FARMING IN OTAGO

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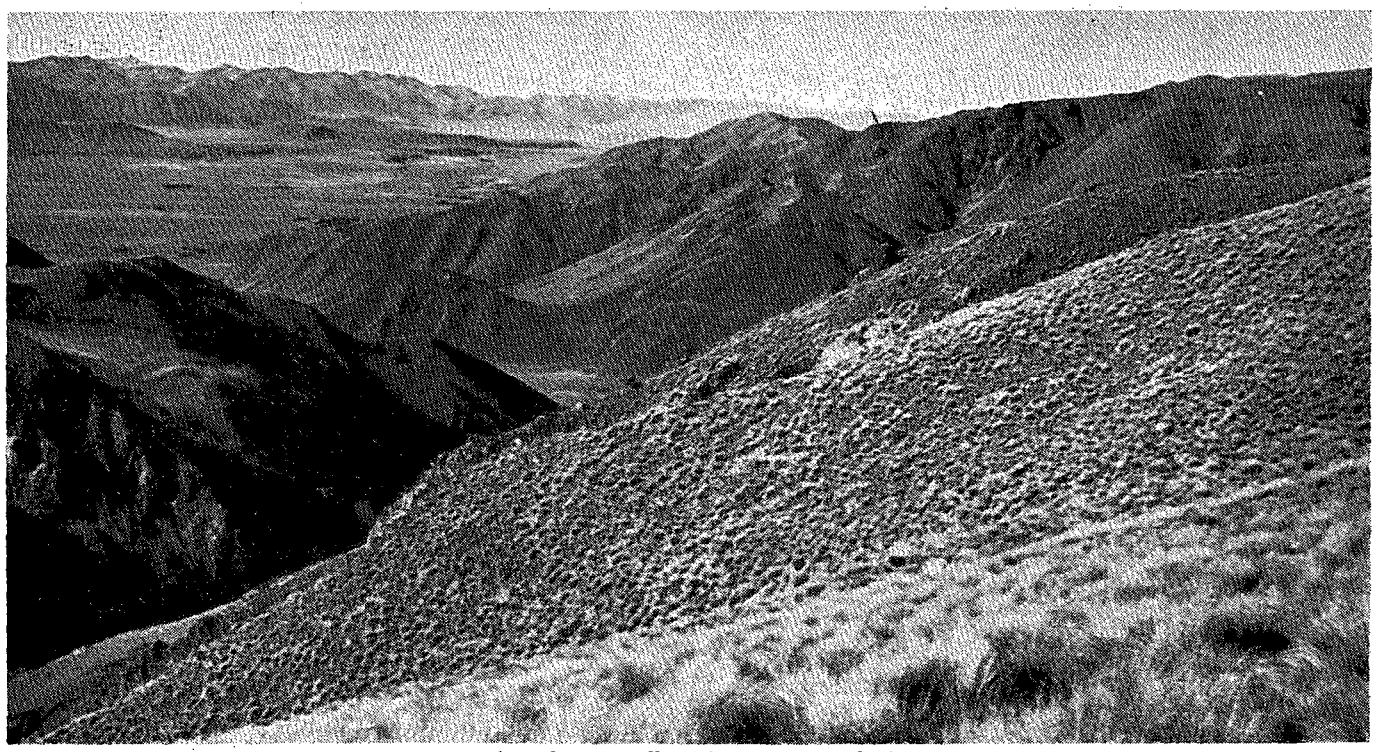
The land district of Otago, comprising the counties of Waitaki, Waihemo, Waikouaiti, Taieri, Peninsula, Bruce, Clutha, Tuapeka, Lake, Vincent, and Maniototo, contains the greatest variations in climatic conditions, topography, and soil types. Consequently, a detailed description of. the farming systems practised in each of the many categories into which land use may be subdivided is beyond the scope of this paper, which will deal broadly with a description of farming in the principal areas of the region. The fascinating story of settlement, which commenced over 100 years ago, has been published in several books freely available to all interested and some of the results from earlier practices, now recognised to be damaging to soil fertility and stability, will be discussed in a later section. The total acreage in occupation is over 8 million and this extends from the intensively farmed alluvial plains at sea level to the summer grazed natural grasslands at altitudes of over 5,000 ft.

Climatic Conditions

The generally adequate and evenly distributed rainfall of the coastal regions in the eastern counties, with their broad areas of medium to high fertility soils, supported a typical vegetation of rain forest and natural grassland with belts of manuka and similar lower fertility associations. on leached soils. Inland from the coastal areas, with increasing elevation, rainfall decreases through the foothill country to the central plateaux, until in Central Otago the total precipitation averages 12-14 in annually with regular frosts and snowfalls in winter. Low winter and high summer temperatures, allied with cold and south-easterly winds, plus warm nor'-west winds in summer and autumn, govern the type of vegetation originally supported and later were the principal factors affecting the pattern of land use.

Soil Types

Greywacke and mica schist were the main parent materials and from these a fairly complex series of soil types has been derived. Those from greywacke were generally low in' plant nutrients, while the mica schist derivatives were fertile soils in which moisture was the principal deficiency.



Tussock and river valley, Omarama, North Otago.

A detailed account of the soil types of the region will be presented in a later paper in which effect of the soil pattern on farming practices will be discussed.

Early Settlement

The history of land settlement throughout Otago has been investigated and published by several authors whose work has recorded the outstanding enthusiasm of those adventurous men and women who laid the foundation for the stable and profitable way of life now enjoyed by their descendants. These accounts of the hardships endured and difficulties overcome by those seeking a living from the soil by the raising of crops and livestock products are all the 'more interesting since the repercussions from gold-mining, with all its short-term benefits, remain as a problem in land use and will continue to affect the prosperity of the whole region.

The records show that as in many other areas, early arrivals cleared bush to provide timber for housing and necessary buildings, and slowly developed the higher fertility river valleys and rolling hills of the coastal regions. As these areas were developed to become the centres of production of essential foodstuffs, such as wheat, oats, potatoes, milk, and meat, intrepid travellers explored the inland hill country and traversed passes leading through the broad expanse of higher elevation scrub, and tussock to the high mountainous and lakes region towards, the west coast.

The huge areas of sheep country runs were occupied before the "gold rush" and it was from these sources of supply that the miners secured meat, while wheat for flour and other. cereals grown on the river valleys and nearby hills of the coastal region were transported by slow and arduous methods to the often very isolated miners' camps inland.

The important points to be emphasised as affecting subsequent grassland production are:

1. The laying waste of many acres of land by the various methods of goldmining;
2. The over-burning and grazing of natural vegetation which had adapted itself to a set of particularly rigorous conditions.
3. The depletion of early developed areas by over-cropping of grain crops.
4. The introduction of rabbits, which soon overran enormous areas of the tussock regions, thence extending to the adjacent farmlands.

Despite the problems which beset the grassland farmer as a result of the practices mentioned, the value of the gold secured and on which many thriving businesses and institutions were

Conversion of tussock to improved pasture, Palmerston.

founded and the sound foundation in religious, educational, and recreational facilities ensured by early settlers are all monuments to the foresight, enthusiasm, and initiative of the early administrators.

Land Use

The development of farming patterns based on soil, climatic, and topographical factors continued in the growmg of cereal and, fodder crops with short-term pastures for sheep and cattle on the cultivable farmlands and the production of wool and store sheep on the runs and stations.

Of the many ventures initiated in Otago to have tremendous. influence on grassland farming throughout the Dominion, probably, the two outstanding projects were the initiation of the frozen meat industry and the processing of artificial fertilisers. The development of these ancillary industries changed the whole farming programme, giving enhanced value to pasture production in the, widest application, since the higher returns, particularly from cultivable areas, resulted not only in increased. production per acre, but also in the development of additional areas. This was assisted by the use of lime and artificial fertilisers, improved strains of pasture species, new equipment, and modern techniques in pasture management and utilisation.

In this way the grassland farmers of Otago, with the ability to adopt new ideas and techniques suitable for the widely varying conditions, have developed the coastal plains and rolling hills from the original bush, tussock, and scrub to a high level of pasture production in which fat lamb, beef, dairying, and. small seeds are allied with supplementary feed and cash crops.

On the lower rainfall inland areas dryland farming in, which lucerne and lucerne plus grass mixtures are the key producers. is successfully practised, while over 65,000 acres under State. irrigation schemes and more than 10,000 acres under private, enterprise contribute greatly to total grassland production. At the same time development of appreciable areas of, cut-over bush country and drainage of swamp areas, made economic by the use of modern equipment and techniques, have added to the total returns.

Investigational Projects

As early as 1900 the reports of the Department of Agriculture contain references to trials with pasture species in Central Otago,' in which the possibility of improving the 'deteriorating natural swards was being investigated.

It is probably correct to state that the initiation of-research into high country grasslands was commenced by the late Dr L.

Cockayne, whose establishment of a series of trial plots and study of the vegetative cover on the Dunstan Range and other areas have been continued by later specialists in this field.

The accelerated man-made erosion resulting from goldmining methods, loss of natural cover by over-burning and hard grazing by rapidly increasing rabbit population, and the combined effect of these factors on run-off and flooding in lower river catchments intensified interest in the re-establishment and efficient management of high country grasslands.

Consequently by the time the value of aerial topdressing was fully appreciated, some useful information regarding the most suitable pasture seeds and fertilisers for these difficult areas was available.

Obviously, little of' lasting value could be attempted until control of rabbits was effected, and the outstanding contribution to progress in Otago by those stalwarts whose' foresight and enthusiasm resulted in the formation 'of Rabbit Boards with the "killer policy" must be fully recognised.

While there remain many problems to be overcome before the most suitable species can be established and maintained on the tussock grassland areas, the important fact is that the application of new methods of management' and the use of native and introduced species will be both practical-and economical.

On the cultivable areas research projects involving a wide range of cultivation practices, pasture species, fertilisers, management techniques, as well as silage 'and hay, have all contributed to pasture production and increased returns. New techniques in land development, by conventional methods involving deep ploughing, fallowing, liming to requirement,. followed by a feed crop before sowing in permanent pasture, surface seeding by special equipment into native or reverted swards, and also the more rapid establishment of a temporary type pasture'by aerial sowing have all been, investigated and are being successfully adopted.

The work on trace elements deserves special mention, particularly as the' first field trials with molybdenum were commenced on the farm of Mr J. O. H. Tripp on the Outram hill country and later extended to the Invermay Research Station and 'to a wide range of farms throughout the Dominion. The importance of this element in its effect on clover vigour and reduction in cost of pasture establishment and maintenance is now well recognised. Work on other trace elements is proceeding and results from the present series of. field trials may contribute additional useful information.

In certain areas difficulty is experienced in establishing clovers and this, led to investigations into seed inoculation which have

Improvement of manuka-clad hill country, Lawrence, South Otago.

resulted in the production of cultures with which seed is now treated before sowing. In view of the contribution of clovers to grassland production generally, the value of this work will be considerable,

Assessment of Grassland Production

The wide range of conditions under which farming is practised in Otago has been discussed and the factors governing grassland production have been briefly surveyed. It is now desirable to study the achievements in terms of factual data and for this purpose the following figures showing increases in fat lambs killed and wool sold are illuminating:

	Lambs killed at Works	Wool Sold (Bales)
1955-56	1,711,561	143,387
1950–51	1,066,281	112,071
Increase	645,280	31,316

The rate of land development and production increase depends largely on availability of capital, the "know how", and faith in the future of farming as a way of life and a business proposition. Consequently, in considering the data presented, while all credit should be given to the combined efforts of the scientist, the extension officer, and the practical farmer, it is not suggested that the rate of progress quoted will be continued. The period covered was one in which the high prices obtained for lamb and wool produced a surplus, much of which was devoted to the development of additional land or the improvement of existing pastures by drainage, fencing, or purchase of new equipment and erection of housing and farm buildings. Nevertheless, the figures demonstrate the scope of possible increases and indicate the ability of grassland farmers of the region in adopting new ideas and techniques.

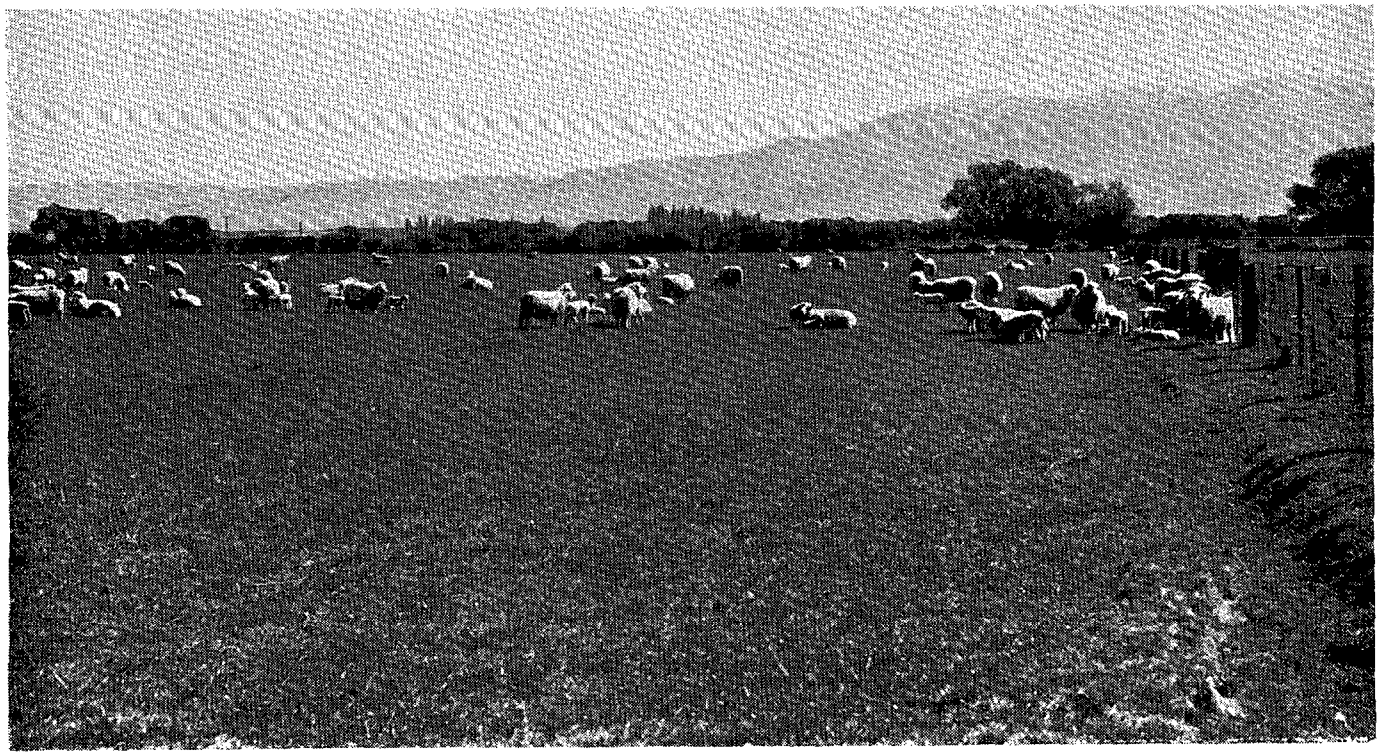
Production Forecasts

To assist in long-term planning to cope with possible future production from grasslands, a detailed forecast by counties was compiled and is now presented as a fitting conclusion to this contribution. Obviously, many factors, several of which are outside the scope of activity of Dominion producers, will govern our rate of progress, but the figures indicate the production potential and set a goal to which all may aspire.

OTAGO LAND DISTRICT-COUNTY SURVEYS-LIKELY INCREASES IN PRODUCTION

C.C.-Carrying capacity.
R.O.-Readily obtainable figure.
L.P.-Most likely production figure.

Land Class	Occupied Acres 000	Present C.C. Ewe Equivalents 000	Estimated future carrying-Ewe equivalents (000) R.O. 10 yr	L.P. 10 yr	R.O. 20 yr	L.P. 20 yr	R.O. 30 yr	L.P. 30 yr	Comments
WAITAKI COUNTY									
High country runs	1,113	328	330	328	340	335	345	340	Improvement in wool production with rabbit destruction
Downlands-Low natural fertility	21	9	15	14	18	16	20	19	Increases with sown pastures and topdressing including Mo
Downlands-Med. fertility—low rainfall	119	185	245	243	300	298	315	310	ditto
Downlands-High fertility	103	214	290	285	310	300	360	350	ditto
Light lands	40	33	48	46	53	51	64	58	Increases in sheep mainly, with more lucerne and irrigation
Bottomlands-High fertility	14	25	34	32	40	38	45	41	Increases with pasture renewal and topdressing
TOTALS	1,410	794	962	948	1,061	1,038	1.149	1.118	
Percentage increases			21	19	34	31	'45	41	
WAIHEMO COUNTY									
High country runs	53	17	20	18	22	20	24	22	Improvement with rabbit destruction and aerial sowing and subdivision
Downlands-Low to medium fertility-low rainfall	92	33	65	52	80	75	90	85	Improvements with sown pastures and lucerne and topdressing
Downlands-Med. to high. fertility	38	64	90	80	110	100	130	120	Improvements with pasture renewals and topdressing
Bottomlands-High fertility	41	72	100	90	120	118	180	150	ditto
Percentage increases	224	186	275	240	332	313	424	377	
TOTALS			48	29	78	68	128	103	



Ewes and lambs on border diked irrigated pasture, Omakau, Central Otago.

Land Class	Occupied Acres 000	Present Ewe Equivalents 000	C.C. R.O. 10 yr	L.P. 10 yr	R.O. 20yr	L.P. 20yr	R.O. 30yr	L.P. 30yr	Comments
VINCENT COUNTY									
High country runs	**1,227**	165	170	170	190	185	210	200	Rabbit destruction will increase wool production; cattle will increase and later on sheep.
Hill country	79	11	12	12	14	13	16	15	Increase in sheep and cattle with aerial sowing and topdressing
Downlands	41	52	65	62	80	75	100	96	Increase with more lucerne and irrigation for meat and wool
Light lands	108	34	50	48	75	70	118	115	ditto
Flats and terraces	136	218	275	270	340	328	390	384	ditto
TOTALS	1,591	480	572	562	**699**	671	834	810	
Percentage increases			19	17	46	40	74	69	
TAIERI COUNTY									
High country runs	43	5	5	5	7	5	9	7	High elevation and snow risk
Hills and upland downs—low rainfall	345	113	121	118	129	126	143	135	Slow increase in wool and cattle after rabbit destruction and aerial sowing
Hills and downs-Medium elevation and rainfall	**80**	28	41	37	75	60	152	90	Steady increase in lamb and wool and cattle with sown pastures and top-dressing and subdivision and settlement
Foothills and downlands	73	85	109	96	136	112	169	128	Increase in sheep and cattle with sown pastures and topdressing
Hills near Dunedin city	15	9	9	9	9	9	9	9	Spread of city boundaries is likely to limit this area.
Medium fertility plains	20	38	44	42	49	46	57	50	Increase with sown pastures and top-dressing; sheep
High fertility plains	29	**110**	121	**118**	132	127	143	135	Increase with pasture renewal and topdressing and closer settlement
Peat soils	**5**	13	14	14	16	15	18	16	Increase with sown pastures and some land development
TOTALS	**610**	**401**	464	439	553	500	700	570	
Percentage increases			16	10	38	25	75	42	

Land Class	Occupied Acres 000	Present C.C. Ewe Equivalents 000	R.O. 10 yr	L.P. 10 yr	R.O. 20yr	L.P. 20yr	R.O. 30 yr	L.P. 30 yr	Comments
WAIKOUAITI COUNTY									
High country runs	60	18	20	20	25	24	30	29	Improvement in wool and later in carrying capacity with aerial sowing and subdivision
Hill country-Low rainfall	25	21	27	26	34	32	41	39	Improvement in wool, sheep, and cattle with sown pastures and topdressing
Downlands-Low fertility	13	10	15	13	25	20	30	25	Improvement in wool and lamb and cattle production with pasture renewal and topdressing
Downlands-Low rainfall	44	21	32	28	48	45	80	75	ditto
Downlands-Med. to high fertility	25	52	68	65	76	74	86	84	ditto
Bottomlands-High fertility	6	22	27	26	30	29	32	30	ditto
TOTALS	173	144	189	178	238	224	299	282	
Percentage increases			31	24	65	55	108	96	
LAKE COUNTY									
High country runs	1,512	190	205	200	220	215	260	250	Rabbit destruction will increase wool clips; cattle will increase
Hills and downlands	31	59	70	66	110	100	135	130	Increase in meat and wool with aerial. sowing and topdressing and with lucerne and sown pastures
Plains and terraces	23	80	60	55	75	70	90	85	Increase with irrigation and lucerne for meat and wool
TOTALS	1,566	299	335	321	405	385	485	465	
Percentage increases			12	7	35	29	62	55	

Land Class	Occupied Acres 000	Present C.C. Ewe Equivalents 000	R.O. 10 yr	L.P. 10 yr	R.O. 20yr	L.P. 20yr	R.O. 30 yr	L.P. 30 yr	Comments
CLUTHA COUNTY									
Hill country	169	72	115	108	165	152	219	210	Improvement with aerial sowing and topdressing for sheep and cattle
Downlands--Medium fertility	162	272	362	352	460	440	590	549	Improvement with sown pastures for sheep and cattle
Downlands—High fertility	140	390	500	490	560	545	614	626	ditto
Bottomlands—High fertility	36	110	125	120	150	145	195	185	ditto
TOTALS	507	844	1,102	1.070	1.335	1,282	1,678	1.570	
Percentage increases			31	27	58	52	99	86	
MANIOTOTO COUNTY									
High country runs	491	58	63	61	65	63	10	65	High elevation; snow risk; improvement with rabbit destruction
Downlands-Low rainfall	65	17	25	23	34	30	40	36	Increased wool and lamb production with lucerne
Plains and terraces-Low rainfall	345	375	460	436	530	500	610	570	Increased wool and lamb production with lucerne and irrigation
TOTALS	901	450	548	520	629	593	720	671	
Percentage increases			22	16	40	32	60	49	

Land Class	Occupied Acres 000	Present C.C. Ewe Equivalents 000	R.O. 10 yr	L.P. 10 yr	R.O. 20yr	L.P. 20yr	R.O. 30yr	L.P. 30yr	Comments
PENINSULA COUNTY									
Hill country	20	38	45	41	54	45	60	50	Some spread of city boundaries will restrict this area, but some increase with aerial sowing and topdressing and some pasture renewal
Percentage increases			18	8	42	18	58	32	
TUAPEKA COUNTY									
High country runs	393	97	111	103	129	120	157	147	High elevation; same snow; wool and cattle will increase
Hill country-Low rainfall	270	15.5	177	175	225	220	285	280	Improvement with aerial sowing and some lucerne
Downlands-Med. fertility	85	160	212	210	250	245	280	275	Improvement with sown pastures for sheep and cattle
Downlands-High fertility	24	74	95	90	110	106	130	125	ditto
Bottomlands of high fertility	40	192	215	210	235	230	255	250	ditto
TOTALS	812	678	810	788	949	921	1.107	1.077	
Percentage increases			19	16	40	36	63	59	
BRUCE COUNTY									
Hill country	116	45	48	45	75	72	100	94	Improvement with aerial sowing and some clearing of scrub
Downlands-Low fertility	54	35	47	43	57	50	80	74	Improvement with sown pastures for sheep and beef cattle
Downlands-High fertility	126	300	390	355	430	420	490	480	ditto
Bottomlands-High fertility	22	70	84	80	97	93	110	107	ditto
TOTALS	318	440	569	523	659	635	780	753	
Percentage increases			29	19	50	44	77	72	

Summary

The early settlement and development of grasslands throughout the extremely widely varying climatic, soil, and topographical conditions of Otago have been discussed in broad terms. Soil types and special practices will be dealt with in subsequent sessions of this conference. Since two most important projects affecting grassland farming-the initiation of the frozen meat industry and processing of artificial fertilisers-were commenced in Otago, it is fitting that this conference should be held in Dunedin at this time when younger members of the Association can be reminded of these outstanding contributions to farming progress.

Major problems to be solved, resulting from early practices, deterioration due to goldmining methods, overcropping of cultivable land, and loss of vegetative cover by over-burning and rabbit infestation added to the difficulties of Otagq pastoralists,

The combination of the efforts of the scientist, the extension officer, and the progressive farmer has resulted in the very appreciable production increases presented. There is ample scope for continued improvement and the results secured in the period) now reviewed give ample cause for faith in the future of grassland farming in the region discussed.

DISCUSSION

Q. (1. L. Baumgart): Regarding future development, which has the greater potential, the intensification of irrigation on improved pastures or the development of the dry areas?

A. From surveys already made there is a potential 100,000 acres available for development by improved pastures and irrigation, plus I million acres of foothill country capable of development using orthodox methods and improved techniques. The three methods must all be applied, but it must be remembered that all irrigation development is very heavily subsidised.

Q. (-. Harrington): In connection with the development, would Mr Elliott comment on the possibility of increasing milk production on the Otago Peninsula?

A, It was not possible to include all details in the slides, but the general development of the area should assist in increasing milk production.

J. W. Woodcock: I have an interest in this part of the country and I feel that by adopting modern methods and with the use of phosphate, sulphur and molybdenum a start has already been made in increasing production. In a rape trial, under irrigation in Central Otago, the dry matter produced was the highest of any trial. There is a great potential for increased production in the future.

Q. (F. S. Beachman): It has been suggested in some quarters that country over 3000 feet elevation should be withdrawn from grazing. The slides showed good clover growth on comparatively high elevation areas. Could Mr Elliott supply any further information?

A. There have been spectacular results from topdressing and seeding, on this country. The next phase is important-the utilisation of this extra feed; fencing and mob stocking is a problem on this country. If this can be done economically, the build up of fertility will be automatic.

Q. (J. Oliver): Do remarks cover only the Otago Provincial District, or is part of Southland included?

A. Eleven counties as named in the Otago land district were discussed in the paper.

Q. (T. Burnside): Increased production has been stressed, but taxation catches up with the farmer. I feel that we should have more cattle, more farm ponds and more shelter belts.

A. Development of ponds is increasing and with the cold north-westerly winds, the need for more shelter has not been stressed sufficiently. Shelter belts should certainly be increased.

Q. (—. Thomson): Could figures be given for the potential of the coastal belt Hampden to Balclutha?

A. The foothill block is the area which will be covered in a later stage of the conference. One million acres are being slowly developed, and with the application of new techniques can be made to carry two million sheep.

Q. (C. E. Tversen): Would Mr Elliott outline the development he considers for the scab weed country, in the absence of the rabbits ?

A. No progress can be made unless all vermin are kept down. The killer policy for rabbits must be kept going. Already scab weed is being discouraged by the introduction of introduced useful grazing species which are asserting themselves. Aerial top-dressing will assist, and development will go ahead as long as finance is available.

Q. (-. McGill): What steps are being taken towards elimination of sweet brier?

A. This is a county problem, a number of counties have taken sweet brier off their schedules. We have not found an economical means of clearing patches, but work is being done using all known materials and methods to find a solution to the problem of control.