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TESTING OF PUREBRED DAIRY COWS.

THE NEW ZEALAND C.O.R. SYSTEM IN 1922.

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THE improvement of dairy herds received a large measure of attention in the dairying districts of New Zealand during 1922. Necessity for such improvement has continued to be manifested to our dairy-farmers as a result of the lowering of their receipts since the war period in much greater proportion than they have been able to reduce the increased costs of production. The marked development in herd-testing during the present season—some 80,000 cows being on association test, as compared with 45,564 in 1921–22—affords strong evidence that the farmers are studying methods of improvement.

New Zealand is even now a comparatively new country from the dairying standpoint, and there are still great areas to be brought in for the purposes of the industry. Until our pastures are further improved, and aided to a greater degree by supplementary feed, the average cow cannot do herself justice. Moreover, as the Dominion is largely extending its grasslands each year, the dairy-cow population has to be correspondingly increased. In the last five years such increase has been some 46 per cent. This means that culling cannot be so stringently carried out as would be the case were the number of cows remaining

fairly stationary. Later on, as more stable conditions are reached in this respect, we may expect to see more uniformly steady progress made in the improvement of our average cow. In the meantime much good work is being accomplished both by culling on test and building up the herds through breeding better heifers to replace the culls.

While more attention is being given to the use of purebred sires for the dairy herds, there is still need for much sustained effort in impressing on the average dairyman the importance and advantages of this practice. The certificate-of-record testing system is undoubtedly doing a great deal in this respect. The agricultural Press of New Zealand has also given the movement faithful support, and much other work is being carried out on educational lines. All things considered, we may expect to see important developments in the future.

INCREASE IN TESTING FEES.

When dealing with the matter of fees in the last annual review of the C.O.R. system the rise to five guineas was mentioned, and it was also hinted that the breeder testing only one or two cows might be called upon to pay heavier fees. This was found unavoidable, and from 1st April, 1922, the rule regarding testing fees was reconstructed to read in part as follows :—

> For the first cow or heifer to be tested on one farm and commencing test after 1st April of each year the fee shall be ten guineas, and for each subsequent cow or heifer commencing test within that same year the fee shall be three guineas : Provided that a period of not more than six months shall elapse between the date of calving of the first and last cow or heifer entered.

It was anticipated that this would tend to increase the number of cows entered by each breeder, so that the lower cost per cow after the first would be taken advantage of. That this view was correct has been borne out by the relationship this season between the number of testing breeders and the number of cows tested. Our records show for the maximum month 280 breeders testing 1,061 cows, which is an increase over the 1921–22 season of 250 cows and a decrease of twenty-nine breeders. This signifies, of course, that the cost per cow to the Department is more closely met than previously, and it is now hoped economic conditions will be such as to enable the Government to continue the service to breeders without further increase of fees. It is pleasing to record that the change has met with a minimum of dissentients.

EXPORT OF PUREBRED DAIRY CATTLE.

The export of purebred dairy cattle continues, and during the calendar year 1922 some 115 head, valued at over £8,500, have been exported, mainly to Australia and Fiji. Many of these animals have been among our best dairy stock, and while in some respects New Zealand cannot afford to lose them, we trust they will become progenitors of good stock under their new ownership.

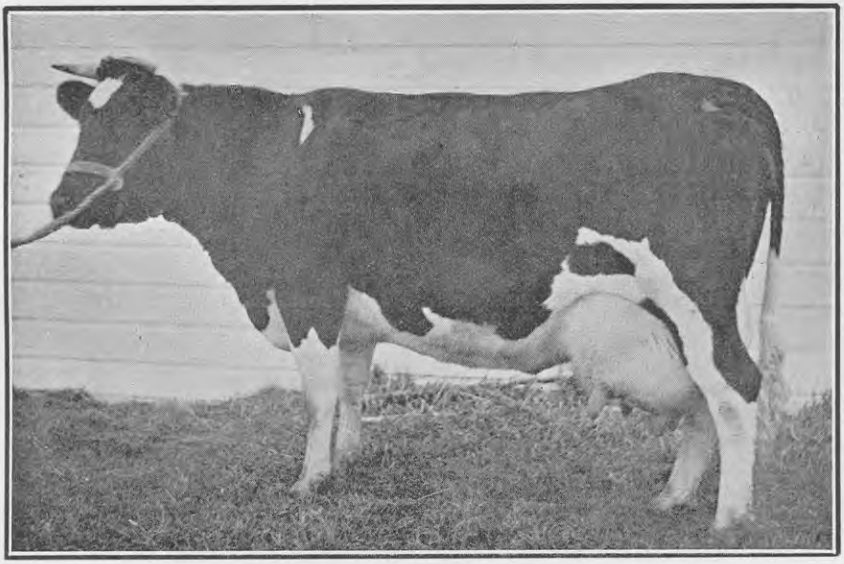
CERTIFICATES ISSUED.

The total number of cows which have received first-class certificates since the commencement of the certificate-of-record testing system has now reached 2,695. In 1922 there were issued 543 ordinary first-

class certificates, and eighty-eight certificates on repeat records. These increases are not so large as those for the previous year, and this may in part be accounted for by the rise in fees from three guineas to five guineas per cow, commencing in January, 1921. During the year under review certificates were issued to five Shorthorn cows as distinct from Milking Shorthorns. The five cows referred to are registered in the New Zealand Shorthorn Herd-book published by the New Zealand Shorthorn Cattle Breeders' Association, Christchurch.

The following table gives particulars of certificates issued since the commencement of the system :—

Breed.	1913.	1914.		1915.		1916.		1917.		1918.		1919.		1920.		1921.		1922.	
		Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.	Ordinary.	Repeat.
Jersey ..	67	104	14	91	4	94	11	94	13	113	8	150	14	227	33	339	49	351	46
Friesian ..	48	67	11	62	9	44	5	62	14	57	14	54	7	82	23	127	25	136	32
Milking Shorthorn	..	..	..	2	..	7	..	21	..	22	..	53	3	59	2	31	6	25	2
Ayrshire..	2	15	1	12	1	9	..	4	4	4	..	2	..	5	..	10	1	18	5
Red Poll	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	12	7	8	3
Shorthorn	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	..
Totals..	117	186	26	167	14	154	16	181	31	196	22	259	24	373	58	519	88	543	88



OAKWOOD BETTY (W. D. HUNT, BAINFIELD, INVERCARGILL).

C.O.R., 1922 : 5 years 9 days ; in 365 days, 21,748 lb. milk, 810·11 lb. butterfat.

JERSEYS.

Class-leaders.

While the Jersey breed has added during the year many excellent certificates to its fast-lengthening list, there is only one change of class-leader to report. In the four-year-old class Mrs. A. Banks and Son's Woodstock's Fancy Free (770·35 lb. butterfat) has given way to Mr. A. J. Smith's St. Lambert's Bell, who, commencing test at 4 years 283 days, has gained a certificate on a yield of 780·32 lb. butterfat. This cow has been on test previously, when, as a senior two-year-old, she produced 470·34 lb. butterfat. The sire of St. Lambert's Bell is Soumise Tom, sire of eight certificate-of-record daughters, two of whom (in addition to St. Lambert's Bell) have received certificates for production exceeding 700 lb. butterfat. Soumise Tom was sired by Soumise Majesty, who has nine certificated daughters on the dam's side. In these pedigrees there appear many names which have played a prominent part in the making of the Jersey breed in New Zealand, and St. Lambert's Bell would seem the product of several generations of successful breeding lines. Not only does her record constitute a class-leadership, but it is the highest Jersey yield for the year.

The list of class-leaders for 1922 is as follows :—

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Aster's August Child	James Nicholson, Kaupokonui	1 337	240·5	365	11,498·5	689·05
Senior Two-year-old.						
Lady Superior ..	John Hale, New Plymouth	2 183	258·8	365	9,975·5	680·33
Three-year-old.						
Woodstock's Baby ..	Mrs. A. Banks and Son, Kiwitea	3 302	307·2	365	12,329·7	657·91
Four-year-old.						
St. Lambert's Bell ..	A. J. Smith, Cardiff ..	4 283	341·8	365	14,423·1	780·32
Mature.						
Sultan's Daisy ..	E. O'Sullivan and Sons, Tariki	6 344	350·0	365	13,502·7	968·22

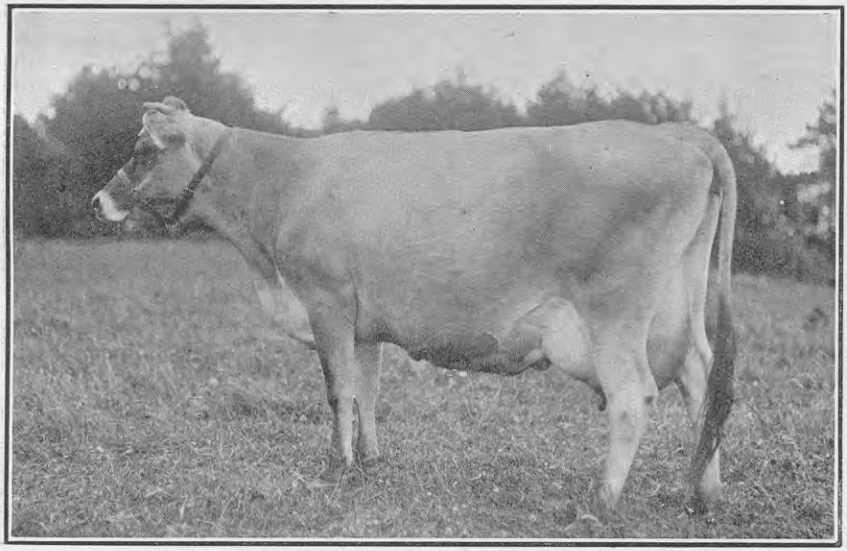
Jersey Class-averages.

The Jersey classes in 1922 comprise 397 certificates, as against 388 for the previous year. Apart from the junior two-year-olds, which show an increase in numbers of twenty-five, the classes numerically are much the same as in 1921. We are able to report a marked increase in the average production for each class, and this may be considered a creditable achievement. It is interesting to record that of the 176 junior two-year-olds included in the average no less than ninety-three (more than half) had the minimum butterfat requirement of 240·5 lb.—that is, commenced their test at two years of age or under. The maximum standard for the class is only 249·7 lb., so that an average yield of 390·17 lb. in an average lactation period of 342 days is clear

evidence of the fact that the young stock of this breed may reasonably be expected to develop some heavy producers. The average certificate-of-record Jersey for 1922 produced 443·75 lb. butterfat from 8,007·5 lb. milk in 344 days. Since the commencement of the system in New Zealand 1,822 certificates have been issued to Jersey cows, and the records represented average 7,572·57 lb. milk and 420·21 lb. butterfat in 342 days. The average test works out at 5·55 per cent.

The figures for 1922, together with those for 1921 for purposes of comparison, are as follows :—

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Fat.
	1922.		lb.	lb.
Junior two-year-old ..	176	342	6,950·4	390·17
Senior two-year-old ..	41	350	7,815·2	427·75
Three-year-old	57	337	8,342·8	462·10
Four-year-old	37	348	8,869·7	498·37
Mature	86	349	9,669·5	525·38
	1921.			
Junior two-year-old ..	151	342	6,281·1	351·37
Senior two-year-old ..	35	336	6,825·8	383·39
Three-year-old	55	332	7,620·3	430·67
Four-year-old	50	343	8,147·0	467·80
Mature	97	340	8,686·5	478·39



ST. LAMBERT'S BELL (A. J. SMITH, CARDIFF).

Leader of the Jersey four-year-old class. C.O.R., 1922 : 4 years 283 days ; in 365 days, 14,423·1 lb. milk, 780·32 lb. butterfat.

Jersey C.O.R. Bulls.

During 1922 twenty names were added to the list of Jersey certificate-of-record bulls (such bull being one who has sired at least four certificated daughters, each from a different dam). This now makes a total of 102 names, with 768 certificate-of-record daughters.

Of the bulls which have qualified during the year the name which first catches the eye is Grannie's Knight, because of the fact that no less than thirteen of his daughters were granted certificates during that period. His sire is K.C.B., who stands out as one of the pioneer bulls of the breed in New Zealand, and his dam is Grannie's Girl, a well-known Taranaki matron. His fourteen certificated daughters now include five two-year-olds with productions of over 500 lb. butterfat, which must be considered very meritorious.

Fancy's Lord Twylish has added another three daughters to his credit, and now, with Roberts, holds fourth place on the list. Among his daughters are Mere, with 663·64 lb. butterfat, which at one time constituted a world's class-record for the breed; Woodstock's Fancy Free, with 770·35 lb.; and Woodstock's Baby, with 690·16 lb. These performances and those of other daughters surely place Fancy's Lord Twylish among the leading bulls of the breed in the Dominion.

The list of bulls is as follows:—

Name of Bull.	Total of C.O.R. Daughters.	Number of Daughters qualified during 1922.	Name of Bull.	Total of C.O.R. Daughters.	Number of Daughters qualified during 1922.
Majesty's Fox ..	30	1	Bush Boy	8	1
Eminent's Fontaine ..	28	1	Molina's General ..	8	1
K.C.B.	26	0	Heather Boy ..	8	0
Fancy's Lord Twylish	19	3	Frisky Campanile ..	8	0
Roberts	19	0	Lord Twylish ..	8	0
Admiral of Puketapu	17	0	V.C.*	7	6
Noble Twylish ..	15	7	Exile of Oaklands ..	7†	0
Grannie's Knight* ..	14	13	Sunlight's Noble General	7	0
Belvedere Sun Prince	13	7			
Bilberry's Goddington	12	0	Blizzard	7	0
Sunflower's Perseus ..	12	0	Stevenson	7	0
Sultan's Disdain ..	12†	3	Goddington ..	7	0
The General ..	11	2	Brighton Twylish ..	7	0
Rainbow	11	2	Petune's Noble ..	7†	0
Golden Swan ..	11	0	Hawkesbury Emperor	7	2
Good Luck ..	10	3	Bilberry's Twylish* ..	6	5
Campanile's Sultan ..	10	0	Mona's Ally* ..	6	4
Lady's Duke ..	9†	0	Viola's Golden Laddie*	6	4
Renown of Meadowbrook	9	1	Masterpiece of Meadowbrook*	6	3
Farleigh Fox ..	9†	1†	Sweet Fox of Collingwood	6	2
Charm's Lord Twylish	9	0			
M.L.C.	9	0	Golden Fox 2nd ..	6	1
Starbright	9	0	Maid's General ..	6†	1†
Rozel's Sultan ..	9	0	Grand Duke ..	6	0
Soumise Majesty ..	9	0	Pride of Egmont ..	6	0
Soumise Tom* ..	8	5	Mabel's Dairyman ..	6	0
The Owl's Victor ..	8‡	4	Belvedere Butter Boy	6	0
Peggy's Campanile ..	8†	3	Marcus	6	0
Oculist 12th ..	8	2	Belvedere Sunset ..	6	0
Mermaid Sultan ..	8	1	Meadowbrook Nobility	6	0

JERSEY C.O.R. BULLS—*continued.*

Name of Bull.	Total of C.O.R. Daughters.	Number of Daughters qualified during 1922.	Name of Bull.	Total of C.O.R. Daughters.	Number of Daughters qualified during 1922.
Belvedere Bilberry's Last	6	0	Oakvale's Redline ..	5†	0
			Maid's Noble General*	4	4
Blondin*	5	5	Noble Warder* ..	4	3
Admiral*	5	3	Butterman Lad* ..	4	1
Holly Bank Squire* ..	5	3	Flandrine's Swan* ..	4	1
Rainbow's King* ..	5	3	Fairy's Campanile* ..	4	1
Protection of Meadowbrook*	5	2	Una's Nobility* ..	4	1
			Mayflower Magnet 2nd*	4	1
Miro Meadow's Maori Boy	5	1	Glory	4	0
			Young Emperor 3rd ..	4	0
Charm's Lord ..	5†	1	Fancy's Carnation Fox	4	0
Genoa Nelson Chase ..	5	1	Knight Commander ..	4	0
Silverlock's Duke ..	5	1	Yankee Sweet ..	4	0
Lord Nelson ..	5†	0	Nestor of Willowbank	4	0
The Squire	5	0	Starlight 2nd ..	4	0
Mona's Campanile ..	5	0	Flower Boy 2nd ..	4	0
Belvedere Jersey Boy	5	0	Melia Ann's Sultan ..	4†	0
Gavotte's Hero ..	5	0	Silver Conqueror ..	4	0
Juno's Laddie ..	5	0	Senor	4	0
Hawkesbury Black Prince	5	0	Black Swan ..	4	0
			Defender of Meadowvale	4	0
Twylish Hope* ..	5	4			
M.H.R.	5	0	Miro Meadow's Star ..	4	0
Silver King (Stuckey's)	5	0	Lord Maitland ..	4	0
Lord Lepperton ..	5	0			

* Qualified during 1922. † Also one second-class-certificate daughter. ‡ Also two second-class-certificate daughters.

FRIESIANS.

Class-leaders.

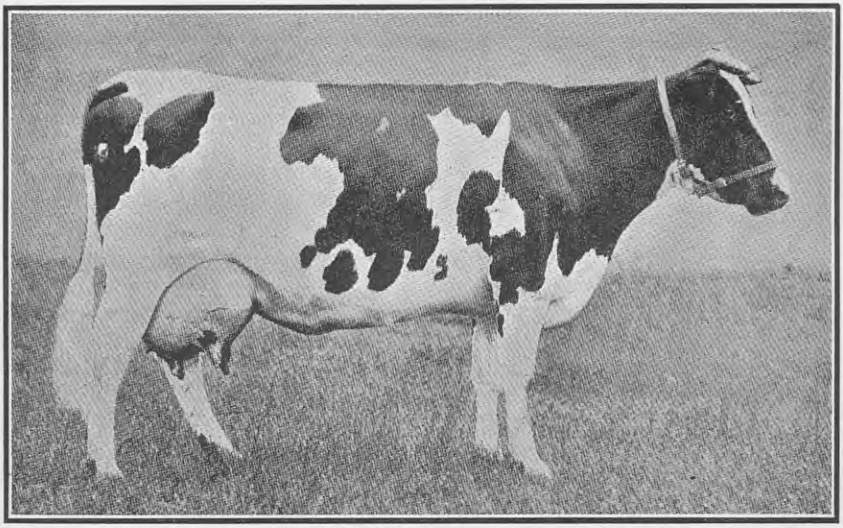
The certificates issued to Friesian cows during 1922 include two performances which raise the previous record for the respective classes. In the mature class Messrs. North and Sons' fine old cow, Burkeyje Sylvia Posch, with her splendid record of 983·20 lb. butterfat, has had to yield place to Mr. Vernon Marx's Alcartra Clothilde Pietje. This cow's performance, constituting her the milk and butterfat champion of New Zealand, was specially reviewed in the *Journal* for November last.

In the junior three-year-old class the production of Messrs. North and Sons' Rosevale Queen Daphne (675·18 lb. butterfat) has been replaced by the 800·18 lb. standing to the credit of Mr. T. H. Richards's Monavale Queen Bess. A glance at the appended table of Friesian class-leaders will show that a year ago this cow was on test as a junior two-year-old, when her performance constituted a record for that class. Monavale Queen Bess has certainly proved that her previous record was no freak, and she may now be considered as entitled to a place among the outstanding cows of the breed. Details concerning her breeding, &c., have been given in a previous number of the *Journal.*

The leaderships for the seven Friesian classes have now reached a standard of which the supporters of this breed may well feel proud.

While there are at present some excellent records in the making, it will be recognized that future changes must be slower in coming. The 1922 list is as follows :—

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd. for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Monavale Queen Bess	T. H. Richards, Cardiff	2 16	242·1	365	20,501·10	740·50
Senior Two-year-old.						
Netherland Princess 4th	John Donald, Westmere	2 341	274·6	365	19,621·60	805·77
Junior Three-year-old.						
Monavale Queen Bess	T. H. Richards, Cardiff	3 56	282·6	365	21,609·30	800·18
Senior Three-year-old.						
Manor Beets Daughter 2nd of Ashlynn	C. A. Hopping, Palmerston North	3 296	306·6	365	18,733·90	863·51
Junior Four-year-old.						
Westmere Princess Pietertje	John Donald, Westmere	4 156	329·1	365	24,199·00	939·78
Senior Four-year-old.						
Buttercup 3rd of Ashlynn	H. R. Green, Kairanga	4 305	344·0	365	20,694·25	833·26
Mature.						
Alcartra Clothilde Pietje	Vernon Marx, Mangatoki	7 355	350·0	365	31,312·50	1,145·24



ALCARTRA CLOTHILDE PIETJE (VERNON MARX, MANGATOKI).

Leader of the Friesian mature class. C.O.R., 1922 : 7 years 355 days ; in 365 days, 31,312·5 lb. milk, 1,145·24 lb. butterfat.

Friesian Class-averages.

The Friesians in the year under review show an increase in average yield over 1921 for each of the seven classes. This increase is most marked in the junior three-year-olds, where the average production has been increased by 78·16 lb. of butterfat. It will also be observed that in the junior four-year-old and mature classes the average production shows increases of 29·84 lb. and 29·34 lb. of butterfat respectively. It will be noticed that the senior four-year-olds are particularly strong, of the eight cows represented four producing over 600 lb., and two of these over 675 lb. — both of the latter being owned and tested by Messrs. H. North and Sons.

The total number of Friesians tested during the year was 168, as against 152 for the previous year. These 168 reached the enviable average yield of 13,498·5 lb. of milk, containing 468·31 lb. of butterfat, in an average lactation period of 345 days. To the end of 1922 a total of 879 certificates has been issued to Friesian cows. The average runs out at 12,829·70 lb. milk and 454·87 lb. butterfat in 341 days, with an average test of 3·55.

The tables of class-averages for 1922 and 1921 are as follows :—

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Fat.
	1922.		lb.	lb.
Junior two-year-old ..	67	343	11,421·1	404·32
Senior two-year-old ..	15	352	12,382·3	419·29
Junior three-year-old ..	14	358	15,779·2	528·94
Senior three-year-old ..	17	345	14,228·2	480·59
Junior four-year-old ..	9	346	14,361·6	508·51
Senior four-year-old ..	8	346	16,423·1	571·56
Mature	38	341	15,615·3	541·40
	1921.			
Junior two-year-old ..	36	336	10,485·5	382·85
Senior two-year-old ..	24	337	11,419·1	409·03
Junior three-year-old ..	16	333	12,714·3	450·78
Senior three-year-old ..	19	335	12,947·8	469·13
Junior four-year-old ..	8	327	13,566·1	478·67
Senior four-year-old ..	7	362	15,858·7	561·87
Mature	42	341	14,588·7	512·06

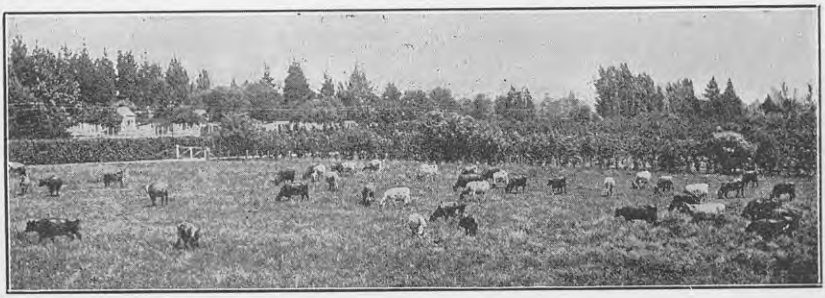
Friesian C.O.R. Bulls.

The Friesian certificate-of-record bulls now total fifty-three, and eleven of these gained their place on the list during the past year. These fifty-three bulls have a total of 395 certificated daughters, or over 50 per cent. of the Friesian cows which have qualified to date. The greatest number of daughters added during the year is credited to Woodcrest Joe, who had six names added to his list, making a total of eighteen. This places him second to Cliffside Laddie and King Segis Wild Rose Homestead, who each have nineteen certificate-of-record daughters. Woodcrest Joe is sire of Dominion Pauline, who produced 695·19 lb. butterfat, Dominion Jocrest with 639·48 lb., and many others whose records are of high merit when it is considered they were made

more nearly under ordinary herd conditions than is the case with most cows while under semi-official test. Following is a list of the bulls :—

Name of Bull.	Total of C.O.R. Daughters.	Number of Daughters qualified during 1922.	Name of Bull.	Total of C.O.R. Daughters.	Number of Daughters qualified during 1922.
Cliffside Laddie ..	19	0	Colonel Manor of Riverside	6	0
King Segis Wild Rose Homestead	19	0	Woodcrest Johanna Pontiac†	5	5
Woodcrest Joe ..	18	6	Royal King Champion†	5	5
Sir de Kol Inka Pietertje	16	1	Salma Torohunga No. 1†	5	4
King Fayne Segis 2nd	15	0	Rex de Kol of Sunnycroft	5	1
Paul Pietertje ..	13	2	Colantha Pietertje Count de Kol	5	1
Kruger 2nd ..	13	0	Dominion de Kol Domino	5	0
Woodcrest Hengerveld Mechthilde	13*	2	Colantha Johanna Lad	5	0
Prince Pietje Paxton	12	2	Dominion Dutchland†	5	2
De Kol Pontiac Burke	12	1	Dominion Domino Dutch Boy†	4	2
Longbeach Van Tromp	11	0	Longbeach Big Patch†	4	3
Mutual Piebe of Rock	10	2	King of the Black and Whites†	4	3
Nazli de Kol ..	10	0	Friesland Colantha Lad†	4	1
Grace's Netherland of Riverside	10	0	Medbury Prince† ..	4*	1
Mutual Piebe de Kol	9	0	Pareora Bindal† ..	4	1
Netherland King of Rosevale	8	3	Holland Queen Son†..	4	1
Longbeach Primrose League	8	2	King Alcartra Rose de Kol	4	0
Bainfield Dutchman ..	8*	2*	Colantha Johanna ..	4	0
Sir Colantha Korndyke Rag Apple	8	2	Indi Paul of Lakeside	4	0
Woodcrest Pietje Pontiac	7	2	King Segis of Friesland Park	4	0
Oak de Kol 2nd Homestead Fobes	7	0	Pietertje Boy ..	4	0
Edinglassie ..	7	0	Longbeach Dutchman	4	0
Rosevale Korndyke Sylvia Posch	6	2	Netherland King ..	4	0
Mutual Mercedes Pietertje	6	2	Rozine's Butter Boy..	4	0
Bainfield Prince ..	6	1	Longbeach Major ..	4	0
King of the Dominos	6	1	Oakwood Holland King	4	0
			Colantha Pontiac ..	4	0

* Also one second-class-certificate daughter. † Qualified during 1922.



MILKING SHORTHORNS AT RUAKURA.

MILKING SHORTHORNS.

Class-leaders.

The certificates gained by members of this breed during the period under review show one change of class-leadership. In the junior three-year-olds Matangi Nancy, owned by Messrs. Ranstead Bros., and with a record of 399·63 lb. butterfat, is replaced by Dominion Carnation of Ruakura, who gained a certificate for 439·20 lb. This increase of approximately 40 lb. brings the record for this class more in conformity with the production of the leaders of the remaining classes. Apart from Maniaroa Princess, leader of the mature class, the leaders for this breed have a fair way to go before the butterfat-production standards set by the other breeds are reached. It is pleasing to note, however, an upward tendency from year to year among the Milking Shorthorns.

The list of class-leaders for 1922 is as follows :—

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
Junior Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Peach Grove Lady Dinah 2nd	W. J. Slack, Otaki Railway	2 180	258·5	365	9,458·8	430·74
Senior Two-year-old.						
Birkland Dainty ..	G. N. Bell, Palmerston North	2 281	268·6	365	11,616·9	459·98
Junior Three-year-old.						
Dominion Carnation of Ruakura	Ruakura Farm of Instruction, Hamilton East	3 9	277·9	348	9,942·6	439·20
Senior Three-year-old.						
Terrace View Rosy 2nd	T. De la Haye, Ngawapurua	3 360	313·0	365	13,270·8	577·00
Junior Four-year-old.						
Matangi Jewel ..	Ranstead Bros., Matangi	4 6	314·1	365	12,524·4	509·45
Senior Four-year-old.						
Matangi Strawberry 2nd	Ranstead Bros., Matangi	4 351	348·6	365	12,774·6	473·50
Mature.						
Maniaroa Princess ..	Ranstead Bros., Matangi	*	350·0	365	15,951·7	700·76

* Mature.

Milking Shorthorn Class-averages.

As was the case last year, the majority of the classes for this breed are so sparsely represented as to make the class-figures of little value, on account of the influence of individual records. The mature class is again the strongest, but even this class has only eight members, as against twenty-seven the previous year, and the average yield has dropped by some 8 lb. of butterfat.

The best record of the year was made by Mr. D. Buick's Studleigh Nancy Lee. This cow has the very fine credit of 623·37 lb. butterfat from 17,177·5 lb. milk in 365 days. She is a mature cow, and had a previous record of 451·10 lb. in 341 days, also in the mature class.

The class-averages for the breed for 1922 and 1921 are as follows :—

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Fat.
	1922.		lb.	lb.
Junior two-year-old ..	6	358	7,681·4	314·27
Senior two-year-old ..	4	331	8,085·0	312·84
Junior three-year-old ..	4	326	9,238·0	378·51
Senior three-year-old ..	2	333	9,257·2	358·26
Junior four-year-old ..	2	340	9,569·2	368·14
Senior four-year-old ..	1	365	10,963·1	418·04
Mature	8	340	11,200·3	444·28
	1921.			
Junior two-year-old ..	3	365	7,700·7	352·81
Senior two-year-old ..	1	365	7,674·4	329·46
Junior three-year-old ..	3	313	7,836·3	291·72
Senior three-year-old ..	1	327	9,459·0	381·85
Junior four-year-old ..	1	356	10,845·3	392·53
Senior four-year-old ..	1	298	8,695·0	338·51
Mature	27	350	11,342·2	452·84

AYRSHIRES.

The number of Ayrshire cows which received certificates in 1922 was twenty-three, which more than doubles the number for the previous year (eleven). This undoubtedly is a creditable increase, but, unfortunately, it is by no means representative of the number of purebred Ayrshire cows in the Dominion. It is to be hoped that the number of tested Ayrshires will increase annually until the breed takes that place among certificate-of-record dairy stock which its number and quality warrant.

Some very meritorious yields were recorded during the year, eight of the twenty-three certificates issued being on productions of over 500 lb. butterfat, and two of these passing the 550 lb. mark. The best-producing Ayrshire of the year was Fancy of Armadale, owned by Mr. W. Hall, Lepperton. This cow commenced her test at almost eleven years of age—probably past her prime—and in 365 days gave 13,767·9 lb. milk containing 572·18 lb. butterfat. Mr. Fred Mills, the breeder of Alexandra of Waipapa, leader of the four-year-olds, was again prominent, his three entries all gaining certificates on productions of over 500 lb.

The twenty-three Ayrshires certificated during the year averaged 438·09 lb. butterfat from 10,448 lb. milk in 346 days. This should be encouragement for Ayrshire breeders to further their breed by placing more cows or heifers under test.

Ayrshire Class-leaders.

One change is recorded for 1922, in the two-year-old class Bright Smile 4th of Greenbank, owned and tested by Mr. W. Moore, Homebush, superseding Mr. C. E. C. Webb's Greenfield's Sprightly 2nd (507·87 lb.). The new leader commenced her test at an age some ten months younger than her predecessor, and her production of 519·62 lb. butterfat, it will be noticed, raises the previous record by about 12 lb.

Following is the tabulated list :—

Name of Cow and Class.	Tested by	Age at starting Test.	Fat req'd for Cert.	Yield for Season.		
				Days.	Milk.	Fat.
Two-year-old.		Yrs. dys.	lb.		lb.	lb.
Bright Smile 4th of Greenbank	W. Moore, Homebush	2 21	242·6	365	13,799·0	519·62
Three-year-old.						
Greenfield's Ina ..	C. E. C. Webb, Koputaroa	3 345	311·5	365	13,958·3	566·02
Four-year-old.						
Alexandra of Waipapa	F. Mills, Waipapa, Hawera	4 348	348·3	365	14,348·6	591·16
Mature.						
Milkmaid of Springview	A. H. Hansen, Te Rehunga	5 349	350·0	365	12,826·2	600·21

Ayrshire Class-averages.

The class-averages for 1922 are as appended. It should be stated that the eleven Ayrshires certificated the previous year were classified according to age in such a manner as to make it impossible to give a table of class-averages.

Class.	Number of Cows.	Average Yield for Season.		
		Days in Milk.	Milk.	Fat.
	1922.		lb.	lb.
Two-year-old	4	342	8,981·7	384·71
Three-year-old	6	348	8,679·1	368·27
Four-year-old	2	354	11,266·9	487·55
Mature	11	345	11,797·2	486·58

RED POLLS.

During the year eleven Red Poll cows received certificates. Of these, two gained certificates on second records, one on third, and the remaining eight for the first time. A total of twenty cows of this breed has received certificates to date. Particulars of their yields have been published from time to time, and readers will have noticed that several of these were very meritorious. So far none but the Central Development Farm, Weraroa, has tested animals of this breed. The eleven cows certificated in 1922 are comprised of six two-year-olds, one three-year-old, one four-year-old, and three mature animals. The six two-year-olds averaged 7,509·76 lb. milk and 337·10 lb. butterfat in 348 days, the three-year-old produced 370·48 lb. butterfat in 365 days, the four-year-old 416·01 lb. butterfat in 338 days, and the three mature cows averaged 10,655·0 lb. milk and 455·79 lb. butterfat in 322 days. Taken as a group the eleven animals had an average yield of 8,632·2 lb. milk, containing 379·68 lb. butterfat, produced in an average lactation period of 341 days.

SHORTHORNS.

The first issue of certificates to representatives of this breed, as distinct from Milking Shorthorns, has been made during 1922, five cows gaining first-class certificates and one a second-class certificate, all in the mature class. The average of the five first-class records works out at 422·38 lb. butterfat and 11,222·8 lb. milk in 331 days. The highest record was made by Mr. J. Bateman's cow, Ellesmere Lady Oswald 5th, with 532·58 lb. butterfat and 13,383·3 lb. milk in 365 days.

SECOND-CLASS CERTIFICATES.

It is pleasing to report that the number of second-class certificates issued during 1922 is an exceedingly small proportion of the total number of cows receiving certificates, which signifies that testing breeders are doing all possible to have their cows calve within the fifteen-month limit set by the rules for a first-class certificate of record. The second-class certificates issued during the year 1922 were as follows: Jerseys, fourteen ordinary; Friesians, nine ordinary and one repeat; Shorthorns, one ordinary.

APPRECIATION.

The Dairy Division desires to record once again its thanks for the help afforded by the secretaries of those breeders' associations co-operating in connection with the certificate-of-record testing. The work brings us in close contact with these officers, more particularly with Mr. W. M. Tapp, secretary of the New Zealand Jersey Cattle Breeders' Association, and Mr. M. J. Thomson, secretary of the New Zealand Friesian Association, because of the larger entries received from followers of these breeds. We have always found them untiring in their efforts to lighten our labours whenever called upon, which is many times a year. Not only the Dairy Division but the country as a whole owes much to the men who are endeavouring to improve the standing of the purebred dairy breeds in whose interest they are directing their energies. The Division is also appreciative of the assistance given by various co-operative and proprietary dairy companies in granting its officers facilities for testing milk-samples for butterfat. The Taranaki Producers' Freezing Company, at Moturoa, also kindly granted such facilities.

C.O.R. HEIFERS OF THE WERAROA RED POLL HERD.

PARASITIC WORMS OF LIVE-STOCK.

RECENT ADVANCES IN TREATMENT.

H. A. REID, F.R.C.V.S., D.V.H., F.R.S.E., Officer in Charge, Veterinary Laboratory, Wallaceville.

FOLLOWING the exceptionally wet summer through which we have passed, the prospect of more or less severe infestation of stock by parasitic worms calls for notice of some of the investigations which have recently been undertaken in the direction of effective treatment. Carefully conducted observations and scientific tests tend to show that many of the agents formerly employed as worm-destroyers have little actual value, and that they ought to be supplanted by drugs possessing greater potency. The patient studies of modern investigators have served to demonstrate the efficacy of some of these. Hall, Ransom, Cooper Curtice, Wilson, Wigdor, and Foster in America, and Veglia and Green in South Africa, to mention some of these observers, have each contributed important information on this subject, to which the writer acknowledges his indebtedness.

It is scarcely necessary to remind farmers of the detrimental and at times dangerous results which may follow infestation of the various species of domesticated animals with stomach and intestinal worms. Examples of the disastrous nature of parasitism are within the range of most stock-breeders' experience. Already in the present year some valuable thoroughbred horses have been lost through the fatal effects of round worms, and it is to be feared that during the autumn and winter months further losses embracing other classes of stock may occur. The object, therefore, of this article is to direct attention to the beneficial effects of certain drugs which, when judiciously employed, may be relied upon to achieve definite results. For the sake of clarity it is proposed to take in order the species of domesticated animals chiefly concerned, to mention some of the more important worm-infestations from which they may suffer, and to suggest the most suitable antidote.

HORSES.

Parasites of the Stomach.

The parasites in this situation with which New Zealand farmers are most familiar are the "bots." These represent the larval stage of the Oestridae or bot-flies belonging to the genus *Gastrophilus*. Of the eight species described, at least three are known to occur in New Zealand—*Gastrophilus equi*, *G. haemorrhoidalis*, and *G. nasalis*.

The question as to the seriousness or otherwise of infestation by these parasites is largely a matter of opinion. Some authorities affirm that bad or even fatal results may follow, while others are inclined to view the presence of bots with far less apprehension. The parasites live upon the tissue-juices, which they absorb from their host, and the lesions set up consist of a slight diffuse gastritis and localized ulceration over the area of the stomach, or, in the case of *Gastrophilus nasalis*, first part of the bowel (duodenum) occupied by the bots. Their sojourn

in these situations is purely temporary, for in the spring and early months of summer the larvæ become detached and are passed out with the dung, to undergo on the ground further development into flies. Should the horse be aged or suffer from broken or irregular teeth, or if feed be scarce, it is conceivable that the presence of bots may add to these disabilities and assist in promoting some degree of malnutrition. But in the writer's experience mortality traceable solely to this cause has not been met with. The obvious presence of the bots during post-mortem examinations has frequently led to conjecture on the part of laymen that the parasites are accountable for the death of the subject, whereas other more serious lesions which ultimately caused the mortality have been overlooked, either through failure to recognize them or through want of diligence on the part of the investigators.

The consideration that, practically speaking, no horse kept in country districts is altogether free from infestation—sometimes to a severe extent, as witnessed when holding post-mortem examinations on subjects dead from other causes—goes far to exonerate the bot from the charges made from time to time against this parasite, and to which medicine-vendors naturally lend support.

Treatment.—Horse-owners who may decide in favour of expelling these invaders of the equine stomach are recommended to employ carbon bisulphide in doses of 4 or 5 drams given in a capsule. Subjects should be fasted for twenty-four hours beforehand, and not allowed food or water for four hours after treatment. To aid in expelling the parasites a pint of linseed-oil may be given not less than two hours after dosage. If given earlier the oil retards the action of the drug. Larvæ of the *Gastrophilus equi* are effectively removed by this process. Those of *G. nasalis*, owing to their situation in the hinder part of the stomach and first portion of the small intestine, are somewhat less susceptible. Larvæ of *G. haemorrhoidalis* which have migrated to the large bowel will escape the action of the carbon bisulphide, though the oil purge will help to clear the bowel of their presence.

Parasites infesting the Bowels.

Of these parasites by far the most serious are the infestations due to round worms (or " wire-worms " as they are often called), known technically as strongyles or sclerostomes.

The two principal species are termed *Sclerostomum equinum* and *Sclerostomum tetracanthum*. *Sclerostomum equinum*, sometimes called the " armed strongyle " on account of the presence of " teeth " in the mouth parts, is a formidable parasite, not solely on account of any particular damage produced in the cæcum (or " blind gut ") and large intestine, where it is found often in company with the latter species, but from the fact that immature forms of this worm inhabit the blood-vessels, where they cause tumour-like enlargements, known as aneurisms. Fatal cases of colic, due to impediment of the circulation and rupture of the vessels involved in these complications, are a not infrequent source of mortality among horses infested by this parasite. *Sclerostomum tetracanthum* is less dangerous. Worms of this species encyst themselves in the mucous membrane of the bowel, but their embryos do not invade the circulation or create the grave lesions characteristic of the former species.

Infestation by wire-worms, apart from the secondary lesions, which may provoke a fatal termination, often sets up a severe form of anæmia and diarrhœa, which undermines the animal's constitution and sometimes ends in death.

Treatment.—To destroy and expel from the intestines the mature worms, American wormseed-oil (oil of chenopodium) is recommended by Hall, after carefully planned experiments to ascertain its reliability and superiority over drugs formerly used for this purpose. The plant from the leaves and seeds of which the oil is extracted is largely cultivated in Maryland, U.S.A. The variety used is known as *Chenopodium ambrosiodes* var. *anthelminticum*. On account of its objectionable taste and smell, and of the burning sensation it produces, it is best given in gelatine capsules; or it may be mixed with oil, care being taken to shake the bottle repeatedly during the dosage to prevent the oil of chenopodium from rising to the surface. The animals to be treated are fasted for thirty-six hours, and 4 to 6 drams of the oil of chenopodium are then given either in a capsule or in linseed-oil. In the former case it should be followed immediately by 1 to 2 pints of linseed-oil, or a physic-ball. Should one treatment fail, which may happen if the purging is not effective, an interval of eight days must elapse before the chenopodium is repeated.

In the case of *Sclerostomum equinum* the dosage will only affect the worms present in the bowel. The embryos entrenched in the walls of the blood-vessels will, of course, not be reached by the drug. Regular dosing and prevention of reinfection will, however, tend to reduce the danger arising from the presence of these immature forms.

To prevent reinfection among grass-fed animals is not always an easy task. Horses after they have been dosed should be removed from paddocks known to be infested. These should then be utilized for stock, such as cattle and sheep, which are unsuitable hosts for the sclerostomes, or the paddocks may be placed under cultivation.

CATTLE.

Stomach-worms.

Stomach-worms are sometimes accountable for serious outbreaks of disease among calves and young stock, characterized by profuse diarrhœa, wasting, and anæmia. These symptoms follow upon a diffused inflammation of the fourth stomach (abomasum), created by the presence of large numbers of the worms.

The worms responsible for setting up these changes are known as strongyles. They are round worms, and include, as a rule, one or more of the following species: *Haemonchus contortus, Strongylus convolutus, S. fillicollis, S. gracilis*, and *Tricocephalus affinis*. To the farmer the differentiation of species is a matter of little practical importance, since any of the worms just named may be implicated in causing the condition known as parasitic gastro-enteritis, an acute inflammation of the stomach and small intestines leading at times to heavy mortality.

Treatment will be referred to when considering these parasites in relation to the infestation of sheep.

SHEEP.

"Grub in the Head."

Judging by the number of inquiries which come to hand this trouble appears to be of fairly common occurrence among sheep in New Zealand. The so-called grub represents the larval form of the sheep-fly, *Oestrus ovis*. The fly is a small species of a greyish-yellow hue. It attends sheep while these are grazing during the warmer months of the year. The female fly deposits its eggs about the sheep's nose, whence they reach the nasal cavities and undergo transformation into larvæ. The larvæ often penetrate into the air-sinuses of the head, or, passing through the perforations in the upper part of the nasal bone, may reach the brain. After spending about ten months in these situations the larva attains maturity, and by its own movements gains access to the nostrils. The irritation set up causes the sheep to sneeze violently, by which act the larva is expelled on to the ground, where it undergoes further development into the mature fly. It is when butchering sheep and splitting open the head that these larvæ or "grubs" are sometimes discovered.

In this country, so far as can be ascertained, little trouble is attributed to the attacks of the fly, but in Europe sheep are stated to suffer severely from the effects of this pest. The symptoms, apart from the annoyance and distress caused through the female fly seeking to deposit her eggs, consist of convulsions, vertigo, circular movements, discharge from the nostrils, and occasionally difficulty in breathing. The writer has been unable to observe severe manifestations of this nature. In this country, at any rate, examples would appear to be rare.

In countries where the presence of the fly assumes menacing proportions endeavours to prevent attacks are made by smearing the sheep's nostrils with pine-tar or other fly deterrent, and by avoiding grazing in summertime in proximity to trees and scrub which may harbour the fly. Shepherds are also in the habit of administering snuff or similar irritant powders to induce fits of sneezing and aid in expelling the grubs. Measures of this nature would only be practicable among small flocks such as are owned by the peasant farmers of European countries. On a larger scale such efforts at protection, which at best are only of very limited value, would rightly be regarded as impracticable, nor under existing conditions in this country do they appear to be necessary.

Flukes.

These leaf-shaped worms, which are sometimes present in the livers of sheep and less frequently in cattle, occur in certain parts of New Zealand, though they are not a common cause of serious trouble. In Europe and elsewhere infestation with these parasites produces the disease known as "liver-rot," which in certain seasons is accountable for very heavy losses.

The liver-fluke needs for one stage of its development a suitable species of fresh-water snail. The trouble is therefore dependent upon the existence of this particular intermediate host. Pastures on low-lying, badly drained land, or where sluggish watercourses or ponds exist, offer conditions suitable for the snail and the propagation of the fluke.

Preventive Measures and Treatment.—Preventive measures are of first importance. These consist of draining, liming, and salting the pastures to render them unfavourable for the snails. With this object also in view watercourses and ponds may be subjected to the action of sulphate of copper. It is stated that sulphate of copper in solution of one part to 1,000,000 parts of water, or 1 oz. to 7,800 gallons, will prove effectual in this respect.

French authorities advise dosing infested sheep with ethereal extract of male fern. One tablespoonful of the male fern is given in a tablespoonful of olive-oil on five consecutive days. The practical difficulties attending this line of treatment when attempted on a large scale are apparent. In the earlier stages of the disease, which are difficult to detect, medicinal treatment might prove effectual, but when once marked symptoms such as wasting, dropsy, and anæmia appear it is doubtful whether internal medication could possibly save subjects suffering from extensive fluke invasion.

Stomach-worms.

The complaint known as parasitic gastro-enteritis is apt to cause heavy losses among lambs and sheep, particularly during the late autumn and winter months. Sheep become infested through consuming herbage or water contaminated by the droppings of sheep or cattle harbouring the worms responsible for setting up this condition. These worms correspond with the species mentioned in relation to the stomach-worms of cattle, with, in addition, a species known as *Strongylus cervicornis*. These latter are so small as to easily escape casual observation. They may, however, be demonstrated in freshly slaughtered animals by examining a little of the contents of the abomasum and a scraping of the mucous lining spread on a piece of glass, for preference with the aid of a hand-lens against a dark background. The round worm (*Haemonchus contortus*) frequently predominates, though several different species can usually be recovered from typical cases of the complaint.

Treatment.—A successful form of treatment devised by Cooper Curtice, of the Zoological Division, United States Bureau of Animal Industry, consists of drenching lambs and ewes at regular intervals with a mixture of bluestone (sulphate of copper). The following directions extracted from the *Journal of the American Veterinary Medical Association* are descriptive of the method employed :—

The stock solution : A stock solution is prepared as follows : Coarsely powdered bluestone, 1 lb. ; boiling water, 2 quarts. Add the bluestone to the water and dissolve it completely. Replace any water that evaporates to make a total of 2 quarts. Store in glass or stoneware, tightly stoppered. This will keep indefinitely, and when diluted for use is sufficient for 400 doses. *This is a stock solution and must not be administered in this strength, for it will kill sheep.* It must not be allowed to lose water by evaporation.

Dilution for use : For use 3 quarts of water are added to 4 fluid ounces of the stock solution for each twenty-five head of sheep to be dosed.

Apparatus : The apparatus needed consists of one 4 oz. glass graduate, one graniteware quart measure, one graniteware gallon measure, and one drenching-tube. A baby's graduated nursing-bottle may be used instead of the graduate and tube, but it is not so convenient, and it takes more time. The drenching-tube consists of three pieces fitted together in this order : A hard or flexible rubber or graniteware funnel, a 3½ ft. rubber tube, and a 6 in. brass tube. The calibre of the rubber tube is ⅜ in. ; the brass tube and the funnel fit into it. The outside diameter of the rubber tube is ⅝ in. A thinner tube has proved less convenient to handle and less durable.

The dose: The bluestone is used only after dilution by the addition of water to the stock solution. Four fluid ounces of the diluted solution are given to each sheep weighing 80 lb. or over. The weight of the sheep may be estimated, but the doses are measured accurately, not guessed at. For a lamb of 60 lb. a dose of 3 fluid ounces and for a lamb of 70 lb. 3½ fluid ounces is used. It has been found unnecessary to take the sheep from the pasture until a short time before dosing. A convenient small pen is prepared either within or next to a large one, so arranged that a few sheep may be driven in quickly and individual sheep released outside after dosing.

Dosing the sheep: Two persons are necessary to give the dose. One straddles the sheep, holds its muzzle with one hand, and inserts the tube 4 in. into its mouth with the other. The other person measures the dose, holds the drenching-tube, and pours the dose into the funnel. Backing the sheep into a corner helps to steady it. The sheep should remain standing with its head nearly horizontal, and care should be taken not to choke or strangle it. Plenty of time should be allowed for it to swallow. Moving the tube in the mouth often aids in getting the sheep to swallow. More than fifty sheep may be dosed in an hour by experienced operators, but *carelessness and haste are dangerous and must be avoided.* The dosing should preferably be done under competent veterinary supervision. In any case it should not be entrusted to inexperienced or naturally careless persons.

Time of dosing: All sheep on the farm except young lambs are dosed regularly every four weeks throughout the year, but pregnant ewes are not dosed within two weeks of lambing. The dosing of the ewes is renewed at the next regular dosing date after lambing. If for any reason it has been necessary to change the date of dosing, a slightly earlier day has been chosen rather than a late one. Sheep occasionally have been dosed one week after a previous dosing without apparent harm. Under such circumstances the next dose follows in four weeks. During the growing-pasture season three-week intervals between doses are better than four-week intervals. The regular dosing of lambs is begun as soon as they are weaned.

Within the last two years the writer has had experience of a very severe outbreak of parasitic gastro-enteritis affecting a flock of ewes, which led to the death of a fair proportion of the animals attacked. The worm chiefly responsible proved to be *Haemonchus contortus.* More recently a similar outbreak affecting goats came under observation. Both these outbreaks were dealt with medicinally by the method adopted by Veglia and Green in South Africa, and referred to in the reports of the Director of Veterinary Research, Union of South Africa, 1919. This method combines the copper-sulphate treatment of Cooper Curtice, with the addition of arsenite of soda. The chemical combination of these two drugs is soluble only in an acid medium—a condition met with in the abomasum, the seat of the worm infestation, but not in the other three compartments of the stomach. The average dose for fully grown sheep is 2 grains of the arsenite of soda with 10 grains of copper sulphate, given as an electuary made up with treacle. Lambs and hoggets should receive proportionally smaller doses.

In practice a quantity of the solution is prepared sufficient for, say, one hundred sheep, as follows: Arsenite of soda, ½ oz.; sulphate of copper, 1½ oz.; hydrochloric acid, ½ oz.; water, 1 quart; violet dye sufficient to colour the solution. The dye is added to give character to the poisonous solution and to prevent its accidental use for other purposes. By staining the mouth parts of the sheep it also enables dosed to be distinguished from undosed animals.

Average doses of the mixture are as follows: Lambs two to four months, 45 minims; lambs four to six months, 1 dram; lambs six to ten months, 1½ drams; two-tooth sheep, 2 drams; full-grown sheep, 2½ drams. The dose should be given for three consecutive mornings, and repeated three times at intervals of a fortnight, and then three times at one-month intervals.

Precautions to be observed: The dosage should be carried out, if practicable, after eighteen hours' starvation, and the first feed should be given four or five hours after the dose. When the arsenical mixture is used, salt in any form, such as salt licks, should be withheld, and water should not be allowed for some hours after the dosage. A graduated syringe is recommended for administering the dose, which should be slowly injected into the mouth while the animal is in the standing position. An assistant to hold the sheep is necessary. Great care should be exercised to avoid the dose "going the wrong way." Should a fit of coughing occur, the head must be at once released, as if any of the mixture should reach the lungs the results may be rapidly fatal.

We have found this system of treatment highly successful, and prefer it to the copper-sulphate-alone method.

Preventive Measures.—These include, if possible, complete change of pasture. The sheep must be removed from the contaminated area, which must remain empty or be used for grazing horses for not less than a year. Infested pastures may, as an alternative, be ploughed and cultivated, and the crops fed off by sheep. Drainage, liming, and salting are also indicated as means to be resorted to in combating the persistence of ova and embryos of the worms. The sheep should be dosed before being placed on fresh pasture-land, otherwise this in turn will soon become heavily contaminated. If possible, extra feed, particularly in winter-time, in the shape of a daily ration of crushed oats, chaff, and crushed linseed cake, should be fed from troughs. An allowance of hay fed from racks is also advisable.

Although we have not yet had the opportunity of trying either of the above methods of treatment on cattle affected with parasitic gastro-enteritis, it is reasonable to suppose that they would be equally effective, the doses in the case of calves of six months and upwards being increased to double the amount recommended for sheep. The general measures regarding precautions to be observed and prevention of reinfection would, of course, apply in the case of either species of ruminant.

SWINE.

Pigs often suffer severely from the presence of round worms in the bowel, causing scouring and loss of condition. Young pigs, which are more susceptible to the ravages of parasitic worms, receive a severe set-back and sometimes remain stunted and unthrifty-looking on account of the damage sustained by the digestive organs in earlier life through worm infestation.

Prevention and Treatment.—Pigs are exceedingly awkward animals to handle, and regular dosing with medicine involves so much time and trouble that few farmers can be expected to follow up this line of treatment. Prevention of infection therefore becomes all the more important. A system advocated by Ransom and Raffensperger in America recommends that before farrowing sows should be carefully washed to remove dirt and any adherent worm-eggs, and then placed in a thoroughly clean farrowing-pen. Two weeks after farrowing the sow and pigs are pastured on clean ground which has been cultivated and sown in fodder crops. There they are kept for a period of about four months. This system ensures relative freedom from worm infection during the most

susceptible period of the pig's existence. Cleanliness of the sties and runs should receive constant attention, in order to avoid the ground becoming fouled with excrement which may contain the worms or swarm with their ova.

As regards medicinal remedies, the results obtained by dosing with oil of chenopodium are said to be very satisfactory. About 2 drams of the oil should be given, after fasting twenty-four hours, in 2 oz. to 4 oz. of castor-oil, in which it must be well shaken up. The mixture can be conveniently prepared for use by adding to the oils a few drops of liquor potassæ, a teaspoonful of sweet spirit of nitre, and a ¼ pint of water. This mixture when well shaken up forms a creamy emulsion which is easily poured from a bottle or tin drenching-can. During medicinal treatment the pigs should be kept in a sty, and not allowed to roam on clean pastures. After the medicine has acted, the sty should be thoroughly cleaned out with the aid of boiling water and washing-soda.

LUCERNE-GROWING IN VINCENT COUNTY (CENTRAL OTAGO).

W. D. REID, Biological Laboratory, Wellington.

THE following notes relate solely to lucerne grown in Vincent County (Central Otago), an extensive area comprising many types of soils and a number of farming systems, and conspicuous by possessing the lowest rainfall of any part of New Zealand. Of the total of approximately 2,000 acres of lucerne examined—which represents nearly the entire acreage under that crop in the county*—it is interesting to note the average areas grown by the respective types of farming in relation to the acreage of the holdings. Thus orchards have 1 acre of lucerne to 18 acres of holding; general farms of under 1,000 acres have 1 acre to 15 acres of holding; small grazing-runs of 1,000 to 20,000 acres grow 1 acre to 250 acres; and the pastoral runs over 20,000 acres grow 1 acre to 10,000. From this it can be seen that up to the present it is only on the farms of under 1,000 acres that the real value of lucerne is adequately recognized, although the crop is admirably adapted to all classes of holdings in the county.

Lucerne has been established in this district for more than twenty-five years, but it is only within the last seven or eight years that the bulk has been laid down, and, except on orchard holdings, the areas of this important crop must increase enormously with the extension of irrigation, bringing, as it will, dairying and closer settlement to many parts of the county. Lucerne has been easily and successfully established on all classes of soils in the district, but is as yet restricted to isolated portions of the river-valleys, terraces, and the mountain foothills. There are many thousands of acres where excellent lucerne stands could be cheaply established, and the yields even from non-irrigated fields are so satisfactory that a real extension of lucerne-growing in Vincent County could easily double the number of stock carried.

* As estimated by Mr. R. B. Tennent, Instructor in Agriculture, Dunedin.

ESTABLISHMENT.

In most cases the lucerne-paddocks are ploughed just previous to sowing, from virgin ground which in its natural condition carries about one-third of a sheep to the acre and is but scantily covered with storksbill (*Erodium cicutarium*), annual fescue (*Festuca myurus*), and poa tussock (*Poa caespitosa*). Where irrigated grass and fescue-tussock (*Festuca novae-zelandiae*) paddocks have been utilized, the ground is broken in the spring and worked up rapidly if for immediate sowing, or fallowed if sowing is held over till the autumn or spring of the following year. On the non-irrigated virgin ground a seed-bed is readily produced, after ploughing, with one stroke of the disk harrow, one with the spring-tooth cultivator, and one with the tine harrow, while sometimes even less cultivation than this is given. Very occasionally paddocks have been roughly graded to assist in the later irrigation or haying, but on the whole it is not the practice to select or work areas to facilitate later management of the crops. From the foregoing it can be seen that successful results follow even where very little labour is expended in producing a seed-bed.

Of the crops 85 per cent. have been spring-sown (September and October), the spring sowings being earlier than in any other part of New Zealand, and the remainder in March. Although the early growth is sometimes retarded by weeds or autumn frosts, recovery is general, and no noticeable difference exists between the established crops of the respective sowings.

Some 59 per cent. of the crops have been pure seedings ; 24 per cent. have been sown with oats ; and 17 per cent. sown with grass mixtures, red clover, or wheat. When the lucerne is sown with oats (2 bushels per acre) the growth is retarded in the first season, but this method of establishing two crops from the one working and sowing apparently does not affect the final stand of lucerne. This only indicates that in Vincent County, at any rate, lucerne is the easiest of any permanent crop to establish successfully. Where red clover is sown in conjunction with lucerne 2 lb. to 4 lb. of clover-seed is used, and the clover dies out in two to three years. It gives an early and luxuriant growth, but this does not injure the subsequent development of the lucerne. Where sown down with grass (say, 7 lb. lucerne, 8 lb. cocksfoot, 10 lb. rye-grass, and 2 lb. white clover per acre) the aim is to produce a permanent sward with lucerne as the dominant clover, to be used either solely for grazing purposes or for occasional hay-production followed by winter grazing.

Practically the whole of the lucerne crops are broadcasted, with an average seeding of 14 lb. per acre, either by hand or with a hand machine, and tine-harrowed in, as in this dry district comparatively deep burying of the seed is not harmful. The rate of sowing has ranged between 5 lb. and 23 lb. per acre, and even with the lower amount satisfactory stands have resulted. There is a general opinion, however, that from 10 lb. to 14 lb. represents the most suitable quantity to use. Marlborough and Hunter River are the usual varieties sown, and although others have been tried they have not justified their use even for special conditions.

Manuring is not practised, and applications of lime and inoculated soil are uncommon. Where such methods have been adopted the stands of lucerne do not show any improvement over the non-treated

FIG. 1. PORTION OF A 50-ACRE LUCERNE-FIELD AT BANNOCKBURN (HOLLOWAY BROS.).

Crop mown, with haymaking operations in progress. Kawarau River in middle distance.

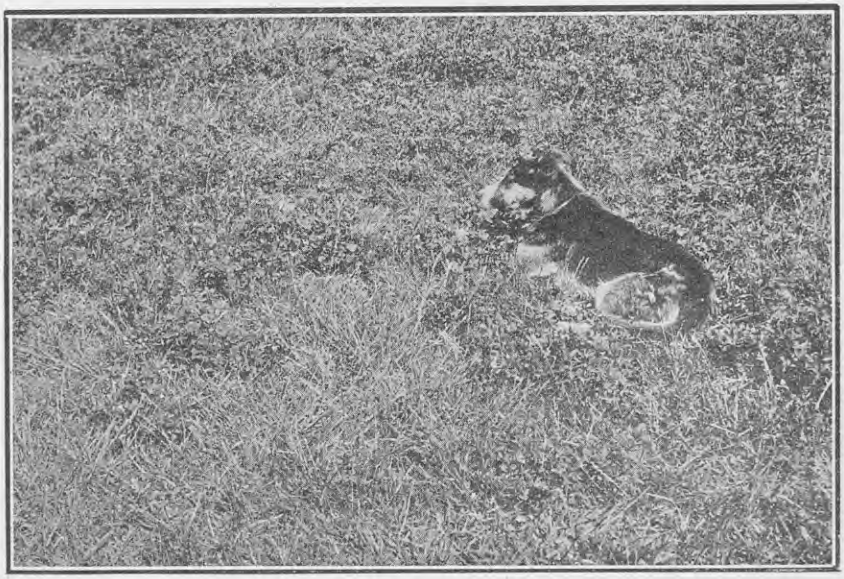


FIG. 2. LUCERNE AND GRASS MIXTURE (A. CROMBIE, BANNOCKBURN).

Sowing five years old when photographed.

[*Photos by W. D. Reid.*

areas, and in most non-inoculated crops nodule development is abundant. It would appear as if lime or inoculated soil would only be necessary in exceptional circumstances, and none of the crops at present growing on the various types of soil indicate these requirements.

Throughout the district good strikes are general under all systems of sowing, and even where poor germination or growth has occurred in the first season later irrigation or rainfall has generally improved the stand. A few farmers have failed to establish the crop even where the strike was excellent, but in all these cases the young crops have been mismanaged by spring stocking, continual stocking, or sowing with a feeding-off crop such as rape.

THE FIRST SEASON OF GROWTH.

As regards the first season of growth, no universal system of treatment exists, but the procedure here described more or less holds good, particularly in regard to the spring sowings. The autumn sowings possibly receive an irrigation after establishment, but otherwise they are not worked until the following spring, when the treatment is similar to that of established crops.

In the case of spring sowings where water is available the crop is irrigated when it has attained a height of 5 in. to 6 in., in November or December, and with pure sowings the applications of water are repeated every four to six weeks of the growing-period, such applications usually coinciding with those made on the established areas. With combined oat-sowings the second irrigation is given before the cutting of the oats—in January or February—for chaffing. Approximately one-third of the stands have not been irrigated during the first season, comprising the crops of the non-irrigated areas and those for which water has not been available in the first season of growth. It is the practice, however, to irrigate during the first season when water is available.

Of the pure sowings about 50 per cent. have been cut when 5 in. to 6 in. in height and the growth left on the ground, the idea being that it acts as a mulch, and in the dry climate of Vincent County this method is probably advantageous. If the young growth contains a large amount of weeds, or if vigorous weeds such as Californian thistle or fat-hen be present, several cuts are made during the first season and left to wither on the ground. Where the first cut is sufficient to retard the weeds, subsequent growth is occasionally removed as a small cut of hay, but more often the stand is summer-grazed during its first season. It must be remembered that what is now being stated is not advice as to how the crop should be treated, but is merely an account of what is done. The writer is well aware that in many districts grazing in the first season to anything like the extent practised successfully in Central Otago would be harmful. About 25 per cent. of the stands have not been cut at all in the first season, but have been autumn-grazed, and in approximately another quarter of the stands where the weed-content has not been high the crops have been cut for hay in February and the later growth grazed.

In the oat-sowings the growth of lucerne arising after the harvesting of the oats is occasionally cut for hay, but autumn grazing is more usual. The early treatment of the lucerne and grass mixtures is similar to the foregoing in that they receive periodic irrigations, and when weeds become aggressive are run over with the mower; they are also autumn-grazed during the first season.

FIG. 3. LUCERNE AND CALIFORNIAN THISTLE.

In foreground, established lucerne cut for hay. In background, thistle area in which lucerne is establishing.

FIG. 4. SMALL LUCERNE-PLANTS IN CALIFORNIAN THISTLE AREA SHOWN IN FIG. 3.

[*Photos by W. D. Reid.*

METHODS OF IRRIGATION.

Although a large number (approximately 25 per cent.) of the lucerne stands are at present being maintained without irrigation and are yielding quite excellent crops, the application of water is a great factor in securing heavy yields. The bulk of the irrigation water is obtained from small privately owned races of local origin, but the large irrigation systems of the Public Works Department and private companies will be the main future sources of water necessary for extension of the more intensive farming systems.

The methods of application of water to the crops are simple, though with the small amount of water available at one time more or less constant attention is required to obtain even distribution. So far little is known as to the amount of water required or received by the crops, and as the soil conditions, slope of the fields, and the water-supply are extremely variable no two crops are treated alike. In one or two cases the fields have been graded to facilitate irrigation and working, but although different slopes of country require different irrigation systems the general method is to distribute by gravitation races and finally by plough-furrows. The farmers prefer a large quantity of water to rapidly flush the paddocks, but it is doubtful whether this method is more efficient except on graded slopes and gravel or sand formations, where natural drainage is possible. On the comparatively level paddocks of silt formation, particularly those with slight hollows, over-irrigation frequently takes place. When it is considered that water equal to 140 in. of rainfall is often applied in a growing season it is obvious that good drainage of at least the upper soil is essential for the health of the lucerne. On an average, however, where a large quantity of water is available, about 60 in. is supplied, and it is clear that this is far more than sufficient for maximum-crop production, particularly on the clayey loams.

Lucerne-fields up to 20 acres in extent receive two irrigations for each cut of hay, but on the larger areas of 40 acres to 60 acres a long time is taken to flood the whole crop, so that on the large fields it is more practicable to apply only one irrigation for each hay-cut. For example, one farmer requires nine days to irrigate 50 acres with 3 heads (cusecs) of water. On a few small paddocks as many as three to four irrigations are given for each cut, and on others where the water-supply is limited the crops receive only one or two irrigations in the season. It will thus be seen that there is no regular or uniform system in applying water.

MANAGEMENT.

Lucerne-fields are closed for the first hay crop in late August or early September. The first cut is taken off at the end of November, and averages about $1\frac{3}{4}$ tons of hay per acre. This spring growth is comparatively slow, and contains a large proportion of weeds, such as rye-grass, mouse-eared chickweed, rib-grass, and Poa pratensis, which, however, generally give no further trouble in the succeeding cuttings. On the small areas it is not uncommon to secure three further cuts during the season; but more often two further cuts are taken on irrigated stands—one during the middle of January averaging about $1\frac{1}{2}$ tons of hay, and the other at the beginning of March averaging about $1\frac{1}{4}$ tons. A fair amount of growth takes place in March and early April,

when the fields are heavily stocked until they become somewhat closely eaten down, at which time most of the stock is removed, but a certain amount of continuous grazing is carried out until the fields are again closed for hay. Although the winter months are a period of non-growth of lucerne, the stands are utilized for the weed and grass growth they produce.

Where hay feeding is carried out during the winter on the lucerne-fields the stocking may remain heavy during the whole period, but, in general, hay feeding is carried out on grass-paddocks, and the lucerne-fields are not utilized for this purpose. Owing to the light rainfall of the district (14 in. to 18 in. yearly) the haying process is comparatively short and certain, generally occupying four days—cutting on the first day, raking into windrows on the second, cocking on the third, and

FIG. 5. SUMMER GRAZING OF A LUCERNE-FIELD AT NORTHBURN STATION (D. MIDDLETON).

This field is irrigated occasionally. Poa tussock in foreground.

[*Photo by W. D. Reid.*

stacking on the fourth. On the large areas the process is a three-day one, by replacing the two days of raking and cocking by one day in the swath.

From the estimates given about 4½ tons of hay would appear to be the average annual yield of irrigated lucerne in Vincent County, but, of course, there is a good deal of variation, depending on the condition of the stand and the elevation. Some average clean irrigated stands, the hay from which has been baled and weighed, give a fairly exact idea of the return as follows: 200 tons hay from 50 acres (three cuts), 42 tons from 10 acres (three cuts), 33 tons from 6 acres (three cuts). To these yields must be added the autumn growth, which is possibly equal to half the final hay-cut.

FIG. 6. AN AVERAGE FIRST CUT OF LUCERNE, BUT SHOWING EFFECT OF OVER-IRRIGATION IN HOLLOW.

FIG. 7. OVER-IRRIGATED LUCERNE, WITH REPLACEMENT (IN FOREGROUND) BY POA PRATENSIS AND RYE-GRASS.

[Photos by W. D. Reid.

The hay obtained is the main winter feed on the farms, and although in one or two cases it is sold for local consumption the quantity available is rarely sufficient for the adequate feeding of the stock on the holdings, particularly on the larger runs. One of the most valuable uses of lucerne hay in Vincent County should be for the feeding of ewes during winter, and were sufficient lucerne grown for this purpose many of the holdings could turn off large numbers of fat lambs. Only on a few of the holdings are large flocks of sheep systematically fed with lucerne hay during the winter, but where this practice has been adopted it has given excellent results. In one instance the hay from an area of 50 acres supports approximately 2,500 ewes in lamb for a little over two months, representing a consumption of about 3 lb. of lucerne hay per day during that period when feed is scarcest. In this particular instance 50 acres of lucerne support the sheep for two months of the year, while 11,000 acres are used to support them for the remaining ten months. Can there be any more striking example of the value of lucerne in increasing the meat and wool production of the country?

Most of the crops are used solely for hay-production, but many growers, including those who sow a lucerne and grass mixture, either use the fields for grazing alone or for a spring hay-cut followed by either continuous or periodical grazing. The latter system of treatment—one hay crop followed by grazing—is the common manner of dealing with the non-irrigated areas of lucerne, which, though not so productive as the irrigated crops, could be grown much more extensively and with profitable results on the low river-banks and much of the lower slopes of mountain-ranges. The lucerne-grass paddocks suit admirably for both grazing and hay purposes, but if continuously grazed the lucerne is gradually killed out and the paddocks require renewing every eight or nine years. On the other hand, when spring growth is not stocked up to the time of the first hay-cut—and this applies to all lucerne areas in Vincent County—the lucerne remains permanent and dominant. As these grazed lucerne-paddocks are used in conjunction with grass pastures, no reliable figures of carrying-capacity are obtainable.

For the most part the lucerne stands are not cultivated, and are comparatively free from weeds, but the more common growths in the irrigated crops are Poa pratensis, rye-grass, white clover, red clover, mouse-eared chickweed, cocksfoot, dock, rib-grass; and in the non-irrigated areas storksbill, chickweed, goose-grass, barley-grass, sterile brome, and rye-grass. These are found in all crops in varying amounts, but only where either grazing methods or over-irrigation have been practised are they at all dominant. Where the weed plants have become aggressive a few growers have resorted to winter and "between cuts" cultivations with spring-tooth cultivators and toothed disk harrows, and under the ordinary conditions of haying, moderate irrigation, and reasonable stocking, successful results have been obtained. On the other hand, fields which have been spring-stocked instead of being hayed, or over-irrigated, do not respond to cultivation, but are apt to become badly infested with Poa pratensis.

CONDITIONS LEADING TO DETERIORATION

The conditions which lead to deterioration of the stands can be briefly summarized as follows:—

Spring stocking or continuous stocking: Areas, both irrigated and non-irrigated, which have been kept stocked during the period of the spring growth rapidly deteriorate; weeds become dominant, and thorough working of the ground and renewal of the stand by seeding finally becomes necessary. On the other hand, the closing of the fields from September to the beginning of December, and then cutting for hay, nearly always guarantees a permanent high-producing stand.

Over-irrigation: This condition, with which is intimately connected poor drainage, soon causes a weakening of the lucerne and its final replacement by grass and weeds. In Vincent County there are many examples of much of the lucerne having been replaced by a more or less continuous turf of Poa pratensis and rye-grass. On many of the clay silts where hollows are present and the surface water cannot readily be removed this condition most frequently occurs, and is often accompanied by a spreading lucerne root-system within a few inches of the surface.

THE RELATION OF BIRDS TO AGRICULTURE IN NEW ZEALAND.

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I. INTRODUCTION.

THE visitor to Salt Lake City, the capital of Utah, is impressed by a monument occupying a prominent position in the town. It is in the form of a simple Doric column surmounted by a granite sphere on which two white seagulls are in the act of alighting. On the base of the column is the legend—

SEA-GULL MONUMENT

ERECTED IN GRATEFUL REMEMBRANCE OF THE MERCY OF GOD TO THE MORMON PIONEERS.

In 1848, when the crops on which the early settlers were entirely dependent for the next season's food—crops nursed with infinite labour on an almost untouched desert—were threatened with total destruction by a plague of the black, short-winged grasshoppers (*Anabrus simplex*), ever since known as "Mormon crickets," huge flocks of gulls from breeding-places on islands in the lake descended on the infested fields—a veritable angelic host to the anxious settlers—and left scarcely a grasshopper alive.

One sometimes wishes a few such spectacular demonstrations of the value of our birds to agriculture could be arranged in New Zealand for educational purposes. The New Zealand farmer is a very staunch supporter of the adage that "seeing is believing," and, unfortunately, the absolutely indispensable services of bird-life are in this country almost entirely overlooked. In North America "the general utility of birds in checking the increase of injurious animals and plants is well understood"; in England and in Europe generally the value of birds is widely admitted; in Australia there is a rapidly growing recognition of the services rendered by them; but in New Zealand, although an exceptionally enlightened Government early saw the need for the wholesale protection of the indigenous birds, this was due rather to the

scientific interest and uniqueness of the Dominion's bird-life than to an estimate of its economic importance. New Zealand has long been accustomed to the idea of bird-protection (though in only too many backblock districts the laws have even been forgotten), but there may be a tinge of novelty in the conception that *bird-protection pays*. By this is meant not only protection in the passive sense as understood in the Dominion—the mere refraining from killing—but an active protection against enemies, and a provision of nesting-sites, nesting-boxes, and of food when scarce—a return, in fact, to the customs of older, more leisurely days and countries, where no corn was harvested without the hoisting of at least one sheaf on a pole as winter food for the birds. The writer is well aware that such proposals in the present state of public knowledge on the question almost savour of the ridiculous; nor would some of them, under New Zealand conditions, be either necessary or desirable.

In the foregoing it will be noticed that the writer speaks of birds as a whole, generally and indefinitely, as though they were nearly all beneficial to man and his work. That is precisely the conclusion the writer wishes to demonstrate—that so far as the indigenous birds of New Zealand are concerned, with one possible exception, all are either beneficial or entirely harmless. With regard to the foreign birds introduced through misplaced sentiment or through fallacious opinions regarding their habits, although complaints have been received of practically every species except the hedge-sparrow, it will be immediately suspected from the foregoing remarks that in so far as concerns their relations to man and his crops they are by no means so black as they are painted. A case might be made out for even the house-sparrow. Many of the imported birds, other than game-birds, were introduced at a time when native pests, increasing phenomenally owing to the tremendous access of new food-supply in the shape of crops and to the driving-away of their natural enemies, the birds, by the burning of forest covert, were placing the early settlers in desperate straits. It must be admitted that to a certain extent they saved the situation, and that the present freedom from such wholesale infestation is in part due to their continued activity.

The protection of the indigenous birds of New Zealand is a matter which calls for the co-operation of every citizen of the Dominion. It is justified on the grounds of scientific uniqueness, of a wholesome sentiment, and of economic value. We are urged to the task by our duty to posterity, by our feelings, and by our pocket. Without the strong backing of enlightened public opinion laws are ineffective. In the very places where the birds are most in evidence the laws are the most difficult of enforcement.

It is hoped in a few popular articles in the *Journal* to demonstrate the general value of birds to man, and to examine all the commoner birds of New Zealand, both introduced and indigenous, to ascertain the specific part each plays in the struggle between the agriculturist and his environment.

The total number of species of wild birds in New Zealand is 234. Of these 209 are indigenous and the rest introduced. If from the indigenous birds we subtract firstly those which are far too rare to enter into economic relation with man, and secondly those, like certain

ocean-ranging species, whose haunts are distant from inhabited areas, we have, with the 25 introduced species, a total of 109 species of birds which are to be considered of more or less economic importance in New Zealand.

The relationships of birds to man may be classified as follows (taking no account of æsthetic values) :—

Beneficial : By destroying animal pests of crops or useful plants, or of domestic animals; destroying vegetable pests or weeds; distributing seeds of useful plants; supplying sport; supplying food; pollinating useful plants.

Injurious : By direct injury to man; direct injury to man's domestic animals; destroying or devouring crops or useful plants; destroying beneficial insects; injury to man's game animals; distributing seeds of weeds.

Of these the role of destroying the insect pests of crops and other useful plants is overwhelmingly the most important phase of bird activity. A noted author has drawn attention to the fact that in the economy of nature the two classes of animals which have attained the most complete mastery of the air—namely, the birds and the insects—are pitted against each other, and so delicate is the balance of power that were it not for birds insects would clear the vegetation from the face of the earth. When we remember that, according to Huxley's moderate estimate, the progeny of one female plant-louse or "green-fly" allowed to multiply unchecked for one year would produce a mass of plant-lice exceeding in bulk the population of China, and when we reflect that birds are the chief factors in preventing this result we are in a better position to estimate the importance of bird-life.

As was stated earlier, the vast majority of the birds are beneficial; but in the case of many of the introduced birds the pros and cons must be considered with care. Where the activities of a given species come under both beneficial and injurious categories it is very difficult to eliminate the personal equation. There are some birds which should be protected and encouraged in every possible way, while there are others which are beneficial when present in limited numbers, but apt to become injurious when unduly numerous. Others, again, are injurious in one district or at one season, and beneficial at another. Several kinds of birds, for example, do splendid service for the greater part of the year, but incur the emphatic condemnation of the fruitgrower during the brief period in which the fruit is ripe. It is hoped to keep the present inquiry as unbiased as possible, and to estimate fairly the proportion of benefit and injury in the activities of each species throughout the season and throughout its distribution.

The Cull Cow and Scrub Bull.—This subject was discussed at the meeting of the Board of Agriculture last month. The Board agreed that the proposal to make the licensing, branding, or spaying of unprofitable animals compulsory was not yet practicable, but that the agricultural and pastoral associations, herd-testing and breed societies, and dairy companies should be asked to assist in an active propaganda against the use of inferior animals as sires, and for the discouragement of the sale of cows as milkers when they had been found to be unprofitable. An article by Mr. A. R. Young, M.R.C.V.S., in a recent issue of the *Journal of Agriculture* on the question of the disposal of these animals was carefully considered and appreciation of it expressed.

THE POISONOUS, SUSPECTED, AND MEDICINAL PLANTS OF NEW ZEALAND.

(Continued.)

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FILICES.

THE common bracken-fern of New Zealand (*Pteris aquilina* var. *esculenta* Hook. f.*), which in some of its varieties is almost cosmopolitan, has long been suspected of causing the death of stock in various countries other than New Zealand. If some of the other genera of this large family are examined it will be found that they are known to be poisonous. Pammel (1911) ("Manual of Poisonous Plants," p. 317) remarks that *Adiantum pedatum* (maiden-hair fern) is probably poisonous. "Male fern" (*Aspidium (Dryopteris) Filix-mas.*) is used as an official remedy in the British and United States Pharmacopœias, the rhizome "not kept more than a year" being the part employed as a vermifuge. In overdose it is a distinct poison, there being five fatal cases recorded with symptoms of vomiting, diarrhœa, vertigo, headache, tremor, cold sweat, dyspnœa (laboured breathing), cyanosis (blueness of skin), mania, coma, convulsions, amblyopia (impaired eyesight), or even amaurosis (loss of sight) with dilated fixed pupils often present. The loss of sight is usually temporary, but has proved permanent. Animals poisoned with male fern show parenchymatous nephritis (inflammation of kidney-tissue).

A case in which sheep were apparently poisoned by fern in the Auckland District is recorded in Volume i of this *Journal*, p. 215. Mr. A. J. Hickman, Veterinarian, reported visiting the locality of the mortality (on 9th March, 1910), and that out of a mob of seventy ewes and three hundred lambs, twelve ewes and eighteen lambs had died. No symptoms were observed during life; the animals were simply found dead, having apparently died without a struggle. The owner suspected anthrax. The deaths occurred about forty-eight hours after the sheep had been put into a paddock that had twice been sown with turnips. No roots had, however, matured, and there was nothing to be had but fern-shoots and sorrel. Post-mortem examination showed the visible mucous membranes pallid; no discharge from nostrils, mouth, or anus. Carcases were in good store condition. Decomposition was fairly advanced throughout, and there was much post-mortem staining on both pleura and peritoneum. The rumen was normal and distended with gas, and full of semi-digested fern-fronds, and apparently nothing else. There was no detachment of the mucous membrane, and no signs of inflammation. The other three stomachs—reticulum, omasum, and abomasum—all normal. Spleen normal. Liver very pallid and softened, but not enlarged. The large and small intestines were normal, the colon containing a few free parasites (strongyles). The lungs were engorged with blood, and dark in colour.

* It should be noted that *Pteridium* is the more modern generic name used by botanists to denote the genus to which the common bracken belongs, though *Pteris* is perhaps as frequently used.

The late Mr. J. G. Clayton, M.R.C.V.S., in June, 1904, investigated a case of sudden mortality in a number of eighteen-months-old Shorthorn heifers at Weber, which were in good condition up to three weeks of death. They were running on a block of 600 acres, and had been on for some months. In February 200 acres of the block had been burnt and sown in English grasses, which had taken badly, small fern being the predominant growth. The heifers were generally on the burn, very seldom going on to other parts of the block. Towards the end of May the owner noticed one heifer dead, but did not attach much importance to it owing to the rough nature of the country. He then went away from his farm for about ten days, and on his return he could not see any cattle alive. He found four dead; after further search the bodies of eleven altogether were found, and it was concluded that the rest had died in the bush. No symptoms were observed, and as the animals had been dead about ten days before being inspected no satisfactory post-mortem examination could be made. All that were examined showed the kidneys to have been affected. In some cases the structure was completely broken down, like damson-pulp. The spleens were normal, and anthrax was certainly not the cause of death. In the Veterinarian's opinion the cause of death was to be found in connection with the burn.

Lander (1912) summarizes the results of inquiry by the officers of the English Board of Agriculture in 1909 and 1910. An editorial article in the *Journal of Comparative Pathology* of 1894, p. 165, draws attention to the important features of bracken disease which serve to distinguish it from anthrax. The absence of bacilli in the flesh fluids and tissues, the normal spleen, the subpleural and subperitoneal hæmorrhage, considerable effusion of blood in the large intestine, a temperature of 106·8° to 108·4°, the disease lasting a few days with abundant bloody discharge from nose and rectum, and the disease occurring only in cattle, are symptoms which serve to distinguish bracken poisoning from anthrax. The symptoms which are mentioned in the English official reports for 1909 as symptomatic of bracken poisoning are loss of appetite, blood-tinged discharge from mouth and nose, blood from bowels, pallor of membranes of eye, great depression, and coma and death in twelve to seventy-two hours after the onset of the symptoms. The lesions include congestion of the pulmonary membranes and small hæmorrhages in the substance, congestion of the stomach and intestines, the wall of the latter being in some parts deep red and thickened by infiltration of blood, blood also being present in the lumen of the intestine. Areas of diphtheritic inflammation and distinct ulceration may be present in the stomach and intestines; the serous membranes show hæmorrhages in their substance, and there are hæmorrhages in the heart and body-muscle and under the skin.

Sir Stewart Stockman (1918), of the English Board of Agriculture, carried out further experiments (*Journal of the Board of Agriculture*, March, 1918) in which direct evidence was obtained of the poisonous nature of fresh fronds of the English bracken by feeding experiments. A bull calf over a period of twenty-nine days received approximately 260 lb. of the fronds of green bracken (about 10 lb. per day with other food). This had a fatal termination. The animal showed identical symptoms during life and identical lesions on post-mortem examination to those seen in cattle dying in the field of suspected bracken poisoning.

It is concluded to be not improbable that bracken contains a small amount of a poison which is able to accumulate in the system and which requires a certain time to produce its full effect, after which severe illness may begin in an explosive manner, possibly some weeks after the poison has been withheld. It seems probable from practical observation that individuals vary in susceptibility, since some cases develop later than others in the same herd; some animals on the same pasture even seem to be highly resistant, and may not show the least sign of illness, while others are dying around them. It is at least possible that the former animals have acquired resistance by a natural process of immunization, as may happen in the case of poisons of the ricin class, and only those succumb which have too brusquely and continuously fed upon the poisonous substance, with the result that they are fatally attacked before the acquired resistance can establish itself. The article concludes that no time should be lost in changing a herd showing symptoms of fern poisoning on to pasture containing no fern.

Hadwen and Bruce (1920) (see abstract in *Experiment Station Record*, Oct., 1920, p. 471) record the results of their observations on the results of the consumption by horses of common bracken (*Pteris aquilina*) on the Pacific slope of British Columbia. Feeding experiments were made with the dried fern. From these the authors concluded that it can be assumed that an addition to the daily diet of about 6 lb. of dried bracken will kill a horse in about a month.

W. E. Lawrence (1922) ("Principal Stock-poisoning Plants of Oregon," Station Bull. 187, Oregon Ag. College), dealing with the common bracken-fern of that State (*Pteridium aquilinum pubescens* Underw.), states that the symptoms known as fern-staggers in horses are undoubtedly more common than any other trouble caused by poisonous plants in western Oregon. The trouble is confined almost entirely to horses, though there are occasional reports that cattle have been poisoned by this fern. It is noteworthy that in these last two countries, both on the Pacific slope of North America, the mortality should be caused by the dried fern fed as an impurity in the hay, the difficulty being in many localities to harvest the hay without contamination with much bracken. Ferny hay is usually rated dangerous when it contains about one-third of the common bracken. It usually requires about a month of feeding upon ferny hay to cause fern-staggers, which is most common in dry years. Horses are known to acquire a taste for the fern after the initial dislike has been overcome, at which stage even bedding with fern must be discontinued, for the horses will then eat the bedding.

Mr. C. C. Empson, when Stock Inspector for the Nelson District, assured the writer that fern poisoning in cattle was prevalent in his district in the winter, when the young fern is coming through the ground from March until June, especially in the latter month, and even as late as September. The symptoms he records are gradual emaciation and anæmia, the animals being almost bloodless when killed or when they die; and they pass a good deal of blood up to the time of death. A beast will acquire a taste for the fern, and even if put on to good grass will return to the fern if it is possible to do so. The droppings are often mixed with blood-clots. After a burn cases are more prevalent, and it is very difficult to pull cattle round when once they are badly affected.

PASTURE TOP-DRESSING EXPERIMENTS AT TE KUITI.

TWO SEASONS' RESULTS.

T. H. PATTERSON, H.D.A., Instructor in Agriculture, Auckland.

IN the *Journal* for May, 1922, was published an article giving the first season's results of trials with phosphatic fertilizers carried out on Mr. Charles Harrison's farm at Te Kumi, about two miles from Te Kuiti. The plots were set out in 1921, on permanent pasture which had been laid down about eight years, and had received no fertilizer for at least five years previous to the dressings, which were applied on 8th and 9th September, 1921. Reviewing the first year's results judged on the weight of hay produced, superphosphate (on the unlimed areas) gave by far the highest yield, with finely ground raw rock phosphate and basic slag about equal. On the limed areas superphosphate gave a slightly better yield than on the unlimed, while the raw ground rock phosphate gave a comparatively poor result. It was pointed out then that experience to date in the Auckland Province showed that lime used with raw rock phosphate did not produce good results.

YIELD OF HAY.

The plots were top-dressed again on 18th and 19th May, 1922, and shut up for hay on 9th October following. They were cut and weighed during the first fortnight in January last. The average of results covering the two years' trials is given in the following table :—

Fertilizer used.	Amount per Acre.	Yield of Hay per Acre: Mean Average of Three Plots.				Increase due to Fertilizer.				Percentage Increase due to Fertilizer.
		Tons.	cwt.	qr.	lb.	Tons.	cwt.	qr.	lb.	
Unlimed.										
Check	No manure	1	3	0	1	..				..
Basic slag ..	3 cwt. ..	1	12	2	2	0	9	2	1	41·3
Superphosphate ..	3 cwt. ..	2	3	0	6	1	0	0	5	87·1
Rock phosphate ..	3 cwt. ..	1	11	1	22	0	8	1	21	36·7
Limed.										
Superphosphate ..	3 cwt. ..	2	0	0	17	0	17	0	16	74·5
Rock phosphate ..	3 cwt. ..	1	7	2	16	0	4	2	15	20·1

On the weight of hay, taking the average yield of the two seasons, superphosphate (on the unlimed areas) has given the highest yield, having produced an increase of approximately 87 per cent. over and above no manure, while basic slag has increased the yield 41 per cent., and raw ground rock phosphate 37 per cent. On the limed area the yield of hay from superphosphate was 75 per cent. over and above the area which received no manure, while rock phosphate only gave 20 per

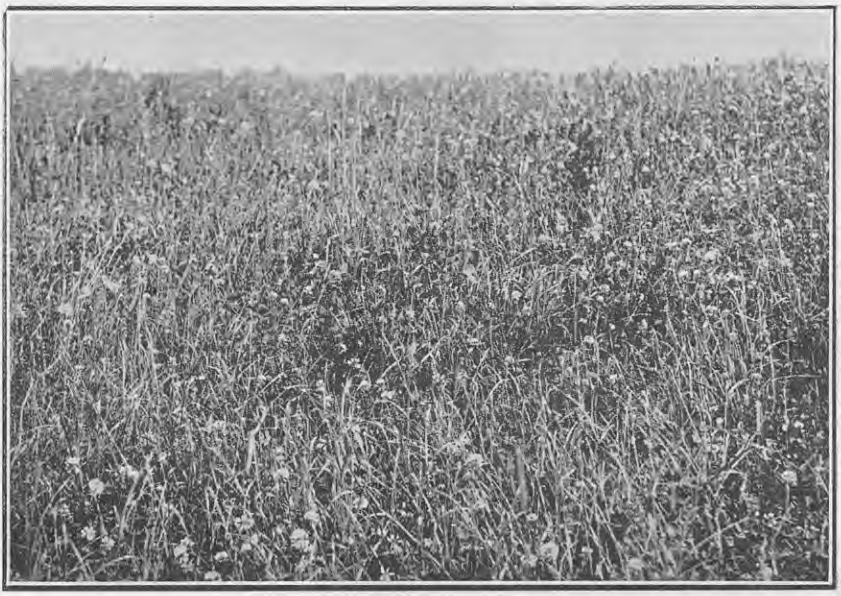

FIG. 1. PART OF SUPERPHOSPHATE PLOT ON THE LIMED AREA, SHOWING DENSE GROWTH OF GRASSES AND CLOVERS.

FIG. 2. ROCK-PHOSPHATE PLOT ON UNLIMED AREA, SHOWING CLOVERS AMONG COCKSFOOT AND RYE-GRASS; YORKSHIRE FOG COMPARATIVELY ABSENT.

cent. increase in yield. This furnishes further evidence that raw ground rock phosphate when put on soil recently limed gives comparatively poor results. On the other hand, superphosphate applied to the soil which had been limed the previous season gave satisfactory results.

To value the action of the fertilizers in terms of weight of hay only is not satisfactory. Though great care is taken to get reliable results, there may be a considerable variation in the percentage of moisture contained in the hay at the time it is weighed. Apart from that, the improvement effected on the pasture by the fertilizer is a most important consideration, and cannot be estimated by the weight of hay produced. Shutting up and allowing the pasture to grow for hay does considerable harm to the pasture for grazing; also many weeds are favoured. Cocksfoot is induced to grow tufty, and white clover suffers through being shaded. These are often important constituents of a permanent pasture, and such is the case with the pasture on which these experiments are being conducted.

IMPROVEMENT IN PASTURE.

The plots considered from the point of view of improvement of the pasture show some important results. On inspection made before haying the areas on which superphosphate and lime had been applied stood out strikingly. The colour of the pasture was a rich healthy green, and the bottom growth dense, due principally to the large proportion of white clover and trefoil (suckling-clover) present. Cow-grass growth was strong also. Alongside the superphosphate-lime plots were those which had received raw ground rock phosphate and lime. On the latter the grasses and trefoil were pale in colour and starved-looking, while the general growth, as shown by the yield of hay, was poor. It had, however, improved a good deal since last season. On the unlimed area the plots which received superphosphate produced a vigorous growth. This fertilizer stimulated weeds as well as grasses and clovers. Yorkshire fog was abundant and luxuriant where super was applied, while alongside in marked contrast were slag plots with very little fog present. The line dividing the areas before the grass was cut could be distinguished by the presence of fog on the superphosphate and its comparative absence on the slag plots. There has been a decided general improvement on the slag plots. The areas which received raw ground rock phosphate but were not limed showed a good growth of grass, while cow-grass and white clover had also responded very well. Fog was not conspicuous as on the superphosphate plots. On the check plots, which received no manure, the clovers were hardly seen, while bracken-fern was well distributed over the areas. The general growth was poor. A considerable amount of sweet vernal and weeds were present.

The accompanying photos give a fair idea of the various features of growth. They were taken just prior to cutting the areas for hay.

GENERAL.

The results here recorded can be regarded only as progress results, and more definite conclusions cannot be drawn until after the trials have been continued over at least five years. Moreover, a summary of

FIG. 3. SHOWING GROWTH OF YORKSHIRE FOG ON SUPERPHOSPHATE PLOT (UNLIMED AREA), ON RIGHT OF PHOTO.

The basic-slag plot may be seen between the superphosphate plot and the plot which has been cut.

FIG. 4. BASIC-SLAG PLOT, SHOWING GOOD GROWTH OF CLOVERS (COW-GRASS AND WHITE CLOVER); COCKSFOOT ALSO NOTICEABLE.

such trials in different districts will give a better idea of the value of the various fertilizers used. As the Te Kumi area here dealt with possesses a light soil on undulating country, representative of thousands of acres of land in the King-country, Waikato, and near-by districts, the results gained to date should, however, be of considerable assistance in guiding farmers. The response to top-dressing with phosphatic fertilizers is so marked that it undoubtedly pays to use such an immediate and effective means of improving pastures. Viewing these interim results, covering two seasons only, it would appear that basic slag is not uniform in its good effects as a top-dressing for pastures. On heavier soils, in moister situations, the results obtained in Auckland Province show to the favour of basic slag and the more slowly soluble

FIG. 5. CHECK PLOT (NO FERTILIZER), WITH MARKED ABSENCE OF CLOVERS.

fertilizers. The point for farmers to note is that fertilizers should be selected according to the soil, the situation, and other factors which have an important bearing on results secured.

In the control of bracken-fern fertilizers help by improving the pasture so that more stock can be carried, and consequently the extra tramping and grazing keep down the fern. Apart from the extra bulk of material produced, and the change brought about in the botanical composition of the pasture, the feeding-quality is improved. This last fact should not be overlooked by farmers.

Analyses of the fertilizers used for top-dressing the test plots were given in last year's report. There were practically no variations in this year's analyses.

WEATHER RECORDS.

Rainfall exercises an important influence on the efficacy of slow-acting phosphatic fertilizers. The following is the record for Te Kuiti during the period of the tests (from data supplied by Mr. Hamblyn, Bank of New Zealand, Te Kuiti) :—

Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Rainfall (Inches) and Number of Wet Days, 1921.												
1·97	2·26	1·86	3·67	2·30	7·16	7·14	4·46	3·51	10·32	4·65	7·50	56·80
13	7	9	10	13	17	18	14	13	21	14	17	166
Rainfall (Inches) and Number of Wet Days, 1922.												
2·93	5·69	6·99	3·78	3·20	2·72	2·52	7·39	2·87	6·14	6·95	2·67	53·85
14	7	18	16	15	10	8	18	9	14	15	17	161

The mean average rainfall for Te Kuiti taken from records covering ten years ending 1922 was 60 in. The year 1919 was omitted because the record was not obtainable.

WILD WHITE CLOVER IN GREAT BRITAIN.

THE following notes are contributed to the *Journal* by Mr. R. McGillivray, of the Agricultural Instruction Branch of this Department, who is at present on furlough, taking a course in agriculture at Reading University, England :—

Wherever in Britain farmers congregate and pastures are discussed one hears the merits of wild white clover extolled. It appears to be the unanimous opinion that it is a plant justly entitled to a conspicuous place in agriculture, and of great importance to the grazier on the downs and hill country. It is contended that its fattening properties excel by far those of ordinary white clover. This view is upheld by some of the most prominent professors attached to the various faculties of agriculture.

Botanically wild white clover does not differ from the cultivated form of *Trifolium repens*. There is, however, under field conditions an appreciable difference in growth and appearance. The writer has visited pastures in various parts of England and Scotland, and in Berkshire had the somewhat rare opportunity of seeing an area of wild white and ordinary white clover growing side by side, these having been sown in 1921 in adjoining blocks, at the same time, and under exactly similar conditions in every respect. The difference in general appearance between the two clovers was evident to even the most casual observer. At the time of visit, in September, the ordinary was flowering luxuriantly, while the wild white had only a scattered inflorescence, and at a short distance gave the impression of being a distinct variety. The wild clover was a much smaller plant, more stoloniferous, with leaves darker in colour, and smaller than the other. The flower-stalks were also much shorter, and more erect in habit, and the plants had completely covered the soil with a mat of rich green herbage, while in the case of the ordinary white clover there were still bare patches to be seen.

In Scotland and the North of England it is claimed that the wild clover is much hardier and more frost-resistant than the ordinary kind. The writer's investigations on this point were carried out in the South of England, where the past winter has been of a mild description, and so nothing definite was ascertained regarding hardiness. The experience of farmers in many parts is that the life of ordinary white clover is short, but wild white clover has only to be sown once, and invariably the pastures where it has been included in the mixture improve with age. Marvellous results have been obtained on the old wild-white-clover leas on the heavier soils by top-dressing with phosphatic fertilizers, especially those of a basic nature.

This clover has attracted attention for many years. The late Martin Sutton, of the firm of Sutton and Sons, Reading, initiated experiments with it as far back as 1854, and placed on record his views regarding its value. It was not, however, until 1886 that the first public experiments were carried out. In that year the Royal Manchester, Liverpool, and North Lancashire Agricultural Society commenced pasture tests on the Right Hon. W. E. Gladstone's Hawarden Estate, in Flintshire. Acre plots of various grass and clover mixtures were laid down, and in a few years' time it was observed that all clovers had disappeared except wild white. It proved so successful in these tests that the experiment had a far-reaching influence not only in the immediate neighbourhood, but in many other parts of the country.

In recent years the University College of North Wales instituted a number of pasture experiments in centres within the counties served by the college. In one plot only in each experiment was wild white clover included in the mixtures. The college report states that thirty months after sowing nine times more ground was covered by white clover where the wild seed was sown than was the case where the same quantity of ordinary white was used. The experiments conducted at Cockle Park, in Northumberland, by Professor Douglas Gilchrist, and also those by Professor Somerville, of Oxford University, proved conclusively that this clover can be successfully and economically established on poverty-stricken soils where other clovers refuse to grow at all.

Wild white clover is a somewhat shy flower, and is therefore not a bountiful producer of seed. Some farmers in Kent informed the writer that they considered themselves fortunate to get 40 lb. of seed per acre, but it is stated on reliable authority that about 75 lb. per acre is obtained on an average. The total amount of seed saved in Great Britain is estimated not to exceed about 90 tons per annum. The price is high. The grower realizes on an average from 14s. to 16s. per pound, and as an indication of the popularity of the strain it may be mentioned that even at the high price it commands retail there is never any carry-over of seed, as the supply has never yet met the demand.

The scarcity of seed has raised the question of growing it under cultivation for seed-production. This proposal has been condemned as likely to impair the hardiness and permanency of the strain. The best seed comes from the south-eastern counties of England, and also from the Cotswold Hills, in Gloucestershire, from pastures that have been down for many generations.

NOTE.—Interested readers are referred to notes on wild white clover in relation to New Zealand, which appeared in the *Journal* for August, 1920 (p. 83), and September, 1921 (p. 162).—EDITOR.

TWO FUNGAL DISEASES OF THE BLUE LUPIN.

K. M. CURTIS, M.A., D.I.C., D.Sc., Mycologist, Cawthron Institute of Scientific Research, Nelson.

DURING the present season two fungal diseases have been found in blue lupin (*Lupinus angustifolius*). This plant is cultivated for seed in various places in the Nelson District in order to supply the demand for the cover-cropping of orchards. Although most of these areas under cultivation are small and widely separated from one another, both diseases are usually present in them. The main factor governing the distribution and virulence of the diseases in a field is the presence of moisture, both in the soil and in the air immediately above it. As a rule the plants grow sufficiently close together for their tops when mature to form an unbroken, interlacing mass of branches and foliage, shutting off from the region of relatively still air round the stalks both sunlight and drying air-currents. When the soil is moist, after rain or through lack of drainage, the air in this enclosed region becomes charged with moisture, and spores of fungi there find conditions ideal for germination and infection.

Although the two diseases usually occur together, as a rule one predominates, the commoner of the two being that caused by the fungus *Botrytis cinerea* Pers. Both diseases are typically stem troubles, but occasionally one or more of the branches becomes infected, while the stem may remain healthy. When the lesion occurs on the stem the symptoms of disease are striking, and are exhibited by the whole of the upper portion of the plant; but when a branch only is diseased the symptoms are shown locally, and under casual inspection may escape notice.

The two diseases will now be treated separately in detail.

I. LUPIN-WILT CAUSED BY *BOTRYTIS CINEREA* PERS.

This disease is economically the more important of the two, as it attacks particularly cultivated, as compared with self-sown, lupin. When a severe attack takes place on the stem the upper portion of the plant gradually wilts, and the leaves lose their green colour, become yellow, and eventually fall, leaving the crown of the plant bare. If the plant is of vigorous growth when attacked the upright habit of the stem is usually maintained till death, but in weak, self-sown plants the stem may bend at the point of infection and the plant fall.

When the branch is the part infected the wilt and fall of the leaves take place as a rule only on the branch concerned, as might be expected, since the derangement of the supply of nutritive substances is only local. The lesions on the stem are usually to be found at soil-level, but they may occur up the stem to a height of about 2 ft. (Fig. 1). They vary in length from $\frac{1}{2}$ in. to 9 in., according to the virulence of the attack and the time the fungus has been at work. Shortly after infection takes place the epidermal cells of the plant become brown in colour, and the diseased area assumes a slightly transparent appearance. The edge of the resulting diseased area shows at times an abrupt

rise in level as it merges into the healthy region. This characteristic can be seen at the left-hand end of the lesion shown in Fig. 2, but it is not of constant occurrence. The disease as a rule extends completely round the stem, and the outer tissues of the plant become permeated with the vegetative hyphæ (strands) of the fungus.

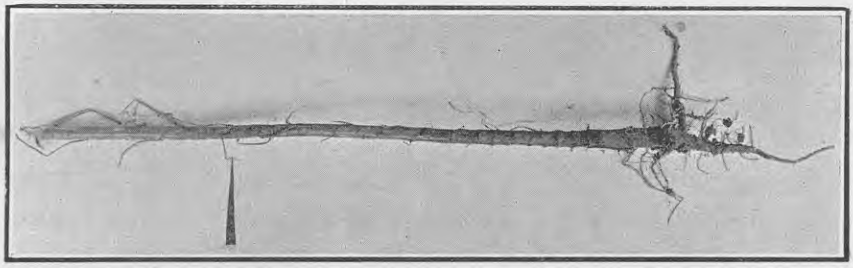

FIG. 1. STEM OF BLUE-LUPIN PLANT ATTACKED BY BOTRYTIS CINEREA. ARROW INDICATES LESION.

FIG. 2. VIEW OF LESION INDICATED IN FIG. 1. NATURAL SIZE.

[*Photos by W. C. Davies.*

FIG. 3. CONIDIOPHORE (*a*) AND CONIDIA (*b*) OF BOTRYTIS CINEREA. (*a*) × 75; (*b*) × 240.

As time elapses, the lesion becomes larger, and eventually conidia (spores) (Fig. 3 *b*) are developed over its central region and to within a short distance of the margin. The conidia are minute, unicellular, oval bodies borne in clusters on tall branched conidiophores (Fig. 3 *a*). The latter are hyphæ that rise more or less perpendicularly into the air from the vegetative hyphæ in the plant. The conidiophores are black in colour and of considerable length, and as the conidia are shining white the general effect to the naked eye of a tuft of conidia on their conidiophores is of a whitish-grey furry mass (Fig. 2). The conidia, on an average, measure about 12·5 × 9·5 μ ($\mu = \frac{1}{1000}$ mm.), and, when moistened, separate readily from the conidiophore. They are borne by wind or on the bodies of insects, or are washed by

rain, to other portions of the same or another plant. They germinate when moisture is present, and in a few hours give rise to one or more vigorous germ-tubes, which in turn infect any suitable plant-tissue with which they come in contact.

The production of conidia on a lesion ceases after a time, and the conidiophores gradually die down upon the plant-surface, revealing as they fall away the young sclerotia already developing at their bases on the stem of the plant. Sclerotia are small black bodies composed of compactly interwoven hyphæ, and are capable of remaining unharmed in a resting condition for considerable time, and so of ensuring the

FIG. 4. SCLEROTIA OF BOTRYTIS CINEREA IN RESTING CONDITION. NATURAL SIZE.

FIG. 5. CONIDIA PRODUCED BY THE SCLEROTIA OF FIG. 4. NATURAL SIZE.

[*Photos by W. C. Davies.*

persistence of the fungus from season to season. They are hard in texture, roughly oval in shape, and vary in length from 1 mm. to 5 mm. When they are small their surface is more or less smooth, but in large specimens it is usually thrown into rounded lobes (Fig. 4).

Although sclerotia can remain dormant for months, if conditions are favourable they may give rise to conidia shortly after they are formed without an intervening period of rest. In Fig. 4 are shown several sclerotia, chiefly of the larger convoluted type. The lupin of the photograph bore them at irregular intervals from the junction of stem and root to a height of 8 in. up the stem. The remains of some of the superficial vegetative hyphæ of the fungus may still be seen in this photograph, below the two large lower sclerotia. The lupin bearing

them was kept dry for several weeks, and then moistened and kept in a saturated atmosphere. In forty-eight hours the sclerotia gave rise to the masses of conidia shown in Fig. 5. The two photographs show as nearly as possible the same part of the stem, and the position of the tufts of conidia of Fig. 5 will be found to correspond to that of the sclerotia of Fig. 4. Fig. 6 is an enlarged view of one of the sclerotial-borne tufts. The conidia and conidiophores formed on sclerotia are similar in structure to those formed on the lesion earlier in the progress of the disease (Fig. 3).

Under natural conditions the sclerotia fall to the ground on the decay of the diseased plant, and there they remain until the following spring, when with the advent of rain and warm weather they break forth into new growth, giving rise to their crop of conidia. These infect lupin-plants of the new season, and the persistence of the fungus into a second year is thus secured.

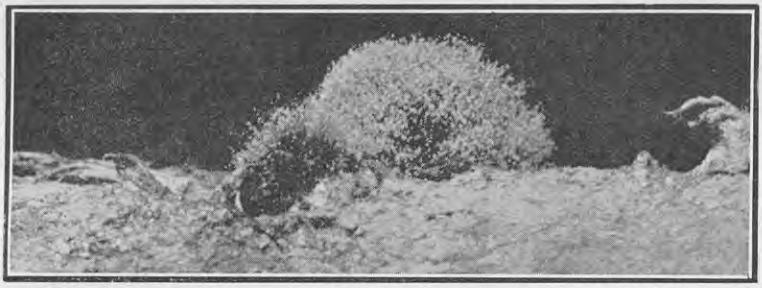

FIG. 6. SINGLE TUFT OF SCLEROTIAL CONIDIA OF BOTRYTIS CINEREA. × 4.
[*Photo by W. C. Davies.*

II. LUPIN-WILT CAUSED BY *ASCOCHYTA PISI* LIB.

This disease occurs more often on self-sown than on cultivated lupin, and seems to attack particularly the weaker plants that have fallen behind in the struggle for light.

The attack may take place, as in the previous disease, at soil-level, but as a rule the lesions occur higher on the stem. One large lesion only may be present, but it is frequently accompanied by several smaller ones above or below it. Branches are occasionally infected, the stem of the plant at the time remaining healthy in some cases and in others becoming diseased. The general symptoms are similar to those exhibited by the plant when infected with *Botrytis cinerea* Pers., but as the plants as a rule are weakly when attacked the disease is more aggressive and the plants quickly succumb.

Fig. 7 shows two stages of attack of *Ascochyta Pisi* Lib. on lupin. The arrows indicate the position of the lesions. In the larger plant the lesion is small, and the plant still retains its crown of green foliage. The smaller plant has been attacked in two places on the stem, and the presence of the disease is indicated by the loss of most of the leaves, and by the change of colour and death of those that are still attached.

FIG. 7 (LEFT). BLUE-LUPIN PLANTS ATTACKED BY ASCOCHYTA PISI. ARROWS INDICATE LESIONS.

FIG. 8. VIEW OF A LESION INDICATED IN FIG. 7. NATURAL SIZE.

[*Photos by W. C. Davies.*

The larger lesions vary in length from 6 in. to 18 in. and completely girdle the stem, while the numerous small lesions accompanying them may be only about $\frac{1}{4}$ in. in diameter and more or less circular in outline. There is no sharply marked margin to the lesion, for the dark-brown colour of the diseased region merges gradually into the normal colour of the stem. Nor is there in this disease an abrupt change in level at the junction of diseased and healthy tissue.

As in the *Botrytis* disease, the vegetative hyphæ invade the outer tissues of the stem or branch and cause their death. After a certain time spores are produced. In the present case, however, they are not formed freely on the surface as conidia, but are enclosed in minute black chambers buried just beneath, but opening by a pore on to, the surface of the host plant. If the epidermis of a lupin-stem be removed the tissue lying immediately beneath it will be found to consist of

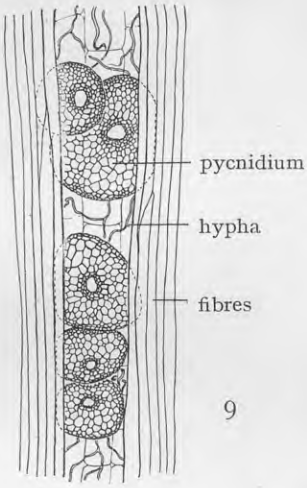

FIG. 9, PYCNIDIA (× 58), AND FIG. 10, SPORES (× 750), OF ASCOCHYTA PISI.

strands of fibres running parallel to one another down the stem. Each strand is separated slightly from its neighbour, the narrow intermediate region being occupied by thin-walled cells. It is down these rows of soft tissue separating the fibrous strands that the pycnidia, or chambers in which the spores are produced, are formed. As the pycnidia attain their full size they push up the epidermis covering them, causing it to fall away and leave exposed the corrugated light-coloured surface of the fibres. Before the epidermis is burst away, however, the presence of pycnidia beneath it may be detected by the occurrence of small ruptures in the epidermis about the size of a pin-prick. These ruptures are due to the projection of the mouths of the pycnidia through the epidermis.

In Fig. 8 is shown a lesion from part of which the epidermis has broken away. Between the strands of fibres in the region where there

is no epidermis a few pycnidia are to be seen, and above and below this region are numerous pycnidial mouths projecting through the still intact portion of the epidermis. A surface view of pycnidia under magnification may be seen in Fig. 9. They are lenticular in shape, and are usually slightly depressed in the region round the mouth, which is of considerable size. Occasionally compound pycnidia are to be found. These are larger than normal, and have two or three mouths, although not usually more than three.

The wall of the pycnidium is composed of small angular cells, and lining its interior are great numbers of spores (Fig. 10). The spores average about 10·5 × 5 μ in size, are hyaline in colour, rather pointed, oval in shape, and are slightly constricted at the junction of the single cross-wall and the outer wall.

When a pycnidium containing mature spores is moistened the spores become free and ooze in numbers from the mouth in a long thread-like mass that coils irregularly upon itself as it emerges into the open. The spores are now free on the surface of the plant, and their distribution is usually completed by the agency of water.

The species of *Ascochyta* that occurs on lupin resembles closely *Ascochyta Pisi* Lib., which attacks peas, beans, and vetches, all of which host plants are relatives of the lupin. The similarity of the fungi and the relationship of the host plants suggest strongly that the species on lupin is the same as that on the pea, and that the organism has merely spread to another host plant. The suggestion is supported by the fact that when peas and lupins occurred near each other, and the peas were attacked by *Ascochyta Pisi* Lib., the lupin was found to be attacked also. The species on blue lupin is therefore regarded, at least temporarily, as *Ascochyta Pisi* Lib. (*Mycosphaerella pinodes* (B. & Blox.) Niessl.).

REMEDIAL MEASURES.

The chief precaution that can be taken against both diseases is to avoid planting lupin in damp situations. If badly drained soil cannot be avoided the difficulty may be partly overcome by guarding against overcrowding of the plants, so that when they are full-grown circulation of air can take place round the stalks. Seed for planting should be taken from healthy fields only. Should either disease establish itself firmly in a field, rotation of crops is desirable.

New Rabbit District.—The constituting of the Puketoi Rabbit District (Akitio County) under Part III of the Rabbit Nuisance Act, 1908, is gazetted.

Wheat and Oats Threshings.—Returns of actual threshings received to the 21st March by the Government Statistician from millowners showed that until then 1,142,538 bushels of wheat and 688,846 bushels of oats had been threshed out. The average yields per acre in cases where particulars of areas were furnished (covering 98 per cent. of total threshings) worked out at 35·59 bushels for wheat and 37·81 bushels for oats. The figures for the Canterbury and Otago Land Districts respectively were as follows: Canterbury—Wheat, 1,009,918 bushels threshed, averaging 36·04 bushels per acre; oats, 600,631 bushels threshed, averaging 37·74 bushels per acre. Otago—Wheat, 56,802 bushels, averaging 31·43 bushels per acre; oats, 35,149 bushels, averaging 39·18 bushels per acre.

CONTAGIOUS VAGINITIS IN COWS.

W. C. BARRY, M.R.C.V.S., Veterinarian, Auckland.

A LARGE number of cases of contagious vaginitis among dairy herds have come under notice of the Live-stock Division during the past season, and many inquiries relative to the trouble have been received. A short description of the condition, together with an outline of treatment, should therefore be useful, especially to dairy-farmers.

Vaginitis, or inflammation of the vagina (passage leading to the womb), is sometimes referred to as "vaginal catarrh." The latter name, however, is not a good one, for the reason that a catarrhal discharge, although often present, is not a constant symptom of the trouble, and may arise from some abnormal condition of the uterus having no connection with the disease under consideration. Various organisms have been mentioned by bacteriologists as giving rise to vaginitis, but so far as I am aware the specific cause is not yet determined.

SYMPTOMS.

Clinically the most important symptom of vaginitis is sterility, the cow not "holding" to the bull but returning again and again at irregular periods. In this respect it is second only to abortion disease as a source of loss and inconvenience to the dairy-farmer. The cow, as a rule, presents no other noticeable symptom beyond failure to hold to the bull. Where this condition exists in herds in which no cases of abortion have occurred (recognizing abortion disease as a common cause of sterility) an examination of the vaginal passage should at once be made. This is done with the cow standing in the bail. The external lips of the passage (vulva) are retracted with the fingers and the condition of the interior noted. The healthy membrane is of a rose-pink colour, with a smooth, glistening surface. When inflamed it presents a red, deeply congested appearance, while on the surface may be observed small elevations, often not larger than a pin-head, which feel to the finger like grains of shot under the membrane. Occasionally a small ulcerated patch may be seen, and very often flakes of a pus-like discharge are present. The part is intensely irritated, and the cow generally resents the manipulation. According to the nature of the eruptions, "vesicular," "granular," and "nodular" forms of the disease have been described, but for practical purposes of treatment these do not require differentiation. In making the examination the hindquarters of the cow should be exposed to a good light. If in a dark shed an electric torch is useful, as the condition may readily escape observation if looked for in a bad light.

Vaginitis may assume either an acute or chronic character. The long-standing cases present the most difficulty in treatment. Adhesions occasionally form between the walls of the vaginal passage, and it is likely that in old cases the lining of the womb itself becomes involved.

The desire for the male in affected cows appears to arise from the irritable condition set up, and is not the result of true "bulling."

We have seen cases of vaginitis existing in in-calf cows, and this point may explain (in some cases at any rate) the reason why a cow having conceived at the first service, takes the bull perhaps several times subsequently. Heifers are frequently affected, and where vaginitis is found to exist in a herd the heifers (if any) will usually be noticed to be the worst cases.

The bull seldom escapes infection, but it is rarely that any symptoms noticeable to the casual observer are present. We have, however, seen during the past season as many as six bulls showing marked swelling of the sheath and a slight discharge from the preputial opening (it is sometimes referred to as balanitis in the bull), but, as before stated, those acute symptoms are exceptional. Unfortunately, the disease in the bull does not prevent his attentions to the cows, but tends rather to increase his activity in that direction.

METHOD OF SPREAD.

Some cases appear to arise spontaneously, but it is most commonly spread by the bull. Having served an affected cow, and becoming himself infected, he is capable of transmitting it to every cow which he afterwards serves. It is also possible for a diseased cow standing in a bail to switch some infective discharge from her tail on to the hindquarter of her neighbour and so infect the latter. During treatment the tubing used in irrigating an affected cow must be disinfected before again using. The same applies to the hands and fingers of those making an examination.

TREATMENT.

Cure is not difficult if the cases are observed early. Much harm is done through the condition not being recognized and strong antiseptic douches being used, which only tend to aggravate the already inflamed state of the membrane. The first essential in treatment is to remove the bull (if running with the herd), and to separate affected from healthy cows. Cows under treatment must be kept from the bull for a period of at least six weeks, otherwise treatment is useless. Limewashing and disinfection of the shed should be carried out. The vaginal passage of affected cows must be irrigated with mild antiseptic and astringent solutions; strong antiseptics do more harm than good. The following solutions are recommended:—

Boric (boracic) acid, in the strength of two teaspoonfuls to a pint of water.

Solution of ordinary salt in water (normal saline solution), made by dissolving one dram (teaspoonful) of ordinary salt in a pint of boiled water.

Permanganate of potash, using one teaspoonful of the crystals to the gallon.

Sulphocarbolate of zinc, in the strength of one teaspoonful in a quart of water.

All water used in making any of the solutions must be first boiled, and used at blood-heat when irrigating. A quart of solution is sufficient to douche one cow. A piece of rubber tubing about 18 in. long, to which a funnel is attached, is the best means of introducing the fluid. There is no necessity to forcibly flush the passage by the

use of a strong syringe. After insertion into an affected cow the tubing should be placed for a few seconds in boiling water before again using. For irrigating the bull's sheath an ordinary bulb enema syringe with vulcanite nozzle can be used.

We have obtained the best results from the use of sulphocarbolate of zinc. The quantity mentioned (one teaspoonful in a quart of water) should be used to wash out the vaginal passage once daily. This must be continued for a fortnight. At the end of this time it is advisable to change the solution, going on to the permanganate for a week, and finishing up by a week's use of the salt solution.

It is found in practice that this plan of varying the solution used is useful. Experience also shows that one month's treatment is usually necessary to cure the disease, and in bad cases even longer. However, with a little patience and intelligent care it will be found that vaginitis can be cleared out of the herd, whereas neglect in treatment may result in serious economic loss.

Importation of Nauru Phosphate.—A statement of the importation of Nauru and Ocean Island phosphate into New Zealand since the British Phosphate Commission took charge shows that there has been a progressive increase in the shipments received, and that last year the Dominion imported practically 16 per cent. of the output, which is the amount of its quota under the agreement.

Administration of Noxious Weeds Act.—At its last meeting the Board of Agriculture considered the question of County Councils taking a more active part in the administration of the Noxious Weeds Act, the Minister having expressed a wish to secure an expression of the Board's opinion thereon. A recommendation was framed on the lines of County Councils being enabled to administer the control of noxious weeds.

Economy in Afforestation.—The last annual report of the State Forest Service states that experiments in more direct methods of planting in the Rotorua region plantations were successfully performed during the year. It was found that the substitution of notch planting for pitting (adopted experimentally over several hundred acres) will result in the lowering of establishment costs by 15s. per acre (a direct saving of at least £6,000 per annum in the annual North Island planting programme). A comparison of results indicates that the trees have succeeded as well, if not better, by the notching method than by pitting. This system is commended to private tree-planters.

The Sir James Wilson Prize.—Regulations governing this benefit—derived from a fund subscribed by the Farmers' Union in commemoration of Sir James Wilson's long and valuable services to the farming community in New Zealand—have been framed by the University Senate as follows: (1.) There shall be a prize to be called the Sir James G. Wilson Prize, of the value of about £5, to be given annually to the candidate who obtains the highest marks in the subject of agriculture in the examination for the degree of Bachelor of Agriculture. (2.) The prize shall be open to all candidates who are taking the course for the degree of Bachelor of Agriculture. (3.) The prize shall consist of books or instruments that are likely to be of service to candidates for the degree of Bachelor of Agriculture, and the books or instruments shall be selected by the winner and approved by the Chancellor. (4.) Every student intending to present himself for examination for the prize shall, not later than the 1st day of August preceding the examination, signify to the Registrar his intention to become a candidate for the prize. (5.) The prize shall not be awarded more than once to the same candidate.

GERMINATION OF AGRICULTURAL SEEDS.

NEW ZEALAND OFFICIAL TESTS, 1921 AND 1922.

THE following table shows the average germinations of agricultural seeds tested at the Department's seed-testing station during the calendar years 1921 and 1922 respectively. The figures are compiled from the analyses of approximately 10,000 commercial samples in each period.

Seed.	1922.	1921.	Seed.	1922.	1921.
Principal Seeds.					
	Per Cent.	Per Cent.		Per Cent.	Per Cent.
White clover	92·0	90·7	Prairie-grass	60·4	66·0
Alsike	91·3	88·0	Crested dogstail	89·7	85·6
Cow-grass	93·2	90·9	Cocksfoot	66·8	63·9
Crimson clover	93·6	93·0	Paspalum	32·6	25·4
Lucerne	90·4	84·0	Oats	94·6	93·1
Trefoil	77·6	74·5	Peas	93·6	90·2
Lotus major	85·4	83·2	Turnip	89·0	87·4
Lotus angustissimus	77·2	65·1	Swede	85·9	85·3
Perennial rye-grass	79·0	80·9	Rape	93·7	90·0
Italian rye-grass	83·2	82·3	Kale	86·2	79·0
Western Wolths rye-grass	84·1	82·7	Mangold	129·7	124·6
Timothy	91·1	84·0	Mustard	87·2	87·5
Brown-top	76·2	56·9	Carrot	73·2	66·8
Red-top	80·0	84·5	Perennial rye-grass by districts—		
Fiorin	85·1	86·0			
Chewings fescue	76·3	60·7	Southern	76·2	81·3
Meadow-fescue	69·0	71·2	Canterbury	86·0	82·3
Meadow-foxtail	50·5	28·7	Sandon	76·3	84·0
Danthonia	47·3	37·6	Poverty Bay	94·8	93·7
Poa pratensis	50·0	43·2	Hawke's Bay	93·1	92·8
Less Common Seeds.					
Suckling clover	81	70	Hard fescue	..	6
Subterranean clover	72	70	Sheep's fescue	36	72
Bokhara clover	..	81	Sheep's burnet	45	60
Egyptian clover	..	45	Poa trivialis	76	45
Strawberry clover	85	80	Rye-corn	82	95
Berseem clover	96	96	Rib-grass	..	69
King Island melilot	63	57	Indian doob	..	26
Sand clover	61	72	Rhodes grass	..	20
Lotus corniculatus	58	71	Couch	..	2
Sainfoin	35	76	Linseed	94	91
Phalaris bulbosa	..	62	Johnson grass	60	..
Japanese millet	89	87	Chicory	..	54
Tall oat-grass	53	50	Chou moellier	..	90
Sudan grass	83	83	Kohlrabi	80	91
Sorghum	50	56	Maize	90	86
Sweet vernal	..	41	Tares	94	99
Yarrow	88	62	Partridge peas	..	99
Yorkshire fog	86	83	Buckwheat	..	99
Tall fescue	66	76			

—Nelson R. Foy, Biological Laboratory, Wellington.

SEASONAL NOTES.

THE FARM.

FIELD CROPS AND PASTURES.

CULTIVATION.

ON the heavier soils which hold moisture, and on land which is not adequately drained, spring cultivation is often difficult and not to be recommended, particularly if the ground is at all inclined to puddle when worked. Late autumn or early winter ploughing is a means of securing a suitable early seed-bed on such types of land. Thorough cultivation is essential for successful cropping. Many failures in summer crops are due to neglect of early and careful preparation of the soil. All roots and forages benefit by the moisture received and conserved on fallowed land. In addition the manure bill is less, because less manure is needed on early- and well-prepared soil. If farmers are using slowly soluble fertilizers for cropping, well-prepared soil allows of their better distribution, and they become available to the crop more quickly; moreover, less manure is lost than is the case on roughly cultivated ground.

Land intended for late sowings of winter wheat should be further cultivated in May; and where spring sowing is to be done it is essential that the soil should be turned up and exposed to the winter weather. The action of frost is most beneficial, especially to heavy soil, both for the improvement of texture and to kill the larvæ of destructive insects. This operation, as already indicated, also conserves moisture, and therefore helps in districts having a low rainfall. In preparing the seed-bed for cereal crops at this time of the year it is not advisable to work the land down too fine; if very loose it may be rolled before sowing, but should not be rolled after, as any clods will afford shelter for the young plants. The field may be rolled in spring to get a level surface. The use of the cultivator in forming the seed-bed will give better results than the disk and harrow; the cultivator works the fine soil down and the clods to the surface, which is ideal at this season.

CEREAL CROPS.

May sees the beginning of the wheat-sowing season in the South Island. All cereal seeds should be pickled before sowing, preferably by the formalin method. The two common smuts are the loose smut of wheat (*Ustilago tritici*) and the stinking smut or bunt (*Tillitia tritici*). Loose smut on wheat is contained in the ovary of the seed, and therefore cannot be destroyed by treatment with formalin. Care should be taken to procure seed from a clean crop. Loose smut in the case of oats (*Ustilago avenae*) is effectively killed by the formalin process. Bunt has its spores exposed always on the hairy end of the grain and in the groove, and for this reason is easily destroyed if treated carefully with the ordinary formalin solution, 1 pint to 30 gallons.

It is particularly desirable that Velvet and Pearl wheats should be got in as soon as possible in Canterbury and North Otago. Though it is also advantageous to get the Tuscans and Hunters in early, they can be delayed if other work is pressing. Algerian and Dun oats can be sown in May, and perhaps afford the best green feed of any varieties under Canterbury conditions. Gartons may also be fed off in the winter in certain localities, but they do not stool so well, and where the soil is of a light friable nature stock are likely to pull the plants out.

Having regard to the prevalence of Californian thistle, it is good practice generally to get oats sown in the autumn in the North Island as well as the South, as the crop will then ripen before there is any danger of the thistle-seeds maturing. On the other hand, spring-sown oats, which do not ripen for a month or six weeks later, are frequently badly infested with mature thistle-seed, and this is doubtless one of the principal means by which the pest is spread.

May is also a good month in which to sow catch-crops, such as barley, for early sheep-feeding. Black Skinless or Cape are suitable varieties of barley.

PREPARATION FOR MANGOLDS.

The mangold is a crop which should receive more attention from farmers who can give the necessary time to its cultivation. It provides valuable feed, particularly for dairy stock, pigs, and poultry. In a good crop the yield of roots is high, and it is not subject to the risks caused by insect pests and fungoid diseases which make turnip-growing so uncertain in many parts of the country. For dairy-farmers it has the advantage of not tainting the milk; moreover (when properly cured), it provides feed which is nutritious, easily digested, and readily assimilated by stock. Those who intend growing mangolds for next season should select a suitable area without delay and make early preparations. About one acre for every twenty cows should be sufficient. Select the cleanest field on the farm, with, if possible, a soil consisting of a deep friable loam or clay, though good crops of the Globe or Tankard varieties may be grown on light soils. If pasture land is to be broken up it should be skim-ploughed without delay, so as to fallow it during the winter. Though normally the mangold gets through dry spells very well it is safer and better practice to prepare for the crop early.

LUCERNE.

If autumn cultivation has not already been done, and a fairly dry spell of weather is experienced, lucerne stands should have any roughage cleared off with cattle, and then be scarified to loosen the surface of the land and check weeds before winter. If the ground is wet, however, it is usually better to forgo this cultivation. The winter months are the period when lucerne is resting, and under no circumstances should it be heavily grazed during that time. A few weaner cattle or pigs will not do it very much harm, but the better practice is to let it stand through the winter with a little rough growth. More lucerne-fields are perhaps ruined by heavy winter grazing than from all other means put together. It should be remembered that lucerne is grown primarily to provide heavy cuttings for hay and green feed in summer, and if denied a rest during the natural dormant period it does not start the spring properly rejuvenated, but is apt to give way to vigorous weeds and grasses.

TOP-DRESSING OF PASTURES.

Now is the time to decide what top-dressing is to be done this season. One of the secrets of success is to apply the fertilizer before the pasture shows much weakness. By this means the better grasses are preserved, the life of the pasture lengthened, and its feeding-value greatly improved. At one time it was thought that a heavy dressing at fairly long intervals gave the best results, but recent investigations go to show that for the average land the best results are obtained from more frequent applications. Basic slag may be applied at any time from May to August, but the months of June and July are generally preferable; 3 cwt. per acre is a suitable average dressing. Basic superphosphate or mixtures of super and Nauru phosphate are often best applied in July or the early part of August. Where it is intended to apply lime followed by super, the lime should be put on in May or June and the super early in August; 4 cwt. to 5 cwt. of carbonate of lime followed by 2 cwt. of super is recommended for average conditions. If it is desired to use Nauru phosphate alone it should be applied as early as possible.

Pastures should be well harrowed after top-dressing, and it is advisable to keep stock off for a week or two or until there has been a good fall of rain.

WINTERING OF DAIRY COWS.

The ordinary pastures will soon be slackening off in growth, and those farmers who made provision for winter forage crops or temporary pastures can extend the milking-period by feeding these. Most herds in the factory-dairying districts, however, will be dried off during May. Next season's returns will depend in no small degree on the treatment the cows receive during the subsequent two or three months. May to August should be recognized as a most important period for the cow, during which she should get the best of treatment. During this period (in the ordinary course) she not only has to mature a big calf, but also to recoup her general strength after a strenuous season and build up for the following one. If this is not properly accomplished she may readily fail to put up a good performance during the next season. It is easy to keep a cow going when she is in good condition, but once she gets down it is difficult to get her up again.

CALF-PADDOCKS.

Where small paddocks are provided they should be broken up and regrassed, if possible. Failing this they may be eaten bare with big cattle, then top-dressed with 10 cwt. of burnt lime per acre, to be followed in August with 2 cwt. of superphosphate per acre.

—*Agricultural Instruction Service.*

THE ORCHARD.

RECORDING THE SEASON'S EXPERIENCE.

THE best teacher is experience, and a fruitgrower will be wise (the busy harvest period being about closed) if he sits down and makes a careful note in the orchard log of the conclusions the experience of the season now passing has impressed upon him. It is best done now before the impression fades and while there is the possibility of some little leisure. For instance, in some of our larger fruitgrowing centres the season has been remarkable for the unusual amount of black-spot on the pip-fruits. What is more remarkable still, there are large areas of Cleopatra and Delicious apples—varieties specially susceptible to this disfiguring fungus—that are remarkably clean, while in the same orchard often Dunns and Jonathans —that are commonly immune—are badly affected. Why is this? Have these well-known characteristics been suddenly reversed? For the last two or three years there has been a tendency to defer the all-important early sprays. To apply them in early spring instead of in the depth of winter was an advantage that has been amply proved. Of late years fruitgrowers have been tempted to defer the application to the "green-tip" stage, and now they are inclined to make the application later still—in the "cluster-bud" stage. The inclination may be a good one, but experience has shown it to be very difficult to follow, especially on the larger areas. When deferred to the last moment in this way it only takes a brief spell of wind or rain or a pump breakdown to miss the important strong dormant spray altogether, and black-spot fungus activity then commences before preventive measures can be adopted. This happened in many instances this past season. Such recommendations, excellent as they may be, can only be carried out with confidence in the case of orchards that are abundantly equipped with spray-pumps and manual assistance. Otherwise it is not safe to defer the commencement of the first pip-fruit spray much later than early September, completing it before the fungus activity commences.

The wet spring and early summer made many growers reluctant to thin the rather heavy crop of apples that set, lest "dropping" should follow later. Dropping did not take place to any extent, and as a result four, five, and sometimes more fruits developed on a spur. This led to broken branches, a quantity of "fallings," forced off as maturity approached, and a big percentage of blemish on the remaining fruit owing to the impossibility of effectively spraying the tight clusters. The result was a 60-per-cent. (or less) "Fancy" grade in the crop. Experience surely has taught a lesson here.

In some stone-fruit sections during the months of January and February, when the weather was moist and hot, brown-rot was very prevalent in fallen fruit and on the trees. The fruitgrower was inclined to take consolation in the opinion that "it was the same in every orchard." But such was not the case; in some such areas this fungus was hard to find, and a good crop of stone-fruit was marketed. Brown-rot must be treated as a most infectious thing and given no chances.

These points and many more now demand the careful cogitation of the commercial fruitgrower, and that will not be effectual unless the conclusions for amended treatment are recorded in the log-book for use the following season.

FENCES, DRAINAGE, ETC.

The present is the best time for repairing the orchard fences and gates, trimming hedges, and cleaning out ditches and drains. It may seem like a counsel of perfection, but there is great comfort and saving of time in the fact that the fences are sufficiently secure to keep the hares out and the pigs in, and everything in its place. Again, drainage is only a name if the outlets are not

kept clear. Flood-waters should not be allowed to stand on orchard areas; one or two plough-furrows in the right place will go a long way to keeping the surface dry. A load or two of shingle in some of the more frequented gateways, and by the tank-stand where the spray-pump is filled, will not be amiss; it will save time and horse-harness in the busy season.

FRUIT IN STORE.

Fruit in store requires very close attention for the first month or so of storage. If the store is of the closed kind it should be ventilated freely at night and during the colder days, in order to dispose of excessive humidity and gases given off by the fruit.

—W. C. Hyde, Orchard Instructor, Nelson.

CITRUS FRUITS.

In many citrus-groves a scarcity of autumn blossoming is very noticeable, particularly so in those which suffered from the frosts of last winter. When the blossom-petals have fallen from this blossoming an application of bordeaux (summer strength) should be given for the control of fungoid diseases. If scale insects are troublesome an application of red oil, at the rate of 1 part of oil to 40 of water, may be applied with beneficial effect when the trees are in the autumn growth.

Those growers contemplating the laying-down of new areas in citrus-trees during the coming season should now put the work of preparation in hand. The soil at this period is usually in excellent condition for the work. It is advisable that those requiring new trees should place their orders early, and have a careful selection of the best-grown trees on the right stocks only supplied to them.

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

POULTRY-KEEPING.

WINTER MANAGEMENT.

In anticipation of cold winter weather it is well to remember that if fowls are to produce a good return in egg-yield everything must be in their favour. This is not to imply that they should be coddled in warm, ill-ventilated quarters. They should be intelligently handled, especially as regards being protected from extremes of weather. A necessary provision is that the house should be roomy, with an open or partly open front as a means of admitting sunshine and fresh air, those great essentials to the well-being of the domesticated fowl. Of course, it must be draught-proof—there must be no cracks in the sides or back walls—or colds, roup, and other troubles may be expected. With such a house the birds can be fed inside during wet weather, and fed early in the evening, so that they will not be moping about with wet plumage waiting for their evening meal to be thrown down in a muddy yard.

All whole-grain food should be fed in deep litter as a means of inducing the birds to exercise as much as possible. There should always be odd grains of food in the litter, in order to keep the birds busy scratching for it. Every endeavour should be made to discourage the birds from resting on their perches by day, as this is apt to cause an overfat condition—a state which does not tend towards promoting heavy egg-production. This does not mean that the ration should be reduced in order to check a production of surplus fat. On the contrary, it means liberal feeding, but by a method which ensures that the birds are made to work to secure at least the greater part of their food. In the long nights of the winter months the birds have ample time to rest without doing so during the day. The life of the laying hen should be a busy one, and only in this condition will she prove to be really profitable.

In dealing with colds (which young birds especially are liable to take at this period of the year), the best advice is to look for the cause and remove it at once. If any birds become affected a simple method of checking the trouble is to place sufficient Condy's crystals in the drinking-water to give it a pink colour. The most common causes of colds are exposure to cold and wind, and ill-ventilated or draughty houses, while damp, dirty, overcrowded quarters are

often responsible. The symptoms are sneezing, eyes watering, nostrils closed, breathing deep, and offensive breath, while generally a bird thus affected also has an unthrifty appearance.

EGG PRODUCTION AND SUPPLY.

The fact that fresh eggs were being retailed in Wellington just before Christmas at 1s. 2d. a dozen, and gradually increased in price to 3s. a dozen by the middle of March, has caused considerable comment by the consuming public, and many are asking themselves if this great difference in price over such a short period is justified, and whether the extreme fluctuation in prices was based on the law of supply and demand or on manipulation of the market. Whatever the answer, the fact remains that the great variation in price during the period mentioned was far too great to be of much real benefit to either the producer or the consumer.

What is required is a more uniform price throughout the year as an inducement to keep the public eating eggs. This can only be brought about by poultrymen breeding more of their pullets to produce autumn eggs, or by a proper system of co-operation among producers for the purpose of cool-storing some of the summer surplus in shell for table use during the less productive seasons. It is only when poultrymen realize the necessity of making the best use of the refrigerator (as is done by the dairy-farmer) as a means of holding any summer surplus for use during the scarce season that consumption will materially increase and the market become stabilized. True, much has been done in this direction by placing in the freezer egg-pulp for winter use by confectioners and other large consumers of eggs; but this in itself is insufficient if the desired reforms are to be brought about. The table-egg trade must be considered as well. By adopting this course the winter prices would be reduced, but the summer prices would be increased. Such an increase in the price of the abundant summer eggs would be a great factor in making the business the profitable undertaking it should be for those engaged in it, and also in inducing people to take up poultry-keeping.

Much is being said in regard to the importance of establishing an export trade in eggs, but it is questionable if any market in the world offers better possibilities at the present time than the local trade, if the latter is catered for in a more intelligent manner. By all means let the industry test the oversea market, chiefly for the reason of ascertaining whether there exists a profitable outlet for any future surplus of supply that may be brought about. The marketing of not only the egg product but the table bird as well is the most vexed problem facing the poultry producer to-day. The problem will never be solved under the present general system of disposal. What is wanted is a sounder system of organization and loyalty among producers than exists to-day, as a means of bringing about the disposal of poultry under co-operative effort.

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

THE APIARY.

LOCAL CONDITIONS IN RELATION TO MANAGEMENT.

As this *Journal* has a Dominion-wide circulation it is necessary that these notes shall as far as possible have a Dominion-wide application. Both climate and flora, however, vary considerably throughout New Zealand, and it is advisable to take this into consideration and vary general instructions to meet local conditions. Every beekeeper should carefully study his own locality both in regard to climate and flora. A knowledge of local conditions applied to the management of the apiary will frequently make all the difference between success and failure. The effect of flora and climate on the question of winter stores may be taken as an example. Most beekeepers throughout the Dominion are dependent on clover, hawkweed, and capeweed for their crop of honey, and it is necessary for them when preparing their bees for winter to leave sufficient honey in the hives to last the bees until this flora is again secreting nectar. From 30 lb. to 40 lb. is recommended. This appears to the novice to be a large quantity. That it is not too much is substantiated by records that have been kept by Mr. John Irving, of South Canterbury. For some years Mr. Irving has kept a colony of bees of

average strength on a scale, and kept a record of its gains and losses in weight. His records make interesting reading. It is sufficient for our purpose to quote the loss in weight of his scale hive during the months when the bees are gathering practically nothing from the fields and are dependent on their stores for sustenance—say, from 1st March to 1st December. The following is Mr. Irving's record for this period for the years named as published in the *Otago Witness* of 17th March last: 1915, loss in weight, 46 lb.; 1919, 34 lb.; 1920, 29 lb.; 1921, 45 lb.; 1922, 41 lb.

This is a fair indication of what the average colony would consume during that period, and of the weight of honey it is necessary for most beekeepers to leave in the hive. This does not apply, however, to all parts of the Dominion. In a district where there are a large number of commercial orchards, or an abundance of willows or native bush, such quantity of honey in the brood-chamber may prove a hindrance to the bees in the early spring. The queen would be cramped for room in which to deposit her eggs. In districts favoured with the flora mentioned beekeepers are frequently able to extract from 30 lb. to 60 lb. per colony of surplus honey during October. Obviously the proximity of large orchards or native bush calls for a system of management distinctly different to the plan adopted by beekeepers in open country, hence the necessity for every beekeeper to make himself acquainted with the peculiarities of the climate and flora of his own district. No clearly defined boundaries can be here named, and a system of management laid down for the district within such boundaries. A surplus is often extracted within ten miles of another district where the bees are starving. Clover sometimes fails almost entirely to yield nectar on account of a low temperature, while beekeepers surrounded by a wealth of thistle bloom may get a good crop of honey.

It will be obvious that if local conditions affect to such an extent the question of winter stores and the surplus gathered it will affect the management of the apiary generally. In the vicinity of commercial orchards or native bush the bees will probably require supers in September, but in open country these will not be required until November. In some fruitgrowing districts it is possible to raise queens in September, and many beekeepers are losing by not availing themselves of the special advantage their district offers them in this regard. If bees are worth keeping they are worth keeping well. There are comparatively few districts where bees cannot gather a crop of surplus honey, but it is necessary for the apiarist to intelligently co-operate with the bees and provide them with the necessary equipment at the right time. If, however, the would-be apiarist has any thought of commencing on a commercial basis it is advisable for him to obtain information of a reliable nature in regard to the probable average quantity and quality of the honey obtained in the district. While large quantites of honey are secured in the vicinity of the native bush it is often dark in colour and possessing an indifferent flavour. Such honey does not command a payable price.

—*H. W. Gilling, Apiary Instructor.*

THE GARDEN.

VEGETABLE-CULTURE.

In most places arrangements for the winter and spring supplies of cabbages, savoys, brussels sprouts, cauliflowers, and broccoli will have been completed some time back. In the middle districts planting should be finished by the end of January; a month earlier in colder districts; and extend to February in the warmer districts. In the latter—which are not entirely confined to the North—the cabbage-moth is a serious pest because it is active later in the season. There are, however, advantages that to some extent compensate for this difficulty. Broccolis, which supply the bulk of the so-called winter and spring cauliflowers, and are indispensable in cold districts, may well be omitted in warm places. Broccolis require a long period of growth, and must be planted during summer, when the moth is active. Cauliflowers come to heads in a much shorter time, and where sharp frosts are not experienced can take the place of broccolis. Experimental work has shown that early varieties sown on 1st April come into use from the third week in September, and large varities sown at the same time are ready a month later. Large varieties sown on 1st May were first cut on

30th November, so that the two sowings gave heads covering the same period as do broccolis, with the advantage of occupying the ground scarcely half the time, and that at a time when the moth is practically absent. So long as the soil is dry, shallow cultivation should be frequent. If the plants are not making satisfactory growth a little nitrate of soda will help them. This may be applied by scratching in a bare half-teaspoonful round each plant, or by dissolving 1 oz. in 4 gallons of water and giving each plant sufficient to reach its roots.

Winter rhubarb: Except in the coldest districts the evergreen varieties can be used the whole year round. It is, however, as a winter crop that they are valuable, and to secure a heavy winter crop very little produce should be taken in the summer months, the stalks being left to die down on the stools. As the stools are always growing, manuring at intervals is necessary to maintain strong growth. There appears to be no doubt but that stable manure is the best fertilizer for rhubarb, and it is considered to be practically impossible to overmanure it with this substance. This does not mean that unlimited quantities are either necessary or advisable, but that it pays to give a very liberal dressing. Fowl-manure in fairly heavy dressings has also proved to give good results where the soil is not of a clayey nature. Cow or pig manure should not be used, except on very light or sandy soil, as these manures make heavy land cold and soggy. When artificial fertilizers have to be used the case is different; comparatively small amounts given at more frequent intervals are safest and best. It is not well to always use the same fertilizer. Blood-and-bone at the rate of 4 oz. per square yard might be alternated with superphosphate 2 oz., bonedust 1 oz., and sulphate of potash and sulphate of ammonia each ¾ oz. Nitrate of soda, 1 oz. per square yard, may be used in addition to any other fertilizer or manure. It will pay to give this salt about three times a year at the present time, in spring, and about midsummer. Manuring or fertilizing should be attended to now before winter really commences.

Asparagus: The tops should be cut down as soon as they are practically dead, and before the berries fall; if the berries fall in any number they cause trouble, young plants coming up as weeds. The tops should be cut a little below the surface of the soil; if the stubs project above the surface not only are they a great nuisance when cleaning the bed, but they become hollow and form a congenial shelter for slugs, woodlice, and other pests. If the soil is weedy it should be cleaned by the means most appropriate in the circumstances. Nothing else need be done at the present time.

Spinach: Where spinach is grown for home use only the leaves are taken. The larger the leaves are the heavier will be the crop, and the better the quality. To secure large leaves the plants should be thinned to from 8 in. to 10 in. apart. For marketing, the whole plant is drawn for tying in bundles, and in this case thinning as just described is not to be done. Potash and nitrogen are both necessary for spinach and should not be omitted. Sulphate of potash, 1 oz. per square yard, should be added to any other fertilizers or manure given when the soil is being prepared, and nitrate of soda in like amount applied to the surface soil after the plants are well up.

Seakale: Although seakale might be out of place in an ordinary farm-garden, no station or homestead garden should be without it. Seakale, if well grown, forms quite the prettiest dish of vegetables, and can be had at any date desired during the winter months. Where a plantation is established the leaves should at the present time be dead or dying off. These should be cleared away (not dug in) and the soil turned over. No manuring is required, but a surface dressing to repel insects should be given. Salt is frequently used, but personally I prefer nitrate of soda, and give at least 4 oz. per square yard. This salt, at the amount stated, will kill small weeds and soft-bodied insects, and acts as a powerful fertilizer, causing strong leaf-growth the following season, with proportionately strong crowns for forcing the next winter, resulting in large heads; and the larger these are the better the quality and appearance. To force the heads the clumps are covered with a box with no bottom, and with a loose lid which is laid on top. The whole is then covered with fermenting manure, a depth of about 12 in. to the box from each side and the top being sufficient. Forcing takes about fourteen days, so that the seakale can be got ready for any date it may be wanted. A good deal of seakale is forced beneath benches in greenhouses, but as only heated houses are of service for the purpose the practice has only a limited application in this country.

—W. H. Taylor, Horticulturist, Wellington.

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.

COW WITH HARD QUARTER.

W. H. PREBBLE, Murchison :—

I should be obliged to you for information concerning the following: We have a second calver that has one quarter hard, and she does not give her milk as she should from this quarter; it only comes out in a dribble. The other quarters are all right.

The Live-stock Division :—

The hardness of the quarter is due to thickening of the gland-tissue, and is probably brought about by a prior case of mastitis. The latter may be due to faulty drying off after the last milking-period or to some accident to the udder. For example, the cow may have injured the udder when jumping over a log. We would advise the following treatment: After milking, apply hot foments to the part, afterwards thoroughly massaging the quarter and then rubbing in oleate of mercury in quantity about the size of a walnut.

LUPINS AND SOIL-INOCULATION.

P. FURSE, Hikuai :—

Will you kindly inform me if white lupin is successful as regards inoculation of soil—lucerne to follow; the time to sow—if April would be too late; the time required for rotting; and if white lupin is preferable to blue?

The Agricultural Instruction Service :—

A crop of lupins will not inoculate the soil for lucerne. You are advised to obtain some soil from an established lucerne-field. April would not be too late for sowing lupins in the Hikuai district, and the white lupin is the most suitable for your light soil. The green material would take about six weeks to rot.

FERTILIZERS FOR TOMATOES.

W. PHILLIPS, Petane :—

Would you kindly inform me as to the amount per acre of sulphate of potash and blood-and-bone to use in the culture of tomatoes, the plants being, say, 3 ft. between rows and 2 ft. between plants?

The Horticulture Division :—

The amount required naturally depends to some extent on the quality of the soil, what manuring it has had before, and what crops (if any) have been grown. There are cases where the soil is in very little need of manure for tomatoes, but presuming that it is required, then 12 cwt. of blood-and-bone per acre would be a fair dressing, this amount allowing a trifle less than 3 oz. per plant. Of sulphate of potash 2 cwt. per acre is sufficient.

PIG-WATTLE SEEDS FOR POULTRY.

H. W. SALTER, Lower Hutt :—

I am enclosing seeds supposed to be of the pig-wattle. I have heard that these are good for fowls, and should be glad to know if this is so. How should they be fed to the fowls?

The Chief Poultry Instructor :—

We have not had any direct experience in regard to feeding poultry with these seeds, but are given to understand that if fed sparingly they will not have an injurious effect on the birds. Judging, however, by the offensive smell they give off when chewed it is likely they would not tend towards giving the eggs a desirable flavour. For the latter reason alone it is recommended that they be but sparingly included in the ration of laying birds.

ERADICATION OF "WANDERING JEW" IN GARDEN.

C. I. MONRO, Palmerston North :—

I have about my place here a large quantity of the plant commonly known as "Wandering Jew," or "Creeping Jenny." Last autumn my vegetable-garden was trenched, and we buried this plant in the soil, expecting it to rot and give a fine supply of humus. However, on turning the soil over again in the spring we found that instead of rotting it had remained quite fresh and green, and during the summer it showed through the surface everywhere. Any information as to eradication will be appreciated.

The Horticulture Division :—

In referring to "Wandering Jew" or "Creeping Jenny" you mention two different plants. The former is *Tradescantia procumbens*. The latter is *Lysimachia nummularia*, which bears yellow flowers and has round leaves. The shape of the leaves has caused the name moneywort to be applied to the family. The species *nummularia* is known as herb-twopence and as Creeping Jenny. Doubtless it is the *Tradescantia* you are troubled with. Every joint of the fleshy branches will make roots if near enough to the air, but it has practically no other means of increasing, and the whole of it would have rotted away had it been buried deeper in the soil. The trenching should have been deep enough to prevent disturbing the weed when preparing the soil for crops. It will now be necessary to persevere with hoeing and cultivation as though it were couch-grass, or trench the soil again to a proper depth. A dressing of quicklime, 1 ton per acre, would hasten the decay of the buried matter.

ERADICATING SORREL.

"HIGH COUNTRY," Moawhango :—

I have just cut a heavy crop of oats off a paddock, and notice a lot of sorrel growing. Would you advise skim-ploughing and leaving it fallow for the winter, or would it be advisable to put lime on, and how much (cartage £2 5s. per ton from railway) ? The elevation is 2,900 ft.

The Agricultural Instruction Service :—

You should plough the land about 4 in. deep and leave fallow over the winter, giving occasional harrowings in order to bring the sorrel to the surface, when the frost will kill it. It would greatly help the paddock if you could apply 5 cwt. of burnt lime per acre. This should be put on the ploughed surface, and may be applied any time during the winter.

British Market for Peas and Beans.—The following information was cabled by the High Commissioner, London, on 7th April: *Peas*—Demand is limited and buyers are holding back. Tasmanian, on spot, selling slowly at 85s. 6d. per quarter. New Zealand spot values 76s. to 80s. Japanese plentiful at 29s. 6d. per cwt. Maple: New Zealand February–March shipments offered at 71s. per quarter; afloat, sellers 72s. 6d., buyers 70s. Tasmanian March–April shipments offered at 82s. 6d., buyers 80s.; spot values 110s. to 115s. *Beans*—Fair supplies of English still obtainable. New Zealand nominal values 50s. to 52s. per quarter.

WEATHER RECORDS.

MARCH, 1923.

THE following general summary and rainfall statistics are supplied to the *Journal* from the Dominion Meteorological Office:—

The early part of the month was generally fine, and anticyclonic conditions continued in the north until the 14th, when an extensive westerly low-pressure area which had previously established itself in the south spread its influences farther north, with squally and changeable conditions and scattered rainfall. The weather, though fair on the whole, continued very changeable for the rest of the month, and the last day of March was stormy in many parts of the Dominion. The lowest reading of the barometer—28·95 in.—was recorded at the Bluff on the 16th, and the highest—30·37 in.—at Wellington on the 5th. The southernmost districts and west coast had most rain. The rainfall was also over the mean in Nelson and Marlborough, but elsewhere the reports to hand are mostly well below the average for the month, being in some places on the east coast of the South Island as low as 65 per cent. under the mean; and in the North Island, at Masterton, 80 per cent., and at Maraekakaho Station, near Hastings, 82 per cent. deficient.

—*D. C. Bates, Director, Dominion Meteorological Office.*

RAINFALL FOR MARCH, 1923, AT REPRESENTATIVE STATIONS.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average March Rainfall.
North Island.				
	Inches.		Inches.	Inches.
Kaitaia	4·74	4	4·00	3·58
Russell	2·68	4	1·92	3·42
Auckland	1·76	8	0·70	3·01
Hamilton	2·38	14	0·98	3·74
Kawhia	2·86	13	1·90	3·12
New Plymouth	4·29	13	1·89	3·46
Inglewood	6·76	14	2·70	7·14
Whangamomona	5·50	14	2·19	5·46
Tairua, Thames	3·08	5	1·44	6·73
Tauranga	2·82	9	1·38	4·00
Maraehako Station, Opotiki	2·44	4	1·28	3·90
Gisborne	1·10	5	0·69	4·60
Taupo	1·97	6	1·00	3·53
Maraekakaho Station, Hastings	0·59	5	0·38	3·35
Taihape	1·52	12	0·84	2·69
Masterton	0·64	10	0·23	3·23
Patea	3·25	12	1·46	3·60
Wanganui	2·49	7	0·92	2·60
Foxton	2·07	8	0·76	1·99
Wellington	2·00	8	1·12	3·23
South Island.				
Westport	8·82	16	1·85	5·80
Greymouth	7·18	18	0·85	9·12
Hokitika	9·20	23	1·80	9·65
Arthur's Pass	..	..	..	5·84
Okuru, Westland	8·88	16	2·94	15·48
Collingwood	6·83	13	1·55	4·19
Nelson	3·24	9	1·28	2·93
Spring Creek, Blenheim	3·31	6	1·76	1·81
Tophouse	8·04	12	1·70	3·44
Hanmer Springs	3·50	6	1·22	2·84

RAINFALL FOR MARCH, 1923—*continued.*

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average March Rainfall.
South Island—continued.				
	Inches.		Inches.	Inches.
Waiau	1·59	5	0·75	1·60
Gore Bay	0·75	5	0·30	2·14
Christchurch	0·41	6	0·15	2·11
Timaru	0·98	7	0·56	2·45
Lambrook Station, Fairlie ..	2·08	5	0·86	2·58
Benmore Station, Omarama ..	1·68	7	1·22	2.64
Oamaru	..	..	..	1·77
Queenstown	2·54	10	0·65	2.63
Clyde..	..	..	..	1·50
Dunedin	3·46	16	..	2·92
Gore	..	..	..	3·23
Invercargill	7·62	19	1·58	3·66

Correction: The February rainfall at Napier (Park Island) was 1·39 in. on six days, not 2·78 in. on seven days as given in last month's issue.

WINTER FARM SCHOOLS, 1923.

THE Department has arranged courses of instruction for farmers in the various districts as follows:—

Auckland District: At Ruakura Farm of Instruction, Hamilton, 11th to 16th June. Applications for enrolment to be made to the Farm Manager.

Taranaki: At Stratford, 7th to 12th May. Enrolment with the Fields Instructor, Moumahaki Experimental Farm, Waverley.

Wellington: At Central Development Farm, Weraroa, 30th April to 5th May. Enrolment with the Farm Manager.

Canterbury: At Ashburton, 14th to 19th May. Enrolment with the Instructor in Agriculture, Department of Agriculture, Christchurch.

Otago and Southland: At Dunedin, 29th May to 4th June. Enrolment with the Instructor in Agriculture, Department of Agriculture, Dunedin.

Details of the respective schools (programme, accommodation, &c.) have been published in the local Press in each case, but any further information desired may be obtained from the departmental officers specified above. Early enrolment is advisable.

FORTHCOMING WINTER SHOWS.

Waikato Winter Show Association: Hamilton, 29th May to 4th June.
Otago A. and P. Society: Dunedin, 5th to 8th June.
Taranaki Metropolitan Agricultural Society: New Plymouth, 6th to 9th June.
Manawatu A. and P. Association: Palmerston North, 19th to 22nd June.
South Taranaki Winter Show Company: Hawera, 3rd to 7th July.
Auckland A. and P. Association: Auckland, 17th to 21st July.

Another 1,000 lb. Butterfat Record.—The mature Friesian cow Hilda Minto de Kol, owned and tested by Mr. C. H. Steadman, Kamo, this month completed a 365-days lactation period under C.O.R. test with a production of 27,773·8 lb. milk and 1,046·31 lb. butterfat. She is due to calve about 30th May, which is well within the time stipulated for a first-class certificate.

REVIEW.

"THE DISEASES OF FARM ANIMALS IN NEW ZEALAND."

UNDER this title a noteworthy addition to what may be termed the utility literature of New Zealand has been made by Lt.-Col. H. A. Reid, F.R.C.V.S., D.V.H., &c., head of the Veterinary Laboratory of the Department of Agriculture, at Wallaceville. Col. Reid needs no introduction to readers of the *Journal*, having been for many years a contributor to this publication — the present issue, in fact, containing a good example of his informative and helpful articles. In the book now under notice—a volume of 587 pages, with thirty illustrations—the author has correlated a wide experience in field and laboratory with the aspect of practical stock-management. The keynote of the work in this respect may perhaps be best indicated by quoting one of its opening passages where (dealing with the general care and nursing of sick animals) the author remarks,—

"The health which the majority of animals in New Zealand enjoy can be attributed largely to the open-air existence which they habitually lead, and their relative freedom from the drawbacks attaching to insanitary and unhygenic surroundings. Nevertheless, even under the best management, disease is liable to occur. Its early detection and the application of rational methods of treatment assures the best means of combating such trouble when it arises. A correct appreciation of the habits and attitudes which animals in health assume is indispensable when we come to consider them under contrary conditions. There being no subjective symptoms, the diagnosis of animal-disease is in the main a process of deduction from observation. The faculty of correct observation demands constant practice."

This is common-sense; and Col. Reid, in his careful and comprehensive descriptions of the causes, symptoms, and treatment of the various diseases dealt with in the book, furnishes a fund of information which will prove of great value to all interested in the care and management of live-stock.

The book is divided into three main parts, dealing with microbic diseases, parasitic diseases, and general diseases respectively. There are also useful general sections on such branches of the main subject as diet, methods of administering medicines, disinfection and disinfectants, &c. Extracts from the Stock Act and regulations thereunder printed as appendices, together with a general index, complete the volume.

Written as it is for New Zealand conditions, the book will assuredly find a place on many a farmhouse shelf. While it is a wise course for stockowners to avail themselves of the services of a reliable veterinary surgeon when possible, there are many districts in the Dominion which have no private practitioner within reach, and in these cases "The Diseases of Farm Animals in New Zealand" will be of special assistance and utility.

The publishers, Messrs. Whitcombe and Tombs, Wellington, have done their part with merit. The book is well printed on good paper and strongly bound in cloth boards. It is issued at the price of 25s.

Gisborne Land District.—A land district bearing this name and having its principal office at Gisborne has been constituted as from 1st April. The new district has been formed partly out of the Auckland and partly out of the Hawke's Bay Land Districts, the boundaries of which are amended accordingly. Roughly it comprises the counties of Cook, Waikohu, Waiapu, Opotiki, and part of Wairoa. Its coastal boundary-points are the mouth of the Maraetotara River (Bay of Plenty) and Ngakau-o-te-Paritu (Hawke's Bay). Details are given in the *Gazette* of 15th March, 1923.