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DAIRY-HERD TESTING IN NEW ZEALAND.

REVIEW OF 1927–28 SEASON.

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THE season of 1927–28 brought forth a revived interest in the testing of dairy herds for yield, with the result that almost 54,000 more cows were tested than in the preceding season. Moreover, the level reached this last season represents 27,280 cows more than for 1924–25, when the hitherto greatest number in the history of the movement in New Zealand since the inception of cow-testing, in 1909, was recorded. In exact figures there were 170,150 cows tested in 1926–27, and 224,130 in 1927–28, an increase of 53,980 cows. The 224,130 tested animals represent 16½ per cent. of the total of the Dominion's dairy cows in milk and dry.

Readers conversant with the subject will recall that dairy-herd testing in New Zealand is carried out under several variants of our original method, and that three systems are now generally recognized —namely, "Association," "Group," and "Dairy Company." Under the Association system the members themselves do the weighing and sampling of their cows for two days (in a few cases one day) in every thirty days, while in the case of the Group system weighing and sampling of the milk for each cow on test is done by a testing officer for one day every month. In both cases samples are tested by testing officers, returns figured, and sheets containing results returned to the dairy-farmers. Testing under the Dairy Company system resembles the Association method, except that the figuring of returns is left to the herd-owners themselves.

Details of classification under these three systems for the past five seasons are given in Table 1, while the accompanying graph gives a clearer conception of the relation between the number of cows tested under each system and as a whole. The graph goes back six seasons. This enables the inclusion of 1922–23, the first year of group testing in New Zealand, and thus an interesting survey of the progress of group testing and of its tendency to replace the original Association system is afforded. A fact immediately apparent from a survey of this table is the marked increase in the Group system—an advance

Table 1.—Number of Cows tested Twice or more, classified according to Season and System of Testing.

System.	1923–24.			1924–25.			1925–26.			1926–27.			1927–28.		
	Organizations.	Cows.	Average Cows per Organization.	Organizations.	Cows.	Average Cows per Organization.	Organizations.	Cows.	Average Cows per Organization.	Organizations.	Cows.	Average Cows per Organization.	Organizations.	Cows.	Average Cows per Organization.
Association	114	96,198	844	117	87,695	750	124	59,345	479	116	56,823	489	115	56,699	493
Group ..	34	43,144	1,269	91	100,055	1,100	86	105,227	1,224	96	109,827	1,144	127	164,610	1,296
Dairy Company	42	11,872	283	51	9,100	178	38	5,204	137	28	3,500	125	18	2,821	157
All ..	190	151,214	796	259	196,850	760	248	169,776	685	240	170,150	709	260	224,130	862

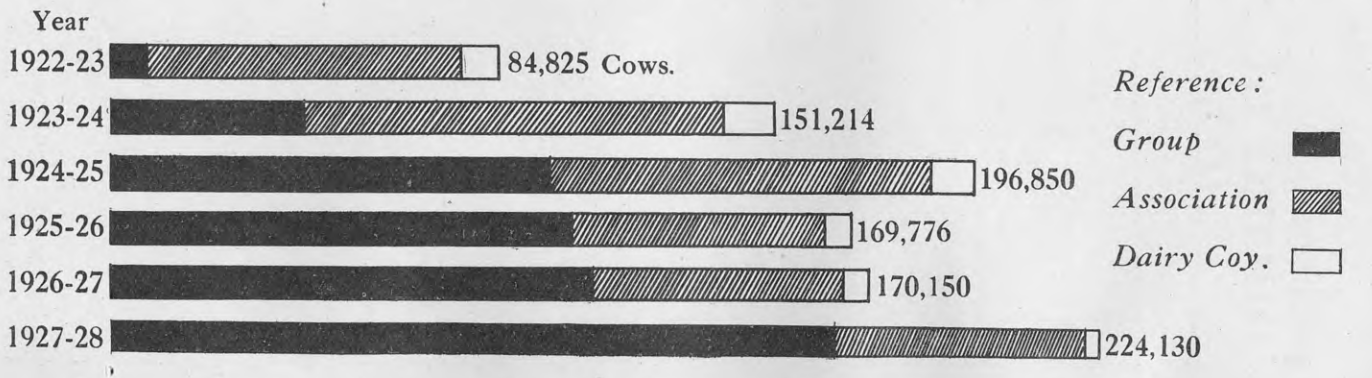

FIG. 1. GRAPH SHOWING EXTENT OF HERD-TESTING IN NEW ZEALAND FOR LAST SIX SEASONS—AS A WHOLE AND ACCORDING TO SYSTEM.

of 54,783 cows. The Association system just fails to reach last season's number, and Dairy Company testing has decreased. It will also be observed that there were 127 groups in operation last year, as compared with 96 in 1926–27, an increase of 31.

In Table 2 the number of cows tested has been taken out in land districts, and, perused in conjunction with similar classification for the four previous seasons, the table furnishes an interesting review. As will be seen, the increase in total cows tested last season is due principally to the marked advance in testing in the North Island, although the South Island shows an increase of approximately 2,600 cows. The increase in the North Auckland Land District is remarkable, although each North Island district shows a decided upward trend from last year. It is gratifying to record a good increase in the figures for Southland.

Table 2.—Number of Cows tested Twice or more, classified according to Season and Land District, &c.

Land District, &c.	1923–24.	1924–25.	1925–26.	1926–27.	1927–28.
North Auckland ..	23,521	31,049	24,951	24,616	41,067
Auckland	63,945	93,912	77,651	82,338	101,796
Gisborne	3,122	4,022	3,891	2,626	5,756
Hawke's Bay ..	4,391	5,468	4,902	2,987	4,638
Taranaki	18,567	16,840	16,485	14,696	23,581
Wellington	30,584	37,415	29,653	29,517	32,267
North Island ..	144,130	188,706	157,533	156,780	209,105
Nelson	1,192	574	880	620	656
Marlborough ..	175	147	441	258	434
Westland	771	..	..	74	..
Canterbury	2,345	2,171	1,799	4,292	3,280
Otago	2,416	1,859	903	950	769
Southland	185	3,393	8,220	7,176	9,886
South Island ..	7,084	8,144	12,243	13,370	15,025
Dominion	151,214	196,850	169,776	170,150	224,130

Table 3 presents the numbers of cows, herds, and associations, together with the average size of herds and associations represented in all effective annual summaries (on the 100-days-or-more basis) received for the past three seasons. In view of the increase recorded in total cows tested, this table runs out much as might be expected. A noticeable feature, however, is the large increase in the average number of cows per association. The term "association" as used in this table denotes a herd-testing organization, whether Group, Association, or Dairy Company. As mentioned in previous reviews, there is, unfortunately, a confusion in herd-testing nomenclature, inasmuch as organizations operating under either the Group or the Association system are termed "herd-testing associations," or simply "associations." In some districts there is a tendency to call the original association

method the "individual" system, but it is doubtful if this is not even more confusing to the average person.

Table 3.—Number of Cows, Herds, and Organizations represented in Effective Seasons' Summaries received. (Basis: All Cows in Milk 100 Days or over.)*

—	1925–26.	1926–27.	1927–28.
Number of organizations	201	211	242
Number of herds	4,458	4,678	5,927
Number of cows	146,398	155,028	206,323
Average number of herds per organization	22	22	24
Average number of cows per herd ..	33	33	35
Average number of cows per organization..	728	734	853

* Including both Group and Organization systems, and on basis of sections or units.

In Table 4 the groups and associations are classified according to herds and cows. It will be noted that the number of cows per group and per association shows an increase. The outstanding feature of this table is that the group herds are more than twice as large as those on Association test. This is due partly to the fact that a group can be operated most successfully and economically among larger herds, and partly because most group organizations insist that all sound cows in the herd shall be tested. Frequently only those cows hitherto untested are entered in Association test, and an association often operates among small farmers in scattered districts where a group would not be practicable.

Table 4.—Average Size of Associations and Groups for which Effective Seasons' Summaries on the Basis of all Cows in Milk 100 Days or over were received.

System.	Season.	Average Number of Herds per Association or Group.	Average Number of Cows per Association or Group.	Average Number of Cows per Herd.
Association ..	1924–25	25	574	23
	1925–26	19	407	22
	1926–27	18	408	22
	1927–28	21	414	20
Group ..	1924–25	26	1,185	45
	1925–26	27	1,205	44
	1926–27	26	1,127	43
	1927–28	28	1,250	45

AVERAGE YIELD OF TESTED COWS.

It is pleasing to be able to report concerning the collection of data pertaining to herd-testing that effective summaries received for the 1927–28 season represent over 92 per cent. of the total number of cows tested twice or more for all groups and associations. Appreciation is again recorded of the prompt and accurate manner in which officers

in charge of the various herd-testing organizations have responded to our requests for summaries of results. Production summaries for purposes of this review are based on all cows in milk 100 days and over, which is the accepted standard for the compilation of ordinary herd-testing returns. The number of cows represented in effective summaries to hand for last season reaches the total of 206,323, an increase of 51,295 over the 1926–27 total.

As regards butterfat-production, last season's average-yield figure shows a decrease of 15·80 lb. from that of 1926–27, the average production for 1927–28 being 224·68 lb. butterfat and for the previous season 240·48 lb. More than one factor played a part in bringing about this falling-off. In the first place, 1926–27 was climatically an exceptionally favourable season, whereas last season was marred by drought; so that, considering the two seasons from a climatic point of view as applying to dairying they represented almost two extremes. Then, again, 54,000 more cows were tested last year, involving the breaking of new ground by the extension of herd-testing to more outlying districts. This would probably mean the inclusion of many less-improved farms, and many herds in the first stages of building-up, and consequently of a number of lower-yielding individuals, which would tend to lower the general average. Another phase of the question is revealed by the fact that whereas at 31st January, 1927, there were in New Zealand 1,303,225 dairy cows in milk and dry, by 31st January, 1928, this number (according to the Government Statistician's interim figures) had risen to 1,352,513, an increase of 49,288. Unfortunately, figures relating to cows actually in milk at the last enumeration are not yet available, but those just quoted are sufficient to show that our dairy-farmers were actually milking more cows last season. This would include to a certain extent first calvers and cows hitherto untried, and these would probably also adversely affect the grand average. All things considered, the average yield of all cows on herd test last season—namely, 224·68 lb. butterfat—must be accepted as very creditable. A grand summary of production results for the past seasons is supplied by Table 5.

Table 5.—Grand Summary of all Effective Herd-testing Results on the Basis of all Cows in Milk 100 Days or over received for the Last Two Seasons.

	1926–27.		1927–28.	
	Days in Milk.	Butterfat-production.	Days in Milk.	Butterfat-production.
		lb.		lb.
Average for all cows (155,028 in 1926–27 and 206,323 in 1927–28)	236	240·48	230	224·68
Highest Association or Group average ..	240	357·46	258	377·70
Lowest Association or Group average ..	131	94·88	185	116·08
Highest herd average	317	511·91	272	484·88
Lowest herd average	100	65·13	112	68·03
Highest cow	276	795·09	263	858·20
Lowest cow	103	17·44	130	7·74
Average daily production of butterfat for all cows	..	1·02	..	0·98

In Table 6 average production is classified according to system of operation, the two principal systems, Group and Association, being the classifications adopted. As would probably be anticipated from the foregoing comment concerning the average yield of all cows tested, averages under both systems show a decline. The Association average dropped by 20·61 lb. of butterfat, and the Group average fell some 15·42 lb.

Table 6.—Average Production of all Effective Results for Past Three Seasons classified according to System. (Basis : All Cows in Milk 100 Days or over.)

Season.	System.	Number of Associations or Groups.	Number of Herds.	Number of Cows.	Average Days in Milk.	Average Butterfat.
						lb.
1925–26 ..	Association	120	2,239	48,823	217	215·40
	Group ..	81	2,219	97,575	236	223·06
1926–27 ..	Association	115	2,140	46,878	220	232·64
	Group ..	96	2,538	108,150	241	243·88
1927–28 ..	Association	115	2,389	47,589	204	212·07
	Group ..	127	3,538	158,734	237	228·46

Figures on hand in the Dairy Division's head office, where is carried out the figuring of returns for associations conducted by officers of the Division, enable us to take out each year a summary founded on all cows in milk 210 days or more. This classification cannot be run out for all cows tested in the Dominion, as the information is not available for cows tested in privately controlled organizations. A 210-day summary provides results more in conformity with the length of a dairying season, and is more exact evidence of what our average normal cow is capable of producing. On the other hand, the 100-day summary includes performances of some cows of such poor quality that they do not milk 210 days. It has the disadvantage, however, of including certain records which should perhaps be omitted—the records, for example, of cows that have died, fallen sick, or been sold or culled, and thus discontinued prior to the date on which under normal circumstances their test would have been completed.

Table 7 gives production results under the headings of cows in milk 100 days and more and cows in milk 210 days and more for associations tested by officers of the Dairy Division. It will be observed that the average 100-days-or-more yield practically equals last year's figure, while the average yield in the 210-days-or-more class, which stands at 282·54 lb. butterfat, shows an increase of 9·15 lb. These results are contrary to the past season's results for herd-testing as a whole, the probable explanation being that the majority of associations conducted by Dairy Division officers have been in operation for several seasons, and consequently the influence of herd-building is in evidence.

Table 7.—Average Production for Associations conducted by Officers of the Dairy Division, comparing Difference in Production between Results of Summaries compiled on the Basis of all Cows in Milk 100 Days or more and 210 Days or more.

Year.	100 Days or more.		210 Days or more.	
	Average Days.	Average Butterfat.	Average Days.	Average Butterfat.
		lb.		lb.
1923–24	227	221·39	258	267·10
1924–25	223	231·51	258	266·29
1925–26	218	221·19	257	259·20
1926–27	236	247·35	262	273·36
1927–28	229	246·91	264	282·54

Table 8 provides a more detailed production classification, and enables a comparison by land districts. As was to be expected, many of the land districts show a decrease in average production from the preceding season. It will also be observed that in almost every instance the largest decrease occurred in those land districts which showed the greatest advance in total numbers of cows tested. It is pleasing to note that the South Island records an increase in average yield as well as in total number of cows tested.

Table 9 has been compiled in order to illustrate the difference in distribution of records for results from the two systems—Group and Association. In the upper half of each of the two season's tabulations the numbers of records are given, while in the lower half these have been converted to percentages. This table is useful in showing where the cows which lower the average occur. It will also be apparent that many unprofitable producers of butterfat are being milked, and how much more favourable the yield of our average cow would be could we eliminate all those animals which fail to produce a quantity of butterfat equal to the present average. This point is more or less emphasized by Table 10, and numbers of the records from which the table was compiled make it clear that the higher average yield of cows in the 210-days-or-more class is not accounted for by the fact that it contains more higher-yielding animals, but because there are fewer cows in the lower-production classes.

Fig. 2, which should be studied in conjunction with Table 10, reveals in a clear form a very interesting position. This graph is based on the data supplied by Table 10, with the exception that the curves have been "smoothed" slightly. The graph supplies the percentage frequency of records appearing in the various classes as marked along its base. It will be observed that two seasons are represented—1925–26 and 1927–28—this graph not having been compiled last year or prior to the 1925–26 season. By "percentage frequency of occurrence" is meant the percentage of the total number of records represented by the number of records which fall within the limits of production within each butterfat-production class specified along the base line of the graph. It will be quite obvious that the trend of the records is towards the higher-production classes, and that the number of low-producing cows is gradually decreasing. This, after all, should be the aim of every dairy-farmer—not so much the elimination of the poor cow as the replacement of the poor cow with a higher-yielding animal.

Table 8.—Average Production, according to Land Districts, &c., of all Cows under Herd-test for which Effective Seasons' Summaries were obtained. (Basis: All Cows in Milk 100 Days or over.)

Land District, &c.	1924–25.			1925–26.			1926–27.			1927–28.		
	Cows in Summary.	Average Days in Milk.	Average Butterfat.	Cows in Summary.	Average Days in Milk.	Average Butterfat.	Cows in Summary.	Average Days in Milk.	Average Butterfat.	Cows in Summary.	Average Days in Milk.	Average Butterfat.
			lb.			lb.			lb.			lb.
North Auckland	25,685	216	205·14	20,925	224	210·94	21,471	224	232·46	36,395	211	191·66
Auckland	77,003	235	224·98	73,101	236	226·08	78,625	240	244·82	95,799	235	225·04
Gisborne	3,455	204	208·34	3,368	212	191·03	2,405	217	218·08	5,244	231	234·39
Hawke's Bay	4,575	243	233·25	4,294	224	189·32	2,285	230	208·95	4,107	230	233·72
Taranaki	11,683	233	251·58	12,846	235	242·42	12,857	241	239·67	22,180	238	247·01
Wellington	24,199	228	230·99	22,043	223	212·64	25,400	258	256·53	29,300	233	244·89
North Island ..	146,600	230	224·48	136,577	231	221·11	143,043	240	252·29	193,025	230	224·72
Nelson	104	258	283·16	609	192	207·16	261	233	239·27	341	154	162·44
Marlborough	..	..	..	..	..	..	..	..	..	..	..	..
Westland	..	..	..	..	..	..	..	..	..	..	..	..
Canterbury	909	196	213·15	391	195	217·21	3,917	207	219·03	2,847	226	222·57
Otago	1,249	204	203·04	804	218	223·60	820	199	247·02	720	239	273·42
Southland	3,013	191	187·28	8,017	217	211·14	6,987	217	215·36	9,390	220	222·94
South Island ..	5,275	197	197·36	9,821	214	212·15	11,985	213	219·06	13,298	221	224·04
Dominion	151,875	229	223·54	146,398	230	220·51	155,028	238	240·48	206,323	230	224·68

Table 9.—Distribution of Records for all Tested Cows in the Dominion represented in Effective Annual Summaries received, Seasons 1926–27 and 1927–28. (Basis: In Milk 100 Days or over.)

System.	Class Limits (in Pounds of Butterfat).																	Total Number of Cows classified.
	Under 50.	50–100.	100–150.	150–200.	200–250.	250–300.	300–350.	350–400.	400–450.	450–500.	500–550.	550–600.	600–650.	650–700.	700–750.	750–800.	800–850.	850–900.	
1926–27.							*Numbers.*												
Association	42	1,653	6,090	9,441	10,855	8,903	5,545	2,663	954	289	75	23	7	2	..	..	..	..	46,542
Group ..	89	2,251	8,946	19,098	26,396	23,644	15,035	7,010	2,603	799	203	47	9	4	..	2	..	..	106,136
Both ..	131	3,904	15,036	28,539	37,251	32,547	20,580	9,673	3,557	1,088	278	70	16	6	..	2	..	..	152,678
							Percentages.												
Association	0·09	3·55	13·08	20·28	23·32	19·12	11·91	5·72	2·04	0·62	0·16	0·04	0·01	*	..	..	..	..	46,542
Group ..	0·08	2·12	8·42	17·99	24·86	22·27	14·16	6·60	2·45	0·75	0·19	0·04	*	*	..	*	..	..	106,136
Both ..	0·08	2·55	9·84	18·69	24·39	21·31	13·47	6·33	2·32	0·71	0·18	0·04	0·01	*	..	*	..	..	152,678
1927–28.							*Numbers.*												
Association	41	2,386	8,947	11,449	10,398	7,433	4,314	1,743	648	168	40	16	3	2	..	..	..	1	47,589
Group ..	552	5,620	19,194	34,598	39,525	31,326	17,956	7,062	2,163	563	127	35	7	2	3	1	..	..	158,734
Both ..	593	8,006	28,141	46,047	49,923	38,759	22,270	8,805	2,811	731	167	51	10	4	3	1	..	1	206,323
							Percentages.												
Association	0·09	5·01	18·80	24·06	21·85	15·62	9·07	3·66	1·36	0·35	0·08	0·03	0·01	*	..	..	..	*	47,589
Group ..	0·35	3·54	12·09	21·80	24·90	19·73	11·31	4·45	1·36	0·35	0·08	0·02	*	*	*	*	..	..	158,734
Both ..	0·29	3·88	13·64	22·32	24·20	18·78	10·79	4·27	1·36	0·35	0·08	0·02	*	*	*	*	..	*	206,323

* Data occurring, but relatively insignificant.

Table 10.—Percentage Distribution of Records and Herd Averages in Organizations controlled by Dairy Division.

Basis.	Class Limits (in Pounds of Butterfat).													Total Number classified.
	Under 50	50–100	100–150	150–200	200–250	250–300	300–350	350–400	400–450	450–500	500–550	550–600	600–650	650–700	
	Records.														*Cows.*
100 days and over	00·05	1·91	10·65	17·89	21·80	21·75	15·11	6·94	2·94	0·70	0·20	0·04	0·01	..	7,884
210 days and over	..	0·04	1·34	9·67	22·67	28·29	21·89	10·22	4·45	1·04	0·31	0·06	0·02	..	5,213
	Herd Averages.														*Herds.*
100 days and over	..	1·43	9·35	18·71	23·26	27·10	14·63	4·56	0·96	..	..	..	..	..	417
210 days and over	..	..	0·32	4·19	21·61	38·39	26·13	7·74	1·61	..	..	..	..	..	310

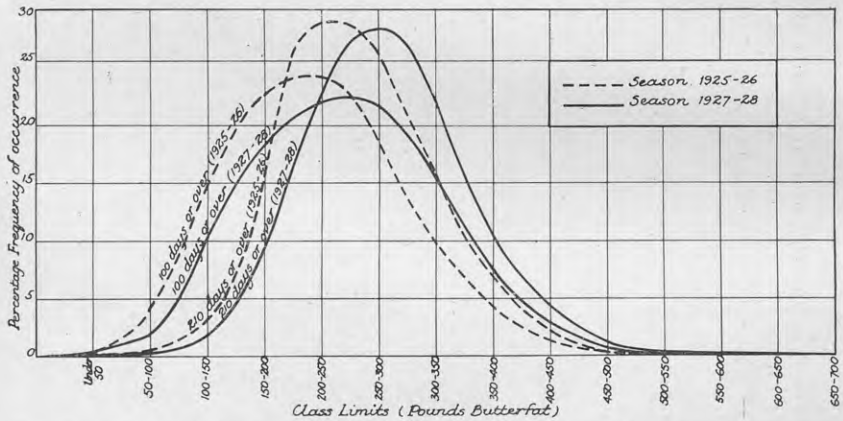

FIG. 2. COMPARISON OF THE PERCENTAGE FREQUENCY DISTRIBUTION OF RECORDS.

CONCLUSION.

Despite the fact that, for reasons given at the commencement of these notes, the production of last season's average cow was not so high as in 1926–27, New Zealand produced more butterfat, indicating that our dairy-farmers milked more cows. It is also apparent that we are gradually replacing our poorest cows with better producers. Market values and general trade conditions suggest better returns from dairying than those of late years, and a further material development of the industry in the Dominion appears to be assured.

Herd-testing now appears to be safely on the ascendant, and there is every indication that a larger number of cows will be milked and more cows tested during the current season than ever before. The subsidy to herd-testing granted last year by the Government was welcomed by dairy-farmers, and no doubt had a part in increasing herd-testing entries. The subsidy has been renewed, and £10,500 is reserved for distribution among testing herd-owners through their organizations this season.

THE GRASSLANDS OF NEW ZEALAND.

GRASSES AND CLOVERS FOR HILL COUNTRY—*continued.*

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(8) Ratstail (Sporobolus indicus).

DURING the past few years many species of grasses and clovers have been reviewed and carefully weighed in the light of the newer conception—namely, that conditions of soil-fertility, soil-moisture, light and shade, climate, and management govern which species are the most profitable for the farmer to use. There is the rye-grass habitat or growing-place, the cocksfoot habitat, the brown-top habitat, and the danthonia habitat, already dealt with in this series. No grass perhaps has been more difficult to allocate to its proper place in the ecologic classification of species and to get accepted by pastoralists and agricultural advisers than ratstail.

Moderately warm climatic conditions, low-fertility soils usually of a loose friable nature such as sand, pumice, and limestone, characterize the ratstail habitat. This grass will grow and persist on soils poorer in quality and more difficult even than those where Danthonia pilosa thrives. It falls more naturally, so far as its growing-place is concerned, along with low-production grasses such as bay-grass (*Eragrostis Brownii*), Grimmer grass (*Triodia decumbens*), and Danthonia semiannularis, although there is no doubt that on sufficiently warm areas ratstail can compete successfully against Danthonia pilosa, particularly when allowed to get away rank. (Fig. 137.) On certain hydraulic-limestone country in North Auckland where the physical conditions of the soil are difficult to maintain right for cocksfoot, &c., ratstail has spread and has formed a tall dense growth that entirely prohibits the establishment or spread of low-growing grasses and clovers. Under ungrazed conditions, therefore, owing largely to its tallness of growth, ratstail may assume complete dominance and completely master danthonia and other low-productive, low-growing species. (Fig. 138.)

In growth-form ratstail is a tussock; the crown is below ground, and spread is by means of short underground tillers and from seed shed. The root-system is extensive, and the larger roots penetrate 2 ft. or more into the subsoil. The grass is held in low repute by many farmers, largely on account of the toughness of its rather broad, erect leaves. Ratstail is a native of Chili and "according to the late Bishop Williams made its first appearance at the Bay of Islands in 1840, shortly after the arrival of a ship called the *Surabayo*, which, while on a voyage from Valparaiso to Sydney laden with horses and forage, put into the Bay of Islands in a disabled state and was there condemned and her cargo sold."*

Ratstail has not the wide distribution over New Zealand that Danthonia pilosa has. It will not tolerate extreme cold, and its climatic range coincides somewhat with that of paspalum, although its adaptability to poorer soil-conditions would make it appear much more tolerant of cold than the latter grass. In North Auckland large areas of ratstail

* "Tutira, the Story of a New Zealand Sheep Station," p. 179; by H. Guthrie-Smith.

FIG. 137. PURE ASSOCIATION OF RATSTAIL ON COUNTRY TOO POOR FOR THRIVING OF BROWN-TOP OR ANY BETTER GRASSES.

Here ratstail by its taller growth suppresses any danthonia in the sward, and precludes its further establishment.

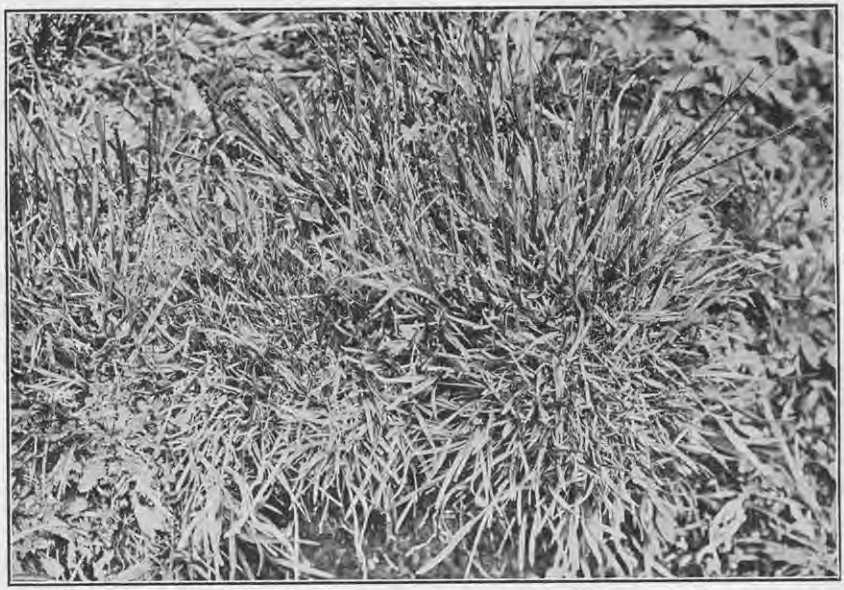


FIG. 138. DANTHONIA SUPPRESSION BY RATSTAIL.

On the sunlit edge of the ledge shown danthonia is persisting, but the ratstail is ousting it elsewhere. Along the coast, particularly of the North Island, ratstail unless kept closely grazed will probably replace danthonia.

[*Photos by E. Bruce Levy.*

have been cleared by late autumn or winter burning, thus exposing the crown and any fresh growth to frost. (Fig. 139.) The grass, however, thrives quite well along the entire coastal country of the North Island, and inland to as far south as the Wanganui River, and possibly farther. In the South Island it is confined largely to the coast of the northern end of the Island on the east, but extends farther south on the west. These climatic bounds, however, may not represent the extreme ultimate limits for ratstail in New Zealand. Within the colder areas we know that spread from seed shed is extremely slow, and as comparatively little seed of this species has ever been intentionally sown within

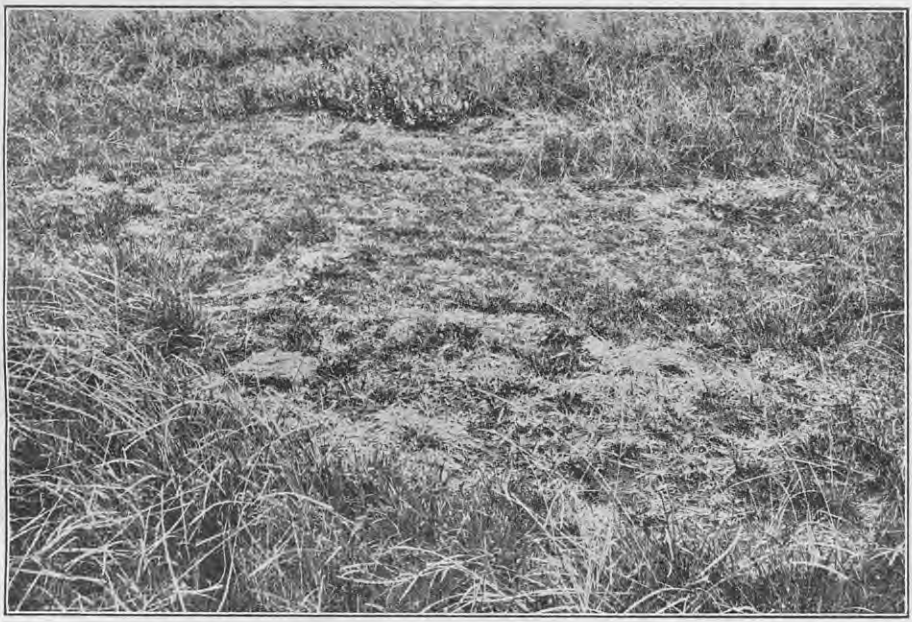


FIG. 139. STRONG RATSTAIL BURNT IN LATE AUTUMN.

The large bare patch in the photo is where the fire spread, and the ratstail is largely killed out. Much effective work has been done in North Auckland by burning ratstail, surface-sowing with seed, and subsequently top-dressing with manure.

[*Photo by E. Bruce Levy.*

these areas there is little chance afforded of knowing without definite experimental work just what the ultimate climatic range may be.

There is no doubt that for the general dry hard-conditioned soil-type throughout New Zealand the grass that has the widest application throughout the entire range of such lands is Danthonia pilosa; but for special warm country, particularly coastal, throughout both Islands, the native danthonia has a big rival in the alien ratstail.

It is almost inconceivable that the New Zealand danthonia soil-type has not its counterpart in other parts of the world. Such will be grassed by species akin to danthonia in demand of soil-fertility requirement,

soil-moisture, light and shade, &c., and when these are introduced into the danthonia habitat here the struggle with our like-demanding species is apt to be keen, and generally speaking the taller grower will survive. It would appear, therefore, that throughout much coastal country, in the North Island particularly, ratstail will gradually assume dominance over danthonia, especially so under light grazing. Under close and continuous grazing which permits plenty of light to the danthonia crown, and which somewhat prejudicially affects the tussocky ratstail, the odds are essentially more equal, and ratstail and danthonia may blend one with the other, making a close and continuous turf. (Fig. 140.)

VALUE OF RATSTAIL.

Ratstail has some very strong supporters, and among these are men of high standing in pastoral New Zealand. Mr. H. Guthrie-Smith and Mr. Bernard Chambers (Hawke's Bay) may be mentioned as the foremost advocates of this grass. Mr. Chambers writes :—

I consider ratstail has no superior on certain soils ; the Kiwi Valley, on the Wairoa Road on Waihua Run, used to be barren useless land covered with stunted manuka a foot or so high. The spreading of ratstail and danthonia has made it one of the finest pastures I know. On the light pumice spurs also of Kiwi Station, where other grasses died out, ratstail formed a beautiful close sward. If kept in order by cattle, it is always grazed close by sheep, and the blades are sweet like those of prairie-grass ; weedy hoggets following thrive wonderfully on the grass and do not scour. I know land north of Gisborne that has been made by ratstail in the grass-seed mixture. On the Havelock North hills in spring-time, directly they begin to burn up, both sheep and cattle neglect danthonia and graze each tuft of ratstail close. . . . At Mokau, Mohakatino, and our Mangtoi Station leasehold, twenty miles up the Mokau River, ratstail stands ahead of all other species on spurs which grew only tawhero (kamahi) and rewarewa, a sure sign of poor light soil. On them cocksfoot, rye-grass, and every other grass died out and gave way to catsear and suchlike rubbish. On those spurs wherever ratstail has got in it has made a beautiful closely-cropped sward.

In a recent communication from Mr. Guthrie-Smith regarding the merits of ratstail for the so-called Hawke's Bay pumice-lands he says :—

Over areas I am describing there is a normal surface of four or five inches of dark dusty humus, then a sheet of four or five inches of grit, then deeper down either a poorish clay or a deposit of packed water-laid reddish sand ; this last contains evidently at least a whiff of clay, as it becomes *hinu* and greasy when wet. For such soils a deep-rooting grass is pre-eminently required. It is supplied by ratstail, which has a root-system exceeding, I should imagine, that of any other pasture-grass in New Zealand. Ratstail in this type of land is able to assimilate any virtues which may exist in the top dusty dark humus, penetrating which it then pierces the pumice land, and is then still able to search for nutriment a good foot into the clays and greasy sand-grits beneath. No wonder we think highly of it ; no wonder it can grow on wretched utterly infertile (surface infertile) northern and western-facing knee and elbow knobs. In such miserable areas—cited purposely because extreme cases of poverty—ratstail has a genuine feeding-value. On normal pumice areas this feeding-value, of course, greatly increases. On lands not properly worked, where mixed danthonia and ratstail grow, everywhere it is my experience that ratstail is bitten close while danthonia stands untouched. Quite good as the latter may be as a poor-country grass, ratstail beats it out of the field because of its enormously developed root-system. Danthonia cannot feed as deep, and therefore cannot reach sources of nourishment open to a rival that can penetrate twenty-four inches into the subsoil. Although not a cold-country plant, this root penetration enables it to maintain a considerable growth even in the winter ; throughout the cold months fresh leaves can always be found rising stiff and stark from the hard uninviting mat. On the tens of thousands of acres of light hill country in northern Hawke's Bay facing north and west—lands hopeless for any other crops than trees—ratstail is the only grass that will provide feed for sheep, and especially (relatively) winter feed ; if ever there

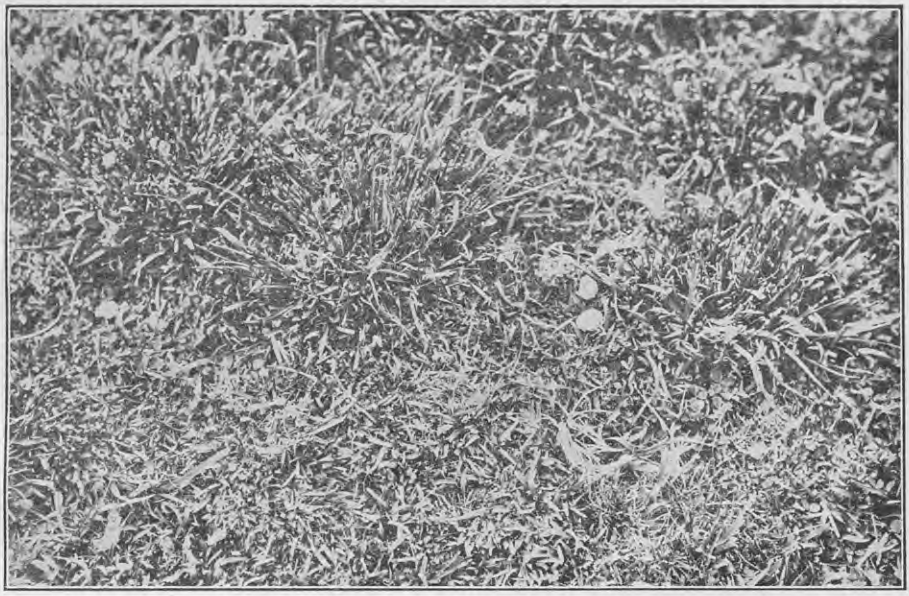


FIG. 140. RATSTAIL AND DANTHONIA PILOSA IN CLOSELY GRAZED SWARD.

Here the conditions are such that ratstail, being closely cropped, cannot overshade the danthonia, and itself is retarded in its development. Thus the two species thrive side by side, making an excellent close and continuous sward.

FIG. 141. RATSTAIL ON THE EAST COAST OF THE NORTH ISLAND.

On the left of the fence ratstail is rank and dominant. Such a paddock, while bad from a herbage utilization point of view, is a great standby in the case of summer drought or in a severe winter. [*Photos by E. Bruce Levy.*

was a poor man's grass it is ratstail. So much for pumice areas. On sound limestone lands where after forty years of feeding the better English grasses and clovers have disappeared ratstail is equally valuable, not only in itself but also from its habit of growth. It grows, even where thick, not quite densely enough entirely to exclude such another invaluable alien as suckling clover. When ratstail shall have spread over my limestone lands they will, I am confident, carry another quarter-sheep per acre. On bad lands, therefore, as also on the excellent fertile limestone of mid Hawke's Bay, ratstail stands forth as a valuable pasture-plant.

It is not for me or any one else in New Zealand to gainsay the opinions of these men, for such opinions are based on the practical experience of a long lifetime, and come from a stock of wonderful general and specific knowledge of practically all pasture plants with which ratstail may be compared.

Ratstail pastures do not gain credit from their appearance. When at all long the pasture looks rough, and at all times lacks that nice green and even appearance characteristic of the regular turf-forming grasses. Even when closely grazed the tussocks appear somewhat raised, and the short stiff leaves present a bristle-brush appearance. It is generally held—and is true—that ratstail is hard on the mouth of sheep, and this has often been put up as an argument against the value of the grass. It must be borne in mind, however, that hill country where we recommend ratstail is not aged-sheep country under any turf whatever. In the words of Mr. Guthrie-Smith himself, "What flockmaster nowadays desires to keep his sheep as records in longevity?" Even if the teeth are somewhat worn and rather belie the animal's age, any practical man when sheep from ratstail country are exposed for sale understands the position, and the fact will scarcely affect his bid.

POINTS IN MANAGEMENT.

The men whose experiences have been cited are large holders and are well equipped with cattle. Perhaps no grass demands stricter attention by "cattleing" than does ratstail. The ill repute in which it is held by many farmers may be attributed largely to the fact that in such cases few or no cattle were available to render it suitable forage for sheep. Ratstail management is distinctly correlated with plenty of cattle, and without this all-important implement ratstail may prove a curse rather than a blessing. This, however, to quote Mr. Guthrie-Smith, "is not the fault of the grass, but of the landowner who does not understand his business; it is a species that must be cattled, just as danthonia or cocksfoot or any other pasture must be cattled, to give best results."

There is no doubt that young ratstail growth is highly nutritious; all classes of stock—horses, cattle, and sheep—thrive remarkably well on it. It has been said that horses grazing on ratstail thrive equally well as oaten-chaff-fed horses; but it is equally true that grazing horses feed largely on extremely short herbage. This emphasizes the need of keeping ratstail short.

An aspect of ratstail that also is a recommendation is that the grass forms a reliable standby in a lean period. Whereas all pastoralists will agree that young growth is the most nutritious, and the exploitation of young growth is the crux of pasture-utilization for maximum value per given weight of herbage consumed, yet on virtually all the poorer hill-country runs the factor of rough growth to tide over crucial summer and

FIG. 142. STRONG, TALL GROWTH OF RATSTAIL ON HEAVY HYDRAULIC-LIMESTONE COUNTRY, NORTH AUCKLAND.

Here so tall and dense a growth of ratstail has been produced that all the lower-growing grasses and clovers are smothered out. On small holdings where wet stock are mainly employed the management of ratstail is extremely difficult, and under conditions such as shown every effort should be made to manure ratstail out.

FIG. 143. RATSTAIL DOMINANT (IN FOREGROUND) ON HEAVY WET HYDRAULIC-LIMESTONE COUNTRY, NORTH AUCKLAND.

On this country there is sufficient rainfall to render available any artificial manures applied, and the effort here should be to so stimulate the better grasses and clovers as to keep ratstail out. [*Photos by E. Bruce Levy.*

winter periods of shortage is equally important as that of well-cropped, short young growth. Ratstail may essentially be relied on to provide this rough growth. Owing to the tough nature of its leaf it matures *in situ* as rough feed and does not lodge. Thus there is provided food of a sort that will at least sustain stock during a summer drought or through a severe winter. (Fig. 141.)

SIGNIFICANCE OF RATSTAIL DOMINANCE ON BETTER-QUALITY SOILS.

Ratstail on certain soils is capable of tall growth (Fig. 142), and in the absence of cattle it may assume control of country that would normally carry good danthonia, some Poa pratensis, crested dogstail, and a trace of cocksfoot and rye-grass—a turf which may be fairly easily managed with comparatively few cattle. This aspect of ratstail, particularly for the small landholder, must be carefully considered. I am not so sure with Mr. Guthrie-Smith that ratstail is a poor man's grass. Ease of management is essential for the small farmer, and the securing of this often more than compensates for any loss incurred through not using a higher producer that is difficult to manage—nay, almost impossible to manage without the expensive implement, cattle. In North Auckland this is strikingly well illustrated in the case of paspalum, and also in regard to ratstail on certain hydraulic limestone country about Paparoa. (Fig. 143.) This country is heavy, wet, and cold, and the physical conditions seem to render it unsuitable for thriving of the better grasses; yet it suits ratstail to perfection. On country such as this, burning and surface sowing of red and white clover, together with manurial top-dressing, often results in the entire elimination of ratstail. It is really a soil-type that should not be carrying ratstail, being wet enough to render available any phosphate manure that may be applied. Ratstail cannot compete successfully against a strong-growing turf of the first-class English grasses and clovers, and even moderately-well-growing brown-top and Lotus major prove more than a match for ratstail. (Fig. 144.) On country, therefore, that is wet enough to render artificial manures readily available, just as the manuring out of danthonia and brown-top is advocated, so here ratstail should not be tolerated, and its elimination from such country, as shown in Figs. 142 and 143, should be the aim of the farmer. Even where the ratstail is not quite eliminated the presence of clovers induced by the manuring renders the ratstail pasture of much greater value. (Fig. 145.)

On country that can be heavily tripod-harrowed in conjunction with manuring the process of eliminating ratstail is made easier. The tussock of ratstail is torn by the harrow, and, provided the soil-fertility is built up enough, species such as brown-top, Lotus major, white clover, &c., readily penetrate the broken crown and thus help to smother the ratstail out all the quicker. Some very good examples of ratstail-control by manuring and harrowing may be seen on the main Awakino Valley Road, where paddocks only lightly stocked, unharrowed, and unmanured may run dominantly to ratstail, while adjoining paddocks well farmed are comparatively free of this grass.

It is on the unploughable, unmanurable hill country—land that has been under beech forest (where the climate is warm enough), poor kamahi, rewarewa, tanekaha, and hinau spurs, &c., poor light soils, fluffy soils, pumice sandhills, and coastal scrub country—that ratstail undoubtedly has a place.

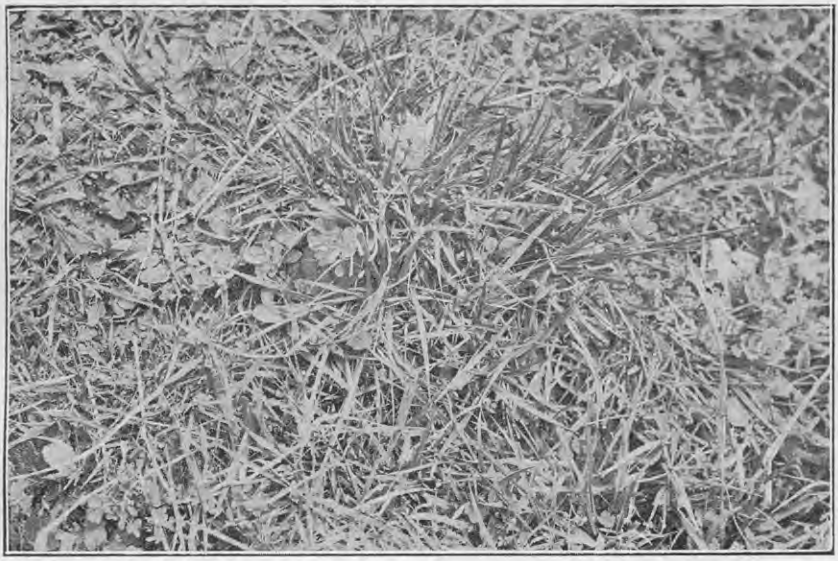


FIG. 144. RELATIVELY STRONG BROWN-TOP AND LOTUS MAJOR COMPETING WITH RATSTAIL ON MR. BERNARD CHAMBERS'S ESTATE, MOKAU RIVER.

By top-dressing, and promoting a vigorous growth of the better grasses and clovers, ratstail may be quite kept in check and ultimately eliminated from the sward. Tripod harrowing helps materially in this work.

FIG. 145. RATSTAIL AND LOTUS MAJOR ON MR. CHAMBERS'S MOKAU COUNTRY.

The presence of a clover working in with the ratstail increases greatly the value of the sward. In the wetter country Lotus major acts well as a companion to ratstail, and on the dry east coast country subterranean clover, suckling clover, clustered clover, striated clover, &c., work in well with ratstail, provided its growth is not allowed to become too rank.

[*Photos by E. Bruce Levy.*

SOWING OF RATSTAIL.

The fine reddish seeds of ratstail are extremely slow to germinate under average field conditions in New Zealand, and even under artificial conditions in the seed-testing laboratory high germination tests are never secured. Where germination has taken place establishment is extremely slow. In experimental sowings made in Taranaki three and four years ago, only a few plants are now visible in the turf. On warmer country, however, establishment is more rapid. On the lighter fluffy soils, owing to the tough nature of the herbage, loss of plants through stock-pulling is often high. The principle of sowing only small amounts of seed of extremely slow establishers is adhered to in the case of ratstail; ½ lb. to 1 lb. of seed per acre included in the mixture affords establishment of a few plants, and reliance is then placed on these reseeding and in the course of time filling up and thickening the turf through shed seed.

Ratstail seed is often difficult to secure, merchants to a very large extent having ceased to handle it, owing largely to depreciatory propaganda mitigating against the demand. It seems to be very desirable that merchants operating over country such as here specified should carry stocks of ratstail-seed and recommend it for the special soil-type and conditions appertaining to the poor hill and coastal country of both Islands. Ability of the holder to manage his country right should, however, be expressly taken into consideration.

CONCLUSION.

There is no doubt that ratstail has a place on the soil-types here defined, and the recommendation of practical men such as Mr. Guthrie-Smith, Mr. Bernard Chambers, and others should go far to allay the general unwarranted condemnation that is abroad in the minds of pastoralists, seed-merchants, and agricultural advisers in general.

(Series to be continued.)

THE RABBIT NUISANCE.

THE section on the rabbit nuisance in the annual report of the Live-stock Division for 1927–28 is introduced as follows:—

The improvement in the state of the rabbit pest recorded last year has been more than sustained, and the rabbit population to-day is considerably reduced. This refers particularly to areas which were previously known to be badly infested. In some parts of the Auckland District where the season was favourable rabbits began to show up where previously, although their presence had been known, they had not shown any tendency to increase, and energetic measures had to be taken. To maintain the position now attained constant vigilance will be necessary both by the settlers and the Inspectors, as any slackening will quickly be reflected in increased numbers of the pest. To Rabbit Boards a full measure of credit for the improved position is due. The Boards constituted have, almost without exception, justified their existence, and the manner in which they have approached the matter and co-operated with the Department has been an inspiration, and deserves the recognition of the Department and the country as a whole. Increased production would have been an impossible task in some districts without an energetic campaign against the rabbit, and the increased sheep now carried is evidence of the success attained. The total amount in subsidies paid out to Boards during the year under the provisions of the Act was £15,300.

BOVINE PARTURIENT ECLAMPSIA.

C. V. DAVUS, M.R.C.V.S., Veterinarian, Live-stock Division, Hamilton.

CONSIDERABLE publicity has been given of late to a condition occurring in dairy cows, from which there has been some mortality in certain of our dairying districts. It has frequently been referred to as "a new mysterious disease." The condition is probably well described under the name of bovine parturient eclampsia—"parturient" because of its association with advanced pregnancy and the after-calving period, and "eclampsia" as conveying some idea of the serious nervous disturbances generally found associated with the condition.

HISTORY.

There is nothing really new about the trouble. Cases have occurred from time to time for some years past in various parts of New Zealand, but it is by no means a disease confined to this country. I have observed identical cases in England. It is admittedly rarer in the British Isles, probably due to the fact that dairy cows there are housed during the autumn and winter months, and are not at pasture.

In order to immediately allay the fear of some dairy-farmers it may be stated that there is no reason to suppose that the condition is in any way contagious or infectious—no more so, in fact, than is the erroneously termed condition "milk-fever," with which most farmers have had at least a little experience.

It is possible for cases to occur both before and after calving, the latter being by far the more common. Cases have been brought to my notice as long as a fortnight before and six weeks after calving. In this country the condition is practically confined to the period from the middle of July to the end of September. It occurs chiefly in cows that calve at the full normal period of gestation, usually without difficulty, and also in those in which the afterbirth is seldom if ever retained.

CAUSE.

The cause of the condition is not known, but there are some interesting points in this connection worthy of mention. Hitherto "sepsis"—by which term is meant a septic infection of the womb—has often been supposed in this country to account for the condition, but, in my opinion, there seems nothing whatsoever to support this. Such a view fails to explain the cases that do occur before calving, is inconsistent with a subnormal temperature, and does not account for the seasonal period during which cases occur. Furthermore, the cases occur in those cows which one would be substantially correct in presuming the least likely to be subject to any such infection—that is, they are neither aborted animals nor those in which the afterbirth has been retained.

Like a somewhat similar condition in the human subject at the same critical period, and of which the cause is equally unknown, bovine parturient eclampsia appears to be an acute toxæmia. A toxin

or poison, probably of a complex nature, circulates in the blood, profoundly affecting the nervous system and the cardiac and respiratory centres in the brain. There are fairly constant pathological lesions in various organs in affected animals, and these certainly to some extent offer support for this view. But although there are toxins of pregnancy, they do not entirely account for the cases in question, otherwise veterinary literature in other countries would abound in information on the subject in bovines, whereas any references are very meagre.

It would appear that, largely owing to the demands of pregnancy and more particularly the onset of lactation, the animal's natural resources are taxed beyond physiological limits, and that as a result there is an upset in the mineral balance, which, when normal, exerts some controlling influence over the production, absorption, and elimination of the ordinary toxins, whether of pregnancy or from dietary sources.

Every effort is made in farm management to retain the natural feed during the late autumn and the winter period, but owing to various causes this herbage often tends to become sour and rank and its mineral content changed. If cows are on poor pasture and actually short of feed, they may show the undesirable consequences of under-nutrition, but they do not appear to suffer from this disease. At the same time any high condition of the cow is not solely responsible, for if this is maintained by a balanced ration made up of good feed, such as first-quality hay, ensilage, roots, or any concentrate food as linseed-meal, bran, &c., she still does not appear to suffer.

W. A. Henry and F. B. Morrison, in their book "Feeds and Feeding," state: "Possibly the milk-producing capacity of our dairy cows has been so increased by selective breeding that it exceeds the ability of high yielding cows to assimilate sufficient mineral nutrients from their feed to meet the heavy demand in producing the large flow of milk during the first part of the lactation period. Later on in lactation, or when they are dry, it is found that they are able to build up again the stores of these mineral constituents in their bodies, if fed plenty of good legume hay." This statement is of further interest inasmuch as dry cows or steers feeding under the same conditions do not become similarly affected.

When there is a seasonal change to spring conditions the risks of any losses are practically eliminated.

SYMPTOMS.

While cases occur over the period already mentioned, the commonest time to observe symptoms is about fourteen days after calving.

An animal will be noted with a starey fixed expression in her eyes. She becomes very restless and nervously alert. There is a peculiar, almost characteristic, gait; paddling with the hind limbs, sometimes snatching each limb up with a sudden jerk, the front legs progressing with a stilty kind of movement.

Various groups of muscles are in a state of tetany, the animal sometimes becoming violent, shaking all over, and bellowing and frothing at the mouth. The jaws are frequently more or less rigidly closed except for a spasmodic champing movement, the pupil of the

eye is contracted, and as the animal moves its head the eyeballs roll from side to side.

The nervous irritability is often greatly increased by disturbing or approaching the animal. The temperature is below normal.

The animal staggers and falls. On the ground the convulsive movements become more marked; the limbs are semi-rigid and constantly on the move. This makes it somewhat difficult to support the animal in her normal position on her brisket. While down she throws her head about violently, and often dies in convulsions. It is not always, however, that any marked symptoms are observed. With little or no warning the animal may drop and die within a quarter of an hour.

Occasionally spontaneous recovery appears to occur. Again, sometimes the animal is down for two or three days, and the more violent symptoms then pass off; but she finally succumbs to cardiac and respiratory disturbances.

TREATMENT.

It should be sufficiently obvious that any lines of treatment must be from a preventive standpoint; the consideration of curative measures is of far more doubtful possibility.

Of the few essential mineral elements that might be lacking consequent on the demands of pregnancy and lactation, calcium and phosphorus are outstanding. This strongly enhances the importance of a liberal daily ration containing these elements in the maternal diet throughout this period. Dairy-farmers, and especially those who have experienced parturient eclampsia, should allow the following mineral mixture to be available for their animals, both in the paddocks and the shed: Bonemeal, 100 lb.; coarse salt, 50 lb.; potassium iodide, 2 oz.

At calving-time, allowing a little time for recovery from the birth, each cow should be given a drench containing—Magnesium sulphate (Epsom salts), 1 lb.; potassium acetate, ½ oz.; ground ginger, ½ oz.; molasses, ½ lb. And, again, where trouble has been known, this drench should be repeated a week later.

When an animal has become seriously affected care has to be taken in the method of treatment. It is often a danger to drench, for two reasons: approaching and handling the animal increases the severity of the symptoms, and the liquid may pass into the trachea and so into the lungs. If it is possible to drench an animal safely, a sedative medicine with the object of controlling the symptoms should be given, such as 2 oz. of laudanum in a pint of water. There are other and more effective means of accomplishing this if the case is attended by a veterinary surgeon.

In all cases it is wise to carry out the udder-inflation treatment as for "milk-fever," in order to be on the safe side. There can be little harm if the usual precautions are taken. Real effort, in spite of any difficulty, must be made to support the animal in the normal position on her brisket. Many farmers do not appear to realize the importance of this. Further, since the temperature is subnormal, the animal should be covered sufficiently and kept warm.

MINERAL CONTENT OF PASTURES.

EXAMINATION OF SOME WAIRARAPA DISTRICT SAMPLES.

B. C. ASTON, F.N.Z.Inst., Chief Chemist, Department of Agriculture.

A NUMBER of soil and pasture samples from various parts of the Wairarapa district have recently been examined, and others are now being analysed with the objective of determining whether any mineral food is so lacking as to injuriously affect the yield from and health of domestic stock. The results already obtained are important enough to warrant publication without waiting for the completion of the analyses. These will take some weeks longer and probably not add materially to the existing facts, whereas the early distribution of the present information may do much to warn the farmer against the possibilities of the coming summer season.

The samples were collected by Mr. C. M. Wright, country analyst under the Mineral Content of Pastures Research Scheme, and were carefully selected from a number of farms in the course of a somewhat hurried preliminary tour of the district in February, 1928. It was noted that most of the pastures presented a dried-up appearance on account of the very long dry spell of weather then experienced, but some of the pastures were green and in good heart. Mr. R. E. Grimmett visited the same district in September, 1928, and collected some further samples of pasture.

THE SOILS.

Briefly, it may be said that the analyses indicate a somewhat varied range of composition for the Wairarapa lands. This is as might be expected, when it is remembered that the materials of which the soils are composed have been derived from the greywacke rocks of the Tararua Mountain Range, the Tertiary rocks of the eastern ranges (Puketoi Hills, &c.), and from the Mauriceville limestone area; that the rivers carry down large quantities of silt and occasionally flood the lower Wairarapa lands, adding another complication, the deposition of river-silt; and that some of the country consists of flax and other swamps supplying soils with a high organic-matter content.

Texture: By the mechanical analysis it was found that the soils of the district vary from loams to fine sandy loams and silty loams, the addition of the adjective indicating that the loam is mixed with a larger amount, in the one case of fine sand, or in the other silt, so as to cause a deviation from the first-named type. In the case of the swamps, the soils will be largely the so-called humus or organic-matter type. There is nothing to take exception to in these mechanical results. The loams belong to a type which furnishes the most fertile soils of the world, and the dilution of a loam containing, say, 15 per cent. of clay with some additional fine sand or silt would improve the loam soil for many purposes.

LIME-REQUIREMENT.

The soils under consideration manifest a great diversity in their demands for lime, as indicated by the calcium content of the soil, the

sourness of the soil measured by the hydrogen-ion concentration (*p*H figure) and by the Hutchinson and Maclennan method for determining the absorbable calcium carbonate ("lime-requirement" figure). The "humus" soils derived from drained swamp-lands are, of course, entirely exceptional in their requirements and characters, and cannot be considered by the standards in use for judging ordinary soils. But apart from these there is only one sample which shows an extraordinarily high lime-requirement, a silt-loam from Hukanui which would require 6½ tons of carbonate of lime per acre to satisfy its requirements fully, the lime-requirement figure being 0·65 per cent., with a *p*H figure of 5·2. Other samples from Kaituna, Hamua, Featherston, and Belvedere show the not unusual lime-requirement figures of from 0·3 to 0·4 per cent. calcium carbonate, with a *p*H figure of 5·3 to 5·8. A sample from Mauriceville gave a negative lime-requirement figure, it being slightly alkaline in action, having a *p*H figure of 7·5, and containing 3·24 per cent. of calcium oxide (lime) soluble in strong acid.

Thus there are in the Wairarapa a range of soils varying largely in their demands for lime—from the slightly alkaline, which require none, up to the subacid, which will take as much as the farmer can afford to apply. The great bulk of the soil would appear, however, to be no worse off for lime than the majority of North Island fertile lands, and the question whether the deficiency of lime in the soil is sufficient to cause serious concern must be examined in the light of the composition of the pasture.

CHEMICAL ANALYSIS.

The chemical analysis of the soils provides the first really disconcerting evidence as to deficiency. In some areas where dairying is carried on the soil is decidedly low, both in available and in total phosphoric acid (for example, at Kaituna, Mauriceville, Hamua, and Hukanui), and every one of the ten samples analysed is low in total phosphoric acid, and three out of the ten are very low. The Kaituna soil is apparently the worst, with only 0·003 per cent. available and 0·02 per cent. total phosphoric acid, and containing only 0·32 per cent. of lime (CaO); while the best soils are apparently those at Featherston, which have 0·014 to 0·016 per cent. of available, and 0·04 to 0·08 per cent. of total phosphoric acid, and a lime content (CaO) of 0·74 to 1·17 per cent. In between these extremes furnished by the Kaituna and Featherston soils fall the other soils. This is evidence of unusual deficiency of phosphate for dairying lands, and will be substantiated by the results of the pasture analysis.

THE PASTURES.

These consist botanically of agrostis species, and the other so-called English grasses, cocksfoot, rye-grass, crested dogstail, timothy, Yorkshire fog, and clovers, as well as moss and weeds and in the swamps native growths, such as rushes—the various species displacing each other according as the environment becomes more suitable to one group of pasture plants than another. A remarkable fact in the botanical composition is that there appears to be no paucity of white clover on any of the land, even the poorest.

It is when one comes to the chemical composition of the samples that the remarkable fact is disclosed that samples of these cow pastures collected in February in several localities yielded such low amounts of phosphoric acid as to place the samples among the lowest recorded in New Zealand for phosphate content. Regarding the other necessary minerals—calcium (lime), magnesium, chlorine, manganese, sulphur, &c., there is no evidence of any deficiency. The lime content of the pastures—as one would expect from the fact that the pasture contained a good proportion of clovers—is high, even on the paddocks untreated by any phosphate or lime dressing. Thus the lime varies from 0·9 to 2·0 per cent. on the dry matter, whereas the phosphoric-acid content (P_2O_5) of these untreated pastures of Kaituna, Hamua, Hukanui, and Belvedere farms is exceedingly low, the percentage varying from 0·19 to 0·26. Even the areas top-dressed with phosphate only show from 0·35 to 0·48 per cent. Some of the richer lands, especially those at Featherston, show slightly higher figures—0·56 and 0·64 per cent. The latter figure was the highest reached on any of the pasture samples collected in February. There is evidence that this low phosphate content may have been partly due to a seasonal cause, as drought is known to affect the phosphate content of the pasture more than the lime or other mineral content. A sample of pasture collected in February from the Kaituna farm gave 0·19 per cent. of phosphoric acid. This farm was again visited in September, when a sample taken gave 0·45 per cent. phosphoric acid. That the phosphoric content of pasture may sink to as low an ebb as 0·19 is, however, a very serious discovery, and means that if this is a usual occurrence in the dry months of summer steps must be taken to correct the mineral content of the cows' rations by supplementary feeding with phosphate licks or pellets, or food having a much higher phosphate content than the pasture.

The average cow would not ingest daily a greater amount of pasture than would be equivalent to 21 lb. of dry matter. The worst Wairarapa district pasture in February contains, say, 0·2 per cent. phosphoric acid, which means that the cow would consume only 0·042 lb. phosphoric acid, an insufficient amount when one considers that only one-third to one-half of it (or less than 0·02 lb. P_2O_5) is digestible, whereas the cow requires of phosphoric acid for maintenance 0·018 lb., for the unborn calf 0·009 lb., and for every gallon of milk produced 0·018 lb., making a total of 0·045 lb., or more according to the yield of milk and physiological condition of the cow.

CONCLUSIONS.

The lesson to be learned from the investigation, so far as it has gone, is that phosphoric acid is the deficiency which must be acted against in the poorer pastures of the Wairarapa. Dry seasons are likely to accentuate considerably this deficiency. It is possible that even when the soil contains enough phosphate for ordinary seasons an exceptionally dry one will necessitate supplementary feeding with rations of high phosphate content, or with a mineral lick or medicine containing phosphates. More work is required to be carried out on the examination of the pastures at different seasons of the year, and a reconnaissance soil survey of the lands is an essential requisite before one can say how far the results for one type of soil hold good for an entirely different type.

TURNIP-MANURING INVESTIGATIONS.

REVIEW OF RECENT EXPERIMENTS AND OUTLINE OF FUTURE WORK.

A. W. HUDSON, B.Ag., B.Sc., Crop Experimentalist, Fields Division.

THE object of this article is not to discuss results of turnip-manuring experiments in detail, but merely to indicate some of the salient features and lessons resulting from investigations which have been in progress for a period of four seasons. The initial experiment of those under review was conducted on the farm of Mr. R. S. Gunn, Darfield, in the 1924–25 season, by Mr. F. E. Ward (now Director of Agriculture in Tasmania) and the writer. Since that time a gradual extension of the work has been made possible, and in the present season (1928–29) it is intended to conduct on turnips and swedes from fifteen to twenty trials throughout Canterbury, some ten to fifteen in Otago and Southland, and one or two in Auckland.

In the light of knowledge gained it has been necessary to modify the scheme of work which it was originally intended to pursue. The reason for this will be apparent when the factors influencing the field germination and yields under different manurial treatments are discussed.

METHODS OF SOWING.

Following the usual Canterbury practice, the manures and seed have been sown in 14 in. rows on the flat, the manure and seed mixing in the course of the fall from their respective boxes through tubes and coulters to the ground. Unlike the European practice of "manuring the ground" before sowing the seed, or our Southland practice of using a ridger which places most of the manure below the seed, the Canterbury method brings all the manure and seed into intimate contact in the soil. It is this close contact between seed and manure which sets up complications.

MANURES UNDER TRIAL IN EARLIER EXPERIMENTS.

Superphosphate, Ephos phosphate, and Nauru phosphate are the phosphatic fertilizers which have been under trial. They have been used at 1 cwt. per acre alone, and in mixtures of super + Ephos and super + Nauru. It very soon became evident that raw Nauru phosphate was quite unsuitable for Canterbury conditions, although mixed

Table 1.

Season.	Yield in Tons per Acre.		
	Superphosphate.	Ephos.	Difference in Favour of Superphosphate.
1924–25	17·5	15·5	2·0
1925–26	15·5	14·7	0·8
1926–27	20·1	11·9	8·2
1927–28	11·1	6·8	4·3
1927–28	17·5	13·0	4·5

with super it gave very fair results. Ephos alone gave quite good results for the first two years, but subsequently the results showed quite conclusively that it was not nearly so efficient as super, although the mixture of the two proves to be practically on a par with super. Table 1 indicates the relative merits of super and Ephos so far as yield is concerned. These results are from experiments carefully conducted in the Malvern, Selwyn, and Levels Counties.

EFFECT OF MANURES ON GERMINATION.

That superphosphate sometimes reduces field germination is well known to farmers, but no information as to the extent of this reduction was available. In the second year of the experiment it was decided to endeavour to measure the relative germination of the differently manured plots. (Note.—The method adopted (see photo) is to take counts, in sixty to one hundred places, of the number of plants falling within a row length of 10 ft. in a single row on each treatment. Plots are seeded at the same rate, and the same coulter row is counted on every plot. If plots of each treatment are repeated ten times from six to ten counts are made in each plot. To ensure a high degree of accuracy it is found that sixty is about the minimum number from which the average should be calculated. The counting is usually done about three or four weeks after sowing.) The seeding was about 9 oz. per acre, and the average numbers of plants in 10 ft. of a single row were as follows for three of the treatments :—

(1) Ephos, 1 cwt. per acre	21·7
(2) Super, ½ cwt. + Ephos ½ cwt.	18·9
(3) Super, 1 cwt.	14·6

Regarding Ephos as 100 per cent., the treatments (2) and (3) germinated 87 and 67 per cent. respectively.

This relationship of kind of manure to germination has been remarkably consistent over a period of three years, and subsequent experiments in which "no-manure" plots have been sown show about the same germination relative to super as does Ephos. All results indicate that Ephos, Nauru, and other similar raw phosphates have no adverse effect on the germination of turnips, whereas superphosphate sown at the rate of 1 cwt. per acre in 14 in. rows gives a germination of about 65 to 75 per cent. of what could be expected when no manure or a slow-acting phosphate is used. If the quantity of super is increased to 2 cwt. per acre in 14 in. rows the germination under the same conditions is usually reduced to 40 to 50 per cent.

Several experiments in which from ½ cwt. to 2 cwt. per acre of super has been used show a regular reduction in number of plants as the quantity of manure is increased. In spite of this adverse initial effect, super at *1 cwt. per acre*, in Canterbury, is undoubtedly as good a phosphatic manure as can be used. The same cannot be said when the quantity in contact with the seed is increased, as is often the case on heavy lands and those blessed with a higher rainfall, which generally occurs along the country in close proximity to the mountains. Under these conditions some means of supplying extra phosphate is desirable; but if it is extra *superphosphate* it must be applied in such a way as not to be in direct contact with the seed.

TAKING GERMINATION COUNTS OF TURNIPS BY PLANTS.

A 10-ft. rod is placed at random in sixty to one hundred places in each manurial treatment, and the plants falling within the rod's length are counted.

WHY SUPER CAUSES GERMINATION INJURY.

Super is the only straight-out phosphate commonly used for agricultural purposes which is soluble in water; consequently when it is put into the soil a certain amount of it dissolves immediately and gives what is comparable to brine. A weak brine is of little use in "pickling" pork, and consequently a lot of salt has to be used in a comparatively small amount of water for successful pickling. A heavy dressing of super concentrated in a small space in the soil produces a comparatively "strong" solution about itself, with the result that the seed, or the young plant, if the seed ever germinates, is "pickled." The effect is usually referred to as "burning (technically the process is known as plasmolysis)." The drier the soil the worse the effect, because there is less water to dissolve the super. It must not be thought that a dry soil is the only one in which superphosphate injury occurs. As a matter of fact, seed-injury takes place, as indicated above, under ideal moisture conditions at the time of sowing. The bad effect is lessened if rain falls during or immediately after sowing, but this often results in poaching of the ground and a bad strike in any case. Injury caused by excessive quantities of super persists for some time after the plant comes through the ground, and is shown by a yellowing, stunted, and starved appearance of the young plants, which may recover as time goes on.

HOW EXTRA PHOSPHATE MAY BE ADDED TO A BASAL QUANTITY OF SUPER WITHOUT FURTHER GERMINATION INJURY.

The following methods apply under this heading:—

(**1**) By adding to an initial quantity of super some slow-acting phosphate such as Ephos, basic slag, or Seychelles. This practice is to be

recommended when the total quantity of manure used exceeds 1 cwt. per acre. Up to 1 cwt. per acre of super alone is just as good as or better than the mixture.

(2) By drilling super into the soil a day or two before sowing the crop. Experiments carried out for two years have shown that as much as 2 cwt. per acre "pre-drilled" in this way will not affect the germination of the seed sown afterwards. The pre-drilling should be done through every coulter of the drill, and at right angles to the direction it is intended to sow the seed. The method has a good effect on yield on land capable of responding to heavy dressings of phosphate. From ½ cwt. to 1 cwt. per acre should be sown with the seed on top of the super pre-drilled.

The following crop-yield results were obtained on Mr. R. J. Low's farm, at Methven, in 1927–28, from the use of super :—

	Tons per Acre.
(1) ½ cwt. with seed in 14 in. rows	16·1
(2) 1 cwt. pre-drilled + ½ cwt. with seed	25·3
(3) 2 cwt. pre-drilled + ½ cwt. with seed	29·4

And using 1 cwt. super with seed in 14 in. rows the yields were as follows :—

	Tons per Acre.
(4) 1 cwt. with seed in 14 in. rows	20·1
(5) 1 cwt. pre-drilled and 1 cwt. with seed	26·6
(6) 2 cwt. pre-drilled and 1 cwt. with seed	30·0

On Mr. H. Ruddenklau's farm at Waimate the yields under the foregoing treatments (1), (2), and (3) were 13·7, 16·5, and 18·8 tons per acre respectively. With treatments (4), (5), and (6) the yields were 13·7, 14·5, and 14·7 tons per acre respectively. In this experiment the germination as a whole was bad, and of course was worse on the plots having 1 cwt. super with the seed than where only ½ cwt. was used. The failure of treatments (5) and (6) to give a good response to the extra phosphate may be due to the fact that too few plants were present for securing full utilization of the extra manure applied. In this experiment treatments (1), (2), and (3) had an average of 9·8 plants per 10 ft., while treatments (4), (5), and (6) had 7·7 plants in the same distance.

(3) A third method of supplying extra superphosphate is to drill the manure across the rows after the crop has been sown and when the leaves have grown to about 3 in. to 4 in. long. This is referred to as "post drilling." The drill coulters pull out very few turnips, and it is probable that the cultivation given is extremely beneficial to the crop. No exact yield figures are available to indicate the value of this method, but a good deal of observation of farmers' results indicates that the method is a very good one.

(4) A fourth method which has been put under experiment is that of sowing the manure through every coulter, and the seed as usual through every second coulter. Thus half the manure applied is with the seed and the other half between the seed-rows.

At Methven the following results were obtained last season :—

	Tons per Acre.
Super, 1 cwt. in 14 in. rows (seed in 14 in.)	20·1
Super, 2 cwt. in 7 in. rows (seed in 14 in.)	27·0

At Waimate there was no difference in yield between the two treatments.

(**5**) Another method which should be tried by farmers is to sow seed and manure through every coulter of the drill. When sowing on the flat the general practice, except in South Canterbury, is to sow in 14 in. rows. Apparently this method is a relic of the practice of sowing on ridges or in wide rows and intercultivating. 14 in. rows are practically never intercultivated, and it is certain that the same amount of seed and manure per acre would result in a more uniform and better strike in 7 in. rows than in 14 in. rows. This should result in a better yield. 1 cwt. of manure per acre, sown in 7 in. rows, gives only half the amount of manure in contact with the seed that is given by 1 cwt. in 14 in. rows. Hence the soluble and efficient super is less likely to injure germination.

A trial was conducted at the Ashburton Experimental Farm last year to test germination and yield, and bore out the foregoing contention. 9 oz. of seed per acre in 14 in. rows gave *nine* plants per 10 ft. row of 14 in. 9 oz. of seed in 7 in. rows gave *fourteen* plants per 10 ft. × 2 rows of 7 in. 1 cwt. of super was used in both cases and sown in the seed-rows only. The 7 in. row sowings yielded 16·8 tons per acre and the 14 in. row sowings gave 15·3 tons per acre, an increase of 1½ tons per acre. When the seeding on the 7 in. row plots was increased to 13½ oz. the yield given was 17·6 tons per acre.

(**6**) A sixth method, which is giving promising results, is that of mixing carbonate of lime with superphosphate in equal parts. Manure-mixing charts indicate that the two substances should not be mixed. In practice the mixing gives excellent results by reducing the germination injury without any apparent serious reduction in the efficiency of the phosphate.

In an experiment on Mr. W. J. Jenkins's farm, at Sheffield, 1 cwt. super + 1 cwt. carbonate of lime (2 cwt. per acre) gave a 50 per cent. better germination than 1 cwt. of super, and an increase in yield of 3½ tons per acre. 2 cwt. super + 2 cwt. lime (4 cwt. per acre) gave the same germination as the mixture at 2 cwt. per acre, with a further increase in yield of 5·2 tons per acre, or 8·5 tons better than 1 cwt. of super.

Hence 2 cwt. of super per acre when mixed with an equal amount of carbonate of lime can be used with safety, although 2 cwt. of super alone would seriously impair germination. Farmers should try this method, keeping in mind the fact that the amount of super per acre must not be reduced below that commonly used. Lime will not serve as a substitute for phosphate.

CONDITION OF COULTER-TIP AND ITS EFFECT ON GERMINATION.

It is generally conceded that the ordinary grain-coulter with a tip so worn as to have an almost square end is the best for sowing turnips, for the following reasons: (1) It does not penetrate very far into a well-packed soil, and therefore the seed is not buried too deeply; (2) it drags a comparatively broad furrow, which enables the manure to be spread a little, thus bringing less into intimate contact with the seed.

For the purpose of making a comparison between the turnip-coulter with the wedge-shaped tip, the grain-coulter with a new tip, and the grain-coulter with a well-worn tip, a trial involving the use of all these

types was carried out at the Ashburton Experimental Farm last year. Super at 1 cwt. per acre in 7 in. rows was used with 9 oz. of seed per acre. About two hundred counts were made on rows sown with each coulter type, with resultant germination in the following ratios: Grain-coulter with well-worn tip, 100; turnip-coulter with wedge-shaped tip, 93; grain-coulter with new tip, 82.

EFFECT OF SUPERPHOSPHATE ON GERMINATION IN DISTRICTS OF HIGHER RAINFALL AND WHERE RIDGING IS PRACTISED.

It is sometimes argued that bad effects such as those experienced in Canterbury do not occur in districts of higher rainfall. That this contention is incorrect may be seen from the results of counts taken on plots of a manure trial conducted at the Gore Experimental Area last season (see *Journal*, August, 1928, p. 120). The crop was sown in twenty-six ridges, and all manures were applied at the rate of 2 cwt. per acre—1½ cwt. being sown from the front box of the ridger and deposited about 3 in. below the seed, and ½ cwt. per acre from the rear box. The latter fell with the seed.

Super and five slow-acting phosphates were used in the trial. The adverse effect of too much super in contact with seed was apparent in the early stages of growth, and counts showed that the germination of the super plots was 70 per cent. of that of the slower-acting phosphates, which latter did not differ from one another. This figure is in very close agreement with that stated for Canterbury conditions when 1 cwt. is sown in 14 in. rows (½ cwt. in 26 in. rows is approximately the same per row as 1 cwt. in 14 in. rows). Hence the problem of overcoming injury by super is just as important in higher-rainfall districts as in Canterbury.

THICKER SOWING WILL NOT COMPENSATE FOR GERMINATION INJURY.

An increase in the rate of seeding will not satisfactorily compensate for injury to germination. Injury to germination causes a patchy crop, and increased seeding will not lessen the patchiness but will rather accentuate it by giving too many plants where injury has not occurred; and where ridging is practised a thickly seeded crop is difficult to thin evenly.

MIXING SEED WITH MANURE.

This practice is very common, because often farmers have no special drill attachment for sowing small seeds. It can be quite safely carried out with slower-acting phosphates such as Ephos, slag, &c., but if superphosphate is being used a matter of three to four hours' immersion of seed in the manure will generally ruin field germination entirely. Hence if the practice is adopted sowing must be done immediately after mixing.

FUTURE RESEARCH.

The programme of work outlined below shows that all the methods of manuring discussed in this article are being further investigated, and it is hoped that within the comparatively near future definite and conclusive results will be at the disposal of farmers.

	Type of Investigation.	Location.
(1)	Super in competition with super and lime in different proportions	North, Mid, and South Canterbury.

Type of Investigation.	Location.
(2) Super plus lime in competition with super plus a slower-acting phosphate	North, Mid, and South Canterbury; Southland; Auckland.
(3) Super plus lime mixed for varying periods before sowing	North, Mid, and South Canterbury.
(4) Sowing in 14 in. rows in competition with sowing in 7 in. rows	North and Mid Canterbury; Auckland.
(5) Pre-drilling, post-drilling, and inter-row drilling of extra phosphate	North, Mid, and South Canterbury.
(6) Trial of soluble nitrogen as addition to phosphate	North, Mid, and South Canterbury.
(7) Trial of varying quantities of super, super plus lime, and super plus a slower-acting phosphate in contact with and below seed in ridge-sowing	Southland.
(8) Trial of phosphate, nitrogen, and potash in ridge-sowing	Southland.
(9) Trial of swede varieties to determine yield, keeping-quality, palatability, &c.	Otago.

This work is being conducted by the Department's Instructors in Agriculture in their respective districts.

MORTALITY AMONG SHEEP FOLLOWING DIPPING.

EXPERIENCE IN CANTERBURY.

E. J. LUKEY, B.V.Sc. (Melb.), Veterinarian, Live-stock Division, Christchurch.

REPORTS of considerable mortality occurring among sheep after dipping were received during last season by the Christchurch office of the Department of Agriculture, covering the whole of the Canterbury District, and it is understood that mortality from the same cause occurred also more or less in other parts of New Zealand. Investigations into the deaths were made by officers of the Department, also in a number of cases by private veterinary surgeons either on behalf of the farmer himself or the firms handling the particular dip. These investigations in every case showed that the deaths were due to bronchopneumonia brought about by the dip-fluid entering the lungs.

My own investigations, in which I was assisted by Mr. F. Mackenzie, Principal Inspector, and Mr. J. W. Smith, Inspector of Stock, were confined chiefly to mid-Canterbury, and more particularly to Ashburton County.

In every case inquired into the history showed that the deaths took place between the second and fifth days after dipping. It was also a very noticeable fact that the mortality seemed to be confined more to rams and lambs, and that in practically every case it was with the first dipping of the season and in the first mob dipped that the deaths had occurred; furthermore, two farmers assured me that it was the very first lambs in the dip that had died. The mortality was greatest during January and February, the two hottest and driest months of the year.

The affected sheep bore a very dejected appearance, standing apart from the remainder of the flock, breathing heavily, and with their

heads down. In some cases there was a blood-tinged frothy discharge from the nostrils, and in others slight salivation.

Several post-mortem examinations were made of carcasses of sheep that had died, and other sheep showing symptoms were slaughtered and examined. The abdominal organs appeared normal to the naked eye, except in a few cases where the abomasum (fourth stomach) showed distinct patches of acute inflammation, the œsophagus (gullet) in these cases also showing similar lesions. The lungs in all cases were in a hepatized condition—that is, a condition resembling a liver. The mucous membrane lining the trachea and bronchial tubes (air-passages) were acutely congested, and in many cases the lungs were of a purple-black colour. There was a frothy blood-tinged exudate in the trachea. In several cases there was an acute inflammation of the larynx, giving indication of having been caused by some strong irritant. The whole picture was one of broncho-pneumonia.

Pneumonia may follow dipping in two ways: First, merely as a result of chill and loss of vitality following dipping under unsuitable conditions, of which common instances are shown when lambs are dipped late in the afternoon and are not dry at nightfall. In such case, if after sundown the temperature of the air falls quickly, and especially if there is a strong cold wind, there is a great probability that a number of lambs will succumb to pneumonia. The same risk attaches to dipping adult sheep, but in a lesser degree. The second cause of pneumonia, and by far the more common of the two, is the accidental aspiration of the dipping-fluid into the lungs of the sheep. This is known as traumatic pneumonia, and was the condition met with during our investigations.

But why was the mortality greater this year than in other years? This is a natural question which the farmer should and did ask.

In some cases the sheep had been yarded overnight; in others they were in a paddock adjoining the dip; and, again, others had been driven through several paddocks and even distances along the road. Was the dip at fault? Many farmers thought the strength of the dip had been altered; but against this, as far as we know, every known liquid or paste dip on the market was reported as having been used. One farmer using a particular dip which will be called "A" had losses. He then changed the dip and used what may be termed "B" with good results. A little farther away another farmer used "B" dip and had losses, so tried "A" with good results. Again, in one case where eighty lambs were dipped, twenty-eight died, although the following day one thousand sheep were put through the same dip with only one or two deaths, which were in all probability due to weakness. The dips themselves as a cause of the trouble must therefore be eliminated from the case.

The term "non-poisonous" as applied to carbolic or cresylic dips is a misstatement of fact, and in most countries these dips must by law be labelled "poisonous" and be treated in the same way as other poisons. All these dips contain the coal-tar product "phenol" and other oils which are not very soluble in water, and therefore need some emulsifying ingredients which the manufacturer adds. The manufacturer gives advice as to the best way to mix and use the dip, and such directions should be strictly observed. Hard or brackish water destroys

or renders inactive the soap present in fluid dips, with the result that the emulsion is broken up and the acids and oils are liberated. The effect of this is that when these acids and oils are inhaled pneumonia supervenes, usually with fatal results, and this is what occurred in the cases under review.

I am of opinion that there was a combination of causes to bring this about :—

(1) The summer being dry the water was possibly not as soft as usual, and in the absence of rain most of the water in the races came from springs. I had one lot of race-water analysed, and although it proved to be soft there was evidence afterwards that rain had fallen between the time of the fatal dipping and the time the sample was taken. Mortality was not general, but occurred in patches where the sources of the water-supply were similar.

(2) Apart from the water, the dips were mixed in various ways and were not always formed into a proper emulsion before putting into the bath. The phenols and oils would float to the top, and the sheep on rising to the surface would be more liable to inhale them into the lungs, which in fact did happen.

(3) Sheep driven straight in off the paddocks and dipped on a full stomach would be more liable to inhale the fluid than sheep with empty stomachs. This occurred in some cases.

(4) Numerous rams which died were in high condition ready for the season. Such animals always require special care in the dip.

In conclusion, all farmers may be advised to take the following precautions when dipping :—

(1) Do not dip sheep while they are in a heated condition, nor heat them up by driving after dipping.

(2) If the water is hard, soften it by adding 2 lb. washing-soda to every 100 gallons of water.

(3) Follow directions given with the dip and mix it overnight, stirring again before using.

(4) Avoid dipping the sheep on a full stomach.

(5) Take time, and do not rush the sheep through the bath.

(6) Use the crutch yourself.

(7) Remember that dirty-woolled sheep means soiling of the dip, thereby weakening it and rendering it more or less inert, with the result that the sheep are not properly treated—which may result in their being " ticketed " at the sale-yards.

(8) Run off the dip-fluid after dipping is finished.

(9) Put fresh water in the dip and run it off again before the first dipping of the season.

Insects for Noxious Weeds Control.—The annual report of the Research Department for 1927–28, dealing with this matter, states: " Owing to the unusually bad summers experienced in the North Hemisphere, unforeseen difficulties have been experienced in the direction of securing adequate supplies of many of the insect species required. In particular this has affected work on the blackberry control research, and the tests carried out have been made with limited supplies of insects. Steps are being taken to avoid a recurrence of this shortage by arranging for further supplies to come from Southern Europe, where climatic conditions are more equable."

POTATO-CULTURE.

DESCRIPTIONS OF SOME OF THE MORE IMPORTANT VARIETIES.*

(Continued.)

J. W. HADFIELD, H.D.A., Agronomist, Fields Division.

Sutton's Supreme and Aucklander.

The variety Sutton's Supreme is not obtainable now in England, and is probably almost extinct in this country also. Certainly it is not grown commercially. The two Aucklanders—Short-top and Tall-top—have been grown and sold as Sutton's Supreme for a number of years. The Aucklander is a valuable New Zealand production, and the writer is indebted to Mr. A. J. Rich, of Kaiapoi, for the following historical facts.

For some years prior to 1900 Mr. James Wright, of Coutt's Island (Eyre County), was growing Sutton's Supreme on contract for a firm in Auckland. The popularity of the variety amongst growers waned on the introduction of Northern Star, which produced an abundance of seed and commanded at the time as high a price as Sutton's Supreme or any other early variety.

Sutton's Supreme always produced a number of tall late plants, however carefully the seed was picked over. Mr. Rich first observed these in 1907, and obtained some selections in 1908. The late Mr. Matthew Laws had been working for Mr. Wright and had also noted the rogues. During 1907 and 1908 he worked for Mr. Rich, and it was Mr. Laws who suggested that Mr. Rich should peg out some of these rogues, which showed increased cropping-power and were conspicuously blight-resistant. Two years later Mr. Rich had 4 tons of this variety, which is now grown under the name of Short-top Aucklander. The name Aucklander was given by Mr. Laws. At this time Mr. Rich took over another farm, and Mr. Laws took a cottage nearby. Mr. Laws had become quite enthusiastic over the possibilities of the new selection, and was always on the lookout for anything distinctive.

About three years later three tall-growing plants, quite distinct from the previous selections, were noted in a crop of Sutton's Supreme. Mr. Rich, Mr. Laws, and another grower each took a plant for further trial. From these plants came the present-day Tall-top Aucklander. Mr. Laws selected quite a number of variations, which were of great interest to himself and other potato-growers in the Kaiapoi district. One Tall-top variety with a very spreading top was grown for some time, but the tubers were too coarse for commercial purposes, and the variety is rarely grown now.

The Tall-top may be distinguished from the Short-top by the following characteristics: The Tall-top is taller, the inflorescence is much more prominent, and the flowers more profuse. The Tall-top tubers are not

* New readers are referred to the section, "Scheme of Varietal Descriptions," page 152 of the September issue.

so shapely, and they adhere to the parent plant when the whole shaw is pulled up just before maturity, and when removed tear away, leaving a much larger wound at the point where the stem was attached. The Short-top comes away more easily and cleanly. When mature the Short-top haulms lie flat and are devoid of leaves; in the Tall-top they stand semi-erect and often have attached a number of dead leaves. The Tall-top is about three weeks later than the Short-top, while Sutton's Supreme is distinctly earlier than either of the Aucklanders.

AUCKLANDER TALL-TOP (NEW ZEALAND SUTTON'S SUPREME).

Origin.—See prefatory notes under heading of "Sutton's Supreme and Aucklander."

Habit.—Vigorous, tall, open, and moderately erect and stiff.

Stem.—Wings lightly waved. Colour 2.

Leaf.—Medium dull green; leaflets small and crinkled.

Inflorescence.—Tall and prominent. Flowers white and fairly numerous.

Tuber.—Oval to kidney. Skin creamy-white, clear, and smooth; very thin and easily bruised. Flesh white. Eyes medium to shallow. Sprouts very pale pink.

Maturity.—Early main crop.

NOTES.—A very fine quality potato. One objection is the very thin clear skin, which bruises easily and shows up the least trace of scab. For means of identifying the Short-top from the Long-top see separate notes.

FIG. 8. SHORT-TOP (LEFT) AND TALL-TOP AUCKLANDER.

AUCKLANDER SHORT-TOP (NEW ZEALAND SUTTON'S SUPREME).

Origin.—See prefatory notes.

Habit.—Vigorous, open, medium height, moderately spreading but stiff.

Stem.—Wings slightly waved. Colour 2.

Leaf.—Medium dark green; leaflets small and crinkled.

Inflorescence.—Medium height; flowers white and scanty.

Tuber.—Shape oval to kidney. Skin creamy-white and clear and smooth; very thin and easily bruised. Flesh white. Eyes medium to shallow. Sprouts very pale pink.

Maturity.—Second early.

NOTES.—A very fine quality variety, the one objection being the clear thin skin, which bruises easily and shows the least trace of scab. This variety is probably to be preferred to the Tall-top for North Island conditions. For means of identifying the Short-top from the Tall-top see separate notes.

Northern Star, Gamekeeper, Maori Chief, and Britain's Best.

The mixture which goes under the name of either Northern Star or Gamekeeper has not yet received much investigation. J. Beverley records (this *Journal*, Vol. X, p. 357) that there is a distinction between these two varieties in the flower, and considers it a mistake to deal with them as synonymous. He states that Gamekeeper, which is of New Zealand origin, is a selection from Northern Star. Maori Chief, another New Zealand variety, is also stated to be a selection from Northern Star, and appears similar in all respects, except that the tubers are white splashed with purple.

Britain's Best, a third New Zealand selection, may be classed as a Northern Star, from which it differs very little if at all.

The following description is adapted from British authorities. The writer has failed to obtain a type description constant in all respects, due, no doubt, to the presence of several varieties.

NORTHERN STAR (GAMEKEEPER, BRITAIN'S BEST, AND MAORI CHIEF).

Origin.—Not known, but was introduced to commerce by Findlay in 1900 or 1902, and caused much excitement in Great Britain, being sold for as much as £25 per tuber.

Habit.—Strong, upright, tall, and dense foliage.

Stem.—Wings waved slightly. Colour 0–1, and extending to the midribs of the young leaves.

Leaf.—Dark grey-green. Leaflets small and pointed.

Inflorescence.—Short and inconspicuous. Flowers small, white, and rare; mostly drop before opening. Flower-buds markedly green.

Tuber.—Round. Skin white, moderately rough. Flesh white. Sprouts pink. Eyes medium and deep at rose end. There is a single spot of pink in the eye, most noticeable in the terminal buds, and some pink at the heel end of an immature tuber. Produces numerous long runners and small tubers.

Maturity.—Late main crop.

NOTES.—An undesirable variety for light land owing to the very large number of seed-size tubers produced. On heavy land its cooking-quality is decidedly inferior. It is distinctly disease-resistant, especially to late blight, and is therefore of considerable commercial value in certain parts of the North Island. Northern Star is the most common rogue in the commercial crops of white potatoes in this country.

Maori Chief is a white potato splashed with purple. See separate notes dealing with this group.

FIG. 9. NORTHERN STAR (LEFT) AND BRITAIN'S BEST.

IRON DUKE, OR PRESIDENT.

Origin.—Iron Duke and President are identical. General is a white-flowered President of Dutch origin, introduced into commerce about 1896. The variety is grown in parts of Canterbury under the name of Majestic, to which it is in no way similar. When grown under its proper name it is generally referred to as Iron Duke.

Habit.—Tall, upright, open, and vigorous.

Stem.—Wings waved. Colour 1.

Leaf.—Light green, large and broad.

Inflorescence.—Tall and prominent. Flowers numerous, large, red-purple and distinctly white-tipped. (Compare with Up-to-Date.)

Tuber.—Round to oval. Skin rough and white. Eyes medium. When mature the skin round the eyes shows a pink tinge, but this is not constant and is difficult to observe. Flesh intermediate to white. Sprouts pink.

Maturity.—Late main crop.

NOTES.—A good cropping variety for rich land. Unfortunately all stocks inspected appear to be infected with mosaic.

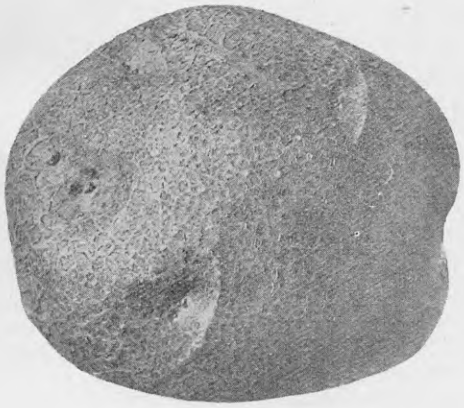


FIG 10. IRON DUKE OR PRESIDENT.

GREAT SCOTT.

Origin.—Raised by G. Mair, of Lockerbie, in 1906, and introduced to commerce by Mr. McAlister, of Dumfries, in 1909. Sefton Wonder is identical with Great Scott, except that the skin of the tuber is russet.

Habit.—Tall, upright, open, and vigorous.

Stem.—Wings straight. Colour 1.

Leaf.—Dark green and glossy.

Inflorescence.—Inconspicuous. Flowers white and rare. Buds generally drop. Occasionally bolters appear bearing profuse flowers on long stalks.

Tuber.—Round. Skin yellowish-white, rough. Eyes medium, and deep at rose end. Flesh white. Sprouts pink.

Maturity.—Second early to early main crop.

NOTES.—Was introduced to this country several years ago, but has not spread. This is hard to explain in view of the fact that it is an excellent cropper, a good keeper, and very resistant to late blight and virus disease.

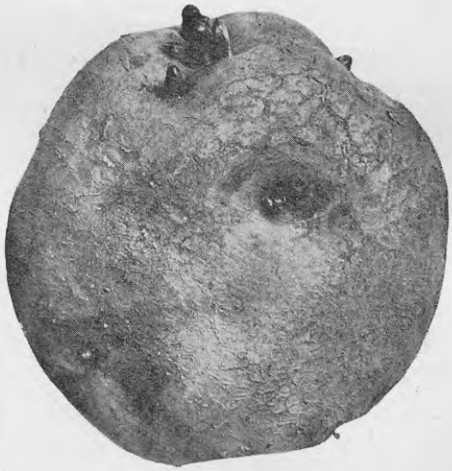


FIG. 11. GREAT SCOTT.

ARRAN CHIEF.

Origin.—Raised by D. MacKelvie in 1907, and introduced by him into commerce in 1911. The pollen parent was Sutton's Flour-ball.

Habit.—Medium to strong vigour, tall, upright, and open.

Stem.—Wings very waved. Colour 2.

Leaf.—Medium green. Leaflets small, wrinkled, and V-shaped.

Inflorescence.—Inconspicuous. Flowers scanty, white, with green tips; drop readily in the bud stage.

Tuber.—Round and somewhat flat. Skin white and somewhat rough. Eyes medium depth, clustered towards the upper rose end. The underside carries very few eyes. Flesh white. There is to be observed on the immature tuber a purple coloration at the junction of stem and tuber. Sprouts deep purple.

Maturity.—Late main crop.

NOTES.—An excellent variety for medium to heavy potato-land, and undoubtedly the most valuable commercial white grown in New Zealand. Unfortunately, it is extremely difficult to procure lines free from Northern Star.

FIG. 12. ARRAN CHIEF.

FIG. 13. NEW ERA.

NEW ERA (PERFECTION, OR PERFECTION NEW ERA).

Origin.—A New Zealand selection which has been tested out in Great Britain and reported to be a bolter from Evergood. The latter was raised by A. Findlay and placed in the market in 1900. It was originally produced under the name of Eldorado. The writer, however, cannot distinguish between New Era and Evergood as described by British authorities, except in the roughness of the skin.

Habit.—Tall, medium vigour, with upright to spreading and open foliage.

Stem.—Wings not waved. Colour o.

Leaves.—Dark gray or yellowish-green. Leaflets crinkled, small, narrow, and pointed and V-shaped.

Inflorescence.—Tall with medium-size trusses. Flowers pale lavender; very rare and generally fall in the bud stage. Flower-buds green and coloured round base.

Tuber.—Short oval and flat. Skin white. Eyes shallow. Flesh very pale yellow (intermediate). Sprouts very pale pink. Chief characteristic is the presence of a proportion of tubers having a distinctly flaked skin; others are more or less smooth. Both types, somewhat modified, may arise from the same plant. It is probable that maturity and soil conditions affect this characteristic, which is very clear in the illustration.

Maturity.—Early main crop.

NOTES.—Evergood is reported to be of particular value on heavy and peaty soils, and to be highly resistant to late blight. This is true also of New Era, which plays an important part in North Island potato growing.

FIG. 14.—FIELD-MARSHAL (LEFT) AND UP-TO-DATE (RIGHT).

UP-TO-DATE AND FIELD-MARSHAL.

Origin.—Introduced to commerce by A. Findlay in 1894 and said to be the result of Patterson Victoria × Blue Don. Field-Marshal is identical with Up-to-Date, except that the tubers have a russet skin.

Habit.—Vigorous, tall, medium, spreading and open foliage.

Stem.—Wings waved. Colour 1. The stems are particularly thick, hard, and woody.

Leaf.—Light to medium green. Leaflets large, and end pair overlap the terminal.

Inflorescence.—Very tall and prominent; borne on thick stalks. Flowers light-red purple, numerous, and lasting over a long period. Colour shades off towards tips of the corolla, but it is not distinctly white-tipped.

Tuber.—Oval to kidney flattened. Skin white and smooth, sometimes roughened. Eyes shallow, mainly at rose end and on upper surface. Flesh white. Sprouts pink.

Maturity.—Early main crop to late main crop.

NOTES.—An excellent variety in every respect, but not grown extensively now owing to the difficulty of obtaining pure lines capable of giving satisfactory yields. This deterioration is almost entirely due to infection by leaf-roll, wilt-disease, and the presence of bolters and wildings. All lines inspected in this country are more or less heavily infected with leaf-roll and wilt-disease. Up-to-Date is frequently grown and sold as Sutton's Supreme. To most people Up-to-Date represents the ideal of what a potato should be. This is evident from the fact that the Scottish Board of Agriculture report no less than 175 synonyms or varieties that are identical with Up-to-Date.

(To be continued.)

PIG-MANAGEMENT.

DEALING with the subject of pigs in his annual report for 1927–28, the Director of the Live-stock Division (Mr. J. Lyons, M.R.C.V.S.), remarks:—

To any one who is familiar with the pig industry of this country it is obvious that if we are to gain a place in the world's market with the products thereof we must materially alter our system as regards the management and feeding of this class of stock. Pigs, if properly fed and sheltered, will thrive excellently in the open during the summer months. Such animals, however, are born in mid-winter or early spring, and it is then that they require most attention if the best is to be got out of them. It is well known that the better an animal is fed and cared for during early life the sooner it will reach maturity, and if through any cause a check is received it may take weeks for the animal to recover, during which period it is being fed at a loss. It is essential, therefore, that every farmer should keep his pigs going well from the time they are dropped. To do this, however, good housing-accommodation (together with a liberal supply of bedding, so that the young animals may be kept warm) must be provided for the farrowing sows, and when reared the young animals must still be housed and given suitable food until such time as weather conditions allow them to be turned into the open. Skim-milk when fed alone is not a balanced ration; too great a bulk of this material is required to bring a pig to maturity. With the addition of concentrates the milk required for one animal could be made to feed two, thus showing a handsome profit for the extra food consumed. When pigs are reared in large numbers in a given space a certain amount of disease is difficult to avoid, but given good conditions for feeding and housing the mortality amongst pigs would be nothing like it is at present. Improved conditions mean increased profits, an object which should be held steadily in view. Pigs should be looked upon as a valuable asset whereby our by-products can be turned into a handsome profit, not as a medium for getting rid of such products.

FEEDING OF CONCENTRATES TO DAIRY COWS.

ECONOMIC DATA FROM LOCAL EXPERIMENTS.

W. M. WEBSTER, B.Sc., M.R.C.V.S., Veterinarian, Live-stock Division.

IN connection with the investigation into the causes of temporary sterility among dairy cows, experimental supplementary feeding with concentrates was undertaken in several badly affected herds in the Wairarapa district during the season of 1927–28. The results in relation to temporary sterility are as yet incomplete, and are outside the scope of this article. However, as the experiments also afforded an opportunity of studying the economic results of such feeding, arrangements were made to collect all available data in this direction.

In considering the material so collected two elementary physiological facts relating to milk-production must be borne in mind:—

(1) Given an adequate ration, a cow is at the flush of her milk-production within three weeks of the time she calves, irrespective of the season of the year.

(2) A dairy cow requires a certain amount of food to maintain her body in its normal condition (without either gain or loss of weight), and from this point of view she ought only to produce milk in direct proportion to the amount of food available over and above her maintenance requirements. However, one of the fundamental laws of nature demands a perpetuation of the species at any cost, and the cow obeys this rule by maintaining her milk-yield as far as lies in her power, no matter how unfavourable the conditions may be. Even though she is obtaining insufficient nourishment she will instinctively continue to produce milk to the best of her ability, at the expense of her own physical condition, for milk is essential to the wellbeing of her calf—that is, the perpetuation of her species. Needless to say, however, the quantity of milk so produced falls considerably short of what she would produce if obtaining an adequate diet.

It is universally recognized in European countries, where supplementary hand feeding is extensively practised and its value during those seasons when there is a shortage of natural pasture fully appreciated, that although a cow will certainly increase her yield at any time during her lactation period in response to generous feeding, she will never give the same gross return if she is stinted at the commencement. A good start at the beginning of the lactation period will give her a lead which she will maintain to the end.

This fact is also appreciated by many progressive farmers in New Zealand, and by those of our stud breeders who have animals under the C.O.R. test, for example. Nevertheless, on the average dairy farm in this country the management of the herd falls far short of this ideal, and all too frequently herds are seen losing condition during the spring months. This is a sure indication that the cows are receiving an inadequate ration and are endeavouring to maintain their milk-yield at the expense of their physical condition. They do not recover that condition or reach the peak of their production until the early summer flush of grass appears, three months rather than three weeks after

calving. Further, their peak production at this late period is never so high as it would have been had they been adequately fed during the early spring and reached their flush at the proper time.

In the experiments here dealt with the three herds selected, which naturally, in the circumstances, contained a high proportion of more or less late calvers, were divided into two equal parts on the basis of the calving-dates, with the object of having an equal number of cows in profit in either group in the herd at any given time. One herd had been tested under the group system in the previous season, and in this instance the two sections were approximately equally balanced on their average butterfat records in addition to their calving-dates.

The two groups in each herd were not separated and were treated alike in every respect, save that, commencing in August, one group in each herd received a daily supplementary ration of 2 lb. of crushed oats and 1 lb. of linseed nuts per head until the time of calving, when the ration was increased by an additional 1 lb. of crushed oats daily. Feeding was carried out once daily in the bails prior to calving, but afterwards the cows received 1½ lb. oats and ½ lb. linseed nuts at each milking. Each animal in the three fed groups received this ration daily until 31st October, when the feeding was discontinued, as there was abundant pasturage available by this date. Two of the herds, including that mentioned above as having been tested during the 1926–27 season, were placed under test in the local herd-testing organizations, while in the third the milk from each group was kept separate and a double account run at the factory throughout the season.

The records thus obtained are extremely interesting and instructive but their significance will perhaps be better appreciated if at this stage a brief description is given of each herd.

Herd A: With one or two exceptions this herd was made up of grade Jerseys. The owner has been testing for several seasons, and two years ago bought in a number of high-grade Taranaki heifers from tested dams. The farm is all fairly good river-flat with a high productive capacity in the early summer, but the district has a low annual rainfall and generally the feed dries up rapidly after Christmas. A small quantity of hay and only a moderate acreage of green crops were available for feeding in the early spring.

Herd B: Crossbred with Jersey predominating, but a considerable strain of Shorthorn blood in evidence. Has been improved by testing and rearing selected calves. The farm consists of drained swamp. The locality has a good average rainfall. The pasturage is good, but inclined to be rank in many parts, and holds well through the summer. A small amount of hay, but a considerable acreage of green oats and cow-grass, was available for supplementary feeding in the early spring and some roots in the autumn

Herd C: A mongrel crossbred herd. Friesian and to a lesser degree Jersey blood predominated, but many animals showed a strain of Hereford, Shorthorn, or Polled Angus blood in their ancestry. The farm is ideal heavy dairying country, with a high well-distributed rainfall. A good supply of hay was available for use in the early spring and a good crop of roots in the autumn.

Table 1 shows the actual production of each group both in butterfat and gross quantity of milk for the season. The average number of days to which these records refer for each group is also indicated. It was stated earlier that each group was selected on the cows' due calving-dates, with a view to equalizing the average period during which the two groups in any one herd would be under test. However, these dates could only be estimated from the service records of the previous season, and on that account some margin of error occurred in herds A and B. Further, on account of the circumstances under which the experiment was inaugurated, the average period is somewhat below the generally accepted nine-months standard. Therefore, in order that direct comparisons may be more easily made, Table 2 has been compiled to show the results from each group reduced to a common basis of 270 days.

Table 1.—Actual Returns.

	Herd A.			Herd B.			Herd C.		
	Average Days in Milk.	Butterfat.	Milk.	Average Days in Milk.	Butterfat.	Milk.	Average Days in Milk.	Butterfat.	Milk.
Fed group	249	318·13 lb.	6,429 lb.	236	291·86 lb.	6,734 lb.	245	267·81 lb.	6,996 lb.
Control group ..	236	238·73 lb.	5,526 lb.	251	260·23 lb.	5,964 lb.	245	249·71 lb.	6,151 lb.
Difference	..	79·40 lb.	903 lb.	..	31·63 lb.	770 lb.	..	18·1 lb.	846 lb.
Value of difference ..	..	£5 18s. 6d.	£4 10s.	..	£2 8s.	£3 17s.	..	£1 7s.	£4 4s.

Note: Butterfat calculated at 1s. 6d. per pound; milk at 1s. per gallon.

Table 2.—Returns all calculated for Purposes of Comparison on 270 Days' Basis.

	Herd A.		Herd B.		Herd C.	
	Butterfat.	Milk.	Butterfat.	Milk.	Butterfat.	Milk.
Fed group ..	286·47 lb.	6,969 lb.	308·07 lb.	7,703 lb.	295·11 lb.	7,708 lb.
Control group ..	219·51 lb.	6,321 lb.	272·43 lb.	6,415 lb.	275·13 lb.	6,780 lb.
Difference ..	66·96 lb.	648 lb.	36·64 lb.	1,287 lb.	19·98 lb.	928 lb.
Value of difference	£5 0s. 6d.	£3 4s.	£2 15s. 6d.	£6 9s.	£1 10s.	£4 13s.

Note: Butterfat calculated at 1s. 6d. per pound; milk at 1s. per gallon.

Table 3 shows the individual daily production of butterfat for each animal in the two groups in Herd A. The figures for the 1926–27 season are also included as far as they were available, and provide an extremely interesting comparison. The benefit of the feeding in the case of heifers is also clearly shown where the best of the "Control" group is a fraction behind the worst in the "Fed" group.

The cash value of the returns from each group is also shown in Tables 1 and 2. As the net cost of feeding worked out at only £1 12s. 6d. per cow it will be seen that all accounts show a profit except that for butterfat in Herd C.

Table 3.—Herd A, Daily Average of Butterfat for Season.

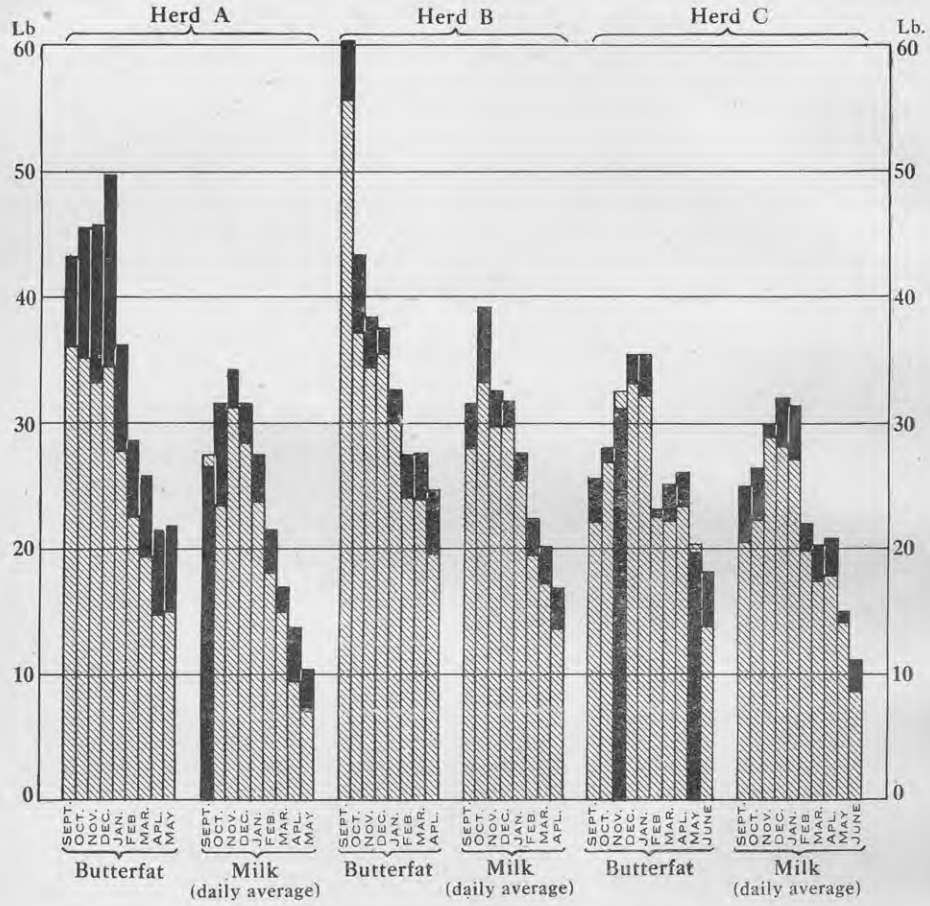
Fed Group.			Control Group.		
No. of Cow.	1927-28.	1926-27.	No. of Cow.	1927-28.	1926-27.
	lb.	lb.		lb.	lb.
1	1·483	0·927	1	1·120	0·962
2	1·406	1·003	2	1·103	0·671
3	1·329	..	3	1·052	..
4	1·316	0·948	4	0·950	1·162
5	1·262	0·937	5	0·922	..
6	1·078	0·856	6	0·863	..
7	0·999	0·893	7	0·762	0·755
8	0·994	0·870	8	0·751*	..
9	0·974*	..	9	0·666*	..
10	0·959*	..	10	0·661*	..
11	0·869	1·205	11	0·646	0·814
12	0·857*	..	12	0·608*	0·986
13	0·840	..	13	0·464*	..
14	0·798*	..			
15	0·757*	..			
Average per day	1·061	0·955	Average per day	0·813	0·892

* Heifers.

The accompanying graph (next page) indicates the average production of each group month by month. The graph also brings out clearly the statement made in the introductory paragraphs — namely, that a cow given a good start at the beginning of the season obtains a lead which she maintains to the end. Although all feeding ceased on 31st October, yet the diagram shows that the "Fed" groups maintained their ascendency to the end of the season.

The variations between the three herds appear very wide, but on consideration the reasons are easily discovered. The rainfall undoubtedly played a part. In the case of Herd C there was a growth of young grass more or less throughout the season, while in Herd A there was little or no growth after Christmas and the summer heat rapidly dried up the grass. The ordinary supplementary feeding carried out in the winter and early spring was also a factor. Herd C received the best treatment in this respect, while Herd A received least. At the same time all three farmers were "doing" their herds somewhat better than the average in the district. In addition, in Herd C there was a higher proportion of late calvers than in the other two, as at least 60 per cent. of each group calved subsequently to 31st October. Thus those late calvers in the "Control" group commenced their milking-period when there was an abundance of natural food available; in other words, they were not stinted at the start.

Apart from these factors, however, the main explanation seems to lie in the type of herd. At the commencement of the experiment the three herds were each in average winter condition. When feeding ceased at the end of October there was no very marked difference in physical condition between the two groups in Herd A. In Herd B the "Fed" group were in decidedly better average condition than the



GRAPH SHOWING YIELDS OF EXPERIMENTAL HERDS.

Whole column shows average production of "fed" group for month; shaded portion shows production of control group; black upper portion indicates difference in favour of "fed" group. "Butterfat" columns represent quantity produced each month; "milk" columns show average daily production.

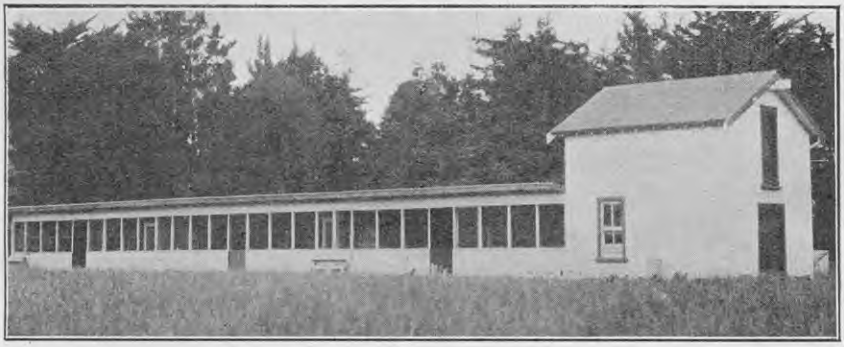
"Control." The "Fed" group in Herd C came into the yard like a line of fat bullocks fit for the butcher.

Thus the high-testing Jersey strain in Herd A responded to the extra feeding almost entirely in extra butterfat, while the strong admixture of beef blood in Herd C responded equally well in its own way—that is, the benefit of feeding was reflected in bodily fat instead of butterfat. Herd B, as was to be expected considering its apparent ancestry, occupied an intermediate position. Incidentally, this varied response to feeding, and also the fact that the gross milk-yield did not exhibit the same wide degree of variation as the butterfat return, serves

as a good illustration of the soundness of the dairy-farming practice in England, where the dual-purpose Shorthorn preponderates over all other breeds. Conditions, of course, are different and inapplicable to New Zealand: milk production is on a quantity basis only, and fat cattle for slaughter fetch high prices. The dual-purpose animal responds well to heavy concentrate feeding in the increased quantity of milk produced (though it is common knowledge that the quality suffers), but at the same time she puts on condition readily and may be sold fat, if desired, at the end of her lactation period.

Though the results given in this article are strictly accurate as far as they go, they are open to some criticism, particularly in the case of Herds B and C, owing to the absence of antecedent data. Similarly the concentrate ration used may not have been the most economical in respect of cost, and no allowance has been made for the unexpended manurial value of the food consumed. However, as already indicated, a study of farm economics was no part of the original purposes for which these experiments were inaugurated. But despite these qualifications the experiments seem to have shown fairly conclusively that New Zealand farmers should aim at the better feeding of their herds during the early spring months; further, that moderate concentrate feeding during those months only is a payable proposition from a factory viewpoint in a high-testing Jersey herd, and in a case such as Herd A it might conceivably prove more economical than the provision of adequate supplies of hay, ensilage, green crops, or other feed such as could be produced on the farm. On the other hand, the experiments have shown that concentrate feeding under similar conditions should be a payable proposition in any herd which is producing milk on a quantity basis for retail town supply.

It is to be hoped that the results, so far as they go, will furnish food for thought to progressive dairy-farmers, and that they may lead to the inauguration of further trials on similar lines designed solely to test the economic aspect of concentrate feeding.



NEW POULTRY HOUSE AND STORE AT RUAKURA STATE FARM.

FARMERS' FIELD COMPETITIONS.

TARANAKI-WANGANUI DISTRICTS, SEASON 1927–28.

J. W. DEEM, Fields Superintendent, Wanganui.

FARMERS' field competitions were conducted last season in the Taranaki-Wanganui districts on much the same lines as in the preceding year. Entries judged showed an increase of 102, the figures being 370 against 268. The increase was mostly confined to North Taranaki, where Mr. J. M. Smith, Instructor in Agriculture, has been giving this branch of educational work special attention.

Haystack competitions were introduced for the first time, and forty-six stacks were judged. The number of ensilage entries judged showed an increase. The entries in both hay and ensilage were large, but owing to the mild winter a great number of the stacks and pits had not been opened, and therefore could not be judged. This particular type of competition is very popular, and is sure to increase in the future, as the value of good ensilage and well-saved hay is becoming more and more realized.

A falling-off in the number of lucerne stands judged is accounted for by the extremely dry weather experienced during judging-time (January and February), when most farmers who had lucerne growing had to make heavy demands on it in order to keep their stock going. Lucerne in South Taranaki and ensilage in North Taranaki saved the situation on a great many farms during the dry period from January to March.

The actual numbers of entries judged in the various competitions were as follows, last year's figures being shown in parentheses: Mangolds, 97 (90); carrots, 62 (61); swedes, 73 (49); turnips, 9 (9); lucerne, 8 (16); chou moellier, 8 (6); ensilage, 67 (37); hay, 46 (nil).

MANGOLDS.

The long dry spell greatly checked the mangold crop in the early stages, but on the whole this root upheld its reputation as a drought-resister, and when the rain did come it made a wonderful recovery. The ninety-seven crops judged averaged 60 tons 6 cwt. per acre, against 59 tons 13 cwt. in the preceding season and 59 tons 14 cwt. in 1925–26.

The heaviest crop for the season under review was that grown by J. B. Hine, of Toko, which weighed 122 tons 13 cwt. per acre and won the Sutton Cup for North Taranaki. Mr. Hine having won this cup for the third year in succession now wins it outright. The heaviest crop in South Taranaki was grown by H. Betts, sen., and turned the scales at 106 tons 2 cwt. per acre. This crop wins the Sutton Cup for South Taranaki. Mr. Betts also grew the best crop in South Taranaki in 1926–27 (128 tons 19 cwt.) and gained the award for the Sutton Cup, which he afterwards lost on a technical point as to the date of entry. To compensate him for this the donors of the cup, Sutton and Sons, through their New Zealand agents, J. G. Ward and Co., Ltd., presented Mr. Betts with a gold medal. Mr. Betts, who is now in his ninety-second year, has set an example for some of the younger competitors by saying that he is going to win the Sutton Cup outright if he has to

live until he is a hundred to do it! P. Turner, of Brunswick, won the Wanganui Sutton Cup with a fine crop weighing 90 tons 6 cwt. The Prizewinner variety was placed first, second, and third in every competition in the past season.

Rotation: It is generally considered bad practice to grow the same variety of crop in the same ground year after year, onions being a notable exception. At the same time it is recognized that if the cultivation is good and the manure adequate mangolds may be grown on the same area for several years. Mr. Hine's performance affords a splendid example of this. He has grown the champion crop in central Taranaki for four seasons in succession in the same field, the weights being as follows: 1925, 89 tons 7 cwt.; 1926, 111 tons 13 cwt.; 1927, 90 tons 11 cwt.; 1928, 122 tons 13 cwt., per acre. The last crop was the heaviest and soundest, no signs of disease being noticeable at judging-time. The crops were all Prizewinner, and the fertilizers used per acre were as follows: 1926, 8 cwt. super and 10 cwt. salt; 1927, 7 cwt. super and 5 cwt. salt; 1928, 3 cwt. super, 3 cwt. slag, 1 cwt. kainit, and 5 cwt. salt. In addition, the crops had a few loads of cow-yard manure each year. The cultivation was good, and the growing crop was able to utilize the fertilizers applied.

General practices: The weights and varieties of manure, amount of seed, and width of drills were much the same as in the preceding year for the average crop. Most of the best crops were given from 4 cwt. to 6 cwt. of phosphatic manure plus 3 cwt. to 5 cwt. of kainit or salt, per acre. Full details on these aspects were given last year in the *Journal* for October (pages 259 and 260).

CARROTS.

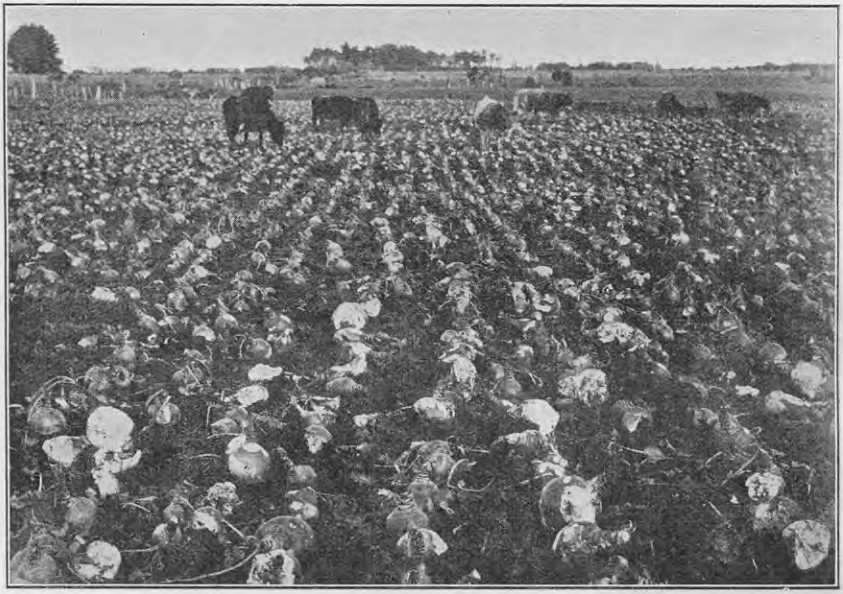
This crop also suffered in the early stages, and, though deep rooting, did not stand the dry weather as well as mangolds, although the crop made a good recovery after the late autumn rains. Most of the roots were badly shaped and only fair quality. The average was 39 tons 17 cwt., against 45 tons 8 cwt. in the preceding season and 44 tons 12 cwt. in 1925–26. Matchless White, Barriball, and Guerande were again the most successful varieties. The heaviest crop, one of 69 tons 15 cwt. (Matchless White), was grown by J. J. Sulzberger, of Duthie Road, Mangatoki. This beats the 1926–27 champion crop by 1 ton 14 cwt. It was certainly a splendid crop, and reflects great credit on Mr. Sulzberger for the care given it.

Guerande carrots again did well, six crops in the Maxwell locality averaging 50 tons 3 cwt. Manures and general practice were much on the same lines as detailed last year. Mr. Sulzberger's crop was grown with a mixture of half super and half bone—5 cwt. to the acre. H. Birch, Maxwelltown, wins the Cooper Cup for the best crop of carrots in the Wanganui district, with a fine crop of Guerande weighing 59 tons 2 cwt. per acre.

SWEDES.

This crop is on the increase, especially in central Taranaki, where some very nice crops were seen. The seventy-three crops judged averaged 38 tons 9 cwt., against 44 tons 5 cwt. in the preceding year and 41 tons 6 cwt. in 1925–26. The heaviest crop this past season was

grown by J. F. L. Vickers, of Midhirst, and weighed 65 tons, against the best crop in 1926–27 of 64 tons 2 cwt. Superlative, Masterpiece, Magnum Bonum, and Grandmaster gave the best results. Many of the crops were suffering more or less from club-root, and a number were ruined by this disease. On the other hand, there was very little dry-rot, only traces being found in most crops. An exception was the Otakeho district, where a few crops were badly affected; this locality was also the worst last year. Manures and general practices with the swede crop were much the same as in the preceding season.



MR. VICKERS'S CHAMPION CROP OF SWEDES FOR NORTH TARANAKI (65 TONS PER ACRE).

SOFT TURNIPS.

There was only one competition in soft turnips. The average of the crops judged worked out at 32 tons 8 cwt. per acre.

CHOU MOELLIER.

On the whole the weather was too dry for chou moellier during the main growing-period, although close up to Mount Egmont there were a few good crops. The eight crops judged averaged 25 tons 19 cwt. per acre. Where not fed off, chou moellier grew most of the winter.

LUCERNE.

As already stated, the dry weather adversely affected the lucerne competitions, as very few of the crops were at the right stage for judging at the prescribed time. Consequently several districts cut out their competitions.

ENSILAGE.

Ensilage-making is now a standard practice on most of the dairy farms in North Taranaki, and on a great many in South Taranaki and farther down the coast. There are indications that it will not be long before most farmers in Taranaki adopt this method of providing autumn and winter fodder, besides solving the difficulty of controlling the surplus grass during the flush period. There are only a few tower silos in Taranaki, but ensilage pits (or trenches) are steadily increasing; however, the majority still depend on the stack. At one time ensilage-making was very strenuous work, but since the mechanical stacker (or hoist) and sweeps have come into more general use the hard work has been largely eliminated, and most farmers who now make ensilage consider it easier than haymaking. In the course of our rounds for judging, some very fine silage was seen, both in pits and stacks. The pit has the great advantage that waste is greatly reduced, but against this in many cases has to be added the extra cost of haulage to the pit, compared with a stack built in the field where the material is grown. A few special crops such as oats and tares are grown, but most farmers depend on surplus grass.

Of the sixty-seven entries judged forty-five were stacks, twenty-one pits, and one a tower silo. The silo owned by H. E. Batten, Tokaora, Hawera, was awarded 97½ points out of a possible of 100, while the best pit, that of A. J. Haseltine, Hawera, received 92 points, and G. H. Bell's, Oakura, 91 points. The best stack was that shown by Honnor Bros., of Hurangi, which gained 87½ points, or 10 behind the silo. The points awarded to these four crops under the different headings are interesting, and particulars are given in the following table. Maximum points are: Quality, 40; colour, 10; evenness, 10; degree of waste, 20; covering, 15; and site, 5—total, 100.

Name.	System.	Quality.	Evenness.	Colour.	Waste.	Cover.	Site.	Total.
H. E. Battle ..	Silo	39	10	9½	19½	15	4½	97½
A. J. Haseltine ..	Pit	38	9	9½	18	13	4½	92
G. H. Bell ..	Pit	38	8	8½	19	13	4½	91
Honnor Bros. ..	Stack	36½	8	8	17	13½	4½	87½
Average ..	21 pits	35·3	8·3	7·8	16·2	12·6	4·3	84·5
Average ..	45 stacks	32·8	7·2	7·3	14·1	12·5	4·4	77·2

Mr. Bell's pit is in a bank. The sides are absolutely perpendicular and are plastered with concrete; the pit has a capacity of 130 tons. Filling started on 12th December, and was continued on the 13th, 16th, 17th, 19th, 21st, and 24th, the material being weighted down with stones on the 25th. Honnor Bros.' stack was a round one, 24 ft. in diameter. Building started during the second week in December; the stack was built up to 6 ft. high, then rested for a day; building then continued for three consecutive days, and the weighting earth was placed in position on the following day.

HAY.

Last season was the first time that hay competitions have been held in Taranaki, and a total of forty-six entries at five centres were judged.

The material was judged in the open stack and points were awarded as follows: Quality, 40; condition, 25; building, 25; and site, 10. This being the first year's experience, the allotment of points was more or less experimental, and although the allocation worked quite well it is probable that some slight adjustments will be made for the next competitions.

The season on the whole was not good for first-quality hay. The clovers were late in coming away, and consequently there was very little of it in many of the stacks. On the other hand, the weather during harvesting was good, and most crops were saved in very fair condition. The average for quality, out of a possible 40, was 30·5; for condition (possible 25), 21·2; and for building (possible 25), 20·3.

The supply of rushes, raupo, and other thatching-material is getting scarce in most localities, and while a few stacks were well thatched there is an increasing tendency to use corrugated iron. If this is carefully done it is very effective, and probably the cheapest in the long-run. Five pounds' worth of iron covers a big stack, and it will last for years.

The best stack was shown by Mr. Hellier, of Lepperton, and consisted of a good mixture of clovers and rye-grass; 37 points out of 40 were awarded for quality, and the total points were 89½ out of 100. Mr. H. Wallace won Mr. W. C. Weston's special prize for the best-built stack, gaining 24½ points out of a possible 25. This stack was a credit to the builder, and it was very pleasing to listen to the complimentary remarks passed by a number of the farmers who accompanied the judges.

GENERAL.

In most districts field competitions are run by branches of the Farmers' Union, Settlers' Association, and kindred bodies, who are responsible for organization, prizes, &c. North Taranaki has gone one better and set up a committee to foster competitions. This committee consists of representatives of the agricultural and pastoral associations, Farmers' Union, settlers' associations, and Department of Agriculture. The main function of this committee is to foster and co-ordinate the competitions and to provide as many championship prizes as possible. Already the committee has received a number of special trophies and donations.

In conclusion I should like to thank the various committees for the arrangements they made to assist the judges; the local newspapers for the keen interest they took in the competitions and the full publicity given to the results; and Instructors Smith, Glasson, and Freeman, of the Fields Division Staff, who assisted with the judging.

Testing Butter for Water Content.—During the official year 1927–28, as in the past, every churning of butter intended for export shipment has been tested for moisture by the Dairy Division. A total of 137,265 churnings were tested, the average water content being 15·19 per cent., as against 15·15 per cent. for the previous year. The churnings over the legal limit of 16 per cent. represented a percentage of 0·73 of the total, and the usual practice of returning these to the dairy companies to be reworked with drier butter was followed.

SEASONAL NOTES.

THE FARM.

GRASS ENSILAGE AND INTENSIVE GRASS-FARMING.

IT is inadvisable to greatly increase the number of cows milked on a dairy farm prior to the adoption of an intensive manuring and rotational grazing scheme unless some provision is made for the supplementary feeding of the cows during the late summer and autumn, when grass-growth is usually poor. A big reserve of fodder in the form of grass ensilage allows the stocking of the farm to be greatly increased, and the maximum results obtained from the spring and early summer production of grass, by providing a certain supply of fodder for the late summer and autumn. Storage of some of the surplus production of grass as silage should therefore become just as much a matter of routine on dairy farms as the making of hay. Besides providing a reserve of fodder for supplementary feeding during periods of poor grass-growth, the mowing of rank pastures during November greatly improves the subsequent pasture-growth. Pastures cut for silage in November produce much more feed in the autumn than pastures cut for hay. Grass ensilage made in pits or trenches requires much less manual labour than where the material is stacked in the field. Indeed, it is really much easier to convert the material into ensilage, where the pit method and horse-sweeps are used, than to make it into hay. The sweeps can be used to deliver the freshly cut grass at the trench or pit, and as the pit becomes filled the horses passing over the green material help to consolidate it.

THE DAIRY FARM AS A LABOUR UNIT.

Many people are looking to a very rapid improvement in production on dairy farms from the adoption of schemes of intensive manuring and rotational grazing. There are, however, certain factors that may limit this rapid improvement, and one important factor is the farm as a labour unit. Fifty-acre farms, carrying twenty to twenty-five cows and employing the full time of one man, and 100-acre farms carrying thirty-nine to forty-five cows and employing the full time of a man and a boy, are probably the commonest sizes of farms in most dairying districts. Twenty years ago, before phosphatic top-dressing was widely adopted, and before the milking-machine was perfected, the 50-acre farm carried about fifteen cows, and the 100-acre farm twenty to thirty cows. The adoption of the practice of phosphatic top-dressing has virtually doubled the carrying-capacity of grass-land, and the use of the milking-machine has enabled the same labour units as were required previously for hand milking to now milk double the number of cows. It has taken some twenty years for this change to be accomplished, although it was early demonstrated that the application of phosphatic manures roughly doubled the produce from grassland.

At the present time the butterfat production of farms situated on similar land varies enormously. For instance, on 50-acre farms in

old-established dairying districts the butterfat production varies from 100 lb. to 200 lb. per acre, and the herds vary from twenty to thirty-three cows. High production per acre is nearly always associated with high carrying-capacity. There is considerable room for improvement in production on farms with a low per-acre production by the adoption of better feeding and the building-up of better and larger herds of cows. An increase in the number of cows on these farms would in most cases not require any additional labour for milking. The herds on 50-acre farms that are producing 150 lb. to 200 lb. of butterfat per acre have in most cases reached the maximum size that can be economically milked with the plant and labour available. An increase in the size of the herds on these farms, unless family labour is available for milking, will require the employment of additional labour for milking. It is important, therefore, when considering the increased carrying-capacity that is possible from the use of intensive methods of manuring, that the cost of milking the extra cows should be taken into consideration on farms that have now a high carrying-capacity.

LUCERNE.

Established stands of lucerne are generally ready for the first cutting some time in November. It is unwise to cut too early, as this usually reduces the weight and number of subsequent cuts. Flowering is frequently late in the spring, and the stage to cut is often determined by the appearance of fresh buds at the base of the crown. As the weather is often unsettled in November, the first cut of lucerne on dairy farms is preferably made into ensilage. For this purpose it should be stacked along with grass from early-mown pastures. This is usually advisable, because the quality of the silage is better when lucerne is mixed with grass.

November is usually the best month for sowing new stands, and care should be taken that lucerne is only sown on land that is perfectly dry in the winter-time. The seed-bed should be carefully prepared. The crop frequently does best after grass, but care should be taken that the land is free from twitch. Many promising stands of lucerne have been ruined by too early cutting in the first year. The first cutting should not take place till the young plants are blooming and fresh buds have appeared at the base. Cutting before this stage is reached greatly weakens the vigour of the young plants.

ROOTS AND GREEN FORAGE-CROPS.

The main sowings of soft turnips, Aberdeen turnips, and swedes take place in November and December. No general rule for time of sowing can be laid down, as conditions vary so greatly in different districts. In Canterbury the attacks of the grass-beetle on newly germinated plants is often serious with November sowings. The root-crop competitions, where they have been carried out for a number of years, have given very valuable information as to the best time for sowing in particular localities.

The main sowings of rape, kale, chou moellier, millet, and maize for green fodder should be made in November. Mustard or Italian rye-grass should be sown with rape; the mustard is best sown after

the rape is up in two rough leaves, so that both crops mature together. Japanese millet should not be sown too early; any time after the middle of November in the warmer localities, and the first week in December in colder districts, is quite soon enough.

—*P. W. Smallfield, B.Ag., Fields Superintendent, Auckland.*

THE ORCHARD.

SPRAYING OPERATIONS.

THE blossoming-period will now have almost passed, and in a good many localities apple and pear trees will be ready for the petal-fall sprays recommended in last month's notes. The period is very critical, as black-spot almost invariably makes its appearance at this time of the year. As some time may have elapsed since the last spraying prior to blossoming, and as it is necessary to refrain from applying the sprays while trees are in full bloom, no delay should now occur in affording trees protection after petal-fall. It is quite safe to spray when 75 per cent. of the petals have fallen, as the function of the blossom and the process of pollination will have been completed. Foliage and fruit will be developing rapidly, the unfolding leaves and swelling fruits requiring renewed protection. A second cover spray should be applied to apples and pears seven to ten days after the petal-fall. Later on the intervals between sprayings may be extended to seventeen days.

On most varieties of pears bordeaux has been recommended, and if weather conditions are favourable for black-spot development bordeaux 3–4–50 should be continued. Otherwise lime-sulphur 1–100 or 1–120 may be used on all pear varieties. Arsenate of lead for codlin-moth control must also be applied, and may be used in combination with either bordeaux or lime-sulphur at the rate of $1\frac{3}{4}$ lb. powder to 100 gallons of spray. Apples require careful consideration now, and the orchardist must decide between the use of lime-sulphur and sulphur in the free form (precipitated sulphur in paste and powder forms, dry-mix, &c.). Lime-sulphur is more efficient as a controllant of black-spot and is a useful insecticide, keeping in check such insect pests as red mite and scales. It is, however, rather severe on certain tender varieties, on trees lacking in vigour, and on the older leaves as the season advances, unless heavily diluted. Free sulphur, although not altogether efficient as far as black-spot control is concerned, is not injurious to foliage, acting more as a tonic; moreover, it is a controllant of powdery mildew.

If lime-sulphur is favoured it should be weakened down as the season progresses, first to 1–120 and later to 1–140. If the orchardist aims at controlling both spot and mildew a combination of the two forms may be used. I would suggest lime-sulphur, 1–120, plus 8 lb. to 10 lb. precipitated sulphur. However, on the tender varieties such as Cox and Dunn's, and on the less vigorous trees, it is advisable to drop the lime-sulphur and continue with precipitated sulphur only. Later in the season, and if weather conditions are not favourable for black-spot, lime-sulphur may be dropped on all varieties. However,

it often happens that red mite is allowed to increase, and more damage is done to foliage by this pest than occurs by the continued use of lime-sulphur. Therefore I would recommend using the weaker-strength lime-sulphur in combination with precipitated sulphur for several sprayings on such varieties as require it.

Arsenate of lead, 1¾ lb. to the 100 gallons of spray, should be applied with every regular spraying. The leaf-hopper usually makes its appearance as the leaves unfold, and Black Leaf 40, strength 1–800, should also be added to the spray. It is often necessary to apply this with the petal-fall spray. If not applied then, it is almost certain to be required by the time the second cover-spray is due. However, if a sharp lookout is kept and Black Leaf 40 applied while the hopper is in the nymph stage, little trouble from this pest should occur.

Stone-fruit should receive further sprayings, chiefly for brown-rot. Dry-mix sulphur and lime, or else lime-sulphur, 1–130, plus precipitated sulphur, 6 lb. to the 100 gallons, should be continued up till picking-time. The latter formula will give better control for red mite and scale insects. If the weather is wet and humid, stone-fruit should be sprayed every week.

FIREBLIGHT.

This disease usually manifests itself towards the end of October, following the blossoming of apples and pears, and is evidenced by a sudden wilting of a number of fruit clusters, usually at petal-fall. Leaves at the base of infected fruit-spurs turn black in the case of pears and light brown in the case of apples. A little later tender shoots may become infected and wilt. Any such symptoms or suspicious signs should be immediately reported to the district Orchard Instructor to investigate, especially in districts where fireblight has not been known to exist previously. By extreme vigilance at this period any fresh outbreak may be located at its inception and traced to its source, thereby making possible its extinction before becoming so widespread that its complete suppression is impossible.

THINNING.

Thinning is one of the most important factors in successful fruit-production, and its importance cannot be too strongly emphasized. The weight of fruit harvested from a well-thinned tree is often greater than that from a tree left to mature the whole of its crop, as the remaining fruits are larger. Here is the cure for the undersized fruit, expensive to pick, expensive to handle, and of low market value.

Uniformity in size may be secured by careful thinning, and diseased and blemished fruits may be removed in the process. The resultant crop is of very much more value, less costly to handle, and of improved quality. Apart from the improvement in the fruit, the advantages to the tree are numerous. The maturing of a well-thinned and distributed crop is less exhausting to the tree; this is evidenced by the better foliage and growth. It is the only way to secure regularity in bearing and maintenance of vigour. The extent to which one should thin can be gauged only by experience. One never comes across instances where thinning has been overdone. On the other hand, it is the experience of many to find that the degree of thinning was totally inadequate. It is a wise plan to disregard the

thinnings on the ground and look only at what fruit is left on the tree; otherwise one is inclined to become alarmed at the apparent waste and lose courage. Thinning should begin early and be pushed on to secure the full advantage from the operation. In most cases by the end of October, when danger of late frosts is usually over, thinning should be tackled in earnest, beginning with Wright's Early, Evans's Early, and Burbank plums, then other stone-fruit, followed by pears and apples. By this time the natural dropping will be over, and the perfect fruits are set. Stone-fruit should be so spaced as to ensure that no two fruits are touching when mature. This is an important point in brown-rot control. Apples often require thinning out to single fruits, especially on older trees and on varieties with short stems, such as Gravenstein.

DISBUDDING, GRAFTS, ETC.

Newly planted trees will require some attention. A limited number of well-spaced shoots should be selected to form the main limbs of the tree, and other shoots rubbed out. Scions on newly grafted trees will be swelling, and the ties will require cutting, otherwise injury may be caused by the tying material cutting in. Scions are often broken off by wind, and it is a wise plan to tie the new shoots to stakes attached to the stock. A fair amount of the growth arising from the stump and branches of trees headed back for grafting should be retained, so as to encourage root activity. Some of these shoots, if in suitable positions, may be used later for further budding or grafting if any grafts fail to take.

CULTIVATION, ETC.

The maintenance of good tilth to retain soil-moisture is most important. Many of our fruit-growing areas suffer long periods of dry weather during the summer, and loss of soil-moisture early in the season results in poor foliage and small fruit. Therefore every effort should be made to secure a fine earth mulch early. An occasional stirring of the soil, particularly after rain, to prevent the forming of a crust, will then keep the land in good condition.

FROST-PREVENTION.

Orchardists who have made some provision to ward off frosts by means of orchard heating should not be tempted to re-store pots before the end of November. Up till that period weather conditions should be watched closely.

—*N. J. Adamson, Orchard Instructor, Hastings.*

Citrus-culture.

Cultivation: Growers should endeavour to secure good cultivation as early as possible, ploughing and cross-ploughing where this has not been done. Dig up all strips of land and the area near the trunk of the trees, and from then onward maintain a clean cultivation for a depth of from 4 in. to 5 in. by the use of the hoe under the trees and horse implements on the open land.

Manuring: Oranges and lemons will greatly benefit at the flowering season by an application of nitrate of soda, 1 lb. to 2 lb. per tree, according to its size.

Spraying: Oranges—At this season young scales are on the move, and it is wise to spray with oil, 1–40, after the fruit has set; this spray will also account for thrip, which were troublesome on oranges during the past dry season. Lemons—Where bordeaux, 4–4–40, has not been applied to the setting crop this should be done, and repeated two weeks later to ensure cover of later-developed fruit; oil, 1–40, can with advantage be applied immediately after bordeaux for scales and thrip.

Reworking: It is timely to work over, by budding, trees which have a good root-system but are otherwise unsatisfactory as regards type or cropping. —*W. H. Rice, Orchard Instructor, Auckland.*

POULTRY-KEEPING.

LATE-HATCHED CHICKS.

THE end of October brings to a close the correct season for hatching out chicks of any breed. It is a recognized fact that the late-hatched bird never gives a high annual egg-yield, nor does it produce an egg of desired size for the export trade. Not only this, it is usually more susceptible to disease and parasitic infection than the early-hatched bird. Of course, where the majority of the hens in the flock are old, and the hatching of young stock has been delayed owing to inability to secure broody hens, poultry-keepers may certainly be advised to hatch out some chicks to replace the old and unprofitable birds, even if they are brought out on the late side.

But, while it is a mistake in the ordinary course to have late-hatched chickens on the plant, it is a greater mistake to hold on to old hens that have passed their profitable period of production. Where the hatching-period is to be extended, the young birds, as pointed out in last month's notes, must receive the best possible attention if they are to make satisfactory development. This involves clean fresh ground, shelter, good nourishing food, and, above all, a plentiful supply of green material. The adoption of incubators and brooders, or the securing of day-old chicks, is the only safe means of having the full complement of chicks brought out at the right season of the year.

THE GROWING STOCK.

With the advent of summer it is important that special care be given to the young stock. Every effort should be made to provide conditions as ideal as possible, in order to guard the birds against a set-back during the trying hot months. After drafting chicks from the brooder to the colony-house special care should be taken to prevent them huddling in corners by night. The colony-house should be rounded off with 1 in. mesh wire netting; then in the event of the chicks piling up they have an opportunity of securing fresh air. It is a mistake to try and harden the chicks off too rapidly after leaving the brooder. Obviously, to remove the young birds from a cosy secluded quarter to an ordinary colony-house is only encouraging them to huddle in their endeavour to secure the warmth and seclusion

they have been accustomed to. While the hardening-off process should be carried out by degrees, the chickens should at the same time be encouraged to perch as soon as possible. It is all against the birds making sound development to allow them to huddle together when hot-weather conditions prevail.

It is commonly believed, and rightly so, that early perching will cause crooked breast-bones. This trouble, however, will be reduced to a minimum if wide perches are provided. A board about 4 in. wide will serve for the purpose. Do not allow the chickens to sleep on a hard floor, as probably this is the most common cause of crooked breast-bones.

The floor should be well bedded down with perfectly dry straw. Grass hay should never be used for this purpose, as it is apt to heat and bring on a sweated condition of the chickens, with serious results. The chief trouble caused in this way is an inflammation of the veins. It first makes it appearance in the hock-joints, which become discoloured. Then a gangrenous swelling follows. In a few days the wings become affected in a similar manner, and later the neck and head swell. At this stage death is usually near at hand. There is no cure for this trouble; it is only a question of prevention. Do not overcrowd, provide ample ventilation, keep the floors clean and dry, and check everything that tends to create a moist atmosphere.

EGG-SHELL QUALITY.

At this period of the year, when the great majority of the birds are laying to their full capacity, weak-shelled or shell-less eggs are apt to be produced. These not only mean a direct loss, but they also encourage the birds to acquire the habit of egg-eating. Such eggs are easily broken, and once the hens have tasted the substance it will probably not be long before they learn to break the shells of the normal eggs for themselves.

Weak-shelled or shell-less eggs are usually caused through the bird's inability to secure the necessary lime as a shell-forming material. Losses through thin-shelled eggs, &c., can be considerably reduced by keeping the birds well supplied with fresh crushed oyster or other sea-shell, while broken burnt bone is also valuable for this purpose. Bleached shell, such as is often collected from the sea-shore, is not so good, as it does not contain the necessary lime to produce the desired strength of egg-shell. It is a mistake to provide the shell—or, indeed, any kind of grit—in a narrow receptacle. The best plan is to place it in a shallow box at least 1 ft. square. In this way the birds are given an opportunity of scratching it about and securing pieces they like best.

The lack of lime is not always the cause of weak or soft-shelled eggs. The overfeeding of rich food, such as meat and meat-meal, are often responsible. Thus, where a liberal supply of egg-shell-forming material is available to the birds, and eggs with poor-quality shells are produced, it will be found a wise course to reduce the amount of forcing diet. Of course, even on the best-managed plants an odd bird may lay imperfectly shelled eggs owing to an overfat condition preventing the reproductive organs from functioning in a normal way. Obviously, such birds should not be retained on the plant.

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

THE APIARY.

SWARMING AND HOW TO DEAL WITH IT.

UNTIL a beekeeper has passed through his first season it is well to depend upon natural swarming for any increase required. After a season's experience a more reliable method may be adopted for enlarging his operations. If increase by natural swarming is followed it is well to effect delay so far as the first swarms of the season are concerned. Very early swarms are not advisable, as the weather and flow of nectar are not always to be relied upon. Usually the swarms are smaller than when delayed, and may have to be fed should the weather prove unfavourable after they have been hived. On the other hand, when swarming has been delayed for two to three weeks the weather and flow of nectar are certain to be much more favourable. In any case, the swarms will be larger, and the work of the parent hive and the swarm will go on rapidly and without interruption.

One of the chief factors in delaying swarming is to enlarge the hive. By giving the colony a super more working-room is provided, the nurse bees are kept busy, and the queen has additional combs in which to lay. Of course, there is a right and wrong time for doing this. The best time to add additional supers is when the brood-chamber is getting fairly full of bees, the weather mild, with a fair flow of nectar, and before queen-cells are started. If the supers are placed on the hives before there is a good force of bees and plenty of emerging brood, there is a danger of the extra space causing a check on brood-rearing, as the additional space will affect the temperature of the hive. However, if the supers are not put on before queen-cells are started it will be too late to have the desired effect, and the preparations for swarming will proceed.

When putting on the supers, if the weather is mild, a frame containing a little sealed brood should be transferred from the brood-chamber to the centre of the upper box, and also two of the side frames of comb, all with adhering bees, placing the latter combs one on each side of that containing brood, and filling their places below with drawn-out combs or frames of foundation.

The presence of several queen-cells in a hive points almost invariably to the fact that swarming is about to take place. When a number of queen-cells are sealed the swarm emerges headed by the old queen, accompanied by the majority of the field-bees. The swarm will seek an alighting-place usually some distance from the hive, and cluster there like a huge bunch of grapes, while skirmishers from the cluster will go further afield seeking a permanent home. However, the beekeeper usually intervenes and provides the permanent home before the swarm has decided on one. The swarm is gathered into a box, which is placed in the shade, and towards sunset is transferred to a clean hive in its permanent position. Next day work starts with vigour, and, given favourable weather, within a week honey and pollen and worker-eggs will be appearing in the combs. The presence of worker-eggs is an indication that the colony is queen-right.

In the parent hive the young queen will be developing, and the first one to hatch will, unless prevented by the workers, crawl over

the combs and endeavour to tear down any other queen-cells she may find and to sting to death their occupants. If foiled in this she will probably lead another swarm from the hive. This may occur three or four times in one hive, leaving the parent stock badly reduced in numbers and the beekeeper with several small swarms which will be useless to provide a surplus. The remedy for this state of affairs is for the beekeeper to examine the hive immediately after the first swarm has emerged, and himself destroy or remove all the queen-cells but one or two.

Unless there is a good honey-flow, or if bad weather sets in, the swarms should be fed inside the hive. This is to give them a good start, and to provide them with material for producing wax. Excellent combs can be produced from sugar-syrup. Feed only the best white cane-sugar. It is advisable in all cases to hive the swarm on full sheets of foundation, and thus take advantage of the natural instinct of the bees to produce wax after swarming. Very little time will be gained if the bees are put on to drawn-out combs.

Frequent examinations of the colonies—every week or ten days during the swarming season—for the purpose of cutting out queen-cells will help to check swarming, but this requires considerable work, and, since it frequently fails in spite of every care, is not usually relied on.

The occurrence of swarming is largely due to overcrowded brood-chambers. This condition of affairs irritates the nurse-bees, which start rearing queen-cells. Therefore, give the queen plenty of room to lay. A suitable plan is to remove all the frames of brood, except the two centre combs, from the bottom chamber. Empty combs or frames fitted with sheets of foundation are put in their place. Secure the queen, and confine her in the new brood-chamber below a queen-excluder, placing the old brood-nest directly above, thus giving additional work for the nurse-bees and plenty of room for the queen to lay. In six to eight days examine the top frames, and remove any queen-cells that may have been built. If for some reason this plan is not desirable, swarming may be controlled and the strength of the colonies equalized by transferring part of the brood from the strong to the weaker ones. Empty worker combs or frames fitted with sheets of foundation are used to replace the transferred brood-combs.

The age of the queen is another factor in promoting swarming. Just as the poultryman relies on his pullets for greater egg-production, so the beekeeper should rely on young queens, and the sooner he realizes this the less trouble he will have in keeping swarming down to a minimum. It is the exception for a queen of the current season's rearing to swarm. Ventilation also plays an important part in controlling the natural inclination to swarm, and care should be taken to provide sufficient at all times of the season. No single system will be found universally effective. Climatic conditions frequently play an important part in bee behaviour. It will be found, however, that the methods stated, or a variation of the same employed either singly or in combination, will materially assist in the prevention of swarming.

—E. A. Earp, Senior Apiary Instructor, Wellington.

HORTICULTURE.

THE TOMATO CROP.

On the main tomato crop under glass the lower bunches will now be ripening, and the plants will be well up the strings on which they are trained. This mass of foliage and the increasing sun-heat make it necessary to give careful consideration to ventilation if the plants are to be kept healthy and hardy and a suitable dry atmosphere is to be maintained. This attention is specially necessary in the early morning of fine hot days. About the time of the first picking—which usually takes place towards the end of November—it is customary to trim off and carry out the lower leaves that shade the ripening bunch, and on well-drained soils that are likely to become overdry a straw mulch of stable litter is now applied. The forcing manures that have been carefully avoided previously may, now that a number of fruit branches have set, be applied from time to time in a liquid form to help the swelling bunches.

Planting the outside tomato crop is done in most districts at about this period. A good bordeaux spray is often suitable treatment for the young plants before they are removed from the boxes. It not only prevents fungous disease, but is a considerable deterrent to insect pests by making the growth unpalatable. Carefully scrutinize each plant before putting it out, discarding those that are blind or untrue to type, soft, or stunted. The early paying crops can be obtained only by setting out good plants at the proper stage of growth. Plant them firmly and rather deep.

VEGETABLES AND POTATOES.

Late broccoli, savoys, and kale should now be sown for winter supplies, or in the warmer districts the autumn and hardier cauliflowers in the place of broccoli, as they have the advantage of a much earlier maturity. Make these beds on good, moist land, and sow them thinly. In no class of vegetable-seeds is there such a wide range of quality as in those mentioned. Needless to say, the best results can only be obtained by using first-class seed-strains. Asparagus-beds must not be allowed to become dry at this season. An ounce of nitrate of soda to each 4 gallons of water is an excellent stimulant now for this crop. Carefully inspect the early potato crop when in flower, and mark down sufficient of the best plants for seed tubers.

STRAWBERRIES AND OTHER SMALL-FRUITS.

The strawberry crop will be ready for the pickers during the coming month, and arrangements for its distribution should be made now. This popular fruit requires expert handling to ensure it being delivered to the consumer while the berries have all their freshness and aroma. To do this the fruit must be gathered in the cool of the day when the plants are free of moisture. The stage of ripeness must depend on the distance they have to travel, but at the beginning of the season, when the weather is cool, they should be riper than later in the season, when they will ripen quicker in transit. If the pickers are properly instructed and supervised very little rehandling should be necessary. The berries should be picked with a short stem and placed in the punnets; these

must be filled, and the top is required to be a fair sample of the fruit beneath. This is a legal requirement, and shipments packed in any other way are liable to bring trouble on the seller. Overripe, misshapen, and undersized berries should be picked and placed in a separate container and sold for culinary purposes. Keep all punnets and crates clean, as this will add very much to the appearance and value of the pack. The berries at all times must be kept in a shaded cool place that is free from dust. Gritty and rain-splashed berries are of no value, so the mulch of straw or rushes should be laid in good time to avoid that danger.

Culinary gooseberries will also soon be ready for gathering. They should be marketed promptly, before the early stone-fruit commences to come on the market. Culinary fruit is in short supply at this season, and gooseberries are useful in supplying it during this interval.

Raspberry and loganberry plantings now require light cultivation in fine weather to destroy weeds and conserve moisture. Apply nitrogenous fertilizers as necessary to induce satisfactory growth, and remove unnecessary sucker growths in the alleys.

TOBACCO-CULTURE.

The earlier plantings of tobacco will now be established in the field. There should be very few gaps in the rows if the plants were well selected and carefully placed. Any replacements should be made promptly with specially selected plants, as otherwise such replacements are backward and cause more work than they are worth. Hoeing and cultivation may now be done with horse-drawn implements, and, if regularly attended to, the plants will benefit, and very little hand cultivation and hoeing will be required later, when the danger of damaging the leaf makes cultivation with horses impracticable. The sooner planting is completed the better.

Precautions should be taken to guard against cutworm attacks. The following is a good poison-bait recipe: Take 1 lb. Paris green, 3 lb. treacle, and 1 bushel bran; boil the Paris green in 1 gallon water; pour the treacle into the boiling mixture and stir well, then take off fire; add the bran to the treacle and Paris green mixture, and work it up quickly by hand, preventing the mixture from forming lumps. Arsenate of lead, 2 lb., may be used instead of Paris green.

This material should be broadcast at the rate of 1 bushel per acre. One application is usually sufficient. Rain spoils the poison, and when rain falls before the poison has had an opportunity of being effective it should be resown. The poisoned bran should be sown with the assistance of the wind; the bran being thrown in the air, the wind will scatter it more or less evenly over the surface of the ground. The first night probably as many as 75 per cent. of the caterpillars will be poisoned.

—W. C. Hyde, Horticulturist, Wellington

Registration of Plant Nurseries.—A total of 695 nurseries were registered by the Horticulture Division during the last financial year, this being an increase of 58 registrations compared with the preceding period.

WEATHER RECORDS: SEPTEMBER, 1928.

Dominion Meteorological Office.

GENERAL NOTES.

DURING September the rainfall for the month exceeded the normal in nearly all parts of the North Island, except at a few places in the Gisborne and Napier districts and at Russell. In the South Island it was below normal in the eastern districts, but all the western half of the Island and the Nelson and Marlborough Provinces had an excess. The fall was more than double the average in places with a westerly aspect in the North Island and also in south-west Otago.

On account of the prevalence of strong westerly winds the temperature range was not large, and the mean was usually about the average or slightly below. There were, however, occasions when rather severe frosts occurred in the inland and eastern districts. On the 23rd, for instance, a short-lived cold snap caused damage to apricots in Central Otago.

In most parts of the Dominion the month was a stormy one on account of the numerous depressions of the westerly type which were in evidence. September, which is the first spring month, is one during which the westerly is the normal type of pressure system; but this year they have been not only unusually frequent, but also of much more than ordinary intensity. The only northern cyclone which affected New Zealand was the one which appeared to the north-west of the Dominion on the 3rd. By the morning of the 4th its centre had reached Cape Maria van Diemen, and during the night of the 4th it crossed the Auckland Peninsula. Rain fell over most of the North Island on the 4th and 5th, and the falls were heavy at places in the northern and east coast districts. On the 6th a secondary developed in the northern portion of the cyclone, which had by then moved to the south-east of New Zealand. But the secondary soon became merged in a very intense depression which advanced over the Tasman, and which covered the New Zealand area on the 7th. During the 7th and 8th stormy conditions with strong north to west winds to gales were experienced, and heavy rain fell in most districts. The gale was particularly severe in Hawke's Bay, where considerable damage was done, especially to power lines. By the 9th winds had backed to south-westerly, still with gale force at many places, but except in the western and southern districts conditions were improving, and by the 10th mainly fair to fine weather prevailed, while a weak anticyclone was crossing the Dominion.

After this date and until the 28th low-pressure disturbances of the westerly type prevailed, and they were frequently of a very intense character. As a result, winds were generally strong northerlies or westerlies, and gales were of almost daily occurrence in many parts of the Dominion. A small tornado passed over the northern portion of Hokitika on the 18th. The most notable of the low-pressure disturbances was the very intense and extensive one which was experienced between the 22nd and 28th. With it were associated very low-pressure readings on the 23rd and 24th, especially in the southern portion of the South Island. At Akaroa, at 9 a.m. on the 24th, the barometer registered 28·62 in. The northerly and westerly gales which were associated with this disturbance were exceptionally severe in many parts of the Dominion, and at places, particularly in the Poverty Bay and East Cape districts, on the 21st to 22nd, caused considerable damage to buildings, trees, &c.

The 25th was a very stormy day, many parts of the North Island particularly experiencing a fierce northerly gale with heavy rain, severe thunderstorms, and hail. Auckland, Waihi, Rotorua, Te Kuiti, and Patea suffered severely. A number of buildings were wrecked by a tornado at St. Helier's Bay, Auckland. During the 25th pressure rose, but on the 26th a further wave crossed the southern portion of the Dominion. After its passage winds changed to south-westerlies, which were general by the morning of the 27th. By the 28th an anticyclone had advanced across the Tasman Sea, and from then until the close of the month the weather was more generally fine over the Dominion than at any other period during September.

A notable feature of the month was the frequency of thunderstorms and hail-showers, nearly all parts of the Dominion having been subject to them to a greater or less extent. Snow also fell on several occasions, chiefly on the high

country of the South Island, but some of the lower levels had slight falls with the strong south-west winds on the 26th and 27th.

Although conditions generally were of an unsettled, squally character, there were brief intervals of fine weather, and sunny days were not infrequent in districts with an easterly aspect.

—*Edward Kidson, Director of Meteorological Services.*

RAINFALL FOR SEPTEMBER, 1928, AT REPRESENTATIVE STATIONS.

No.	Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average September Rainfall.
	North Island.				
		Inches.		Inches.	Inches.
1	Kaitaia	5·26	14	0·90	4·75
2	Russell	4·13	14	0·65	4·36
3	Whangarei	6·82	20	1·97	4·91
4	Auckland	7·84	23	1·47	3·65
5	Hamilton	8·34	22	1·98	4·40
6	Kawhia	9·52	23	1·80	4·32
7	New Plymouth	9·06	26	2·28	5·22
8	Riversdale, Inglewood ..	16·47	23	3·06	9·48
9	Whangamomona	14·52	21	2·41	7·15
10	Eltham	9·55	21	1·26	3·91
11	Tairua	9·90	19	2·04	4·78
12	Tauranga	7·84	20	1·62	4·41
13	Maraehako Station, Opotiki	7·00	20	1·30	4·18
14	Gisborne	1·87	10	0·68	3·01
15	Taupo	9·22	19	1·85	3·82
16	Napier	2·39	12	0·79	2·19
17	Maraekakaho Stn., Hastings	2·39	20	0·67	2·58
18	Taihape	5·93	23	0·70	3·44
19	Masterton	3·61	18	0·68	3·13
20	Patea	5·75	21	1·02	3·58
21	Wanganui	3·11	13	0·60	2·96
22	Foxton	3·32	13	1·20	2·43
23	Wellington (Karori Reservoir)	3·54	15	0·64	3·50
	South Island.				
24	Westport	10·30	25	1·73	6·82
25	Greymouth	11·92	24	1·63	7·96
26	Hokitika	14·18	26	2·11	9·33
27	Ross	18·24	21	3·00	13·06
28	Arthur's Pass	22·96	16	3·81	15·50
29	Okuru, Westland	12·86	19	1·55	12·48
30	Collingwood	15·94	20	2·46	10·13
31	Nelson	5·51	16	1·37	3·75
32	Spring Creek, Blenheim ..	4·34	13	0·98	2·69
33	Tophouse	11·44	21	1·83	5·47
34	Hanmer Springs	5·19	12	1·04	4·10
35	Highfield, Waiau	1·82	9	0·56	3·12
36	Gore Bay	0·96	7	0·25	3·31
37	Christchurch	0·93	10	0·37	1·79
38	Timaru	0·36	7	0·12	2·07
39	Lambrook Station, Fairlie ..	0·68	7	0·26	2·21
40	Benmore Station, Clearburn	2·06	14	0·56	2·10
41	Oamaru	0·29	7	0·07	1·69
42	Queenstown	5·55	13	1·21	2·47
43	Clyde	0·63	5	0·22	1·06
44	Dunedin	1·93	15	0·37	2·74
45	Wendon	2·06	14	0·42	2·32
46	Gore	4·32	17	1·01	2·65
47	Invercargill	5·34	21	0·64	3·11
48	Puysegur Point	11·12	25	1·32	5·53
49	Half-moon Bay	7·46	24	0·75	4·54

ANNUAL SHEEP RETURNS AS AT 30TH APRIL, 1928.

TABLE I.—SUMMARY BY SHEEP DISTRICTS.

Class.	Auckland.	Napier-Gisborne.	Wellington-West Coast.	Marlborough-Nelson-Westland.	Canterbury-Kaikoura.	Otago (including Southland).	Total in Dominion.
Stud rams (entered in flock-books)	1,046	1,255	3,218	846	3,527	2,259	12,151
Other rams	34,255	96,639	79,565	18,456	79,684	75,601	384,200
Wethers	336,489	587,432	636,741	221,254	549,165	693,566	3,024,647
Breeding-ewes	1,339,246	3,680,579	3,192,053	727,800	3,337,802	3,256,571	15,534,051
Dry ewes	56,056	253,339	160,701	43,203	197,017	158,811	869,127
Lambs	613,383	1,919,935	1,490,173	349,484	1,372,402	1,564,257	7,309,634
Totals, 1928	2,380,475	6,539,179	5,562,451	1,361,043	5,539,597	5,751,065	27,133,810
Totals, 1927	2,289,488	6,317,884	5,350,448	1,369,648	5,102,411	5,219,137	25,649,016

TABLE II.—COMPARATIVE STATEMENT: TEN YEARS, 1919-28.

Year.	Stud and Flock Rams.	Stud Breeding-ewes.	Stud Dry Ewes.	Stud Lambs.	Total Stud Sheep and Flock Rams.	Sheep of Distinctive Breed not entered in Flock-books, and Crossbred Sheep.				Grand Total, Stud and other Sheep.
						Wethers.	Breeding-ewes.	Dry Ewes.	Lambs.	
1919	321,304	165,676	12,196	127,150	626,326	3,922,632	12,176,224	1,799,201	7,304,171	25,828,554
1920	306,621	154,516	9,803	109,454	580,394	3,901,742	11,415,159	1,814,391	6,208,284	23,919,970
1921	322,144	158,608	9,513	110,428	600,693	3,634,799	11,989,180	1,336,306	5,724,053	23,285,031
1922	322,072	154,277	7,259	98,221	581,829	2,727,624	12,341,777	952,789	5,618,240	22,222,259
1923	330,055	172,843	9,013	119,749	631,660	2,551,627	12,890,160	808,919	6,199,073	23,081,439
1924	332,814	179,533	9,727	132,137	654,211	2,807,832	12,896,561	1,036,723	6,381,249	23,775,776
1925	355,579	184,744	7,867	131,485	679,675	3,063,663	13,530,479	875,899	6,398,239	24,547,955
1926	370,535	192,055	10,053	138,526	711,169	3,212,435	13,756,197	1,069,682	6,155,510	24,904,993
1927	388,274	199,219	8,644	144,897	741,034	3,074,974	14,632,511	823,047	6,377,450	25,649,016
1928	396,351	205,720	7,347	145,969	755,387	3,024,647	15,328,331	861,780	7,163,653	27,133,810

TABLE III.—DISTRIBUTION OF THE VARIOUS BREEDS, AND OF CROSSBREDS, IN EACH SHEEP DISTRICT (1928).

Breed.	Auckland.	Napier-Gisborne.	Wellington-West Coast.	Total in North Island.	Marlborough-Nelson-Westland.	Canterbury-Kaikoura.	Otago.	Total in South Island.	Total in Dominion.
Stud sheep (entered in flock-books)—									
Merino	..	1	..	1	9,408	13,043	6,719	29,170	29,171
Lincoln	482	2,098	5,642	8,222	521	97	429	1,047	9,269
Romney	16,082	14,446	79,887	110,415	9,094	4,746	37,418	51,258	161,673
Border Leicester	701	..	316	1,017	455	10,269	12,416	23,140	24,157
English Leicester	800	24	96	920	1,008	18,686	612	20,306	21,226
Shropshire	407	..	72	479	58	2,405	1,511	3,974	4,453
Southdown	4,332	9,481	29,620	43,433	1,007	16,660	2,219	19,886	63,319
Corriedale	264	62	2,131	2,457	1,053	35,308	12,269	48,630	51,087
Ryeland	629	282	669	1,580	1,065	1,968	139	3,172	4,752
Other breeds	102	..	..	102	109	1,094	775	1,978	2,080
Totals	23,799	26,394	118,433	168,626	23,778	104,276	74,507	202,561	371,187
Sheep of distinctive breed but not entered in flock-books—									
Merino	9,443	26,896	6,273	42,612	194,924	512,938	328,945	1,036,807	1,079,419
Lincoln	13,395	49,346	15,499	78,240	2,467	10,797	4,682	17,946	96,186
Romney	390,146	1,472,780	1,137,985	3,000,911	121,522	115,760	275,618	512,900	3,513,811
Border Leicester	3,133	2,187	747	6,067	2,660	31,500	34,727	68,887	74,954
English Leicester	2,470	2,446	1,043	5,959	8,199	61,034	8,087	77,320	83,279
Shropshire	2,662	223	925	3,810	1,691	6,105	2,990	10,786	14,596
Southdown	10,678	23,504	47,328	81,510	1,587	21,904	1,596	25,087	106,597
Corriedale	1,755	843	29,347	31,945	26,580	595,671	387,284	1,009,535	1,041,480
Half-bred	5,530	1,097	13,894	20,521	236,313	750,539	331,443	1,318,295	1,338,816
Ryeland	406	11,754	250	12,410	88	1,369	202	1,659	14,069
Other breeds	264	138	263	655	23	2,182	248	2,453	3,118
Totals	439,882	1,591,214	1,253,554	3,284,650	596,054	2,109,799	1,375,822	4,081,675	7,366,325
Crossbreds and others not otherwise enumerated	1,916,794	4,921,571	4,190,464	11,028,829	741,211	3,325,522	4,300,736	8,367,469	19,396,298
Grand totals	2,380,475	6,539,179	5,562,451	14,482,105	1,361,043	5,539,597	5,751,065	12,651,705	27,133,810

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.

CONTROL OF SHEEP LEG-LICE.

"FARMER," Mangapehi :—

I should be glad of information regarding the life-history of leg lice on sheep. At what time will dipping be most effective ?

The Live-stock Division :—

The female of the sheep leg-louse (*Haematopinus pedalis*) lays about one hundred eggs, each egg being attached to the hair by its small end. There is no metamorphosis, and the young louse appears from the egg after about fourteen days. It then passes through several moults, and the females become mature and ready to lay eggs in from thirty to thirty-three days from its first appearance as an egg itself. In view of this life-history it will be clear that the best means to adopt for control is to dip once and repeat the dip in sixteen to eighteen days' time. It is necessary for the sheep to be totally immersed, because the louse is frequently on the face as well as the legs. If only a few sheep are affected they can be treated by applying the solution to the legs and face.

SPRAY FOR KILLING GORSE.

"GORSE," Glentunnel :—

Can you advise a mixture for spraying gorse that will kill the root without being injurious to the soil or to stock grazing where the spray is used ?

The Fields Division :—

It is difficult to recommend anything that will fully comply with these requirements. We have found a solution of salt and water very effective with gorse, but the soil will generally not grow anything for about two years after the application. The procedure is to add salt to water until a potato will float in the solution. The material should then be applied with a large sprayer. Two applications have generally been found necessary. The treatment is not injurious to animals.

FEEDING IODINE TO FARM ANIMALS.

G. A. BICKNELL, Greytown :—

Would you be so kind as to give me particulars of iodine salts for feeding to animals, and the amount to be used ; also where the material can be obtained.

The Live-stock Division :—

Iodine is given to animals in very small amounts, the most common method being to mix this mineral with others in the form of a salt lick. Potassium iodide is the form in which iodine is usually administered, about 2 oz. to 4 oz. being added to 100 lb. of the mineral mixtures. The following lick containing iodine in correct proportion is recommended for cattle and sheep : Bone-flour, 50 lb ; ground limestone, 23 lb. ; salt, 20 lb. ; sulphur, 5 lb. ; oxide of iron, 2 lb. ; potassium iodide, 4 oz. The lick may be placed in boxes or troughs within easy reach. As the mixture contains too high a percentage of salt for pigs, in their case the salt should be reduced to 10 lb., the limestone being increased in proportion. If it is intended to feed potassium iodide to sows alone, the following is recommended : Dissolve 1 oz. of potassium iodide in 1 gallon of water, and mix in the feed one tablespoonful of this solution once a day for each brood sow. Any firm supplying licks for stock would add the required mineral on request. Potassium iodide may be obtained from any chemist.

SUDAN GRASS.

A. W., Inglewood :—

Will you please advise me if the Inglewood district is suitable for the growing of Sudan grass, and if it has been tried in New Zealand.

The Fields Division :—

Sudan grass has been well tested all over New Zealand. In very warm situations it does well, but Inglewood would be on the cold side, and you would get better results from Japanese millet. If you do try Sudan grass it would be best to have it in a well-sheltered warm situation.

DAIRY-FARMING INQUIRIES.

MILN BROS., Awamarino :—

(1) Would you please give us a list of ingredients for ointment for healing badly cracked and scabby cow-teats. (2) In case of a cow suffering from palsy of hindquarters, when using oil of turps as a lotion for massaging loins and legs should it be used straight or broken down with another ingredient? (3) Is there any cure for ragwort poisoning in the early stages?

The Live-stock Division :—

(1) An ointment recommended for application to sore teats is made as follows: Thoroughly mix together boric acid, 1 oz.; zinc oxide, 1 oz.; vaseline, 1 lb. (2) When used as a liniment for frequent rubbing into cow's skin, turpentine should be mixed with three times its own volume of linseed-oil, olive-oil, or other bland substance. (3) Owing to the fact that ragwort acts on the liver in an insidious and slow way, the symptoms of poisoning are not often exhibited until structural alterations have taken place which are not amenable to any treatment by medicinal measures. The only thing to do is to take the animals off ragwort-infested pasture as soon as the very first symptoms occur, if detected.

TREATMENT OF HEIFERS FOR RINGWORM.

ARCHIE BECROFT, Te Hana :—

Last season I had two heifers which grew warty-looking growths round their eyes. It seemed to start with the hair coming out, leaving a rough dry skin which gradually came up to hard growths, some 1 in. long and ½ in. thick. This spring I have some yearling heifers showing the same symptoms—patches of hair off and the skin roughing up, mostly on the top side of the eyes. Any advice will be appreciated.

The Live-stock Division :—

From your description the heifers are probably affected with ringworm. You are advised to wash the affected parts with a solution of soap and washing-soda, and clean up and scrape off the scabs, when dry applying tincture of iodine over the whole patch. If you have no tincture of iodine use kerosene, and repeat the treatment in a week.

MANURING OF TURNIPS.

FRANK M. ROBINSON, Springfield :—

In the Gore experimental plots last season 1 cwt. super plus 1 cwt. Nauru phosphate was used as the standard turnip-manure. (See *Journal* for August, page 123.) Is this mixture recommended for general use in a moderately moist climate in preference to, say, 1¼ cwt. super?

The Fields Division :—

The mixture was used because it had been found that 2 cwt. superphosphate applied with the seed lowered the germination considerably, as mentioned in the report referred to. In our opinion, 2 cwt. superphosphate per acre will give

excellent results if the germination difficulty is overcome. In experiments in Canterbury it was found that when super was mixed with equal quantities of carbonate of lime (ground limestone) prior to sowing the germination difficulty was largely overcome, and results were in every way satisfactory. In your district one would expect to get better results from 2 cwt. per acre of super, plus carbonate of lime, than from an application of super and Nauru phosphate.

IMPORTATION OF ANIMAL-MANURES.

THE annual report of the Live-stock Division for 1927–28 makes the following reference to this subject:—

It is now nearly twenty-five years since the importation of animal-manures into New Zealand was prohibited from all countries, with the exception of Australia and India, which were the chief sources of supply. In those countries the Department of Agriculture inaugurated a system of licensing and inspection of the sterilization of animal-manures intended for shipment to New Zealand, with a view of preventing the introduction of diseases such as blackleg and anthrax through the medium of such manures. This system has stood up to the present, but for some years past the demand for animal-manures from abroad has decreased to the vanishing-point, with the result that the inspection has been carried on at a loss. In consequence of this position it has been arranged to withdraw the inspection from Australia, while the position in regard to Calcutta, where the cost is also considerable, requires to be given consideration in the same direction.

AGRICULTURAL SHOWS, SEASON 1928–29.

THE following show-dates have been notified by agricultural and pastoral associations:—

Poverty Bay A. and P. Association: Gisborne, 23rd and 24th October.
Wairarapa P. and A. Society: Carterton, 24th and 25th October.
Timaru A. and P. Association: Timaru, 24th and 25th October.
Marlborough A. and P. Association: Blenheim, 24th and 25th October.
Thames Valley A., P., and H. Association: Te Aroha, 27th and 28th November.
Manawatu A. and P. Association and Royal Agricultural Society of New Zealand: **Royal Show,** Palmerston North, 30th, 31st October, and 1st November.
Ashburton A. and P. Association: Ashburton, 1st November.
Northern A. and P. Association: Rangiora, 2nd November.
Wanganui A. and P. Association: Wanganui, 7th and 8th November.
Canterbury A. and P. Association: Christchurch, 8th and 9th November.
Egmont A. and P. Association: Hawera, 14th and 15th November.
Otago A. and P. Society: Dunedin, 21st and 22nd November.
Stratford A. and P. Association: Stratford, 21st and 22nd November.
Nelson A. and P. Association: Richmond, 23rd and 24th November.
Auckland Metropolitan A. and P. Association: Auckland, 23rd and 24th November.
Helensville A. and P. Association: Helensville, 29th January, 1929.
Feilding A. and P. Association: Feilding, 5th and 6th February.
Tauranga A. and P. Association: Tauranga, 5th and 6th February.
Dannevirke A. and P. Association: Dannevirke, 12th and 13th February.
Masterton A. and P. Association: Solway, 19th and 20th February.
Whakatane A. and P. Association: Whakatane, 20th February.
Taranaki Metropolitan Agricultural Society: New Plymouth, 6th and 7th March.
Methven A. and P. Association: Methven, 27th March.
Te Awamutu A., P., and H. Association: Te Awamutu, 20th March.

Export of Rabbit-skins.—The number of rabbit-skins exported for the twelve months ended December, 1927, was 12,928,669, valued at £682,658, as against 20,444,390, valued at £740,975, for the preceding year.