2 16	242·1	365	6,290·0	382·26
Arthingworth Winnie	E. Smallbone, Richmond	1 350	240·5	365	8,098·1	377·72
Silverdale Lucky ..	G. Hodgson, Whakapara	1 289	240·5	365	6,342·1	372·74

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat
		JERSEYS—*continued.*				
Junior Two-year-old—continued.		Yrs. dys.	lb.		lb.	lb.
Girl Grey	R. C. Leach, Woodville	1 337	240·5	365	7,050·7	365·36
Roslyn Sweet Pansy	J. Harris, Bombay ..	1 353	240·5	341	5,764·8	363·36
Silverdale Butterfly..	G. Hodgson, Whakapara	1 212	240·5	336	6,631·6	362·99
Hurden Queen ..	G. E. Cowling, Manaia	2 5	241·0	357	5,591·6	357·84
Violet King's Loveliness	J. Pill, Hawera ..	1 340	240·5	365	5,683·9	352·92
Waikari Iris ..	L. A. Higgins, Belgrove	2 15	242·0	365	6,963·2	347·74
Maori Butterfly ..	G. R. and H. Hutchinson, Auckland	1 328	240·5	338	6,090·4	343·44
Ashton Prairie Belle	R. L. Parkin, Fitzroy	1 324	240·5	365	6,174·4	342·94
Hurden Fury ..	G. E. Cowling, Manaia	2 20	242·5	330	6,766·0	342·22
Hurden Rosebud ..	G. E. Cowling, Manaia	2 14	241·9	348	6,347·4	334·63
Waikari Jersey Queen	L. A. Higgins, Belgrove	1 344	240·5	365	6,531·0	321·24
Kaucket Buttercup	G. T. Gibbons, Ngaere	2 79	248·4	264	5,262·7	279·71
Arthingworth Mina ..	E. Smallbone, Richmond	1 345	240·5	365	6,199·6	263·91
Senior Two-year-old.						
Happy Life ..	E. Bennett, Cardiff ..	2 294	269·9	365	11,641·9	664·51
Jersey Brae's Peerless	W. H. Miers, Rukuhia	2 358	276·3	365	7,702·4	541·80
Brooklyn's Cream Lady	H. J. Lancaster, Glen Oroua	2 207	261·2	365	9,988·2	532·35
Meadowvale Gambonia	E. O'Sullivan and Sons, Tariki	2 312	271·7	365	9,107·4	516·89
Meadowvale Lovematch	E. O'Sullivan and Sons, Tariki	2 267	267·2	365	9,065·2	496·07
Vulpe's Flower Girl ..	R. C. Leach, Woodville	2 337	274·2	365	7,759·2	480·06
Anchor ..	C. Stevens, Maungatapere	2 248	265·3	365	8,857·6	474·57
Meadowvale Solid Gold	E. O'Sullivan and Sons, Tariki	2 110	251·5	331	8,208·8	412·16
Holly Oak's Laura ..	A. J. Hale, Hillsborough	2 199	260·4	365	6,206·4	402·45
Silverdale Flora ..	G. Hodgson, Whakapara	2 196	260·1	266	4,435·6	274·83
Three-year-old.						
Waipiko Gerda ..	C. G. C. Dermer, Waipiko	3 331	310·1	365	12,375·9	710·75
Twylish's Daisy ..	F. J. Saxby, Ohaupo..	3 350	312·0	365	11,175·1	704·24
Penrose Waif ..	J. B. Clemow, Stratford	3 0	277·0	365	9,927·0	594·35
Rita Molina ..	J. S. Rae, Taneatua ..	3 341	311·1	365	9,905·2	562·64
Laurel's Shiny Gem	R. C. Leach, Woodville	3 353	312·3	365	9,359·9	487·62
Brentwood's Gem ..	C. A. Willis, Pukekohe	3 327	309·7	364	7,954·7	486·33
Plymouth Rose ..	H. P. Pickerill, Kelso	3 88	285·8	338	7,525·2	451·71
Star of Eve ..	J. S. Rae, Taneatua ..	3 342	311·2	308	7,951·8	450·36
Waikari's Queen ..	L. A. Higgins, Belgrove	3 352	312·2	365	10,056·6	446·96
Silverdale Biddy ..	W. K. Mackie, Dargaville	3 4	277·4	365	7,526·2	444·11
Silverdale Nell ..	G. Hodgson, Whakapara	3 1	277·1	360	7,960·6	436·44

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		JERSEYS—*continued.*				
Three-year-old—continued.		Yrs. dys.	lb.		lb.	lb.
Pretty Maiden ..	G. A. Gamman, Marton	3 29	279·9	365	8,332·5	428·71
Lady Charlotte ..	M. Devenish-Meares, Te Puna	3 352	312·2	365	6,845·8	383·66
Myrtle's Pet ..	J. S. Rae, Taneatua ..	3 125	289·5	365	8,113·8	374·86
Royal Patritia ..	C. Stevens, Maungatapere	3 50	282·0	365	4,855·3	349·10
Glowing Embers ..	G. E. Cowling, Manaia	3 282	305·2	320	6,028·9	315·76
Broady's Princess ..	Mrs. M. A. Rogers, Katikati	3 47	281·7	279	5,515·4	295·69
Four-year-old.						
Twylish Rosebud ..	R. L. Tippler, Shannon	4 305	344·0	365	9,072·9	536·32
Magnolia Lady Hope	C. Stevens, Maungatapere	4 318	345·3	365	8,194·8	501·70
Mignonne's Pet ..	J. S. T. Short, Hawera	4 309	344·4	362	8,523·2	494·26
Silver Leaf ..	B. E. Veale, Tirohia ..	4 31	316·6	365	9,334·2	447·70
Rose Hellier ..	G. E. Cowling, Manaia	4 10	314·5	342	8,760·1	447·13
Silverdale Heather ..	G. Hodgson, Whakapara	4 281	341·6	338	7,043·6	427·87
Silverdale Maid ..	G. Hodgson, Whakapara	4 216	335·1	365	8,152·2	404·43
Mature.						
Cherry's Pet ..	W. Miskelly, Eltham ..	7 19	350·0	365	14,514·5	726·06
Mifanwy	A. and J. O'Donnell, Hawera	6 277	350·0	365	10,872·9	663·50
Golden Fernleaf ..	C. Stevens, Maungatapere	7 299	350·0	365	11,130·4	652·22
Whenuku Bell Bird ..	T. M. Remington, Westmere	6 334	350·0	365	12,166·5	652·07
Richwood Snow Pet	G. R. and H. Hutchinson, Auckland	6 2	350·0	365	10,160·4	617·67
Sweet Lucy Grey ..	K. M. Stevens, Maungatapere	6 231	350·0	365	12,839·2	601·82
Golden Wonder ..	C. Stevens, Maungatapere	6 24	350·0	365	11,717·2	597·02
Glendernal's Dolce ..	Mrs. M. A. Gadsby, Stratford	9 3	350·0	357	9,583·4	562·75
Queen Patritia ..	C. Stevens, Maungatapere	7 363	350·0	365	9,939·1	555·73
Stromna's Buttercup	G. Hodgson, Whakapara	6 73	350·0	346	8,899·4	548·13
Almadale Queen ..	W. H. Miers, Rukuhia	5 295	350·0	365	9,335·3	541·50
Glenmore Flower ..	A. C. Lovelock, Woodville	5 35	350·0	349	9,747·2	539·25
Mercedes Noble Lady	A. C. Lovelock, Woodville	6 346	350·0	365	8,310·3	536·73
Glory's Pride ..	J. S. T. Short, Hawera	7 353	350·0	365	11,183·4	536·35
Rewa Ixia ..	A. Hazelton, Waihou	7 253	350·0	360	10,258·4	515·07
Cambridge Ne Plus Ultra	B. E. Veale, Tirohia ..	7 42	350·0	364	8,423·2	512·30
Roslyn Genoa Flower	A. J. Harris, Bombay	6 8	350·0	354	9,010·8	504·23
Munster	F. J. Wyatt, Towai	7 325	350·0	365	7,109·1	484·34
Liryclear Lassie ..	G. Milligan, Hastings	9 33	350·0	365	8,257·0	474·05
Stromna's Blossom ..	G. Hodgson, Whakapara	5 101	350·0	360	7,485·4	467·29

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
		JERSEYS—*continued.*				
Mature—continued.		Yrs. dys.	lb.		lb.	lb.
Grafton Peppercorn	A. A. White, Auckland	5 360	350·0	335	10,335·7	467·01
Mermaid's Lark	S. R. Lancaster, Palmerston North	10 312	350·0	354	8,819·2	466·74
Eunice of Bulls	J. H. Sherrard, Otaua	5 231	350·0	353	9,363·9	453·38
Royal Jenny	A. C. Lovelock, Woodville	5 255	350·0	306	8,773·8	447·30
Flair	J. S. Rae, Taneatua	5 348	350·0	365	8,881·4	442·01
Patty	G. E. Cowling, Manaia	13 149	350·0	365	7,532·3	402·77
Richwood Snow Lass	W. H. Fitness, Rehia	6 114	350·0	283	8,447·6	396·97
Maxim Maid's Glory	F. J. Wyatt, Towai	8 7	350·0	360	8,035·8	389·74
Golden Swan's Gem	W. Bullock, Buckland	7 250	350·0	364	8,534·7	383·43
Jacob Irene	K. M. Stevens, Maungatapere	8 312	350·0	242	6,664·0	381·90
Tyrone	A. A. White, Auckland	8 92	350·0	319	6,476·0	381·39
Sweet Irene	C. Stevens, Maungatapere	11 271	350·0	365	6,858·3	378·30
		FRIESIANS.				
Junior Two-year-old.						
Bainfield Topsy 12th	W. D. Hunt, Waikiwi	2 34	243·9	365	15,110·5	651·38
Princess Johanna Mercedes	J. Court, Auckland	2 64	246·9	365	18,897·1	594·83
Nepian Lady Burton de Kol	T. Henderson, Okaiawa	2 12	241·7	365	12,586·6	548·06
May Egmont de Kol	J. Stables, Riverlea	2 44	244·9	365	13,552·2	513·08
May Pontiac Mooie	J. Court, Auckland	2 68	247·3	365	15,695·6	505·10
Cluny Pietje Lulu	Piri Land Company, Auckland	2 145	255·0	365	11,581·3	437·79
Oaklea Julip Pietertje	N. P. Nielson, Tiakitahuna	1 353	240·5	359	12,357·5	394·79
Ashlynn 139th	Piri Land Company, Auckland	2 37	244·2	339	9,243·0	354·70
Clevedon Princess Kroons 11	N. P. Neilsen, Tiakitahuna	1 326	240·5	365	11,210·8	335·92
May Mischief Alcartra	S. Andrew, Kaikoura	2 5	241·0	310	8,325·3	312·57
Rosebud Alcartra Beets	W. H. Madill, Auckland	1 339	240·5	287	7,812·1	303·19
Senior Two-year-old.						
Westmere Anna Patch	A. Burgess, Rongotea	2 264	266·9	365	16,948·4	510·45
Ryvington Thorn	T. O. Hodgson, Tamahere	2 349	275·4	365	11,173·2	442·99
Junior Three-year-old.						
Mary Alcartra	S. Andrew, Kaikoura	3 31	280·1	365	14,893·9	477·84
Fencourt Pet	J. H. Jamieson, Cambridge	3 8	277·8	365	10,237·1	311·07
Clevedon Dorothy	P. F. Boucher, Kumeu	3 91	286·1	292	7,294·7	290·25
Senior Three-year-old.						
Regina Sadie de Kol	J. McAnulty, Ashburton	3 349	311·9	365	18,274·4	688·24
Ashlynn 47th	Piri Land Company, Auckland	3 354	312·4	365	13,019·6	510·47

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
			FRIESIANS—*continued.*			
Senior Three-year-old—continued.		Yrs. dys.	lb.		lb.	lb.
Carlowrie Lady ..	R. K. Macdonald, Edendale	3 336	310·6	365	14,055·0	476·82
Junior Four-year-old.						
Daisy Bell 3rd ..	R. Wylie, Seaward Downs	4 22	315·7	287	13,564·0	444·13
Ashlynn 24th ..	Piri Land Company, Auckland	4 15	315·0	320	12,820·3	439·65
Senior Four-year-old.						
Marchioness o'Gowrie	T. Henderson, Okaiawa	4 333	346·8	365	25,463·4	852·85
Dominion Corona ..	R. A. Cameron, Paraparaumu	4 255	339·0	365	18,263·1	611·35
Woodcrest Inka Pietje	G. A. Marchant and Sons, Cardiff	4 240	337·5	365	13,861·5	496·25
Mature.						
Westmere Netherland Princess	W. D. Hunt, Waikiwi	5 32	350·0	365	23,758·0	878·61
Princess Gem ..	James Hart, Tatuanui	7 363	350·0	365	23,455·2	794·84
Riverdale Snowflake	E. F. Peacocke, Hamilton	7 280	350·0	365	18,145·5	628·88
Weston Lea Fancy de Kol	E. F. Peacocke, Hamilton	5 46	350·0	365	15,293·0	609·42
Alcartra Galatea's Rose	Marchant and Sons, Cardiff	9 3	350·0	365	13,885·1	519·77
Clevedon Pearl ..	P. F. Boucher, Kumeu	7 163	350·0	365	13,170·9	443·69
Queen Tirania Segis	P. F. Boucher, Kumeu	7 200	350·0	288	11,683·0	400·95
			MILKING SHORTHORNS.			
Mature.						
Newstead Lucy ..	E. Ridgley, Waiuku ..	..	350·0	365	16,116·8	631·02
Sinai Riri	Ranstead Bros., Matangi	..	350·0	365	13,458·3	551·26
Sinai Rangi ..	Ranstead Bros., Matangi	..	350·0	342	10·531·6	439·05
Daisy 3rd	R. Peach, Ashley Bank	..	350·0	305	10·064·9	436·60
Hamilton Pansy ..	Ranstead Bros., Matangi	..	350·0	353	9,254·2	408·41
Tainui Violet ..	Ranstead Bros., Matangi	..	350·0	365	9,820·1	390·98
Glenbank Ruby ..	A. D. Bell, Clevedon	..	350·0	365	9,765·2	387·73
			AYRSHIRES.			
Two-year-old.						
Dimple of Edendale..	W. Hall, Lepperton ..	2 327	273·2	365	13,063·3	529·46
Four-year-old.						
Eliza B of Ayrshire Downs	Litchfield Bros., Tirau	4 339	347·4	365	10,633·8	486·05
Mature.						
Bertha of Ayrshire Downs	Litchfield Bros., Tirau	5 17	350·0	365	13,330·6	584·76
Generosity of Woodlands	Robertson and Blackley, New Plymouth	5 290	350·0	361	11,764·6	552·68

LIST OF RECORDS—*continued.*

Name of Cow and Class.	Tested by	Age at Start of Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
Second-class Certificates.						
JERSEYS.						
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Lady Twylish of Rosy Creek	A. and J. O'Donnell, Hawera	2 7	241·2	365	10,506·5	528·13
Holly Oak Bo-Peep	M. V. Reeve-Smith, Aria	2 11	241·6	365	8,955·3	483·26
Te Matai Ruby ..	H. J. Lancaster, Levin	1 294	240·5	365	7,112·5	350·95
Three-year-old.						
Perfecta	R. L. Tippler, Shannon	3 334	310·4	365	11,709·8	551·26
Four-year-old.						
Maria Louisa ..	F. J. B. Ryburn, Paterangi	4 344	347·9	365	12,115·3	623·80

THE SEASON'S LAMBING: DOMINION ESTIMATES.

FOLLOWING are complete estimates of the current season's lambing, computed from estimated average percentages furnished by the Department's Inspectors of Stock in the various districts. Corresponding figures for the three previous years, together with the actual numbers of lambs tailed, are also given for comparison.

Year.	Number of Breeding-ewes.	Estimated Average Percentage of Lambing.	Estimated Number of Lambs.	Actual Number of Lambs tailed.
NORTH ISLAND.				
1923 ..	7,170,154	91·34	6,549,143	..
1922 ..	6,771,482	90·36	6,118,530	5,955,081
1921 ..	6,312,456	89·65	5,659,355	5,457,643
1920 ..	5,838,704	87·95	5,135,524	5,074,751
SOUTH ISLAND.				
1923 ..	5,892,849	83·99	4,949,313	..
1922 ..	5,724,572	82·53	4,724,475	4,949,440
1921 ..	5,835,332	83·28	4,859,425	4,810,258
1920 ..	5,729,845	80·20	4,595,426	4,539,797
DOMINION.				
1923 ..	13,063,003	88·02	11,498,456	..
1922 ..	12,496,054	86·77	10,843,005	10,895,521
1921 ..	12,147,788	86·59	10,518,780	10,267,910
1920 ..	11,568,549	84·11	9,730,950	9,614,548

A READY-RECKONER FOR WEIGHT OF FIELD CROPS PER ACRE.

C. H. SCHWASS, Fields Division, Wellington.

FOR several seasons past the writer has been associated in the work connected with the judging of farmers' field competitions and boys' and girls' agricultural club plots in Taranaki and other centres on the west coast of the North Island. Articles relating to this work have from time to time appeared in the *Journal*, and readers will have a good knowledge of what it comprises.

When the root crops are judged points are awarded for quality, cultivation, and weight, and in connection with boys' and girls' club plots for records also. The points for weight are arrived at by allowing a certain number per ton per acre. In determining the weight per acre the field or plot to be judged is carefully inspected, two or more average areas selected, and the produce of these areas weighed; from these weights the average for that particular sized area is arrived at, and the yield per acre is calculated from it. The measurements of the areas weighed are not always the same. When the crop has been sown broadcast or sown in narrow drills the area dealt with is generally 11 ft. square, while if the crop is in wide drills the area is two or more rows $\frac{1}{2}$ chain long. If the crop is in 22 in. drills the area of ground covered by one row 1 chain long is equivalent to an area 11 ft. square, and both are $\frac{1}{360}$ of an acre. In all drills of other widths the ground covered by a row 1 chain long is a different proportion of an acre, and the weights per acre are, of course, calculated accordingly.

It may be mentioned that all the root crops—both mangolds and carrots—grown by the boys' and girls' clubs on the west coast of the North Island have been grown in 22 in. drills.

It is admitted that this method of weighing crops does not give the strictly exact weight per acre, owing to variations in the crop, although such variations are, of course, taken into consideration when selecting areas. For all practical purposes, however, it is accurate enough, and is the only quick method of arriving at the yield. It operates alike for all competitors in the competitions and gives general satisfaction.

Calculating the weights under the conditions pertaining in the field was found very arduous, and the writer endeavoured to obtain a ready-reckoner, but without success, and so was compelled to compile one for himself. The formulas for arriving at the weights per acre off the different sized areas have been supplied to large numbers of inquirers who wished to weigh their crops for their own information, and it is in the hope that the ready-reckoner may prove of wider use that the following representative table is now published. Similar tables covering other units of area or width of drills may be printed in a future issue of the *Journal*.

TABLE SHOWING WEIGHT OF CROP PER ACRE WHEN THE AREA FROM WHICH THE PRODUCE IS TAKEN IS 11 FT. SQUARE OR 1 CHAIN IN 22 IN. DRILLS—EQUIVATENT TO $\frac{1}{360}$ ACRE.

Weight per Area.	Weight per Acre.				Weight per Area.	Weight per Acre.				Weight per Area.	Weight per Acre.				Weight per Area.	Weight per Acre.			
lb.	Tons	cwt.	qr.	lb.	lb.	Tons	cwt.	qr.	lb.	lb.	Tons	cwt.	qr.	lb.	lb.	Tons	cwt.	qr.	lb.
1	0	3	0	24	70	12	4	1	4	151	24	5	1	12	226	36	6	1	20
2	0	6	1	20	77	12	7	2	0	152	24	8	2	8	227	36	9	2	16
3	0	9	2	16	78	12	10	2	24	153	24	11	3	4	228	36	12	3	12
4	0	12	3	12	79	12	13	3	20	154	24	15	0	0	229	36	16	0	8
5	0	16	0	8	80	12	17	0	16	155	24	18	0	24	230	36	19	1	4
6	0	19	1	4	81	13	0	1	12	156	25	1	1	20	231	37	2	2	0
7	1	2	2	0	82	13	3	2	8	157	25	4	2	16	232	37	5	2	24
8	1	5	2	24	83	13	6	3	4	158	25	7	3	12	233	37	8	3	20
9	1	8	3	20	84	13	10	0	0	159	25	11	0	8	234	37	12	0	16
10	1	12	0	16	85	13	13	0	24	160	25	14	1	4	235	37	15	1	12
11	1	15	1	12	86	13	16	1	20	161	25	17	2	0	236	37	18	2	8
12	1	18	2	8	87	13	19	2	16	162	26	0	2	24	237	38	1	3	4
13	2	1	3	4	88	14	2	3	12	163	26	3	3	20	238	38	5	0	0
14	2	5	0	0	89	14	6	0	8	164	26	7	0	16	239	38	8	0	24
15	2	8	0	24	90	14	9	1	4	165	26	10	1	12	240	38	11	1	20
16	2	11	1	20	91	14	12	2	0	166	26	13	2	8	241	38	14	2	16
17	2	14	2	16	92	14	15	2	24	167	26	16	3	4	242	38	17	3	12
18	2	17	3	12	93	14	18	3	20	168	27	0	0	0	243	39	1	0	8
19	3	1	0	8	94	15	2	0	16	169	27	3	0	24	244	39	4	1	4
20	3	4	1	4	95	15	5	1	12	170	27	6	1	20	245	39	7	2	0
21	3	7	2	0	96	15	8	2	8	171	27	9	2	16	246	39	10	2	24
22	3	10	2	24	97	15	11	3	4	172	27	12	3	12	247	39	13	3	20
23	3	13	3	20	98	15	15	0	0	173	27	16	0	8	248	39	17	0	16
24	3	17	0	16	99	15	18	0	24	174	27	19	1	4	249	40	0	1	12
25	4	0	1	12	100	16	1	1	20	175	28	2	2	0	250	40	3	2	8
26	4	3	2	8	101	16	4	2	16	176	28	5	2	24	251	40	6	3	4
27	4	6	3	4	102	16	7	3	12	177	28	8	3	20	252	40	10	0	0
28	4	10	0	0	103	16	11	0	8	178	28	12	0	16	253	40	13	0	24
29	4	13	0	24	104	16	14	1	4	179	28	15	1	12	254	40	16	1	20
30	4	16	1	20	105	16	17	2	0	180	28	18	2	8	255	40	19	2	16
31	4	19	2	16	106	17	0	2	24	181	29	1	3	4	256	41	2	3	12
32	5	2	3	12	107	17	3	3	20	182	29	5	0	0	257	41	6	0	8
33	5	6	0	8	108	17	7	0	16	183	29	8	0	24	258	41	9	1	4
34	5	9	1	4	109	17	10	1	12	184	29	11	1	20	259	41	12	2	0
35	5	12	2	0	110	17	13	2	8	185	29	14	2	16	260	41	15	2	24
36	5	15	2	24	111	17	16	3	4	186	29	17	3	12	261	41	18	3	20
37	5	18	3	20	112	18	0	0	0	187	30	1	0	8	262	42	2	0	16
38	6	2	0	16	113	18	3	0	24	188	30	4	1	4	263	42	5	1	12
39	6	5	1	12	114	18	6	1	20	189	30	7	2	0	264	42	8	2	8
40	6	8	2	8	115	18	9	2	16	190	30	10	2	24	265	42	11	3	4
41	6	11	3	4	116	18	12	3	12	191	30	13	3	20	266	42	15	0	0
42	5	15	0	0	117	18	16	0	8	192	30	17	0	16	267	42	18	0	24
43	6	18	0	24	118	18	19	1	4	193	31	0	1	12	268	43	1	1	20
44	7	1	1	20	119	19	2	2	0	194	31	3	2	8	269	43	4	2	16
45	7	4	2	16	120	19	5	2	24	195	31	6	3	4	270	43	7	3	12
46	7	7	3	12	121	19	8	3	20	196	31	10	0	0	271	43	11	0	8
47	7	11	0	8	122	19	12	0	16	197	31	13	0	24	272	43	14	1	4
48	7	14	1	4	123	19	15	1	12	198	31	16	1	20	273	43	17	2	0
49	7	17	2	0	124	19	18	2	8	199	31	19	2	16	274	44	0	2	24
50	8	0	2	24	125	20	1	3	4	200	32	2	3	12	275	44	3	3	20
51	8	3	3	20	126	20	5	0	0	201	32	6	0	8	276	44	7	0	16
52	8	7	0	16	127	20	8	0	24	202	32	9	1	4	277	44	10	1	12
53	8	10	1	12	128	20	11	1	20	203	32	12	2	0	278	44	13	2	8
54	8	13	2	8	129	20	14	2	16	204	32	15	2	24	279	44	16	3	4
55	8	16	3	4	130	20	17	3	12	205	32	18	3	20	280	45	0	0	0
56	9	0	0	0	131	21	1	0	8	206	33	2	0	16	281	45	3	0	24
57	9	3	0	24	132	21	4	1	4	207	33	5	1	12	282	45	6	1	20
58	9	6	1	20	133	21	7	2	0	208	33	8	2	8	283	45	9	2	16
59	9	9	2	16	134	21	10	2	24	209	33	11	3	4	284	45	12	3	12
60	9	12	3	12	135	21	13	3	20	210	33	15	0	0	285	45	16	0	8
61	9	16	0	8	136	21	17	0	16	211	33	18	0	24	286	45	19	1	4
62	9	19	1	4	137	22	0	1	12	212	34	1	1	20	287	46	2	2	0
63	10	2	2	0	138	22	3	2	8	213	34	4	2	16	288	46	5	2	24
64	10	5	2	24	139	22	6	3	4	214	34	7	3	12	289	46	8	3	20
65	10	8	3	20	140	22	10	0	0	215	34	11	0	8	290	46	12	0	16
66	10	12	0	16	141	22	13	0	24	216	34	14	1	4	291	46	15	1	12
67	10	15	1	12	142	22	16	1	20	217	34	17	2	0	292	46	18	2	8
68	10	18	2	8	143	22	19	2	16	218	35	0	2	24	293	47	1	3	4
69	11	1	3	4	144	23	2	3	12	219	35	3	3	20	294	47	5	0	0
70	11	5	0	0	145	23	6	0	8	220	35	7	0	16	295	47	8	0	24
71	11	8	0	24	146	23	9	1	4	221	35	10	1	12	296	47	11	1	20
72	11	11	1	20	147	23	12	2	0	222	35	13	2	8	297	47	14	2	16
73	11	14	2	16	148	23	15	2	24	223	35	16	3	4	298	47	17	3	12
74	11	17	3	12	149	23	18	3	20	224	36	0	0	0	299	48	1	0	8
75	12	1	0	8	150	24	2	0	16	225	36	3	0	24	300	48	4	1	4

TABLE SHOWING WEIGHT OF CROP PER ACRE—*continued.*

Weight per Area.	Weight per Acre.				Weight per Area.	Weight per Acre.				Weight per Area.	Weight per Acre.				Weight per Area.	Weight per Acre.			
lb.	Tons	cwt.	qr.	lb.	lb.	Tons	cwt.	qr.	lb.	lb.	Tons	cwt.	qr.	lb.	lb.	Tons	cwt.	qr.	lb.
301	48	7	2	0	384	61	14	1	4	467	75	1	0	8	549	88	4	2	16
302	48	10	2	24	385	61	17	2	0	468	75	4	1	4	550	88	7	3	12
303	48	13	3	20	386	62	0	2	24	469	75	7	2	0	551	88	11	0	8
304	48	17	0	16	387	62	3	3	20	470	75	10	2	24	552	88	14	1	4
305	49	0	1	12	388	62	7	0	16	471	75	13	2	20	553	88	17	2	0
306	49	3	2	8	389	62	10	1	12	472	75	17	0	16	554	89	0	2	24
307	49	6	3	4	390	62	13	2	8	473	76	0	1	12	555	89	3	3	20
308	49	10	0	0	391	62	16	3	4	474	76	3	2	8	556	89	7	0	16
309	49	13	0	24	392	63	0	0	0	475	76	6	3	4	557	89	10	1	12
310	49	16	1	20	393	63	3	0	24	476	76	10	0	0	558	89	13	2	8
311	49	19	2	16	394	63	6	1	20	477	76	10	0	24	559	89	16	3	4
312	50	2	3	12	395	63	9	2	16	478	76	16	1	20	560	90	0	0	0
313	50	6	0	8	396	63	12	3	12	479	76	19	2	16	561	90	3	0	24
314	50	9	1	4	397	63	16	0	8	480	77	2	2	12	562	90	6	1	20
315	50	12	2	0	398	63	19	1	4	481	77	6	0	8	563	90	9	2	16
316	50	15	2	24	399	64	2	2	0	482	77	9	1	4	564	90	12	3	12
317	50	18	3	20	400	64	5	2	24	483	77	12	2	0	565	90	16	0	8
318	51	2	0	16	401	64	8	3	20	484	77	15	2	24	566	90	19	1	4
319	51	5	1	12	402	64	12	0	16	485	77	18	3	20	567	91	2	2	0
320	51	8	2	8	403	64	15	1	12	486	78	2	0	16	568	91	5	2	24
321	51	11	3	4	404	64	18	2	8	487	78	5	1	12	569	91	8	3	20
322	51	15	0	0	405	65	1	3	4	488	78	8	2	8	570	91	12	0	16
323	51	18	0	24	406	65	5	0	0	489	78	11	3	4	571	91	15	1	12
324	52	1	1	20	407	65	8	0	24	490	78	15	0	0	572	91	18	2	8
325	52	4	2	16	408	65	11	1	20	491	78	18	0	24	573	92	1	3	4
326	52	7	3	12	409	65	14	2	16	492	79	1	1	20	574	92	5	0	0
327	52	11	0	8	410	65	17	3	12	493	79	4	2	16	575	92	8	0	24
328	52	14	1	4	411	66	1	0	8	494	79	7	3	12	576	92	11	1	20
329	52	17	2	0	412	66	4	1	4	495	79	11	0	8	577	92	14	2	16
330	53	0	2	24	413	66	7	2	0	496	79	14	1	4	578	92	17	3	12
331	53	3	3	20	414	66	10	2	24	497	79	17	2	0	579	93	1	0	8
332	53	7	0	16	415	66	13	3	20	498	80	0	2	24	580	93	4	1	4
333	53	10	1	12	416	66	17	0	16	499	80	3	3	20	581	93	7	2	0
334	53	13	2	8	417	67	0	1	12	500	80	7	0	16	582	93	10	2	24
335	53	16	3	4	418	67	3	2	8	501	80	10	1	12	583	93	13	3	20
336	54	0	0	0	419	67	6	3	4	502	80	13	2	8	584	93	17	0	16
337	54	3	0	24	420	67	10	0	0	503	80	16	3	4	585	94	0	1	12
338	54	6	1	20	421	67	13	0	24	504	81	0	0	0	586	94	3	2	8
339	54	9	2	16	422	67	16	1	20	505	81	3	0	24	587	94	6	3	4
340	54	12	3	12	423	67	19	2	16	506	81	6	1	20	588	94	10	0	0
341	54	16	0	8	424	68	2	2	12	507	81	9	2	16	589	94	13	0	24
342	54	19	1	4	425	68	6	0	8	508	81	12	3	12	590	94	16	1	20
343	55	2	2	0	426	68	9	1	4	509	81	16	0	8	591	94	19	2	16
344	55	5	2	24	427	68	12	2	0	510	81	19	1	4	592	95	2	3	12
345	55	8	3	20	428	68	15	2	24	511	82	2	2	0	593	95	6	0	8
346	55	12	0	16	429	68	18	3	20	512	82	5	2	24	594	95	9	1	4
347	55	15	1	12	430	69	2	0	16	513	82	8	3	20	595	95	12	2	0
348	55	18	2	8	431	69	5	1	12	514	82	12	0	16	596	95	15	2	24
349	56	1	3	4	432	69	8	2	8	515	82	15	1	12	597	95	18	3	20
350	56	5	0	0	433	69	11	3	4	516	82	18	2	8	598	96	2	0	16
351	56	8	0	24	434	69	15	0	0	517	83	1	3	4	599	96	5	1	12
352	56	11	1	20	435	69	18	0	24	518	83	5	0	0	600	96	8	2	8
353	56	14	2	16	436	70	1	1	20	519	83	8	0	24	601	96	11	3	4
354	56	17	3	12	437	70	4	2	16	520	83	11	1	20	602	96	15	0	0
355	57	1	0	8	438	70	7	3	12	521	83	14	2	16	603	96	18	0	24
356	57	4	1	4	439	70	11	0	8	522	83	17	3	12	604	97	1	1	0
357	57	7	2	0	440	70	14	1	4	523	84	1	0	8	605	97	4	2	16
358	57	10	2	24	441	70	17	2	0	524	84	4	1	4	606	97	7	3	12
359	57	13	3	20	442	71	0	2	24	525	84	7	2	0	607	97	11	0	8
360	57	17	0	16	443	71	3	3	20	526	84	10	2	24	608	97	14	1	4
361	58	0	1	12	444	71	7	0	16	527	84	13	3	20	609	97	17	2	0
362	58	3	2	8	445	71	10	1	12	528	84	17	0	16	610	98	0	2	24
363	58	6	3	4	446	71	13	2	8	529	85	1	0	12	611	98	3	3	20
364	58	10	0	0	447	71	16	3	4	530	85	3	2	8	612	98	7	0	16
365	58	13	0	24	448	72	0	0	0	531	85	6	3	4	613	98	10	1	12
366	58	16	1	20	449	72	3	0	24	532	85	10	0	0	614	98	13	2	8
367	58	19	2	16	450	72	6	1	20	533	85	13	0	24	615	98	16	3	4
368	59	2	3	12	451	72	9	2	16	534	85	16	1	20	616	99	0	0	0
369	59	6	0	8	452	72	12	3	12	535	85	19	2	16	617	99	3	0	24
370	59	9	1	4	453	72	16	0	8	536	86	2	3	12	618	99	6	1	20
371	59	12	2	0	454	72	19	1	4	537	86	6	0	8	619	99	9	2	16
372	59	15	2	24	455	73	2	2	0	538	86	9	1	4	620	99	12	3	12
373	59	18	3	20	456	73	5	2	24	539	86	12	2	0	621	99	16	0	8
374	60	2	0	16	457	73	8	3	20	540	86	15	2	24	622	99	19	1	4
375	60	5	1	12	458	73	12	0	16	541	86	18	3	20	623	100	2	2	0
376	60	8	2	8	459	73	15	1	12	542	87	2	0	16	624	100	5	2	24
377	60	11	3	4	460	73	18	2	8	543	87	5	1	12	625	100	8	3	20
378	60	15	0	0	461	74	1	3	4	544	87	8	2	8	626	100	12	0	16
379	60	18	0	24	462	74	5	0	0	545	87	11	3	4	627	100	15	1	12
380	61	1	1	20	463	74	8	0	24	546	87	15	0	0	628	100	18	2	8
381	61	4	2	16	464	74	11	1	20	547	87	18	0	24	629	101	1	3	4
382	61	7	3	12	465	74	14	2	16	548	88	1	1	20	630	101	5	0	0
383	61	11	0	8	466	74	17	3	12										

SEASONAL NOTES.

THE FARM.

SUMMER DAIRYING.

JANUARY is now approaching, and with it the most critical period in the dairy-farmer's calendar. December sees most of the grasses reach maturity, and with normal summer weather the period following shows a marked decline in the production of the pastures. This coincides with and tends to encourage the natural tendency of the cows to dry off, or, at any rate, to seriously curtail their milk-yield, and a good supply of succulent food coming forward as the pastures decline will make all the difference in butterfat-production. Japanese millet and early-sown soft turnips provide very useful January feeding. The millet can subsequently be shut up for further feeding, and land that has grown turnips be prepared for an early sowing of grass. Ensilage, too, acts as an excellent brake on the downward trend of production. An ensilage pit or stack can, in fact, be brought into use at any time of the year when most needed.

CEREAL HARVEST.

The dryness and warmth of the early summer this year has hastened the ripening of grain crops, and the harvesting of oats will now have commenced. It is always advisable to cut oats before they become too ripe. Inexperienced farmers are apt to allow their crops to become dead-ripe before cutting, with the result that there is loss of grain and deterioration in quality of straw.

The weather in January is often tricky, and it is advisable to have all grain stooked as soon as cut. The stooks should not be large, from ten to fourteen sheaves being sufficient. These should be put up as firmly as possible so that they will stand heavy wind. It should also be remembered that well-built stooks will turn a lot of rain, while if they are carelessly made and go down, considerable damage may result in loss of colour in the grain.

The round stack is generally best for North Island conditions. These stacks should be made a handy size, so that one or more may be finished in a day, according to the team employed.

The wheat harvest will generally follow oats in Canterbury and other grain-growing districts. It is usually necessary to leave the wheat in stook at least a fortnight before carting in. From the quantity of badly-conditioned wheat submitted for sale one must stress the importance of putting wheat into stack before threshing. Circumstances of one kind or another often lead a farmer to thresh out of stook, and sometimes in moist weather. This seriously militates against the obtaining of a first-grade sample, and it is very difficult for such wheat to come into condition. Wheat in stack should not be threshed for at least five or six weeks, and preferably longer, as sweating takes place in the stack and the process extends over several weeks. Owing to the possible shortage of wheat this year there will be a danger of farmers assuming a "that will do" attitude, and a hint will not be out of place.

With the greater need nowadays for pure seed-wheat it behoves growers to secure a clean line of seed, and save their own seed for succeeding years. This will necessitate roguing a few acres and threshing it separately. Roguing, which is the removal of foreign varieties from the crop grown, can best be done just before harvest. Two or three men moving through the standing crop in narrow parallel strips a week or two before harvest will be able to recognize any rogues. These should be pulled out by the roots and not merely picked off, as the short later heads might be missed.

ROOT CROPS.

The sowing of root crops is generally completed by Christmas, but in the higher districts swedes may be sown up till the middle of January. After this it is safer to try turnips, and for this purpose Hardy or Imperial Green Globe

will be found among the best. The sowing should be heavier than in the spring, as germination will probably not be so good—from 14 oz. to 16 oz. being about the right amount. Except in wet localities, the results from sowing on the flat as against the ridge will be better during the dry period, and the land should be well rolled before sowing, so as to ensure a supply of moisture from the subsoil. The dipping of seed in turpentine as a preventive of insect attack in the seedling stage, although often suggested, does not appear to be of very much value, but definite experimental work in this direction is lacking.

In ridged areas the early-sown crops should be thinned either by hand or machine. The thinning of turnips of late years has been somewhat overlooked in most districts, but where carried out it has been found a sound practice.

FEEDING OF RAPE AND TURNIPS.

Early-sown rape should be ready toward the end of January, but care must be taken not to stock this crop until it is in a good condition for feeding. This is when the leaves turn a bluish colour, it then having its highest feeding-value. If the crop is badly infested with aphis or moth the better plan is to feed it off at once, thus destroying the breeding-ground for the insects, with the hope that the second crop will be clean. The same remarks apply to the swede crop if this is being badly attacked and likely to be ruined. It is then good practice to put some sheep or lambs on to eat off the tops quickly and starve out the pests, trusting to a new growth to develop the roots.

Turnip-feeding to dairy cows still arouses much controversy and sometimes no little heartburning. The best plan for the dairy-farmer is not to treat turnips as a grazing-crop at all—at any rate, while the cows are still in milk. The aim should be to secure a supply of good-sized roots from a comparatively small and well-worked area; carting-off is not then the laborious work it is apt to be when the bulbs are small and the area large. From 30 lb. to 40 lb. per day per cow is reasonably safe if the roots are fed at the proper time.

THE HAY CROP.

The hay crop has been earlier than usual this year in most districts, but in the later localities there will still be a good deal to save. If the weather is showery the crop should be allowed to remain in the swath until there is a prospect of a fine day or two to save it. It is wonderful how long hay will remain good in the swath if not disturbed, but once it is shaken up it deteriorates rapidly if not put into stack. It is always advisable to add salt to hay; about 10 lb. per ton is generally sufficient, but the poorer the material the more salt is required.

Extra care in stacking will be amply repaid by the saving in waste. Aim to build high, so that the roof area will be proportionately small and pressure good. A flat top will also be avoided should the supply of material fail to come up to expectations.

Paspalum is now making strong growth in the North Auckland districts, and where it tends to get ahead of the stock it should be cut for ensilage or hay. The subsequent growth also will be more succulent and palatable.

CULTIVATION.

This is the all-important time of the year, especially under Canterbury conditions, for cleaning twitch-infested lands. Where the plough can be used to advantage it is the most effective implement. If the grubber is used it must be worked almost incessantly during the dry weather, as small pieces of twitch left in partly consolidated land will soon infest the area again. Where it is desired to clean up land badly infected with weeds generally the ground should be ploughed as early as possible and given frequent workings to destroy the roots.

January is a good time for preparing land intended for winter or early spring green crops.

—*Fields Division.*

SHEEP-DIPPING.

It is in the interest of every sheepowner to ensure that his flocks are efficiently dipped—that is, dipped so that the sheep will remain clean until the following shearing. In order to obtain satisfactory results it is necessary to use

a poisonous dip. Great care should be taken to follow out the instructions on the packet or drum, as probably half the failures in dipping are due to owners neglecting to carry out the manufacturers' instructions.

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

A serious mistake that has come under notice is the making-up of a dip three parts poisonous and one part non-poisonous. These two classes of dip are composed of different constituents, and the one does not increase the strength of the other. A dip so constituted could be classed only as of 75-per-cent. strength, and, without doubt, the condition of numbers of tick- or lice-infested sheep is due to this cause. The poisonous dip should be made full strength, with 25 per cent. liquid carbolic dip added. This is especially beneficial where the water is hard. Water can also be softened by the addition of about 3 lb. of washing-soda to every 100 gallons of water, or soap may be added until the water lathers on stirring.

The following rules should be strictly observed in dipping: (1) Avoid dipping in wet weather; (2) measure accurately the bath-water; (3) dissolve thoroughly powder dip before using; (4) mix the dip properly; (5) thoroughly stir the bath; (6) immerse sheep for at least one minute; (7) use the dip full strength; (8) never dip in a dirty bath; (9) if sheep are affected with lice, dip again in a fortnight's interval, as the eggs will hatch in about ten days. On no account should a dog that is inclined to heel the sheep be allowed in the yards when dipping, as this is one of the chief causes of blood-poisoning.

—*Live-stock Division.*

THE ORCHARD.

STONE-FRUITS.

THE period of stone-fruit harvest will soon be at peak, and marketing of the crop in the best possible condition should be the aim. This can be done only by careful selection at picking-time. Once the fruits have attained size for the variety, close watch should be kept for signs of ripeness. Ripeness from the orchardist's point of view is rather different from the ripe condition expected by the consumer. Ripeness for the grower is when the fruit has attained that degree of advancement beyond which it would commence to become soft-ripe. On the judgment shown by the picker in selecting fruit which is mature but not soft often depends the difference between profit and loss.

It is very rare for all the fruits on any tree to be found in condition in less than three pickings, while it is astonishing to the uninitiated what development takes place in the smaller fruits which are left on the tree at first picking. Observation discloses that a large proportion of the overripe peaches and nectarines come from the inner part of the tree. Fruits exposed on the outer parts naturally colour up better and are more readily seen; those in the sheltered parts very rarely take on colour to indicate ripeness, yet, once they have attained size, ripening takes place even more rapidly than with exposed fruits. Close attention should therefore be given to fruit grown on the inner parts of the trees if loss due to overripeness is to be eliminated.

Careful grading as to size and quality also assists towards presenting the fruit in the best condition. Fruit packed on size reduces the risk of a loose pack and shaking contents, and consequent bruising in transit; fruit of the one quality packed together also presents a better appearance.

With the risk of brown-rot appearing in a ripening crop or developing in transit every effort should be made to counteract this disease. Lime-sulphur, 1–125, plus 6 lb. of atomic sulphur should be applied up to within, say, ten days

of picking. Though at all times there is uncertainty of control, this mixture is giving the best results of any in use at the present time. Further measures for control are the use of new cases and, above all, the prevention of skin-puncture.

After the fruit is harvested the orchardist should go over the trees, cut out any broken limbs, and daub the cut with coal-tar to prevent the entry of silver-blight. The land can then be sown down to a cover-crop. Any crop found suitable to the district is preferable to weeds, but a leguminous crop should be chosen if such can be grown.

PIP-FRUITS.

Now is the time to concentrate on getting the pip-fruit area of the orchard into the most advanced condition. If any work falls in arrear at this season it is most difficult to overtake, as picking, &c., will soon demand first consideration. Cultivation should be continued to kill weeds, and, most especially, to break the earth-crust after any shower of rain.

Seasonable pests and diseases to be prevented or controlled are codlin-moth, leaf-roller, leech (arsenate of lead, 1½ lb. to 100 gallons); powdery mildew (lime-sulphur, 1–100, or atomic sulphur, 8 lb. to 100 gallons), also pruning off all mildew-infected tips if time allows; leaf-hopper, red mite, woolly aphis (nicotine, 1 pint to 100 gallons); and black-spot (bordeaux, 3–4–40, or lime-sulphur, 1–100).

With the fruits showing signs of colour it is now more than ever necessary to avoid as far as possible the spray being deposited in drops, otherwise the colour will be spotted. The casein-spreaders are best for this purpose, causing an even diffusion of spray often desired but not attained prior to the introduction of this valuable adjunct. Casein in the crude form requires special preparation, but there are several brands of prepared material on the market. An efficient dosage is 1 lb. per 100 gallons of any spray.

There is at this period a market for the more advanced sizes of such cookers as Alfriston, Lord Suffield, Prince Alfred, &c. Some degree of immaturity is permissible thus early in the season when cookers are in strong demand, size being the main consideration. Immaturity is not permissible in marketing early dessert sorts, such as Irish Peach, Astrakhan, Quarrenden, &c.; indeed, it is to be avoided in them. Fruits arriving in immature condition usually meet with poor demand and injuriously affect the market. When a market opens slack and low it is often difficult to restore confidence or prices. That immature fruit has a depressing effect is well known to those who view the markets as a whole, but is not sufficiently recognized by those who each send a few cases, which combine to cause the effect.

ORGANIZATION.

Orchard conveyances, packing-sheds, grading-machines, and fruit-harvesting gear should now be put in order to receive the crop, cases made up, and preparations made for action generally. Special boxes should be reserved for handling the fruit in the orchard, and clean cases used in which to pack the fruit for market. When the cases are used in the orchard they often become discoloured and dirty, and bring discredit on the contents. The movement among growers for concerted action in the endeavour to improve market conditions depends for success a good deal on the individual orchardist. While the main organization can do much good, it must fail in part, if not altogether, unless supported by the grower perfecting his own orchard organization by providing proper packing facilities, materials, &c. While efforts should be made to economize by reducing marketing-costs, efficiency should be the keynote; but without forethought and organization, efficiency is interrupted. This will apply with equal force whether the channel of distribution be through a central controlling Board, merchant, or auctioneer.

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

CITRUS-CULTURE.

In groves where *Lecanium oleae* scale has not been efficiently dealt with by the early application of red-oil emulsion, 1–40, in the spring, a further application of this spray should now be made. It is very noticeable that quite a number of growers are not dealing with this pest as they should. Some growers have gone so far as to say that spraying with red-oil emulsion will not efficiently check

the spread of the scale, but I am firmly of opinion that this troublesome pest can be almost completely controlled by the careful and judicious application of the emulsion at the *correct periods*.

A citrus-tree is always a hard tree to spray in an efficient manner, as, owing to its glossy foliage, one is apt to consider that all parts of the tree have been well covered with the spray when such is not the case. In many instances too little attention is paid to the proper covering of the under-surface of the leaves, which, especially in the case of the lemon, is the chief breeding-ground of the scale. Again, a large number of growers, who for one reason or another allow their trees to grow too thickly, and in some cases allow the lower branches to drag right on to the ground, are preventing to a large degree the carrying-out of proper spraying.

If two applications of the oil are not sufficient, then a third one should be made, applied at the time best calculated to catch young scale on the move. The defoliation caused by the use of oil, of which one hears so much from some growers, is to a very large extent caused either by faulty emulsification or badly mixed sprays. No doubt also in some instances the defoliation may be traced to weakness in those particular trees.

Where the application of bordeaux, 4–4–40, has been deferred, this may yet be applied.

FIREBLIGHT.

It may now be reasonably expected that fireblight will show up in various localities at any time during this season of the year. The second infection—namely, tip-infection—may be looked for in apples at any time from now on. It is too early at the time of writing these notes to definitely state the degree of freedom or otherwise from fireblight of orchards in the Auckland District, but it is pleasing to note that up to the present time only one infection has been identified in the commercial areas. Although this is the case, it does not follow that any other district will be in such a happy position, and it is therefore necessary to maintain a strict watchfulness over all pip-fruit orchards, whether they are situated in an area where fireblight has previously been known to exist or not.

Although fireblight has been existent in New Zealand now for three years, it is possible that there may be some growers who have not yet made themselves conversant with the procedure advised to be adopted in the event of the disease being identified. The disease is easily detected at this stage, whereas later in the season—during the winter months—it is difficult, and in many cases impossible, to locate.

Control measures consist in the removal of diseased portions of infected trees. On lateral shoots cut some inches below cankers; on larger branches cut out the cankers and all discoloured tissue with a sharp knife. The wounds should then be sterilized with a corrosive-sublimate solution, and painted over with coal-tar. It is important that all instruments used—secateurs, knives, &c.—should be sterilized after each cut. This is necessary so that these instruments will not spread infection.

All severed laterals, cankered portions, &c., should be immediately burned, for if they are allowed to lie about they will be the source of further infection now and in the following spring.

For sterilizing knives, secateurs, &c., use formalin, 1 part, and water, 20 parts. Mix and keep in a convenient wide-mouthed receptacle, so that the instruments can be readily dipped in it. Quick immersion will be sufficient to kill any organism likely to be present.

For disinfecting areas on the trees that have been cut use corrosive sublimate, 1 part, and water, 1,000 parts. This equals one tabloid to 1 pint of water. Apply with a small brush. This is a *deadly poisonous* compound, and should not be left lying about. Keep it in a glass or earthenware receptacle—not in a tin—and do not dip knives or secateurs into it, as metals decompose the solution.

As a wound-covering after sterilization with corrosive sublimate use pure coal-tar. Apply with a stiff brush. It is practically harmless to the tree, and when coated on the wound prevents the entry of parasitic fungi.

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

POULTRY-KEEPING.

CARE OF THE GROWING STOCK AND LAYERS.

Now that the work of hatching is over and the chickens have passed the brooder stage the demands on the poultry-keeper's time will not be nearly so great as formerly.

Care of the growing stock and maintaining the laying-flock in a high productive condition will necessarily claim first attention. Especially should the hens it is intended to cull next autumn be placed on a forcing diet, in order that every available egg be secured before they are disposed of. To achieve this, a good supply of forcing-material, such as boiled meat, meat-meal, or skim-milk, should be included in the ration. Of course, if these rich foods are oversupplied, ovarian troubles are apt to follow, such as protusion of the oviduct and the production of shell-less eggs, &c. If these troubles make their appearance the forcing diet should be reduced by degrees until the trouble ceases. This is not to say that the whole flock should be kept back merely because the forcing diet has had an injurious effect on an odd bird or two. Poultry-keepers must use their own discretion in this respect.

DEALING WITH BROODY HENS.

Among other things that should be attended to now is keeping the nests free from broody hens, as this condition not only means a loss in eggs but encourages the presence of vermin. The houses should be regularly visited after dark, and all broodies at once removed to the broody-coop. The latter should consist of three compartments. The first day's broodies should be placed in No. 1 compartment, the second in No. 2, and the third day's in No. 3. In a general way, if the birds are removed from the nest on the first sign of broodiness they may be liberated on the fourth day. Thus, if properly attended to, the broodies in No. 1 compartment may be set free when the fourth day's broodies are being cooped. The floor of a broody-coop should be made of slats or small-mesh wire netting; it should also be raised above ground-level on legs or bricks, &c. In this way a free draught of fresh air is provided which greatly tends to make the bird lose the desire to set. The broody hens should not be starved because they are not laying: the better the food and the attention they receive the sooner will they resume egg-production. The broody-coop should be arranged in such a way that food, clean water, and grit are available to them at all times.

INCUBATING AND BROODING EQUIPMENT.

All incubators and brooding appliances should be thoroughly cleaned and disinfected before being set aside. Lamps should be well scoured in boiling water; the brooder runs should be turned up and limed, and everything done to ensure in these a clean condition and a good growth of grass in the spring.

THE SURPLUS COCKERELS.

The stock should on no account be overcrowded; it is one of the worst and frequent mistakes made by poultry-keepers. All surplus cockerels four and a half months old and over should be marketed without delay. The table cockerel is only truly profitable when marketed before the second lot of feathers commence to develop. It is a weak policy to market a cockerel in a mere store condition. Turning such a bird into a choice table delicacy by good feeding and special care and management will not only double its weight but also the profit made by the poultry-keeper. It is useless trying to fatten cockerels unless they are free from vermin. Dust frequently with flour of sulphur and carbolic powder, in order to keep the lice in check, and also see that the quarters in which the birds are kept are maintained in a thoroughly sanitary state.

GREEN FOOD.

For success in poultry-keeping one of the principal points is to secure the greatest profit possible from the flock over the cost of production—which does not necessarily mean obtaining the greatest number of eggs. Any system of feeding, for instance, that will return a higher net profit over its cost than another is a matter that should at all times be considered. With this end in view I cannot urge too strongly the necessity of providing an adequate supply

of green material at all seasons of the year. It not only replaces to a material extent more costly foods, but, in addition, it is an essential for maintaining the birds in good health.

In anticipation of dearer wheat next year the question of providing for an ample supply of green material is a matter that should not be neglected now. Nothing is better than silver-beet; it gives a great yield per acre, and plants of the previous year's sowing—the leaves of which have been removed in the autumn—will furnish just the tender material in the spring, when the chickens in the brooder are demanding a constant supply. Cabbage, mangolds, kale, rape, &c., are also suitable for poultry.

Where lucerne is grown and there is a surplus over current requirements it should be cut and cured in a succulent stage and put by for winter use. Lucerne should be cut on a rising weather-glass, so that it may be stacked or placed under cover before it sheds its leaves or gets into an overdry, bleached condition. In the succulent stage the fowls will relish it when finely chaffed and boiled or steamed overnight. It will also have the effect of promoting egg-production. On the other hand, if it is not cut in its tender stage, and is subjected to weather conditions over a period of time, it will prove next to useless when included in the ration. Some poultry-keepers chaff the lucerne as soon as it is cut, and spread it lightly over the concrete floor of the brooder-house to dry, when the latter is not in use. Others use a galvanized-iron roof for this purpose, boards being placed around the roof to prevent the chaff from blowing away. In this way the chaff retains its properties to the fullest extent. Another advantage in chaffing lucerne green is that this is much more easily carried out than when the stuff is dry.

At this time of the year in particular there should be no stint of green food on a poultry plant. Especially does this apply to the growing stock; they cannot thrive to the best advantage without it; moreover, they can be practically half-fed upon it. During hot weather one frequently sees chickens practically refuse to eat grain material unless forced to by hunger, whereas if green-stuff is thrown to them they will simply rush it. This indicates what they require, as usually what they eat up greedily is what they need for promoting healthy development, an essential requirement for future heavy egg-production.

It is always best to feed green-stuff separately, and late in the day during hot weather. Thus if more is supplied than the birds require it will generally be found fresh enough for them the following morning. On the other hand, if fed early in the day any left over will become dried up to such an extent that the birds will not eat it, with the result that it will be wasted.

Neglect to provide the stock with a liberal supply of green food, occasionally or at all periods of the year, is a common weakness found on many unsuccessful plants.

—F. C. Brown, Chief Poultry Instructor.

THE APIARY.

RETURNING SWARMS.

SWARMS in January are of little value except as increase for next season, and should be returned to the hives whence they originate if they can be traced. It is a good plan to kill the old queen in the swarm when returning it, at the same time destroying all but two queen-cells in the parent colony. If the hive is cramped an extra super may be given, and with this inducement the colony will usually settle down at once to work.

After-swarms should always be returned to the parent hive. They are easily disposed of even if the beekeeper does not know whence they came. If they are shaken through an excluder into an empty super the virgin queen or queens can easily be picked out as they attempt to force their way through, and once these are removed the bees will return to their old home. The young queens can then be used to replace poor queens in the apiary. It is an excellent plan to have one or two queen-cages always on hand. The young queens can each be confined in a separate cage, and when the queen to be destroyed is removed the closed cage containing the virgin can be placed on top of the frames and left

there for twenty-four hours, during which time she will be fed by the bees in the hive. At the end of twenty-four hours she can be released and allowed to run down into the frame, when she will be accepted by the bees.

VENTILATION.

The matter of ventilating the hives should by now be receiving every attention. Every means should be used to ensure the bees having an abundance of fresh air day and night. All weeds and other obstructions should be removed from the fronts of the hives, and the entrances enlarged as much as possible. In extreme cases the hive-bodies should be raised from the bottom-boards by means of small blocks of wood. On no account should the bees be allowed to cluster outside the hives, and, wherever they show a tendency to excessive fanning, steps should be at once taken to increase the supply of fresh air to the colonies.

SUPERS.

One of the necessities of a well-regulated apiary is an abundance of supers when the honey-flow is in full swing. Every inducement should be given the bees during the often brief season to gather in every available drop of nectar. No beekeeper with business acumen will allow his bees to loaf or cluster outside the hives for lack of storage-room. It is well, when adding additional supers, to place them between the brood-chamber and the first super, or at least to raise a few frames of honey from the first super into the second when adding the latter.

It should be understood, however, th t supering must not be overdone, and the bees disheartened by being given too much work at one time. On no account add a second super until the bees are well at work on the first, and in cases where the colonies are only building up well at the beginning of the honey-flow—that is, where a poor colony has been requeened and the new queen's brood has not as yet hatched—it is an excellent plan to tier up with half-stories. Many an apiarist has had a moderate return from a small colony with half-stories, when it is doubtful if any return at all would have been obtained by the use of full-depth supers.

QUEEN-EXCLUDERS.

January is the month when queen-excluders are of most use to the beekeeper, especially in southern districts. Whatever their disadvantage may be in some localities, in the south they have proved their efficacy in enabling the apiarist to finish extracting before the hot weather goes, without the destruction of any brood whatever. They should never be used for general purposes until the main honey-flow is in full swing. By that time the bees are used to working in the supers, and with nectar in abundance to be had all around them they will work cheerfully right through the hive, passing through the holes in the excluders as if no obstruction existed.

The best method of using the excluders is as follows: All sealed brood should be raised above the excluder, and the queen confined below on drawn-out combs. The brood above the excluder should be watched for a few days in case any eggs have been elevated, as the bees will sometimes attempt to raise queen-cells above the excluder. If this happens, the queen-cells should be destroyed, as the queens which will emerge from them will not be able to pass through the excluders to get mated, and will in time develop into drone-layers. By providing the queen with plenty of empty combs she will be able to continue laying at a sufficient rate to keep up a supply of workers, and as the brood hatches out in the upper stories the cells will be at once filled up with honey.

Excluders are often condemned as being productive of overswarming, but in many localities swarming ceases automatically as soon as the main honey-flow commences, and if the queen is allowed plenty of room in the brood-chamber, and the brood in the supers carefully watched for the production of queen-cells, very little harm can come from the use of queen-excluders, while the immense advantage of being able to extract combs entirely free of brood is worth a great deal to the apiarist at his busiest season.

THE MARKET POSITION.

Recent reports received by the New Zealand Co-operative Honey-producers' Association from their London agents indicate that the sales of New Zealand honey have greatly improved during the past two months. The information

is gratifying, and will tend to reassure beekeepers throughout the Dominion. Prior to the receipt of the 1922 crop the association was holding bulk supplies of honey to the extent of 500 tons, and the prospects of its disposal at remunerative prices were not considered to be too bright, owing principally to the arrival of Californian honey on the English market, which has been offered at lower rates than the price obtained for our product. To meet the situation shareholders in the association received instructions to dispose of as much of their crop as was possible locally, but, notwithstanding that large quantities of bulk honey were absorbed in the Dominion last season, on the arrival of the available supplies for export at the close of 1922 there was approximately 1,000 tons of honey to market. As a result of considerable propaganda work the balance of the 1921 stocks have been cleared, and it is anticipated that the whole of the 1922 shipments will be absorbed before the arrival in England of the current season's crop.

—E. A. Earp, Senior Apiary Instructor.

THE GARDEN.

VEGETABLE-CULTURE.

PLANTING out the winter crops will be the chief work for January. Brussels sprouts, broccoli, savoy cabbage, and kale, leeks, and celery form valuable supplies for the winter. They all require rich land well prepared. If artificial manures have to be used two parts each of superphosphate and bonedust, and one each of sulphate of potash and sulphate of ammonia, is a mixture that will suit many soils. Make a liberal dressing, and harrow or lightly dig it in.

Soak the seed-beds well the day before lifting the plants, and see that the roots are not allowed to dry out during the removal. Examine the plants carefully, rejecting those that are "blind" or of bad type. If necessary, spray or dip them in an insecticide before they are put out. Plant firmly, and water them in.

Encourage vigorous growth on asparagus and rhubarb beds. If the weather is hot and dry give them a good watering and apply a dressing or two of nitrate of soda.

Salads, peas, French beans, and carrots may still be sown in small quantities for late crops.

TOMATOES.

Trimming and tying of the plants will now require constant attention. As the bottom bunch of fruit approaches maturity the older leaves surrounding it may be removed. An application now of soluble fertilizers will be of benefit in most cases: two parts of superphosphate, one part of sulphate of potash, and one of nitrate of soda is a popular mixture. Apply it at the rate of 5 cwt. or 6 cwt. per acre (2 oz. to the square yard).

In the packing of tomatoes for the market, as in the packing of most fruit, uneven maturity is the most common defect. It is a very serious one, for when such packs are opened up in the auction-room they suffer by comparison with better ones. The size-grading of tomatoes for packing is also becoming more generally adopted.

SMALL-FRUITS.

In many raspberry-gardens the canes are small and the foliage affected with leaf-spot. A great improvement would be made if as soon as the present crop is gathered the old canes were cut out and burnt, and the new suckers thinned and sprayed with bordeaux and arsenate of lead, a second application being made, if necessary, after an interval of three weeks. A soil-dressing of soluble chemical fertilizers should also be made. In this way strong, clean canes may be secured for the next season's crop.

Most breaks of black-currant and gooseberry plants would receive great benefit from a similar spray treatment.

—William C. Hyde, Horticulture Division.

ANSWERS TO INQUIRIES.

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

CALF-MANAGEMENT.

F. S. RUTHE, Leigh :—

Could you give me a preventive to stop the scouring of calves? I would also like to know what quantity of milk should be given to each calf for each feeding?

The Live-stock Division :—

Scouring in young calves is most commonly produced through some dietetic influence. Feeding skim-milk in a too sour condition, allowing calves to gorge themselves with cold milk in very hot weather, or using milk-pails and vessels which are not kept scrupulously clean and scalded before use, are all prolific causes of diarrhœa, through digestive disturbance. Also, the pen or place where the young calves are kept requires to be clean, and when mortality occurs it is advisable to change their location. As regards medicinal treatment, it is best to commence with a moderate dose of castor-oil—say, 2 oz. to 3 oz. After this has operated, and if scouring continues, a teaspoonful of chlorodyne, shaken up in a little milk, is useful. In the early stages the addition of lime-water to the milk is often all that is required. Regarding the milk requisite for a calf at each feeding, owing to individual requirements it is impossible to lay down any definite quantity, as some calves will consume much more milk than others of the same age. Again, the quantity will, of course, vary with the age of the calf. Speaking generally, a calf one month old will consume 4 pints of milk three times daily; at three months old, 5 quarts of separated milk morning and evening, with the addition of the usual supplementary feed—linseed, oatmeal, &c.

DERMATITIS IN LAMBS.

"INQUIRER," Waipu :—

This year with several of my lambs I have noticed a breaking-out round the top of the hoofs. There is no discharge, but the affected part is simply raw and slightly swollen, and not accompanied by lameness. Would you please enlighten me as to this ailment and the necessary treatment? Is it contagious?

The Live-stock Division :—

The condition you describe is termed dermatitis or inflammation of the skin around the coronets. It is questionable whether the trouble is contagious; it is more likely due to a common cause operating. The spell of wet weather experienced earlier in the season, by influencing the nature of the feed, probably has brought about constitutional disturbance leading to the inflammatory condition of the skin. The lesions are also occasionally seen about the mouth, and this is attributed to the sheep rubbing the mouth on the affected feet. For treatment, in the first place a change of pasture is desirable. If many lambs are affected, the quickest method is to put them through a foot-bath of lysol in water (2 per cent. solution), the bath to be filled sufficiently to cover the affected parts as the lambs go through; or this can be carried out by immersing the feet in a bucket containing the solution. Usually two dressings at intervals of a few days are sufficient. Afterwards apply zinc-ointment to the coronets, removing any crusts or scabs which may have formed.

PRAIRIE-GRASS UNDER TARANAKI CONDITIONS.

"NEW CHUM," Oaonui :—

Prairie-grass seems to be a great winter grass, but I am told that it will not do here. The farm is on a by-road about half-way between Rahotu and the mountain. I should be glad of particulars regarding this grass when sown pure.

The Fields Division :—

Prairie-grass is a very fine winter grass in localities where it does well, but from our experience in Taranaki we could not advise you to grow it with any certainty of success in your district. If sown in a warm sheltered position fair results may be expected for a year or two, provided it is not fed too hard. The seed may be sown in the spring or early autumn at the rate of 60 lb. per acre. It should be sown broadcast and disked in, being hard to get through a drill. A better mixture would be 40 lb. prairie-grass and 10 lb. perennial rye-grass per acre.

FOUL-IN-THE-FOOT OF CATTLE.

"SUBSCRIBER," Walton :—

Please give me the cause and treatment for cows or calves with swollen hoofs which discharge pus from between the hoof and around the top in the hair.

The Live-stock Division :—

This condition is what is commonly termed "foul-in-the-foot" of cattle. The cause is bacterial, and is favoured by cattle standing in dirty, muddy places. Treatment is as follows: First pare away all broken or diseased horn from the foot, especially in the cleft; wash well with an antiseptic in water, and when dry paint in the cleft and around the top of the hoof with tincture of iodine, using a stiff brush; finally draw a piece of tow smeared with Stockholm tar into the cleft of the foot, this preventing further infection. Usually one or two applications of this treatment will be found sufficient, but in bad cases it may be necessary to first apply a bran poultice to the foot. It is essential that any muddy yards or places in which the animals stand be drained and covered with a light dressing of lime.

CUCUMBER AND TOMATO CULTURE.

H. T. P., Lower Hutt :—

What is the reason for a large proportion of the young fruit on my cucumber-vines failing to mature? They turn yellow, and I find that the majority of them are hollow. They are growing under artificial heat, watered regularly, the beds kept wet, and liquid manure applied once a week, and the house is hosed twice a day to keep the atmosphere humid. What, also, is the reason for some fruit "damping-off"? Is it advisable to apply sulphate of ammonia to a crop of tomatoes that have only had potash and super but appear to be doing all right and the fruit setting freely?

The Horticulture Division :—

Your cucumber-plants are probably being overcropped. If the tomato-plants are doing well, defer feeding till the mulch is laid, when a liquid manure composed of superphosphate, sulphate of potash, and sulphate of ammonia would probably be beneficial.

Californian Thistle.—A special order has been made by the Cook County Council declaring that Californian thistle shall not be deemed to be a noxious weed within that county. Authority for such action is given by section 2 of the Noxious Weeds Amendment Act, 1923, the text of which was printed on page 338 of last month's *Journal*.

British Market for Peas.—The following information was cabled by the High Commissioner, London, on 1st December: Continental demand is good for blue, and market considerably stronger. Japanese on passage and forward have been sold for £21 per ton. New Zealand nominally worth £17 to £20 per ton ex store; Tasmanian, £20 to £21; English small, round, hand-picked, quoted at £19 10s. to £20 10s.; and Dutch, at £23 10s. ex store. No forward business in New Zealand maple owing to poor quality of recent arrivals.

WEATHER RECORDS: NOVEMBER, 1923.

Dominion Meteorological Office.

GENERAL SUMMARY.

THE weather of November was this year in striking contrast to what was experienced in the same month last year. This November will not be remembered, as it is usually regarded by the meteorologist, as the last month of spring, but as a summer month, and that of a very decided character.

The general report of the observers is that it was warm and dry in nearly all parts of the country; as a matter of fact, it was a record dry November month in many districts. Parts of Canterbury had small falls of rain on only one or two days. Maraekakaho Station, near Hastings, in Hawke's Bay, and Highfield, Waiau, Canterbury, were both exactly 91 per cent. below the mean November rainfalls.

Striking the average of the stations in the North Island shown in our table, we find they were 36 per cent. below the average; while the South Island stations were 46 per cent. below the mean. There were exceptions in both Islands: Kaitaia and Russell, in the far North, were above their respective averages for the month; and in the South Island Arthur's Pass and Okuru were also well above their usual November quantity; Nelson was also 0·30 in. above its November mean. A good fall of rain about the 16th was experienced in the Nelson and Blenheim districts, and accounted for this condition.

There were a number of changes during the month, and one or two stormy times, but generally the changes which made rain probable passed without precipitation. Dull and threatening skies were frequently experienced, with warm and humid conditions, and light northerly winds were much in evidence.

The weather in the latter part of the month may almost be described as a "heat wave," there having been some record temperatures for this time of the year. In Christchurch 90° F. was recorded; at Rakaia 91°; and in the Wairarapa over 85°. There was at times great evaporation, especially on the Canterbury Plains, from strong dry north-westerly winds.

—*D. C. Bates, Director.*

RAINFALL FOR NOVEMBER, 1923, AT REPRESENTATIVE STATIONS.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average November Rainfall.
North Island.				
	Inches.		Inches.	Inches.
Kaitaia	4·44	5	2·04	3·27
Russell	3·48	8	1·43	1·61
Whangarei	2·90	10	1·10	3·41
Auckland	2·46	11	1·41	3·26
Hamilton	3·22	15	0·81	4·05
Kawhia	2·12	10	0·98	4·49
New Plymouth	3·43	12	0·79	4·58
Inglewood	5·93	13	1·05	8·93
Whangamomona	4·42	12	1·68	7·40
Tairua, Thames	2·72	11	1·34	3·55
Tauranga	3·17	12	0·80	3·21
Maraehako Station, Opotiki ..	2·76	8	0·84	2·78
Gisborne	0·72	8	0·21	3·15
Taupo	2·66	8	0·78	3·41
Napier	0·23	..	..	2·60
Maraekakaho Station, Hastings ..	0·14	6	0·04	2·12
Taihape	2·02	15	1·03	3·67
Masterton	0·38	4	0·18	2·87
Patea	1·30	9	0·53	3·72
Wanganui	0·83	4	0·57	3·31
Foxton	1·02	7	0·42	3·63
Wellington	0·75	8	0·25	3·47

RAINFALL FOR NOVEMBER, 1923—*continued.*

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average November Rainfall.
South Island.				
	Inches.		Inches.	Inches.
Westport	2·66	13	0·74	7·08
Greymouth	4·72	15	1·10	9·46
Hokitika	5·06	13	1·14	10·68
Arthur's Pass	16·78	14	4·30	15·00
Okuru, Westland	18·14	10	3·84	12·96
Collingwood	5·90	9	2·02	7·68
Nelson	3·14	7	1·84	2·84
Spring Creek, Blenheim	1·06	6	0·58	2·41
Tophouse	2·87	13	0·66	7·07
Hanmer Springs	0·56	4	0·40	2·91
Highfield, Waiau	0·20	1	0·20	2·39
Gore Bay	0·31	5	0·20	1·98
Christchurch	0·52	2	0·49	1·84
Timaru	0·76	3	0·42	1·97
Lambrook Station, Fairlie ..	0·40	3	0·20	2·00
Benmore Station, Omarama ..	1·21	6	0·62	2·05
Oamaru	0·72	5	0·30	1·94
Queenstown	2·31	6	0·86	2·77
Clyde	0·71	6	0·23	1·36
Dunedin	1·94	10	0·72	3·27
Gore	1·27	11	0·41	3·08
Invercargill	2·72	14	0·62	4·56

FORTHCOMING AGRICULTURAL SHOWS.

Woodville A. and P. Association: Woodville, 22nd and 23rd January.
Horowhenua A. and P. Association: Levin, 30th and 31st January.
Feilding I., A., and P. Association: Feilding, 5th and 6th February.
Buller A. and P. Association: Westport, 8th and 9th February.
Clevedon A. and P. Association: Clevedon, 9th February.
Rodney Agricultural Society: Warkworth, 9th February.
Dannevirke A. and P. Association: Dannevirke, 13th and 14th February.
Te Puke Agricultural Association: Te Puke, 14th February.
Whakatane A. and P. Association: Whakatane, 20th February.
Masterton A. and P. Association: Solway, 19th and 20th February.
Katikati A. and P. Society: Katikati, 21st February.
Rotorua A. and P. Association: Rotorua, 27th February.
Opotiki A. and P. Association: Opotiki, 27th February.
Tauranga A. and P. Association: Tauranga, 28th February.
Waipu Agricultural Association: Waipu, 28th February.
Omaha and Pakiri A. and H. Society: Leigh, 1st March.
Taumarunui A. and P. Association: Taumarunui, 5th March.
Taranaki Metropolitan Agricultural Society: New Plymouth, 5th and 6th March.
Waikato Central Agricultural Association: Cambridge, 5th and 6th March.
Morrinsville A., P., and H. Society: Morrinsville, 12th March.
King Country Central A. and P. Association: Te Kuiti, 13th March.
Hawke's Bay A. and P. Society: Hastings, 18th and 19th March.
Mayfield A. and P. Association: Mayfield, 22nd March.
Methven A. and P. Association: Methven, 27th March.
Temuka and Geraldine A. and P. Association: Winchester, 3rd April.

(Agricultural and Pastoral Association secretaries are invited to supply dates and location of their shows.)

EXPORT OF APPLES, 1924 SEASON.

CONDITIONS OF GOVERNMENT GUARANTEE.

CONDITIONS for the Government guarantee of 1d. per pound net return on shipments of apples made from New Zealand during the 1924 export season are as follows:—

1. The guarantee shall be limited to approved varieties and classes of fruit packed in compliance with the requirements of the "Extra Fancy" or "Fancy" grades, and shall be restricted to a maximum of 250,000 cases.

2. The Government's liability under the guarantee shall include all packing and marketing expenses which the Department of Agriculture may deem reasonable and necessary, plus 3s. 4d. per case. No allowance to be made for cool storage unless an approved system of precooling is adopted, in which event such allowance shall not exceed 5d. per case; and, further, the insurance allowance shall not exceed that required to provide an ordinary marine-risk cover. In case of shipments to the United Kingdom no charge for selling-commission exceeding 5 per cent. will be allowed, nor will a total exceeding 1s. per case be allowed for the following overseas charges—namely, supervision, port rates, dock charges, warehousing, cartage, tolls, porterage, forwarding, and surcharges.

3. The guarantee to be limited to fruit grown and shipped (otherwise than under a f.o.b. contract) by *bona fide* fruitgrowers or fruitgrowers' co-operative societies, through channels recommended to the Minister of Agriculture by the Fruit Export Advisory Committee, and approved by him.

4. Any grower who exports any portion of his "Extra Fancy" or "Fancy" grade fruit crop outside the guarantee shall be deemed to have forfeited his right to participate in the guarantee with respect to all fruit exported during the season by him or on his behalf.

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

6. Payment of claims under the guarantee shall be calculated on the basis of the average price received by the claimant for the whole of the "Extra Fancy" and "Fancy" grade fruit exported (otherwise than under a f.o.b. contract) on his account during the season, irrespective of markets.

7. The Government reserves to itself the right (*a*) to limit the quantity of fruit shipped to any particular port should freight rates or market conditions, &c., be deemed unsatisfactory; (*b*) to insist on all fruit being precooled prior to shipment, if deemed necessary; (*c*) to withhold the privileges of the guarantee from all fruit shipped in vessels the storage facilities of which are held by the Department to be unsatisfactory; (*d*) to withhold the privileges of the guarantee with respect to any market in connection with which the Advisory Committee are of the opinion a satisfactory f.o.b. or c.i.f. trade is or can be established.

EXPORT REGULATIONS.

With respect to the Export Regulations, the following modifications will be allowed as regards apples for the 1924 season:—

CLASSES.

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

COLOUR STANDARDS.

Notwithstanding the provisions of the regulations, which will not be altered in this respect until further experience has been gained, apples carrying 10 per cent. less colour with respect to "Extra Fancy" and 5 per cent. less colour with

respect to "Fancy" than is required by the regulations will be accepted during the 1924 season for export to Europe. The above reduction in colour will apply to all the classes, including the "striped" class above referred to.

GRADES OF FRUIT.

In addition to the grades "Extra Fancy" and "Fancy," apples conforming to the undermentioned "Good" grade will be approved for export for the 1924 season:—

"Good" grade: Apples of this grade shall be of not less size than 2⅜ in. (200 apples per case), excepting such special dessert varieties as may be approved by the Director of the Horticulture Division, in which case the minimum size shall not be less than 2¼ in. (225 per case). They shall be mature, sound, smooth, clean, well formed, hand-picked, true to name, and free from disease, visible bitter-pit, skin-puncture, or broken skin at stem, and other defects. Slightly blemished apples may be included in this grade, provided that no individual apple shall have more than 5 per cent. of its surface affected thereby. Apples affected by unnatural russet may also be included in this grade, provided that no individual apple shall have more than 15 per cent. of its surface affected thereby. The individual apples of "solid red," "partial red," and "striped" varieties shall carry not less than 30 per cent., 15 per cent., and 10 per cent. respectively of good typical colour. The individual apples of yellow or green varieties shall be of good characteristic colour.

Twenty cases of any one grade shall be the minimum consignment accepted for export.

MINIMUM AND MAXIMUM SIZES OF APPLES FOR EXPORT.

The minimum and maximum sizes of apples of "Extra Fancy" and "Fancy" grades approved for export shall be those set out against each variety respectively in the list of varieties approved for export.

SPECIFICATIONS OF EXPORT APPLE-CASE.

The timber recommended for the construction of an export fruit-case is white-pine of good quality, but *Pinus insignis*, rimu, and beech timber, if well and evenly cut, will be accepted. Owing to the unsatisfactory nature of cases constructed of poplar timber, cases of this class will not be approved for export.

The inside measurements of the export bushel case shall be 10 in. by 11¼ in. by 19¾ in.

Sizes of timber: The ends shall be made of boards of the following size—10 in. by 11¼ in. by ¾ in.; one-piece board at each end; both end boards to be planed on the outer side. The sides shall be made of boards of the following size—10 in. by 21¼ in. by $\frac{5}{16}$ in.; one or two boards optional for each side, provided that no side board shall be less than 4¼ in. in width. The tops and bottoms shall be made of boards of the following size—11 in. by 21¼ in. by $\frac{5}{16}$ in.; one or two boards optional, provided that no board used for the purpose is less than 5 in. in width. Provided that tops and bottoms may be made of boards of the following size—11 in. by 21¼ in. by $\frac{3}{16}$ in., to be used with the addition of four cleats per case, measuring 11 in. by 1 in. by $\frac{5}{16}$ in.

In the event of two-piece sides being used in the construction of the case above referred to the space between the boards shall not exceed ¼ in. In the event of two-piece tops and bottoms being used the space between such boards shall not exceed ½ in.

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

Strapping: All cases to be strapped with a wire or steel band, such strapping to be tightly applied and to be not more than 1½ in. from end of case.

MARKING OF CASES.

A fruit-export label of new design has been approved, and its use will be essential in connection with all "Extra Fancy" and "Fancy" grade apples exported during the coming season.

A label of the design approved must be placed on each end of every case. Words and figures indicating the following only will be permissible on the label: (1) "New Zealand Apples"—"New Zealand" to be composed of letters of 1¼ in. and "Apples" of letters ¾ in. in height; (2) grower's registered number—to be of 1¼ in. type; (3) broker's registered number or shipping mark—to be of figures not less than 2½ in. and not more than 3 in. in height; (4) name of province if desired—this must be placed immediately below the broker's number, and must be composed of letters not exceeding ¾ in. in height; (5) name of variety of apple, grade, and number of apples in the case—all of which must be of ¼ in. type. The grade will be printed on each label. The name of the variety must be placed immediately above, and the number—indicating the apples in the case—on the right of and in line with the grade-name.

A label of similar design, but produced in one colour only, must likewise be used in connection with all "Good" grade apples shipped. With the exception of the grade-name the marking of this label must in every way comply with the requirements as set out above with respect to the "Fancy" grade label.

Although a very great improvement in the branding and marking of cases was effected in 1923 over previous seasons, there is still room for further improvement in this direction. The aim should be toward uniformity in the various rubber stamps required, and colour and quality of ink used in connection with the marking of labels. In the latter connection the manager of the New Zealand Fruitgrowers' Federation has undertaken to secure and make available to shippers a good-quality ink approved for the purpose.

REGISTERED EXPORT NUMBER.

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

In respect to fruit packed by a packing organization to which a registered number has been allotted, such consignments may be marked with the registered number of the packing association only, provided that each grower's fruit is shown separately on the advice-note for examination, and stacked in separate lots, so that the Inspector may have no difficulty in determining which is the particular lot under examination. For example, a line of 100 cases of Cox's Orange coming from two different growers would be submitted as follows:—

Shipping-mark.	Registered Export Brand.	Total Number of Cases.	Variety.	Grade.	Number of Cases.	Pack.
345	P607	60	Cox's Orange ..	Fancy ..	14	163
			,, ..	,, ..	14	175
			,, ..	,, ..	8	188
			,, ..	,, ..	12	210
			,, ..	,, ..	12	225
345	P607	40	Cox's Orange ..	Fancy ..	8	163
			,, ..	,, ..	5	175
			,, ..	,, ..	7	188
			,, ..	,, ..	9	210
			,, ..	,, ..	11	225

These would be stacked separately in two lots, and examined as different lines.

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

PACKING.

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

Sizes 64's to 80's (both inclusive), paper 11 in. by 11 in.
Sizes 88's to 110's (both inclusive), paper 10 in. by 10 in.
Sizes 120's to 200's (both inclusive), paper 9 in. by 9 in.
Sizes 210's to 240's (both inclusive), paper 8 in. by 8 in.

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

VARIETIES.

The following varieties of apples (which were accepted for export in the 1923 season), owing to their unsatisfactory carriage and out-turn, and the low prices realized in consequence of this or other unsuitable marketing characteristics, have been removed from the 1924 export list: Alfriston, Ballarat, Reinette du Canada, Washington.

The following have been removed mainly on account of there being an insufficient quantity offering to warrant retention: Sharp's Late Red, Claygate Pearmain, Golden Russet, Scarlet Pearmain, Shepherd's Perfection.

The varieties marked with an asterisk in the following lists, although retained, are considered to be of little value for export purposes, and growers are advised to consider the reworking of these varieties, as well as those above mentioned, with a more suitable export variety, such as Delicious. In the case of London Pippin the fruit must be specially good of the variety.

APPROVED FOR EXPORT TO EUROPE.

Max. Size.	Variety.	Min. Size	Max. Size.	Variety.	Min. Size.
	Solid Red Varieties.				
96	Baldwin*	225	110	Rokewood	225
96	Hoover*	225	96	Tasma	225
	Partial Red Varieties.				
110	Crofton	225	110	Scarlet Nonpareil ..	240
96	Delicious	225	110	Shorland Queen ..	225
110	Dougherty	240	96	Spitzenberg	225
110	John Sharp ..	225	110	Stark	225
110	Jonathan	240	110	Wagner	225
110	King David ..	240	110	Worcester Pearmain ..	225
96	Rome Beauty ..	225	110	Yates	240
	Striped Varieties.				
110	Adams Pearmain ..	225	120	Ribston Pippin ..	225
110	Allington Pippin* ..	225	110	Senator	225
120	Cox's Orange ..	240	110	Statesman	225
96	Premier	225	110	Stayman	225
	Yellow or Green Varieties.				
96	Boston Russet ..	225	110	Gravenstein	225
110	Brownlee's Russet ..	225	96	London Pippin ..	200
110	Cleopatra	225	96	McMahon's White ..	225
96	Dunn's	210	110	Newtown Pippin ..	240
110	Golden Pippin ..	225	96	Parlin's Beauty* ..	225
110	Grannie Smith ..	225	110	Sturmer	240
			110	Willie Sharp ..	225

APPROVED FOR EXPORT TO SOUTH AMERICA.

Max. Size.	Variety.	Min. Size.	Max. Size.	Variety.	Min. Size.
	Solid Red Varieties.				
80	Baldwin	140	96	Rokewood	140
80	Hoover	140	80	Tasma	140
	Partial Red Varieties.				
96	Crofton	140	80	Salome	140
80	Delicious	140	80	Scarlet Pearmain ..	140
96	Dougherty	140	96	Shorland Queen ..	140
96	Jonathan	140	80	Spitzenberg	140
96	John Sharp ..	140	96	Stark	140
96	King David ..	140	80	Wagner	140
80	Rome Beauty ..	140	96	Yates	140
	Striped Varieties.				
96	Adams Pearmain ..	140	96	Statesman	140
80	Premier	140	80	Stayman	140
80	Senator	140			
	Yellow or Green Varieties.				
96	Cleopatra	140	80	Newtown Pippin ..	140
80	Dunn's	140	80	Parlin's Beauty* ..	140
80	McMahon's White ..	140	96	Sturmer ..	140

SPECIAL CONDITIONS APPLYING TO EXPORT TO SOUTH AMERICA.

The modifications regarding colour standards allowed for European markets will not apply to apples for the South American market.

Grades: No fruit below the standard of "Fancy" grade as defined in the Export Regulations to be exported to South America.

Cases: Specifications of standard export case to be strictly observed.

Packing: Corrugated strawboard to be used on top and bottom of cases; wood-wool not to be used. The use of printed wrapping-paper is strongly recommended. All large fruit to be double-wrapped unless paper of sufficient size is used.

RUAKURA FARM SCHOOL FOR YOUTHS.

IN the *Journal* for August last, page 127, reference was made to the permanent farm training-school for youths established at the Ruakura Farm of Instruction, Hamilton. A further twenty youths will be accepted for training in February next, and the attention of parents or others concerned is drawn to the fact that applications for entrance will not be received later than 20th January, 1924. The course consists of two years' practical and theoretical agriculture, divided into a total of four terms. The fees for each term amount to £18. Full particulars relating to the school, and application forms for enrolment, may be obtained by applying to the Director-General, Department of Agriculture, Wellington.

New Rabbit Districts.—The constituting of the Manawatu and the Tokoroa Rabbit Districts for the purposes of Part III of the Rabbit Nuisance Act has been gazetted.