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CONFIDENTIAL

DEPARTMENT OF AGRICULTURE

IDA VALLEY IRRIGATION SURVEY

1955

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DEPARTMENT OF AGRICULTURE

IDA VALLEY IRRIGATION SURVEY - 1955.

1. The present Ida Valley Irrigation Scheme nominally supplies water for approximately 12,000 acres of the valley floor in Ida Valley.

2. The dominant system of farming is the semi-intensive grazing of Romney cross sheep under a wild flooding system of irrigation for the production of wool and fat lambs.

3. With a low annual rainfall and a high annual evaporation rate, the above system of farming is impossible without irrigation.

4. The low stock carrying capacity combined with an extreme climate makes this very healthy sheep country.

5. Pastures and lucerne which show a ready response to irrigation on these soils, comprise 97% of the valley floor.

6. The available supplies of irrigation water could be better utilised by more efficient methods of irrigation.

7. Farmers' reaction to reduced quotas of irrigation water was to use a large proportion of their quota on a slightly reduced acreage before 30 November.

8. In 1953/54 a farming year affected by reduced irrigation quotas, owner's surplus per farm was £2,358 (85/3 per acre) reflected the relatively high standard of living enjoyed by the farming community.

9. This surplus confirms the impression following inspection that farms could stand the burden of increased irrigation water charges in return for a guaranteed full water supply.

10. Under the present reticulation of approximately 12,000 acres, the following summarised table compares

    (a) The stocking and production during years of reduced quotas, with

    (b) The potential stocking and production under an assured water supply.

	(a)	(b)	Increase
Breeding ewes (No.)	49,000	66,000	17,000 (35%)
Production of wool (lb)	607,000	783,800	176,800 (29%)
Fat Lambs (lb)	1,374,800	1,911,100	536,300 (39%)
Fat Cattle (No.)	330	660	330 (100%)

Including store lambs, this increase, based on the current price cost ratio, would result in an additional £84,000 revenue. Conversely, this sum also reflects the loss in revenue to restricted irrigation water quotas.

11. If the present reticulation is extended to provide permanent irrigation to the German Hills area (4,000 acres) the increased stocking and production would be:

6,000 Breeding ewes
210 Bales wool (325 lb)
4,823 Fat lambs
60 Fat cattle

The increased revenue on the current cost-price ratio is equivalent to £28,000.

12. Thus, assuming an increased storage for the Ida Valley Scheme to ensure full irrigation on existing irrigated areas and to allow increased reticulation of the German Hills area, then the increased stocking and production may be summarised thus:

	Present	Potential	Increase	
Breeding ewes (No.)	49,000	72,000	23,000	(47%)
Wool (lb.)	607,000	852,000	245,000	(40%)
Fat Lambs (lb.)	1,374,800	2,075,100	700,300	(51%)
Cattle (Store fat) (No.)	330	720	390	(118%)

This total production increase in terms of additional revenue is equivalent to £110,000 based on the current cost-price ratio.

13. It is our opinion that by expanding the present acreage of lucerne, plus increased border dyking and sprinkler irrigation and better controlled wild flooding, this valley could support at least 4 ewe equivalents per acre (including 3 breeding ewes).

14. In order to avoid confused thinking on any future proposal, it is essential, before voting, that a personal visit be made to each farmer to acquaint him with the impact of the proposal on his own farm.

IDA VALLEY IRRIGATION SURVEY 1954/55

INTRODUCTION AND SCOPE OF SURVEY

The Ida Valley is located in the middle of the semi-arid region of Central Otago. The valley is 140 miles by road from Dunedin city, and 20 miles from Alexandra. From the air the valley appears as an oasis of intensive livestock farming, with verdant grassland in the midst of barren rocky mountain ranges of extremely poor worth, even for extensive grazing of fine-woolled sheep.

This farm survey covered the upper part of Ida Valley, that is irrigated by the Ida Valley Irriegation Scheme from the Upper Manorburn and Poolburn Dams. All farmers within this scheme were visited for details of their holdings, methods of farming and irrigation, water usage, farm production and financial returns. In addition, those farms on German Hills bordering the Ida Valley, along Rough Ridge, which have little or no irrigation under the present scheme were visited in view of the proposal to extend irrigation to the German Hills district by means of a higher race.

Of the 33,000 acres of valley floor affected by the Ida Valley Irrigation Scheme, details were collected from 53 farms, representing 29,507 acres, or 89% of the above area.

The survey was carried out in March 1955, and while most of the data was obtained for the two seasons 1953/54 and 1954/55, stocking rates were collected for a number of years. As these were years of restricted irrigation water quotas, this report deals largely with the impact these restrictions had on farm management practice and production.

1. OBJECTIVES

The objectives of the survey may be summarised as follows:

(1) To ascertain present land use and systems of farming in that area affected by the Ida Valley Irrigation Scheme.

(2) To describe farm management practices and water usage.

(3) To ascertain stocking and production under restricted irrigation water quotas.

(4) To ascertain the economic factors associated with the above.

(5) To assess potential stocking and production under an assured irrigation water quota.

(6) To assess the potential stocking and production under an assured irrigation water quota and extended to include the area known as German Hills.

2. PHYSICAL FEATURES, CLIMATE AND SOILS

General Features:

Ida Valley is of low relief and is enclosed by rough ranges. The centre of the valley is mostly flat, and large areas of these central flats are not irrigated by the present scheme. Most of the Valley has a gentle slope towards Poolburn Creek, which is the main drainage outlet. On the lower slopes of Rough Ridge, a formation of higher terraces known as the German Hills, borders the valley.

Ida Valley lies near the centre of Central Otago. It is an intermontane basin, oblong in shape, and enclosed by Rough Ridge (3,000') on the east, and Raggedy Range (2,000') on the west. The valley is open to the north and there is a gentle fall from the head of the valley at Moa Creek to the northern limit of the irrigation scheme where the Poolburn and Ida Burn Creeks meet to break through the Raggedy Range to join the Manuherikia River.

The parent rock material of the surrounding ranges gives rise to and is the main soil-forming factor of the various soil types found in the valley. The mica-schist formations of Rough Ridge and Raggedy Range are reflected in the soils of the valley, which overlie the sub-stratum of Tertiary clay.

After a long period of farming under this irrigation scheme, the valley is not closely settled in comparison with intensively-farmed districts elsewhere. The prosperity that has accrued to this region with the use of irrigation water, is not evident in the appearance and general condition of the farms and buildings.

The valley is well roaded and access on to the farms is easy. Omakau, the main railhead for the region, is about 8-12 miles from the farms.

Climate

Ida Valley is sheltered from outside climatic influences by the surrounding ranges and by the further series of mountain ranges that figure in the physical pattern of Central Otago. The altitude in the valley is 1,300 feet above sea level. Annual rainfall is low, with about 20 inches on the surrounding hills, and only 15 inches in the valley. At Moa Creek the rainfall over the past 3 years has averaged only 12.7 inches on 61 days. The monthly distribution of average annual rainfall is shown in Table 1.

TABLE I

Moa Creek Monthly Distribution of Average Annual Rainfall

January	1.96 inches
February	1.78 "
March	1.52 "
April	1.13 "
May	0.99 "
June	0.84 "
July	0.77 "
August	0.63 "
September	0.95 "
October	1.48 "
November	1.36 "
December	1.57 "

Yearly average ... 14.98 inches

The efficiency of the low rainfall is reduced by drying north-west winds and high temperatures of 90°F in summer. Much of the rain comes in heavy convectional downpours and the number of rain days is low. Of the average annual rainfall 65% falls in the summer half-year when surface heating is at a maximum: that is, an average of 9.67 inches falls in the growing season.

Table II shows the rainfall at Moa Creek in the season from 1 October-31 March in the years for which records are available.

TABLE II

Moa Creek - Rainfall in the Growing Season - 1 October - 31 March Since 1931

Year	Inches	Year	Inches
1931-32	10.62	1943-44	10.86
32-33	8.32	44-45	14.72
33-34	12.32	45-46	9.62
34-35	16.50	46-47	4.84
35-36	7.88	47-48	8.27
36-37	13.07	48-49	8.88
37-38	5.52	49-50	7.56
38-39	9.68	50-51	8.55
39-40	11.79	51-52	9.75
40-41	8.03	52-53	11.47
41-42	10.01	53-54	6.98
42-43	13.64	54-55	8.75

The number of sunshine hours in the year is high, but more than 150 ground frosts are recorded in the Valley, with hard frosts (some 20° of frost and more) in winter, and some light frosts on clear nights in summer. From mid-April to mid-October low temperatures severely restrict plant growth, and the dormant period and the growing season are each about 6 months long. In summer the growth of pastures and crops is determined by availability of water.

Soils

The soils of Ida Valley are derived from the mica-schist formations of the surrounding ranges. The forces of natural erosion have dissected the old terrace levels in the valley to form a complex soil pattern on the valley floor. Underlying most of the soils is a layer of gravel which lies on the deep bed of Tertiary clays forming the sub-stratum. These deep clays have a relatively high content of soluble salts.

As the soils are closely related to the terraces on which they are found, a simple classification can be made according to the 3 terrace levels which are recognized in the valley.

A. High Terrace
B. Intermediate Terrace
C. Low Flood plain

This system of terraces is common to most of the intermontane basins of Central Otago. A brief description of the soils on these terraces is given.

A. On the high terrace which comprises the dissected remnants of a former plain in the valley, the soils have a foot of schist gravel overlying a deep impermeable Tertiary clay subsoil. These are the oldest soils of the valley and have shallow topsoils on the gravel and in some places stones appear at the surface. A hard clay pan has formed in the gravel, and presents a problem with the application of irrigation water, as surplus water perches on the hard pan to give the wet conditions in which rushes thrive.

This problem is evident on the west side of the valley from Moa Creek to Poolburn. In the main the topsoils on this high terrace are loamy sands and sandy loams.

B. The intermediate terrace is the most extensive and the soils here form the bulk of the farm land in the valley. The soils of deep fine sandy loams, and loamy sands are probably the most fertile in Ida and have the greatest promise and scope for irrigation. Unfortunately large areas in the centre of the valley are not irrigated at present. In some places these soils are salty and it appears likely that soluble salts have been washed in from the higher terrace where irrigation has probably aggravated this salt problem.

C. Low flood plains bordering the creeks are narrow and form a small part of the total farm area. The soils are very recent in formation and little of the area is irrigated. Drainage of these soils has greatly improved with the work carried out on Poolburn Creek and some of this area is now too well drained. Before this scheme was completed, the poorly drained soils gave good grazing for cattle and sheep, but in recent years of water shortage there has been much less feed available.

Another soil type is found on the fans along the base of the surrounding ranges and specially on the west side from Moa Creek to Poolburn. Schist gravel has been washed down over the high terrace and a fertile soil has developed on these gently sloping fans which are very suitable for irrigation.

In some parts of Ida Valley the Schist alluvium is absent and soils have developed on the deep tertiary clays. Where this occurs soils are heavy clay loams, and the topography is rolling downlands.

Drainage

Under conditions of low rainfall and no irrigation the natural drainage was sufficient, but the application of irrigation water introduced problems of underground seepage and waterlogging of low-lying parts, which have been largely overcome by the straightening and deepening of Poolburn Creek. In the recent years of water shortage that area of flat land not irrigated in the centre of the valley has been too well drained.

It is estimated that nearly 1,000 acres are poorly drained - 32 farms had no drainage problems and 20 farms have drainage areas averaging about fifty acres. Five farms had areas of 100 acres or more of poorly drained land. The area of indifferent drainage occurs chiefly on the west side of the valley between Moa Creek and Poolburn.

Shelter

This is a rather featureless landscape with a general lack of trees for shelter, except around homesteads.

3. HISTORY OF FARMING

The Ida Valley Irrigation Scheme was the first government scheme to operate, hence Ida was a pioneer area for irrigation practices and results.

At the time of the gold rushes in Central Otago 80-90 years ago, Ida Valley was held in huge runs by a few runholders. With the great influx of miners into Central, cereal cropping became important in Ida to supply their needs. As the demand for land increased some subdivision of the large holdings took place. The railway was completed through Central and this further encouraged subdivision.

The first idea of the possibilities of irrigating the valley probably came from observing the methods used by gold miners who took water by means of narrow races for many miles through the rough mountain ranges. Part of that system of races, using water from the Manorburn watershed was adopted in the irrigation scheme.

Following a report in 1909 the first Government scheme began irrigating in the valley in 1917 and 3,200 acres were signed up by 1919. Settlers were rather slow to accept irrigation, and in 1920 it was decided to supply Galloway area from the Manorburn Dam and the combined area irrigated rose to 5,900 acres in 1922/23. A rapid increase took place to 13,169 acres in 1926/27 and 13,754 acres were irrigated in 1931/32. This area exceeded the planned 12,000 acres for the scheme, and some rationing of water was necessary in dry years. To improve storage, Poolburn Dam was constructed, and was completed in 1931.

The amount of sub-division that took place after the advent of irrigation was disappointing. The average size of irrigated farms is still large. The system of farming changed from cropping to semi-intensive livestock farming with sheep and cattle. Wool, fat lambs and cattle became the chief items of production, and farmers prospered from the higher productivity of their land under irrigation. Favourable conditions for these farmers arose from adequate supplies of irrigation water at a low annual cost, large farm acreages at low capital valuation and low rental, and from low operating expenses for farming permanent pastures under irrigation. Successful results from irrigation have been clearly demonstrated in Ida but greater production could be obtained with more subdivision and more intensive use of water.

From 1930 the system of farming has been firmly established on livestock production. Farm practices and methods of applying water to the land have been established and the stock carrying capacity has been determined under conditions of ample water supply. Starting with the season 1947/48 water supplies have been cut due mainly to the low run off in the catchment areas. Rationing of water has been imposed as follows:

1947/48	15%	reduction in water supply
1948/49	54%	do.
1949/50	32%	do.
1950/51	83%	do.
1951/52	18%	do.
1952/53	33%	do.
1953/54	20%	do.
1954/55	66⅔%	do.

This series of dry years has greatly upset the established pattern of farming and the confidence of farmers in the future supply. Stock-carrying capacity and production are so dependent on an adequate water supply that in times of drought the farmer has to reduce his stock numbers haphazardly and at short notice. Great fluctuations of stock numbers carried on these farms have occurred in recent years, as farmers have been forced to quit stock in summer and autumn (at low prices) and buy in replacements in the spring (at high prices) in the hope of a good season to come. This uncertainty of water supplies has upset the established routine on most farms. With the onset of dry conditions, cattle numbers were the first to be reduced, and as conditions worsened sheep were sold and ewe flocks were reduced.

Today, farming in the Ida Valley is based on the irrigation of pastures for grazing sheep and cattle. Old pastures produce well with irrigation, so that little pasture renewal is done. Cropping is kept to a minimum requirement for stock feed and pasture renewal. Irrigation is by flooding from contour races and only 10 acres of the valley are border dyked. More effieient application of water could probably be obtained with both border-dyking and sprinkler irrigation from the races.

4. LAND UTILISATION

Full data on utilisation was collected from 53 farms in the Ida Valley and the total area of these properties was 67,206 acres, of which 29,507 acres were on the valley floor and 37,699 acres on the surrounding tussock hills. Asthe tussock hills are of poor quality, and provide very little grazing, except for limited periods of the year, the valley floor area was taken to be the significant area, and much of the data is given in relation to this area.

Tenure:

Of the total of 67,206 acres, 51,951 acres (77%) were held on leasehold tenure, while the remaining 15,255 acres (23%) were freehold. Most of the tussock hill country is leasehold, and the valley floor has approximately equal areas of freehold and leasehold.

Size of Properties:

The 53 properties have an average area of 557 acres of valley floor to each farm. The following table shows the range in valley floor areas, together with the amounts of tussock hill run in conjunction on these properties.

TABLE III

Area on Valley Floor	Number of Properties		Range in area of tussock hills - acres
	In Group	Having tussock hill over 100 ac	
Under 250	8	2	1,094-2,761
250-499	20	4	738-4,220
500 -999	16	5	645-5,700
1,000 and over	9	6	1,395-2,643
TOTALS ...	53	17	

Utilisation

The following table shows the land use on the valley floor for the 53 properties during the summer of 1954/55.

TABLE IV - LAND UTILISATION

	Acres	% Effective Valley Floor
Pasture under 1 year old	294	
Lucerne under 1 year old	402	
	696	2.4
Pasture 1-5 year old	3,710	
" over 5 year old	22,036	
	25,746	88.9
Lucerne over 1 year old	1,557	5.4
Cash Crops	94	.3
Summer fodder crops	290	1.0
Winter " "	417	1.4
Fallow	163	.6
Effective valley floor	28,963	100.0
Waste, buildings &c.	544	
Total valley floor	...29,507	

The area of new pasture sown for this season, at 1.0% of effective valley floor area, shows the small amount of cultivation and renewal of pastures carried out. That this season was lower than is normally the case is indicated by the 3,710 acres of pasture which had been sown in the previous five years (annual average of 2.6%) and the reason given is the reduced irrigation water supply for the 1954/55 season. Many farmers stated that because of the dry soil conditions that year they would not risk sowing down pasture. Some excellent irrigated pastures of up to 40 years old were seen, and the low level of pasture renewal supports the fact that adequately irrigated pastures have a long productive life. On the other hand dryland pastures deteriorate in only a few years. A typical pasture mixture included perennial ryegrass (20 lb), cocksfoot (3 lb.) cowgrass (3 lb) and white clover (2 lb.) These were generally sown in November and December with rape or turnips and the broadcast method was most popular for sowing.

Winter feed is provided mainly by making lucerne hay. Winter fodder crops amounted to only 1.4% of the valley floor for the 1954/55 season and 2.0% for the previous season. Approximately 1,400 acres or 4.8% of the valley floor area was cut for hay. This is an average of 26 acres per property.

The fact that lucerne over 1 year old occupies

5.4% of the area and that more new lucerne than new pasture is being sown indicates the increasing importance of lucerne in the valley.

Other data showed that 38 out of the 53 properties grew lucerne, and a third of these used their lucerne entirely for cutting hay, while the remainder used it for grazing as well as for hay.

Lucerne was generally sown as a pure stand, although about 25% is sown with oats as a cover crop.

The amount of cash crop in the season 1954/55 was negligible.

Lime and Fertilisers

The amount of liming done in the valley is very small at 1% of the pasture and lucerne over 1 year old. Superphosphate topdressing was carried out on 8.2% of the area. This indicates the natural fertility of the soil which, from limited soil test results, appears to be well supplied with the major elements required for plant growth.

5. STOCK MANAGEMENT

Ninety per cent of all ewes are Romney cross for the production of fat lambs and wool. The remaining ewes - mainly halfbreds-are confined to those properties in the valley which have tussock hill country as well, where wool is the chief product and surplus lambs are sold as stores.

Fluctuation in supply of irrigation water affects the method of replacement, and the numbers required in the Romney Cross flocks. As will be seen in the section on production, breeding ewe numbers are very closely associated with water supplies. After a season of restricted irrigation, winter feed supplies are seriously affected, and flock numbers have to be reduced, by heavier culling of ewes, and by retaining fewer replacement stock, or by purchasing fewer ewes where this method is practised.

It would probably not affect replacement policy if irrigation water was restricted to a constant figure, but due to the fact that meagre years may be followed by adequate supplies, ewe flocks have to be suddenly increased to utilise increased feed produced, and the normal method of breeding replacements has to be supplemented by buying in hoggets or mature ewes. It should be noted that efforts to co-ordinate ewe numbers with feed supply must always be one season out of step. Summing up, approximately two-thirds of the Romney ewe flocks are maintained by keeping ewe hoggets to provide the bulk of replacements, while in years of fluctuating water supply there is more, or less, buying of replacement ewes to provide the balance. The remaining Romney flocks (one third) buy all replacements as a general rule and these are generally purchased as two-tooth ewes.

The most popular ram for replacement stock is the Romney, while fat lamb sires are generally Southdown with Border Leicester and Border-Leicester x Southdown cross being used to some extent.

Ewes are generally kept until they are 5-6 years old, when they have produced 4-5 lambs, and they are then disposed off to the works as fat ewes, provided there is sufficient feed to fatten them.

Lambing takes place in late September to early October. A high proportion, 40-50% of lambs tailed are sold fat-off-mothers by beginning of February and these represent 60-70% of all fat lambs sold.

Very little crop is grown specifically for lamb fattening (1% of valley floor area 1954/55), but new grass is generally sown with either rape or turnips and this supplements irrigated pasture and lucerne for finishing off the lambs. Lambing percentage is fairly high at 114% for the two seasons 1953/54 and 1954/55. The average weight of fat lambs for these seasons was 34.0 lb. and 31.5 lb. respectively which reflects the necessity for disposing of lambs early in seasons of greatly reduced irrigation water quota as was the case in 1954/55.

Winter feed crops are not grown to any extent and lucerne hay provides the bulk of winter food supplies. Ewes are lambed down on new pasture where available.

Those properties which have tussock hill country use this to carry the ewes for a short period in autumn after weaning in late January or early February. Flushing of ewes prior to tupping is dependent on having adequate supplies of irrigation water in autumn to provide succulent pasture for this purpose. Lucerne also commonly provides grazing during this period.

The main shearing period is November and December, although six properties shore their ewes before lambing. The average weight of wool per sheep shorn was 10.0 lb. and 9.8 lb for the seasons 1953/54, 1954/55.

Beef cattle are now carried to only a limited extent, although it was indicated that cattle played a more important part in times of adequate irrigation. Production of cattle is discussed in the section dealing with potential production.

There is great dependence on irrigation water for stock water supplies, and about one-third of all farmers are wholly dependent on irrigation water. Other sources are bores, wells and creeks which flow intermittently.

Scarcity of stock water becomes acute when irrigation quotas are reduced and creeks dry up - it is a customary practice for farmers to reserve part of their meagre quota to fill up lagoons and dams for the autumn and winter months.

6. MISCELLANEOUS NOTES

Many farmers have occupied their farms for well over thirty years and methods of farming have become wedded to tradition. It must be admitted, however, that younger farmers are interested in up-to-date farming techniques and are progressive in outlook. The following shows the break-up of farmers into years of occupation:

Years in occupation	% of Farmers
1 - 9 years	33
10 - 19 "	12
20 - 29 "	15
30 plus	40
	100

As a corollary to the above the ages of farmers in occupation underlines the maturity of the settlement:

Age of Farmer	% of Farmers
Under 30 years	7
30-39 years	10
40 - 49 years	37
50 - 59 "	21
60 and over	25
	100

There was an average of just over four persons, including children, per farm. Total permanent labour on 56 farms included 45 owners, 33 sons and 15 permanent hands. This totalled 93 and in addition there were 18 casual workers making for a total labour force of 111, or nearly 2 permanent hands per farm, including working owners. Single labour was scarce, and there is the usual neighbour assistance for the busy periods. A critical housing shortage exists for married couples.

7. IRRIGATION WATER USAGE

Before discussing water usage of Ida Valley farmers, the following water deficiency table is worth bearing in mind:

TABLE V

Water Deficiency Table - Ida Valley

	Rainfall Average for 15 years	Evaporation Average for 15 years	
January	1.96 inches	5.60 inches	
February	1.78 "	4.34 "	
March	1.52 "	3.09 "	
April	1.13 "	0.88 "	
May	0.99 "	0.41 "	average for 9 years (only 9 readings for 15 years owing to ice on water)
June	0.84 "	0.19	Average for 4 years (only 4 readings for 15 years owing to ice on water)
July	0.77 "	0.06	Average for 2 years (only 2 readings for 15 years owing to ice on water)
August	0.63 "	0.62	Average for 2 years (only 2 readings for 15 years owing to ice on water)
September	0.95 "	1.38	Average for 13 years
October	1.48 "	3.10	
November	1.36 "	4.79	Average for 14 years
December	1.57 "	5.26	
Yearly average	14,98 "	28.37 inches	

Information was obtained on water usage for the two seasons 1953/54 and 1954/55. In both these years irrigation water was restricted: in 1953/54 irrigators were allocated 80%, and in 1954/55 only 33⅓% of the normal irrigation water.

Farmers reacted to this drastic cut in water by reducing the number of applications of water. The following table shows the figures for 36 farms for which full details were obtained for both years.

. TABLE VI.

Areas irrigated in 1953/54, 1954/55

	1953/54	1954/55	Difference
No. of farms	36	36	
Total Day heads	4,552	2,148	- 2,404 (53%)
" area irrigated	6,799	5,577	- 1,222 (18%)
Av. number of applications on area irrigated	2.6	1.7	

From the above table it can be assumed that when full water quotas are available the average number of water applications would be between 3 and 4 per season. It was commonly expressed by farmers that 4 applications were required in a season to give the best results. It was found that each application is heavy and that 4 such applications would maintain pasture production. Table VII shows the extent that various applications were made in the two seasons.

TABLE VII

Applications of Irrigation Water

Percentage of irrigated area covered by the number of applications

Irrigated area receiving	Percentage of Irrigated area 1953/54	1954/55
One application for the season	3	42
Two " " " "	46	44
Three " " " "	22	10
Four " " " "	28	4
Five " " " "	1	-
	100%	100%
AVERAGE depth of water applied in each application (inches)	5.6	4.7

This shows that in 1953/54 when irrigators received 80% water, 51% of the irrigated area was covered with 3 or more applications with an average depth of 5.6 inches each time. In 1954/55 with only 33⅓% of their normal water, they covered only 14% of their irrigated area with 3 or more applications averaging 4.7 inches each time.

In the 1953/54 season an average of 16 inches of irrigation water was applied to each acre irrigated, while in 1954/55 only 8.9 inches was applied. With the drastic cut in water in the latter year, farmers reduced the area irrigated by 18%: their attitude was optimistic in that they used a larger proportion of their water early in the season and prayed for a good rainfall to carry the pastures through. This action is shown up by the figures of the amount of water used before November 30 in the two seasons:

1953/54 34.4% of their allocation used by November 30
1954/55 52.0% do.

The term "dayhead" is a measure of the volume of water - it is the flow of a cusec or "head" of water for 24 hours. A dayhead will cover 24 acres to a depth of 1 inch () = 24 acre

inches). The normal quota in Ida Valley is based on the allowance of 150 dayheads for 200 acres irrigated for the season; that is ¾ dayhead per acre, or 18" of water over the irrigated area for the season.

In this survey it was found that the average farmer did the following amount of irrigating in the 2 seasons:

In 1953/54 he applied 126 dayheads of water on 189 irrigated acres in 63.3 days of irrigating.

In 1954/55 he applied 60 dayheads of water of 155 irrigated acres in 34.8 days of irrigating.

The average farmer normally draws about 2 heads of water at a time in order to cover a large area of land. The opinion is that a good flow of water is required to push the water over a largd area quickly and also to cover the irregular land surface that they irrigate. Very little of the area is border dyked, and flooding from contour races is the rule.

With the drastic cut in water in 1954/55 an earlier start was made with irrigation due to the lower rainfall at the time. Irrigation started nearly 3 weeks earlier than in the 1953/54 season. Whereas in 1953/54 14 farmers out of 50 started irrigating before mid-October, 33 had started by this date in 1954/55. Furthermore, the water was finished more than a month earlier than usual, and instead of finishing irrigating in March they finished at the start of February in 1954/55. Whereas 23 out of 50 farmers had finished by March 1954, 40 out of 50 farmers had finished by March 1 in 1955.

The rainfall during the growing season and the amount of irrigation water applied are shown as follows:

	1953/54	1954/55
Rainfall 1 October-31 March	7.0	8.8
Irrigation water applied per acre	16.0	8.9
Totals (inches)	23.0	17.7

Better than average rainfalls in the summer of 1954/55 played an important part in saving the pastures and in enabling the farmers to postpone the disposal of some of their livestock. Without these fortunate rainfalls in January and February, more stock would have been sold at very low prices. As it was, some sales of stock did take place that season due to the shortage of irrigation water.

Of the area on the valley floor approximately 40% is served by the irrigation scheme and charged for in a normal season. The area covered by this survey showed that of the acreage signed for in the scheme, 89% was irrigated in the 1953/54 season and 66% in the 1954/55 season.

Whereas in Ida Valley the normal allocation of water is ¾ dayhead per acre signed up for, there are five farms adjoining the valley on the Galloway side, which receive water from the same system and these are allotted 1 dayhead per acre. Furthermore these 5 farms were favoured with a higher allocation than the Ida Valley farms in recent years of water shortage. This differential treatment is a cause for some dissatisfaction among farmers in the valley. The following figures show the differences:

	Ida Valley	Galloway farms
Normal allocation per acre (day heads)	0.75	1.00
Percentage of normal allocation in 1953/54	80	92
1954/55	33½	72½

The foregoing summarises the irrigation practices of farmers when water supplies are reasonably adequate and when there is a drastic reduction in the normal quota. It also suggests the likely practices under an assured water supply. Herein possibly lies the key to a more complete exploitation of irrigation, resulting in a considerable increased farm production. This point is elaborated upon in the section dealwith with Production, which also attempts to show the effect restricted water supplies have had on stocking and output.

8. ECONOMIC FACTORS

The economic factors associated with farm management are now examined for the year 1953/54 under the following headings:

Farm Capital,
Gross Farm Income,
Total Farm Expenditure,
Owners Surplus.

The year under review was one of reasonable water supplies and, although farms were obviously not fully stocked, it does indicate the economic standing of the farming as a background to any proposed capital expenditure in the Ida Valley Irrigation Scheme.

Farm Capital

Farm capital represents the total valuation of land and improvements, plant, machinery and stock. The land and improvements are based on the latest Government valuation figures, plant and machinery figures are at estimated resale value, whilst stock has been valued at conservative market rates ruling in 1953/54.

On the smaller sized farms, capital is high at £47.10. 0 per acre but as farms increase in size, this figure falls. For farms over 1,000 acres, the average is £22 per acre and the average for all farms is £28.14. 0 per acre. Total farm capital per ewe equivalent ranges between £13.8.0 - £14.16.0. Table VIII shows the farm capital structure for the 55 farms in the survey.

TABLE VIII

Farm Capital Structure

	£	£ per acre	Per Cent
Unimproved Value of Land	228,090	7. 9. 0	
Value of improvements	336,940	11. 6. 0	
Capital Value	565,030	19. 5. 0	68
Livestock	182,913	6. 3. 0	22
Plant and Machinery	85,157	2. 9. 0	10
Total Farm Capital	833,100	28. 7. 0	100

The capital value of land and improvements form a large part of the total farm capital, but this is customary on irrigated land.

Plant and machinery can be shown in terms of power machinery with engines attached and non-power machinery:

	£	Per cent
Power machinery (tractors and trucks)	56,280	66
Non-power machinery	28,877	34
	85,157	100

The capital invested in plant and machinery in Ida Valley averages £2.18. 0 per acre which is low compared with the cropping areas, such as Otago Downlands at £4. 6. 0 per acre. Machinery generally was in fair condition with little attempt at adequate housing.

Gross Farm Income

Gross farm income comprises the receipts from livestock and other products sold during the 1953/54 season plus or minus changes in stock valuations. Table IX shows the contribution made by each item as a percentage break-up of gross income.

TABLE IX

Gross Farm Income

Item	% Contribution
Wool	42
Fat Lambs	39
Other Sheep	12
Sub Total	93
Cattle	6
Crops, Miscellaneous	1
	100%

The main feature of farm income is that 93% of the gross farm income came from sheep products of which wool and fat lambs are the two chief items. Fat lambs do particularly well in Ida Valley and as was noted in the section under lambing, a large percentage are sent to the works fat off the mothers.

Included in other sheep sold are cast-for-age ewes and rams, and fat wethers. Cash cropping is insignificant with less than 1% of farm income. Cattle sold are not very important, contributing only 6% to income but this could be higher with full water supply.

The gross farm income per farm, per acre and per ewe equivalent is now shown with the equivalent returns in parenthesis for Southern Maniototo in the year 1952/53.

Gross farm income per farm:	£5666	(7427)
" " " " acre:	£10.4.0	(5.12.0)
" " " " ewe equivalent:	£5. 6.0	(4. 2.0)

With the total valley acreage at 33,000 acres the total annual revenue accruing to the farming community is approximately £338,000.

Total Farm Expenditure

These expenses shown in Table X as a percentage break-up, include all the routine farm operating expenses, depreciation allowances on all buildings, plant and machinery, and interest charges on the valuation of livestock and plant.

TABLE X

Total Farm Expenditure

Item	%
Wages and Contract	14
Repairs and Maintenance	8
Irrigation Charge (M.O.W.)	3
Tractor, truck and car	8
Lime, fertiliser and seed	8
Cartage	3
Sheep: Flock replacements	18
Store sheep	1
Cattle	6
Other expenses	10
Depreciation	12
Interest on stock and plant	9
TOTAL	100%

The largest item in Table X is expenditure for flock replacements at 18% of total farm expenses. This high figure reflects not only the normal purchases that are required annually to maintain the ewe flock but also some additional purchases to restore the sheep numbers from the low levels caused by the forced sales of stock when irrigation water was short.

The next largest item is for wages which are no higher than for corresponding areas without irrigation. This would be reasonable considering that the number of days spent on irrigation work are not high when the water is so restricted as it has been in recent years. When full supplies of water are available and even permitting the purchase of excess water the demand on labour may cause this item for wages to rise a little.

Cattle purchases as shown for this year are well below that expected in a normal year when full water is available. The Ida Valley once produced a considerable number of prime fat cattle but this production has been severely cut in recent years.

Irrigation charges show us a remarkably low item in the expenses and this also applies to the outlays on lime, fertiliser and seed.

Again the per farm, per acre and per ewe equivalent value is compared with the Southern Maniototo Plain figures for 1952/53.

Total Farm Expenditure per farm:	£2826	(3618)
" " " " acre:	£5.2.0	(2.15.0)
" " " " ewe equivalent	£2.13.0	(2. 0.0)

Owner Surplus

Owners' surplus is the amount available from farm receipts after meeting all running expenses, depreciation on all assets and interest on the value of stock, plant and land. In other words it is the amount available to a farmer as a reward for managing and working on the farm.

Owner surplus for farm tends to rise with farm size, but the surplus per acre tends to fall as farms increase in size. The owner surplus per acre averages 85/3 for the 43 farms for which these details were available: 15 farms were below this average and 28 farms above. The surplus per farm is at a very satisfactory average figure of £2358 and 23 farms are below and 20 farms above this figure. The distribution of owner surplus is shown in the following table.

TABLE XI

Distribution of Owner Surpluses for 43 Farms

Owner Surplus	Number of Farms
Loss:	2
Surplus: up to £1,000	6
£1,000 and under £2,000	14
£2,000 and under £3,000	8
£3,000 and under £4,000	7
£4,000 and under £5,000	4
£5,000 and under £7,000	2
	43

This table shows that farmers in Ida Valley have sound financial returns which would not be much affected by additional charges for irrigation water in return for a guaranteed full supply.

The average surplus per acre is arrived at as follows:

Gross Farm Income per acre	205/-
Total Farm Expenses per acre	102/3
	102/9
Less Interest on Capital Value	17/6
Owner Surplus	85/3

Finally, it is interesting to compare this surplus with surpluses arrived at in a similar manner in Southern Maniototo and in Canterbury light lands, the latter two groups having little, if any, access to irrigation.

	Ida Valley	Southern Maniototo	Canterbury Light Lands
	1953/54	1952/53	1952/53
Owners' surplus per Farm:	£2358	£3173	£1652
Acre:	85/3	48/-	72/-
Ewe Equivalent:	44/-	36/-	-

This table serves to emphasise the sound economic background of the farming community, but, as will be stressed later, net returns fall afar short of a readily obtainbale figure under full irrigation and improved farm management techniques.

Out of the owners' surplus must be paid living expenses, income tax, savings and reinvestment in the farm. This capital reinvestment averages £285 per farm of which one half was spent on dwellings, one third on plant and machinery, one tenth, or £28, on land and the balance of £11 on farm buildings. Excluding dwellings, capital reinvestment was disappointing, and this was generally reflected in the appearance of the farms and the attitudes of the farmers.

9. PRESENT PRODUCTION

The number of breeding ewes were obtained for a period of 6 years betweenn 1950 and 1955 and these figures are used in Table XII to show the close relationship between production and irrigation water supplies.

TABLE XII

Trends in Breeding Ewe Numbers

Season	% of Normal Irrigation water Quota Received	Total Breeding Ewes to ram	Breeding Ewes per acre of Valley Floor
1949/50	68	51,600	1,56
51	17	43,100	1.31
52	82	47,000	1.43
53	67	51,300	1.56
54	80	52,000	1.58
55	33	47,600	1.44
Average 6 years	58	49,000	1.48

(Total area of Valley floor 33,000 acres).

Unfortunately a drop in the irrigation quota not only affects the currency in production but also restricts the number of breeding stock which can be wintered to provide the basis of production for the following season, regardless of irrigation water supply available for that season. Also there is evidence that having been forced to drastically reduce their ewe flocks following a season of restricted irrigation water supply, farmers do not readily expand their flocks again for fear of future water cuts and breeding ewe numbers are only built up again slowly.

Details for the seasons 1953/54 and 1954/55 when irrigation water was 80% and 33⅓% of quota respectively, illustrate the effect that restricted irrigation has on lambs production, as shown in Table XIII.

TABLE XIII

	1953/54	% Of Lambs	1954/55	% Of Lambs
Lambs tailed	998		949	
Lambs bought	12		-	
Total lambs	1,010	100	949	100
Fat off mothers	551	54.6	413	43.6
Fat off feed	242	24.0	234	24.6
Total sold fat	793	78.6	647	68.2
Other lambs sold	41	4.0	146	15.4
Ewe lambs retained	118	11.6	93	9.8
Other lambs retained	32	3.2	40	4.2
Lamb deaths	26	2.6	23	2.4
Average lambing percent	114		114	
Average weight dressed lamb	34.3		31.5	
Average weight (net) Lamb meat sold per acre valley floor (lb.)	46.8		39.7	

Note that although fat lamb meat per acre was lower in 1954/55 when irrigation water supply was 33% of quota, more lambs were sold as stores and these are not accounted for in lamb meat figures which refer only to fat lambs. Note also that fewer ewe lambs were retained due to feed shortage.

Details of wool production for the two seasons1953/54 and 1954/55 showed that wool weight per sheep shorn was 10.0 lb. and 9.8 lb., while wool weight per acre was 21.6 lb. and 19.7 in the respective seasons.

10. POTENTIAL PRODUCTION UNDER FULL IRRIGATION QUOTA

Data was collected from the surveyed farms to indicate the carrying capacity with full quota of irrigation water. This was based on stock carried in years of sufficient irrigation water, i. e. 100% quota of water. On this basis the assessed number of breeding ewes carried per acre was 2.0. Data for the 6 years 1950/1955 averaged 1.48 ewes per acre, the average quota for these years being 58%.

The following table compared a 6 year average with the estimated potential total breeding ewes which could be carried with full irrigation quota.

TABLE XIV

Breeding Ewes - under Restricted and full Irrigation Quotas

Area of Valley floor	33,000 acres
Breeding Ewes average of 6 years (1.48 ewes per acre)	49,000 ewes
Breeding Ewes potential with full quota of water (2.0 ewes per acre)	66,000 "
Increase	17,000 "

Assuming that two thirds of ewe flocks were maintained by breeding own replacements, potential winter carrying capacity under full irrigation quota would be:

TABLE XV

(See next page)

Livestock under restricted and full irrigation quotas. TABLE XV

	6 year average	100% Quota
Breeding ewes	49,000	66,000
Ewe Hoggets	7,500	10,000
Other Sheep	7,500	6,500
Breeding Cows	125	200
Other Cattle	700	1,120
Ewe equivalents per acre Valley floor	1.9	2.5

This gives an estimated winter carrying capacity of 2.5 ewe equivalents per acre with full quota of water and is an increase of .6 ewe equivalents per acre (32% increase) on the six year average.

In order to estimate the increase in quantity of lamb meat produced the following assessments have been made in Table XVI.

TABLE XVI

Lamb Production under Both Restricted and full Irrigation Quota

	Average 6 seasons	100% quota
Breeding ewes	49,000	66,000
Lambing percentage	114	114
Lambs tailed	55,860	75,240
Fat lambs sold	41,660	56,210
Other lambs sold (5%)	2,790	3,760
Ewe lambs retained	7,500	10,000
Other lambs retained (4%)	2,230	3,010
Lamb deaths (3%)	1,680	2,260
Area valley floor	33,000	33,000
Average weight dressed lamb	33 lb.	34 lb.
Total weight dressed meat	1,374,800 lb.	1,911,100 lb.
Average weight lamb meat sold per acre valley floor(lb)	42	58

Fat lambs sold increase by 14,550 (35%) and total lamb meat by 536,300 lb. (39%)

To arrive at potential wool production, winter carrying capacity figures were reduced by 5% to allow for deaths. This gave the following sheep shorn, and the total wool weights were calculated using 10 lb. of wool per sheep as the basis.

TABLE XVII

Wool Production Under restricted and full Irrigation quotas

	Average 6 seasons	100% quota
Sheep shorn	60,700	78,380
Total weight wool shorn	607,000 lb	783,800
Bales of wool (325 lb.)	1,868	2,412
Wool per acre of Valley floor	18.4	23.5

This represents an increase of 176,800 lb. (29%) or 544 bales from the 33,000 acres of valley and associated hill country with full quota of water. The production from the hill country would remain a constant factor.

The following Table XVIII summarises the likely increases in production if full quota of water was available as compared with the six seasons of restricted water supply 1950/1955. These production increases would mean an addition to the gross income of approximately £84,000 based on current prices, - no account has been made for the additional revenue from the sale of old ewes which would be disposed of as fats.

TABLE XVIII

Summary of Stocking and Production - Under restricted and Full Irrigation quotas

	Breeding Ewes		Ewe Equivalents per acre	Wool		Fat Lamb meat		Sale of Stock			TOTAL
	Per acre	Total		Per Acre lb.	Total lb.	Per acre	Total	Fat Lambs	Store	Cattle	
Average 6 yrs 1950/55 Average 58% Irrigation quota	1.48	49,000	1.9	18.4	607,000 (1,868 bales)	42	1,374,800	41,660	2,790	330 (est)	
Potential 100% irrigation quota	2.0	66,000	2.5	23.5	783,800 (2,412 bales)	58	1,911,100	56,210	3,760	660	
Increases	.5	17,000 (35%)	.6	5.1	176,800 (544 bales) (29%)	16	536,300 (39%)	14,550 (35%)	970 (31%)	330 (100%)	
Value of increase at current prices				(3/6)	£30,940			(59/-) £42,923	(35/-) £1,697	(£25) £8,250	Approx. £84,000

11. ADDENDUM TO POTENTIAL PRODUCTION : GERMAN HILLS

It has been suggested that if steps were taken to increase the storage for the Ida Valley Scheme it would be difficult in higher rainfall seasons, to resist demands for an extended irrigation scheme. This is likely to consist of a new race running from Moa Creek to Poolburn Creek and extending on down the east or German Hill side of the valley.

Some of these farmers can irrigate a small area of their farms from the present scheme, but the proposed extension would embrace an additional 4,000 acres.

In Table XIX an attempt has been made to measure the increased production following irrigation of the 4,000 acres by a comparison between present and potential production.

TABLE XIX

German Hills Scheme - 4,000 acres
Present and Potential Production

	Present		Potential		Increase	
	Per acre	Total	Per acre	Total	Per acre	Total
Breeding Ewes	1	4,000	2.5	10,000	1.5	6,000
Total Ewe Equiv.	1.5	6,000	4.0	16,000	2.5	10,000
Wool lb.	12.0	* 150 bale	29	360 bale	17	210 bale
Fat Lamb Meat lb.	25	100,000	66	264,000	41	164,000
Fat Cattle	-	30	-	90		60

* 1 bale = 325 lb.

(Increased revenue on current cost price rates would amount to approximately £28,000)

The present stocking and production of the 4,000 acres likely to be commanded by the scheme can only be assessed as each farm has areas of non-irrigible flats plus substantial areas of hill country. By reasons of aspect and topography, this area lends itself to irrigation and appeals more than any other area inspected and there should be little difficulty in attaining the above production figures. Of course, subdivision of farms and paddocks would become imperative, and in common with the remainder of the valley, there would have to be a stepping up of farming efficiency to cope successfully with increased stocking.

12. PRESENT AND POTENTIAL PRODUCTION UNDER 100% IRRIGATION QUOTA INCLUDING GERMAN HILLS SCHEME

Thus, if in the future, sufficient water is available to ensure not only the full quota of water for the present scheme, but sufficient to irrigate the 4,000 acres included in the supposed German Hills Scheme, the resultant increase in stocking and production is summarised in Table XX.

TABLE XX (See next page)

TABLE XX

Present and Potential Production

	Present	Potential 100% Quota Ida Valley Scheme	German Hills Increase with Irrigation	Total prod. with 100% quota and German Hills	Total Increase
Carrying Capacity					
Breeding ewes	49,000	66,000	6,000	72,000	23,000 (47%)
Production					
Wool (lb)	607,000	783,000	68,200	852,000	245,000 (40%)
Fat lamb meat (lb)	1,374,800	1,911,100	164,000	2,075,100	700,300 (51%)
Cattle (Store and fat)	330	660	60	720	390 (118%)

This total production increase in terms of additional gross income represents approximately £110,000 based on current prices. (That is for wool, fat lamb and cattle increases).

It should be emphasised that the above increases are computed on the carrying capacity and production of the Ida Valley (including German Hills) in years of full quota water supplies. These increases are by no means excessive - in fact, it is our opinion that three breeding ewes plus replacements, plus cattle, totalling four ewe equivalents per acre could be carried on the Valley floor following full irrigation under the following conditions:

(a) With a full quota of water, it should be possible by border dyking, x sprinkler irrigation and controlled wild flooding to irrigate an additional 4,000 acres.

(b) Thus the Manorburn, which is now nominally supplying water for 12,000 acres plus Galloway, could satisfactorily command 16,000 acres plus Galloway and excluding the 4,000 acres in the proposed German Hills Scheme.

(c) To fully capitalise on an assured water supply, the acreage of lucerne should be considerably expanded.

(d) The seepage problem must be overcome by a greater realization of the virtues of controlled irrigation. The larger holdings can, under present conditions, support a sizeable area of seepage with a dense rush cover without reducing stock numbers, but the more efficient smaller farms cannot afford this waste.

(e) To exploit the irrigation potential sub-division of farms and paddocks is an urgent pre-requisite.

(f) A higher all round standard of farming efficiency would be required.

13. ATTITUDES

Co-operation was excellent throughout the survey, and farmers were frank in their opinions. It was evident that

the older farmers are loath to meet increased irrigation charges in return for an assured supply of irrigation water, although much of this resistance could be traced to confused thinking. The younger group of farmers are progressive in outlook and ideas and without exception are prepared to pay increased irrigation charges for a guaranteed irrigation water supply and to fully exploit such a supply.

It is strongly recommended, however, that before any future proposal relevant to the Ida Valley Scheme is put to the farmers' vote, a personal visit should be made to each farmer to fully acquaint him with all facts of the proposal in relation to his own farm. Otherwise, misinterpretation and misunderstandings will lead to muddled thinking and final rejection of a proposal.

14. GALLOWAY SCHEME

The 5 farms on the Galloway side that are supplied from the Upper Manorburn Dam, have some differences in farming from Ida Valley. These 5 holdings show a great range in size and in farm production. On 2 of these farms other water is available from pumping schemes for irrigation, and another farm has purchased some land near Omakau to use for fattening: 3 of the farms have barren run country attached.

Approximately 1500 acres are irrigated from the Galloway Scheme. Mention has been made of the larger water allocation made to these farmers, and under normal conditions this is justified by the facts that soils are generally more porous, they require more frequent irrigations and the rainfall is lower than in Ida Valley. Compared with the 4 applications needed in Ida, these farms need 6 or more on their stony soils and at least 4 on their best soil. From the records available, it appears that the rainfall is lower by nearly 3" per annum (12" compared with 15" in Ida). In the past 3 dry years the rainfall has averaged 11.46" per year, compared with 12.7" at Moa Creek. The rainfall received in the growing season is compared over the past six years:

	Rainfall received from 1 October - 31 March	
Season	Galloway	Moa Creek
1949/50	7.21"	7.56
1950/51	5.95	8.55
1951/52	10.45	9.75
1952/53	7.77	11.47
1953/54	5.86	6.98
1954/55	6.38	8.75

In general, finer woolled sheep are run than in Ida, to utilise their run country. Lambing percentage tends to be lower at 94% (114% in Ida) and 48% lambs are fattened off (68% Ida).

More lambs for replacements are kept, and there is less buying in of stock on these farms. This retention of lambs results in a lower sale of lamb meat from these farms. Wool production averaged 8.6 lb. per sheep shorn of fine wool, compared with 9.8 lb. of medium crossbred wool in Ida.

The average figures for gross income, farm expenditure and owner surplus are similar to Ida Valley. The average owner surplus is approximately £2,500 compared with £2,348 in Ida. Average returns for the area of effective valley land are compared with Ida:

Financial Returns per acre

	Galloway	Moa Creek
Gross Farm Income	205/-	180/-
Farm Expenditure	102/3	82/-
	102/9	98/-
Interest on Capital Value	17/6	14/-
Owner surplus	85/3	84/-

With such remarkable likeness in these returns there appears to be no grounds for altering the present allocation practice for irrigation. As in Ida Valley these farmers could use more water, and these areas of shortage have affected their stock numbers and production to the same extent as in Ida. Similarly with an assurance of 100% water supply this area could increase production to the same degree as in Ida Valley.